Phase 1 Heritage Impact Assessment of the proposed new construction of a new Waste Water Treatment Works (WWTW) and associated pipe line infrastructure in the town of Sterkspruit, EC Province.

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Executive Summary

At the request of Eko Environmental Consultants a Phase 1 Heritage Impact Assessment was carried out for the three-phase construction of a new Waste Water Treatment Works (WWTW) and associated pipeline infrastructure in the town of Sterkspruit in the Eastern Cape Province. A pedestrian survey revealed no evidence of *in situ* Stone Age archaeological material, capped or distributed as surface scatters on the landscape. There are also no indications of rock art, prehistoric structures or historical buildings older than 60 years within the vicinity of the study area. It is unlikely that the proposed development will result in any significant archaeological impact along the demarcated footprints. The proposed pipeline routes are regarded as of low archaeological significance and are assigned the rating of Generally Protected C (GP.C).

The palaeontological significance of the sedimentary bedrock at Sterkspruit is considered high and the nature of the proposed development suggests possible impact on potentially fossil-bearing Stormberg Group strata. It is considered likely that fossil remains may be encountered during excavation of sedimentary bedrock within the proposed pipeline and pump station footprints for Phase 1, 2, and 3. However, fossils are not evenly distributed in their occurrence in sedimentary strata so the probability of palaeontological impact resulting from a linear development of this scale may not be as high. The sedimentary bedrock component at Sterkspruit is rated Generally Protected A (GP.A). An investigation of alluvial deposits of the Kromspruit and associated tributaries indicates that impact on potential palaeontological heritage resources within the overlying Quaternary soils is unlikely. The palaeontological significance of the unconsolidated Quaternary soils is therefore considered as low. The superficial sediment component at Sterkspruit is rated Generally Protected C (GP.C).

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Introduction

At the request of Eko Environmental Consultants a Phase 1 Heritage Impact Assessment was carried out for the three-phase construction of a new Waste Water Treatment Works (WWTW) and associated pipeline infrastructure in the town of Sterkspruit in the Eastern Cape Province (**Fig. 1**). The study is required in terms of Section 38 of the National Heritage Resources Act 25 of 1999 as a prerequisite for any development which will change the character of a site exceeding 5 000 m2 in extent or new linear development exceeding 300 m in length. The task involved identification and mapping of possible archaeological heritage within the proposed project area, an assessment of their significance, related impact by the proposed development and recommendations for mitigation where relevant.

Terms of Reference

- Identify and map possible heritage sites and occurrences using available resources.
- Determine and assess the potential impacts of the proposed development on potential heritage resources;
- Recommend mitigation measures to minimize potential impacts associated with the proposed development.

Methodology

The heritage significance of the affected area was evaluated through a desktop study and carried out on the basis of existing field data, database information and published literature. This was followed by a field assessment by means of a pedestrian survey. A Garmin Etrex Vista GPS hand model (set to the WGS 84 map datum) and a digital camera were used for recording purposes. Relevant archaeological and palaeontological information, aerial photographs and site records were consulted and integrated with data acquired during the on-site inspection. The study area is rated according to field rating categories as prescribed by SAHRA (**Table 1**).

Description of the Affected Area

Locality data

1 : 50 000 scale topographic map: 3027CB Sterkspruit

1 : 250 000 scale geological map 3026 Aliwal North

The study area is located within the town of Sterkspruit. The proposed footprint is primarily located within commercial and residential areas (**Fig. 2**).

Background

Palaeontology

Sterkspruit lies within the outcrop area of the Molteno Formation (Stormberg Group). The Molteno Formation overlies the Beaufort Group and consists of a sequence of coarse-grained sandstone and mudstone that was deposited in a braided river, fluvial environment. This formation contains an extremely rich fossil flora, silicified woods and palynormorphs (MacRae, 1999; McCarthy and Rubidge, 2005). Apart from important insect fauna, animal fossils are very sparse, including rare fish, conchostracans, bivalves as well as invertebrate trace fossils and dinosaur tracks. Rare trackways do provide some of the earliest indirect evidence for the first dinosaurs to appear in the South African fossil record (MacRae, 1999; McCarthy and Rubidge, 2005). The Elliot Formation consists of a sequence of red mudstone and subordinate sandstone that was deposited in an arid, braided river and playa lake environment. The formation contains one of richest Late Triassic to Early Jurassic dinosaur faunas in the world, containing key data on early diversification of the dinosaurs. Several important new dinosaur taxa have recently been discovered in the Free State, including early dinosaurs, ornithischians, rare theropods and crocodilomorphs as well as rare amphibians, turtles, fish, advanced mammal-like reptiles and early mammals. Other fossil elements include petrified wood insects and trace fossils (MacRae, 1999; McCarthy and Rubidge, 2005). The lower Elliot Formation is associated with the Late Triassic aged “Euskelesaurus” Range Zone, whilst the upper Elliot Formation is associated with the Early Jurassic *Massospondylus* Range Zone.

There is currently no record of Quaternary fossil localities in the vicinity of Sterkspruit.

Archaeology

The archaeological footprint of the region is largely represented by rock art sites, Stone Age cave deposits and open sites. Rock paintings are numerous in the region, but are primarily restricted to sandstone cliffs, caves and overhangs. Rock paintings

have been recorded at a number of cave sites between Sterkspruit and Herschel (Van Riet Lowe 1941).

Field Assessment

Phase 1

The WWTW site is underlain by a thick mantle of Quaternary to recent superficial deposits that has been disturbed by previous construction activities (**Fig. 3**) A small farm cemetery is located at the entrance to the existing WWTW (**Fig. 4**). The footprint of the proposed gravity and pump lines are underlain by Stormberg Group sediments capped by shallow to deep superficial deposits of varying depth. The pipelines are located next to existing tar and gravel roads within the commercial and residential area of the town (**Fig. 5**).

There is no above-ground evidence of intact or capped Stone Age or prehistoric archaeological material within the confines of the footprint for the new WWTW and associated pipelines. There are no indications of prehistoric structures, rock art sites or historically significant structures older than 60 within the Phase 1 footprint area.

Phase 2

The footprint of the proposed pump station, pump and gravity lines is located next to existing tar and gravel roads within the commercial and residential area of the town (**Fig. 6 & 7**). The proposed route is underlain by Stormberg Group outcrop and geologically recent superficial deposits. No fossils were observed within exposed bedrock outcrop covered by the footprint. There is no above-ground evidence of intact or capped Stone Age or prehistoric archaeological material within the confines of the Phase 2 footprint. There are no indications of prehistoric structures, rock art sites or historically significant structures older than 60 within the Phase 1 footprint area.

Phase 3

The pump station site is located on Quaternary to recent superficial deposits. The associated pipeline footprint is located next to existing tar and gravel roads within the commercial and residential area of the town (**Fig. 8**). No fossils were observed within exposed bedrock outcrop covered by the footprint. There is no above-ground evidence of intact or capped Stone Age or prehistoric archaeological material within the

confines of the Phase 3. There are no indications of prehistoric structures, rock art sites or historically significant structures older than 60 within the Phase 3 footprint area.

Impact Statement

The palaeontological significance of the sedimentary bedrock at Sterkspruit is considered high and the nature of the proposed development suggests possible impact on potentially fossil-bearing Stormberg Group strata. It is considered likely that fossil remains may be encountered during excavation of sedimentary bedrock within the proposed pipeline and pump station footprints for Phase 1, 2, and 3. However, fossils are not evenly distributed in their occurrence in sedimentary strata so the probability of palaeontological impact resulting from a linear development of this scale may not be as high. The sedimentary bedrock component at Sterkspruit is rated Generally Protected A (GP.A).

An investigation of alluvial deposits of the Kromspruit and associated tributaries indicates that impact on potential palaeontological heritage resources within the overlying Quaternary soils is unlikely. The palaeontological significance of the unconsolidated Quaternary soils is therefore considered as low. The superficial sediment component at Sterkspruit is rated Generally Protected C (GP.C).

It is unlikely that the proposed development will result in any significant archaeological impact along the demarcated footprints. The terrain is regarded as of low archaeological significance and is assigned the rating of Generally Protected C (GP.C).

Recommendation

Sterkspruit is underlain by palaeontologically significant Stormberg Group sediments, and any damage to, or loss of fossils due to inadequate mitigation would be a highly negative palaeontological impact. On the other hand, exposure as a result of excavation and subsequent reporting of fossils could be seen as a positive palaeontological impact provided that SAHRA is notified immediately.

The graveyard located at the WWTW site should be fenced off and included into the development management plan as a no-go zone. The site must be strictly avoided.

References

Groenewald, G.H. and Groenewald, D. 2013. Palaeontological heritage in the Free State. SAHRA Palaeotechnical Report.

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McCarthy, T. and Rubidge, B.S. 2005. *The Story of Earth and Life*. Struik Publishers, Cape Town.

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Kitching, J.W. 1977. *The distribution of the Karoo Vertebrate fauna*. BPI Memoir 1. University of the Witwatersrand.

Van Riet Lowe, C. 1941. *Prehistoric Art in South Africa*. Archaeological Series No. V. Bureau of Archaeology, Dept. of the Interior. Pretoria.

Tables and Figures

Table 1. Field rating categories as prescribed by SAHRA.

Field Rating	**Grade**	**Significance**	**Mitigation**
National Significance (NS)	Grade 1	-	Conservation; national site nomination
Provincial Significance (PS)	Grade 2	-	Conservation; provincial site nomination
Local Significance (LS)	Grade 3A	High significance	Conservation; mitigation not advised
Local Significance (LS)	Grade 3B	High significance	Mitigation (part of site should be retained)
Generally Protected A (GP.A)	-	High/medium significance	Mitigation before destruction
Generally Protected B (GP.B)	-	Medium significance	Recording before destruction
Generally Protected C (GP.C)	-	Low significance	Destruction

Table 2. Featuresand localities recorded during the foot survey.

Feature	**Coordinates**
Phase 1 WWTW	30°31'6.88"S 27°22'0.85"E
Phase 2 Pump station	30°32'4.98"S 27°20'39.27"E
Phase 3 Pump station	30°31'23.17"S 27°22'18.08"E
Cemetery	30°31'10.08"S 27°21'56.26"E
Bridge	30°32'11.57"S 27°18'58.39"E

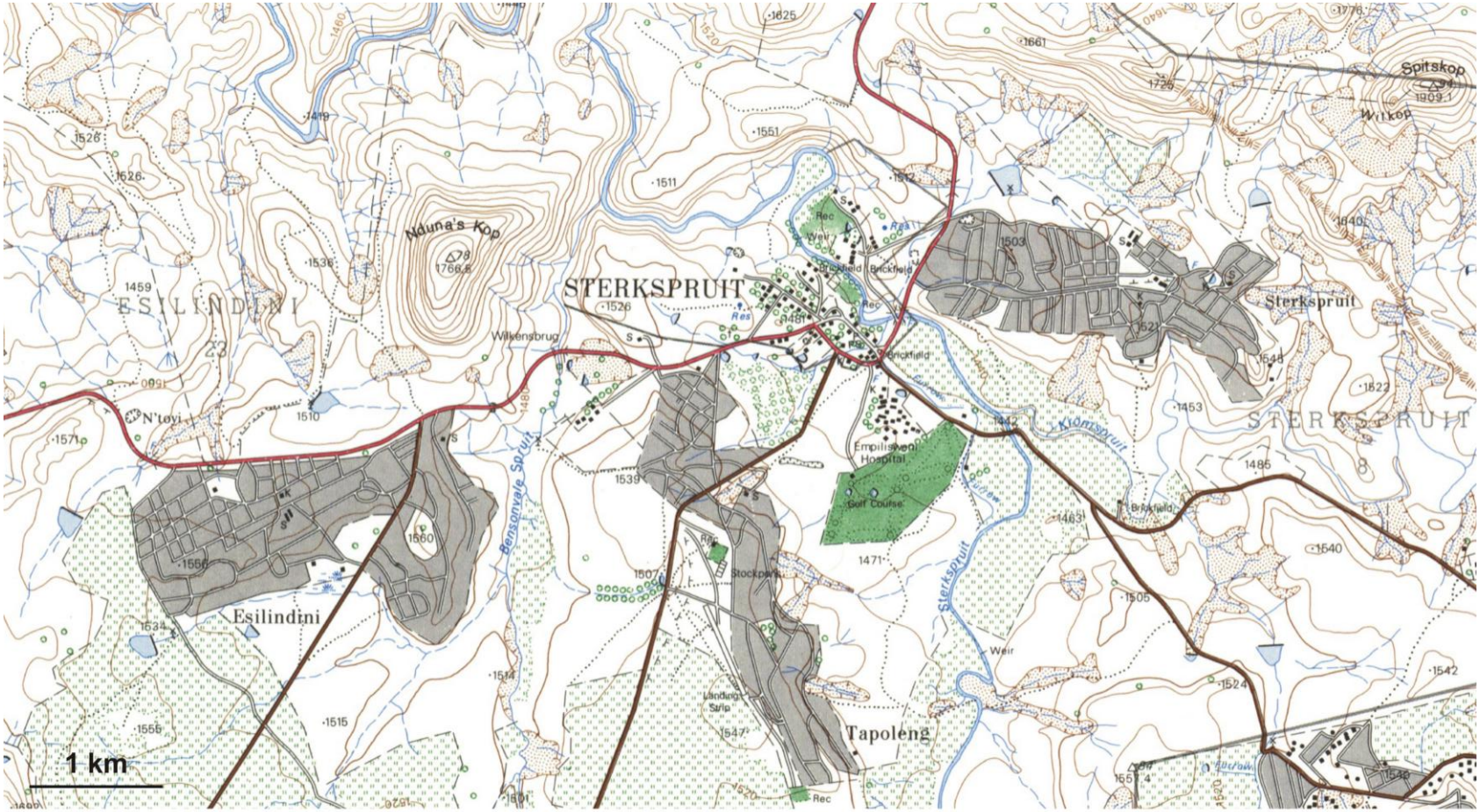

Figure 1. Map of Sterkspruit (portion of 1:50 000 topographical map 3027CB Sterkspruit)

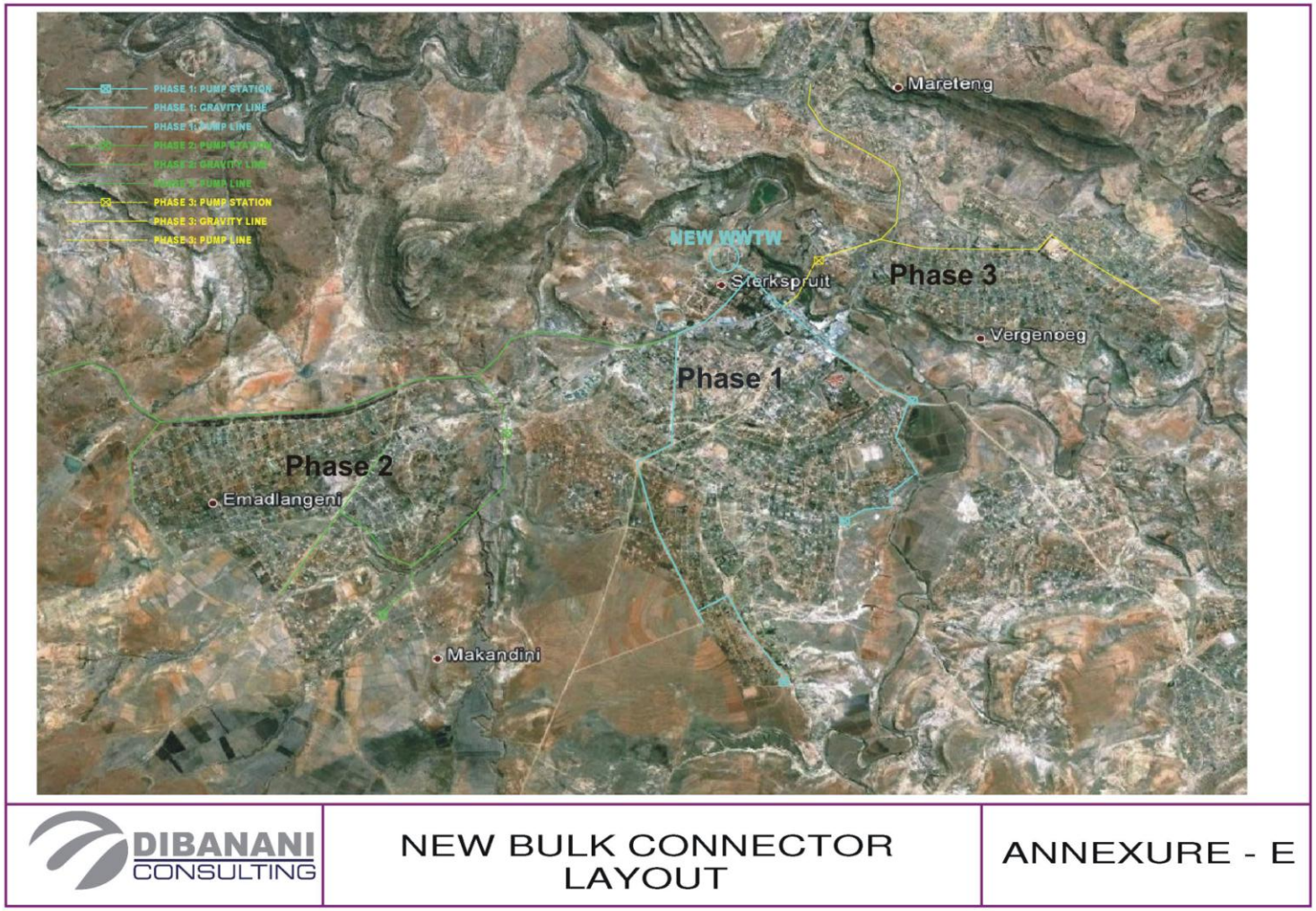

Figure 2. Layout of the proposed development.

Figure 3. The WWTW site looking north (above) and overbank (alluvial) deposits of the Kromspruit at the WWTW site, looking southwest (below).

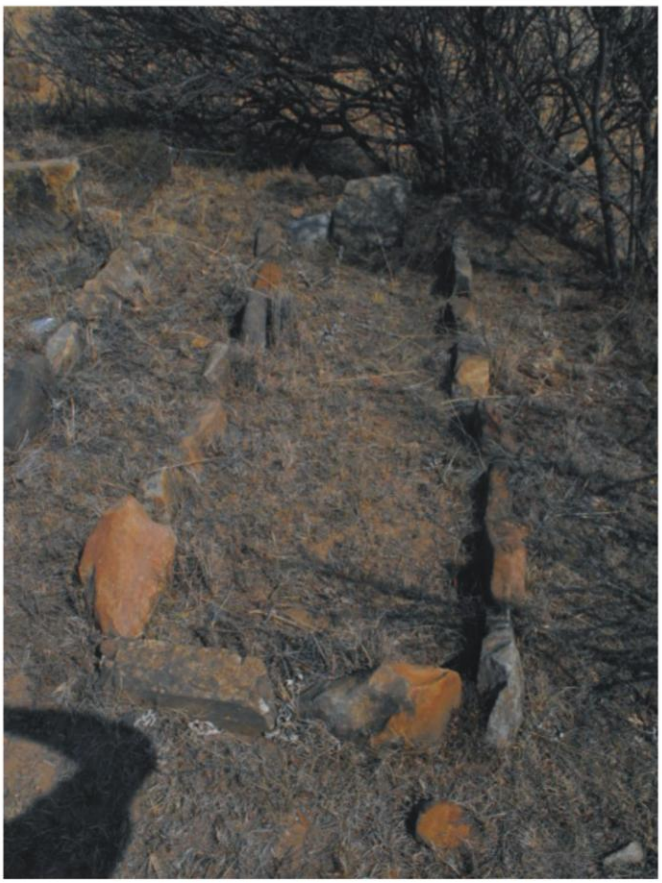

Figure 4. Small graveyard located near the entrance to the proposed new WWTW site.

Figure 5. Phase 1 pipeline route

Figure 6. Phase 2 pipe line route.

Figure 7. Phase 2 pipe line route.

Figure 8. Phase 3 pipe line route.