PALAEONTOLOGICAL IMPACT ASSESSMENT OF THE PROPOSED DEVELOPMENT OF THE H2 ENERGY POWER STATION AND ASSOCIATED INFRASTRUCTURE ON PORTION 21; 22 AND 23 OF THE FARM HARTEBEESTSPRUIT IN THE THEMBISILE HANI LOCAL MUNICIPALITY, NKANGALA DISTRICT NEAR KWAMHLANGA, MPUMALANGA PROVINCE

Prepared for:
Savannah Environmental (Pty) Ltd
PO Box 148
Sunninghill
Johannesburg
2157

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Prepared by

BANZAI ENVIRONMENTAL (PTY) LTD

P.O. BOX 11023

UNIVERSITAS

BLOEMFONTEIN

9323

EXECUTIVE SUMMARY

H2 Energy (Pty) Ltd proposes the development of the 600 MW H2 Energy Power Station and associated infrastructure near KwaMhlanga, in Mpumalanga Province. The development site is approximately 9 km south of KwaMhlanga, and approximately 800 m north of the Palesa Coal Mine. According to the National Heritage Resources Act (Act No 25 of 1999, section 38), a palaeontological impact assessment is required to detect the presence of fossil material within the proposed development footprint and to assess the impact of the construction and operation of the project on the palaeontological resources.

The proposed development site of the H2 Energy Power Station (Portion 21; 22 and 23 of Hartebeestspruit 434) is underlain by the metamorphic sediments of the Selons River Formation (Rooiberg Group, 2.06 billion years old) and Ecca Group (Early-Mid Permian, 290-266 million years old, Karoo Supergroup). The metamorphic rocks are unfossiliferous and thus have an insignificant to zero palaeontological sensitivity. The Ecca Group is not known to contain body fossils of vertebrates, but trace and plant fossils have been described as well as coal beds. This Group has a high palaeontological sensitivity.

An EIA level palaeontology report will be conducted to assess the value and prominence of fossils in the development area and the effect of the proposed development on the palaeontological heritage. The purpose of the EIA Report is to elaborate on the issues and potential impacts identified during the scoping phase. A Phase 1 field-based assessment will be conducted and research in the site-specific study area as well as a comprehensive assessment of the impacts identified during the scoping phase.

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1 INTRODUCTION

Savannah Environmental (Pty) Ltd has been appointed as the independent Environmental Consultants by H2 Energy for the undertaking of the Environmental Impact Assessment (EIA) process for the proposed H2 Energy Power Station and associated infrastructure.

The proposed power station will have a generation capacity of up to 600 MW. The H2 Energy Power Station is planned to make use of Supercritical (SC) or Ultra-supercritical (USC) Pulverised Coal (PC) or Circulating Fluidised Bed (CFB) boiler technology, dry cooling methods, and dry ash disposal methods. Coal required to fuel the project will be sourced from the Palesa Coal Mine located approximately 800 m south of the project site, and will be transported to site via overland conveyor. Bulk water required for the project will comprise treated municipal grey water, and will be supplied by one or more Local Municipalities. Bulk water will be transported to site via overland pipeline(s). Electricity generated by the power station will feed into the grid via a new 275kV overhead power line.

Environmental Authorisation (EA) for the bulk water supply pipeline, and power lines will be obtained under separate applications for Authorisation, and have therefore been excluded from the current scope of EIA. Mention will however be made of these facilities.

Description

The facility is proposed to make use of Supercritical (SC) or Ultra-supercritical (USC) Pulverised Coal (PC) or Circulating Fluidised Bed (CFB) boiler technology and will include the following infrastructure:

- Power generation units –These units will make use of Pulverised Coal (PC) or Circulating Fluidised Bed (CFB) boiler technology, and dry cooling methods; and will have a generation capacity of up to 600 MW. Supercritical (SC) or Ultra-supercritical (USC) boiler technology is envisaged for implementation. SC and USC boiler technologies are more efficient than conventional subcritical boiler technology, and will result in reduced emissions and waste streams.
- Overland coal conveyor – an overland conveyor will be constructed between the Palesa Coal Mine and proposed project site, to provide for the supply of raw coal to the project.
- Raw material loading and offloading, storage areas, and handling facilities – designated areas for the loading and offloading, and storage of raw materials such as coal and limestone (in the case of CFB technology) will be established on site. These storage areas will be equipped with necessary infrastructure such as stackers and reclaimers. The main coal stockpile will be located within the mine property, with a strategic 30-day stockpile located on the site.
- Coal crusher (and screening plant in the case of PC technology) – to allow for the crushing of Run of Mine (RoM) coal to adequate size for use in the combustion process in the boilers.

- Flue Gas Cleaning (Flue Gas Desulphurisation (FGD) plant and Selective Non-Catalytic Reduction (SNCR) plant in the case of PC technology).
- Ash dump – Ash generated by the project will be stored in an above-ground ash dump to be located within the project site. Dry ashing technology will be used. Ash stored in the ash dump will be compacted and rehabilitated using topsoil and vegetation.
- Water infrastructure such as a raw water storage dam, storm water runoff dam, ash dump runoff dam, and wastewater treatment plant – bulk water required to supply the project comprising treated Municipal grey water will be transported to site via overland pipeline(s). Bulk raw water will be treated in the onsite wastewater treatment plant to create boiler feed water for use in the power station, potable water, as well as water to be used in the firefighting pumps and emergency diesel feed water pumps. Rain water runoff from the power station and coal stockpile will be collected in a storm water runoff dam before being treated for use in dust suppression activities. Runoff collected from the ash dump will be stored in an ash dump runoff dam, and will be used for ash conditioning in the ash dump sprays. Wastewater and effluent generated onsite will be collected, reused and recycled such that no offsite disposal will be required. The power station will be designed as a Zero Liquid Effluent Discharge (ZLED) site.
- A substation – for the transformation of electricity generated by the project, and to allow for its integration into Eskom's national electricity grid before being transmitted and distributed to end users.
- Office and maintenance area/s and buildings – to support the onsite personnel and day-to-day functioning, and successful running and maintenance of the project. These include administrative buildings, change houses and bathrooms, security building, medical station, and canteen.
- Access roads – to provide main and secondary access to, and within the proposed project site and its various facilities.

The project is intended to form part of the Department of Energy's (DoE's) Coal Baseload Independent Power Producer (IPP) Procurement Programme. Ultimately, the power generated from the power station will feed into and supplement the national electricity grid.

The Power Plant Facility design is based on the availability of 3 million tonnes per annum RoM coal for the remaining 30 year Life of Mine (LoM). The plant capacity will be up to a maximum of 600 MW electricity production with the project potentially being implemented in phases.

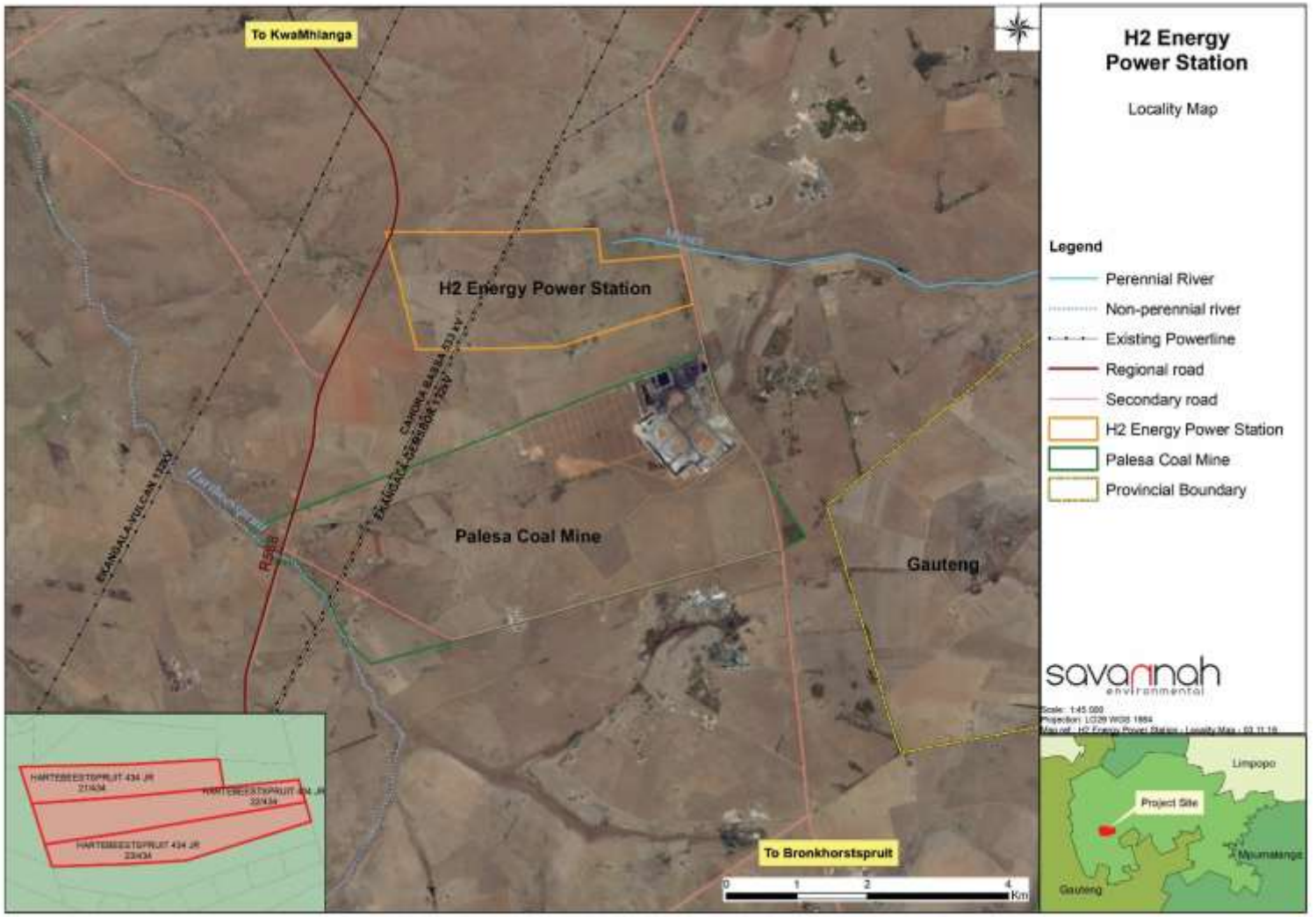

Figure 1: The location of the 600 MW H2 Energy Power Station and associated infrastructure located on Portion 21; 22 and 23 of the Farm Hartebeestspruit No 434 in the Thembisile Hani Local Municipality, Nkangala District near KwaMhlanga, Mpumalanga Province (Map provided by Savannah Environmental).

1.1 LEGISLATION

Cultural Heritage in South Africa is governed by the National Heritage Resources Act (Act 25 of 1999). This Palaeontological Environmental Impact Assessment forms part of the Heritage Impact Assessment (HIA) and complies with the requirements of the above mentioned Act. In accordance with Section 38, an HIA is required to assess any potential impacts to palaeontological heritage within the site.

SECTION 35 OF THE NATIONAL HERITAGE RESOURCES ACT 25 OF 1999

- The protection of archaeological and palaeontological sites and material and meteorites is the responsibility of a provincial heritage resources authority.
- All archaeological objects, palaeontological material and meteorites are the property of the State.
- 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.
- No person may, without a permit issued by the responsible heritage resources authority—
    - Destroy, damage, excavate, alter, deface or otherwise disturb any archaeological or palaeontological site or any meteorite;
    - Destroy, damage, excavate, remove from its original position, collect or own any archaeological or palaeontological material or object or any meteorite;
    - Trade in, sell for private gain, export or attempt to export from the Republic any category of archaeological or palaeontological material or object, or any meteorite; or
    - Bring onto or use at an archaeological or palaeontological site any excavation equipment or any equipment which assist in the detection or recovery of metals or archaeological and palaeontological material or objects, or use such equipment for the recovery of meteorites.
- When the responsible heritage resources authority has reasonable cause to believe that any activity or development which will destroy, damage or alter any archaeological or palaeontological site is under way, and where no application for a permit has been submitted and no heritage resources management procedure in terms of section 38 has been followed, it may—
    - Serve on the owner or occupier of the site or on the person undertaking such development an order for the development to cease immediately for such period as is specified in the order; and/or
    - Carry out an investigation for the purpose of obtaining information on whether or not an archaeological or palaeontological site exists and whether mitigation is necessary.

2 OBJECTIVE

According to the South African Heritage Resources Agency (SAHRA) Archaeology, Palaeontology and Meteorites (APM) Guidelines: Minimum Standards for the Archaeological and Palaeontological Components of Impact Assessment Reports, the aims of the palaeontological impact assessment are:

- To identify exposed and subsurface rock formations that are considered to be palaeontologically significant;
- To assess the level of palaeontological significance of these formations;
- To comment on the impact of the development on these exposed and/or potential fossil resources; and
- To make recommendations as to how the developer should conserve or mitigate damage to these resources.

The objective is therefore to conduct a Palaeontological Impact Assessment, which forms of part of the Heritage Impact Assessment (HIA) and the EIA Report, to determine the impact of the development on potential palaeontological material at the site.

When a palaeontological desktop/scoping study is conducted, the potentially fossiliferous rocks (i.e. groups, formations, members, etc.) represented within the study area are determined from geological maps. The known fossil heritage within each rock unit is collected from published scientific literature; fossil sensitivity maps; consultations with professional colleagues, previous palaeontological impact studies in the same region and the databases of various institutions may be consulted. This data is then used to assess the palaeontological sensitivity of each rock unit of the study area on a desktop level. The likely impact of the proposed development on local fossil heritage is subsequently established on the basis of the palaeontological sensitivity of the rocks and the nature and scale of the development itself (extent of new bedrock excavated).

If rocks of moderate to high palaeontological sensitivity are present within the study area, a Phase 1 field-based assessment by a professional palaeontologist is necessary. Generally, damaging impacts on palaeontological heritage occur during the construction phase. These excavations will modify the existing topography and may disturb, damage, destroy or permanently seal-in fossils at or below the ground surface that are then no longer available for scientific study.

When specialist palaeontological mitigation is suggested, it may take place prior to construction or, even more successfully, during the construction phase when new, potentially fossiliferous bedrock is still exposed and available for study. Mitigation usually involves the careful sampling, collection and recording of fossils, as well as relevant data concerning the surrounding sedimentary matrix. Excavation of the fossil heritage will require a permit from SAHRA and the material must be housed in a permitted institution. With appropriate mitigation, many developments involving bedrock excavation will have a *positive* impact on our understanding of local palaeontological heritage.

3 GEOLOGICAL AND PALAEONTOLOGICAL HISTORY

The Karoo Supergroup strata are between 310 and 182 million years old and span the Upper Carboniferous to Middle Jurassic Periods. During this period the basin developed from an inland sea flooded by a melting ice cap, to a giant lake (Ecca Lake) fed by seasonal meandering (and periodically braided) rivers. The lake progressively shrank as it filled with sediment and the basin's rate of subsidence stabilised.

The Beaufort Group consists of largely fluvial sediments which were deposited on the floodplains of these rivers. In time the land became progressively more arid and was covered with windblown sand just before the end of the basin's cycle. Finally the subcontinent was inundated with basaltic lava to form the capping basalts of the Jurassic aged Drakensberg Group. During the Jurassic, the volcanic Drakensberg were formed and cracks in the earth's crust were filled with molten lava that cooled to form dolerite dykes. Magma injected horizontally between sediments, cooled down and formed horizontal sills of dolerite.

3.1 GEOLOGY

The geology of the study area is on the 1:250 000 geology map 2528 of Pretoria (Council for Geoscience). The H2 Energy Power Station development is underlain by the Selons River Formation (Rooiberg Group, Transvaal Supergroup) approximately 2.6 billion years old and the Early to Mid - Permian Ecca Group (Karoo Supergroup) of approximately 290-266 million years old.

Selons River Formation (Rooiberg Group)

According to SACS (1980) the Rooiberg Group consisted of the Selons River Formation which was divided in the Klipnek Member and the Doornkloof Member. Schweitzer *et al*. (1995) correlated the Doornkloof and Klipnek Members of the Selons River Formation (SACS, 1980) with the Schrikkloof and Kwaggasnek Formations respectively, thus rendering the Selons River Formation and its members redundant. The Kwaggasnek, Schrikkloof, Damwal and Dullstroom Formations are now known as the Rooiberg Group and comprises of volcanic units. Metamorphosed sediments of quartzites, sandstones, mudrocks and cherts are present which is mainly fluvial in origin.

Ecca Group

The Permian aged Ecca Group is characterized by shale, shaly sandstone, grit, sandstone conglomerate, and coal in places near the base and top. The Ecca Group consists of mainly deep water sediments in the south and deltaic sediments with extensive coal beds in the north.

3.2 PALAEONTOLOGICAL HERITAGE

Selons River Formation (Rooiberg Group)

As already mentioned, the Rooiberg Group is approximately 2.6 billion years old and comprises of volcanic units. The Rooiberg Group is known not to be fossiliferous.

Ecca Group

The Ecca Group is not known to contain body fossils of vertebrates, but trace and plant fossils have been described from the group. The Ecca is well-known for the occurrence of coal beds that resulted from the accumulation of plant material over long periods of time. Plant fossils described by Bamford (2011); Azaniodendron fertile, Cyclodendron leslii, Sphenophyllum hammanskraalensis, Annularia sp., Raniganjia sp., Asterotheca spp., Liknopetalon enigmata, Glossopteris more than 20 species, Hirsutum 4 spp., Scutum 4 spp., Ottokaria 3 spp., Estcourtia sp., Arberia 4 spp., Lidgetonnia sp., Noeggerathiopsis sp. and Podocarpidites sp. According to Bamford (2011) "Little data have been published on these potentially fossiliferous deposits. Around the coal mines there is most likely to be good material and yet in other areas the exposures may be too poor to be of interest. When they do occur fossil plants are usually abundant and it would not be feasible to preserve and maintain all the sites, however, in the interests of heritage and science such sites should be well recorded, sampled and the fossils kept in a suitable institution".

This trace fossil assemblage of the non-marine *Mermia* Ichnofacies, is dominated by the ichnogenera *Umfolozia* (arthropod trackways) and *Undichna* (fish swimming trails), the unique mesosaurid reptiles, palaeoniscoid fish, small eocarid crustaceans, insects, trace fossils (king crab track ways. shark coprolites?), palynomorphs (organic-walled spores and pollens), petrified wood (mainly of primitive gymnosperms, silicified or calcified) and sparse vascular plant remains (Glossopteris leaves, lycopods etc).

Figure 2: The surface geology of the proposed 600 MW H2 Energy Power Station and associated infrastructure located on Portion 21; 22 and 23 of the Farm Hartebeestspruit No 434 in the Thembisile Hani Local Municipality, Nkangala District near KwaMhlanga, Mpumalanga Province. The site is completely underlain by the Selons River Formation (Transvaal Group) and Ecca Group.

4 GEOGRAPHICAL LOCATION OF THE SITE

The proposed site is located approximately 9 km south of KwaMhlanga, and approximately 800 m north of the Palesa Coal Mine in the Thembisile Hani Local Municipality of the Nkangala District in Mpumalanga Province.

5 METHODS

A Palaeontological Scoping study was conducted to assess the potential risk to palaeontological material (fossil and trace fossils) in the proposed area of development. The author's experience, aerial photos (using Google, 2015), topographical and geological maps and other reports from the same area were used to assess the proposed area of the development

5.1 ASSUMPTIONS AND LIMITATIONS

The accuracy and reliability of desktop Palaeontological Impact Assessments as components of heritage impact assessments are normally limited by the following restrictions:

- Old fossil databases that have not been kept up-to-date or are not computerised. These databases do not always include relevant locality or geological information. South Africa has a limited number of professional palaeontologists that carry out fieldwork and most development study areas have never been surveyed by a palaeontologist.
- The accuracy of geological maps where information may be based solely on aerial photographs and small areas of significant geology have been ignored. The sheet explanations for geological maps are inadequate and little to no attention is paid to palaeontological material.
- Impact studies and other reports (*e.g*. of commercial mining companies) - is not readily available for desktop studies.

Large areas of South Africa have not been studied palaeontologically. Fossil data collected from different areas but in similar Assemblage Zones might however provide insight on the possible occurrence of fossils in an unexplored area. Desktop studies therefore usually assume the presence of unexposed fossil heritage within study areas of similar geological formations. Where considerable exposures of bedrocks or potentially fossiliferous superficial sediments are present in the study area, the reliability of a Palaeontological Impact Assessment may be significantly improved through field-survey by a professional palaeontologist.

6 IMPACT ASSESSMENTS

A scoping assessment of the impact significance of the proposed 600 MW H2 Energy Power Station and associated infrastructure located on Portion 21; 22 and 23 of the Farm Hartebeestspruit No 434 on local fossil heritage is presented here:

6.1 NATURE OF THE IMPACT

Infrastructure associated with the H2 Energy Power Station includes:
(Information supplied by Savannah)

- Power generation units
- Overland coal conveyor.
- Raw materials loading and offloading, storage areas, and handling facilities.
- Coal crusher (and screening plant in the case of PC technology).
- Emission stacks
- Flue gas cleaning (Flue Gas Desulphurisation (FGD) plant and Selective Non-Catalytic Reduction (SNCR) plant in the case of PC technology).
- Ash dump.
- Water infrastructure including a raw water storage dam, wastewater treatment plant and storm water runoff and ash dump runoff dams.
- A substation/switching yard.
- Office and maintenance area/s and buildings.
- Access roads.

The excavations and site clearance will involve substantial excavations into the superficial sediment cover as well as locally into the underlying bedrock. These excavations will modify the existing topography and may disturb, damage, destroy or permanently seal-in fossils at or below the ground surface that are then no longer available for scientific research.

6.2 SENSITIVE AREAS

The site is underlain by the Selons River Formation (Rooiberg Group) and Ecca Group (Fig. 2). The Selons River Formation is volcanic rocks and is unfossiliferous. The Ecca Group is not known to contain body fossils of vertebrates, but trace and plant fossils have been described from the group. This Group has a high palaeontological sensitivity.

6.3 GEOGRAPHICAL EXTENT OF IMPACT

The impact on fossil materials and thus palaeontological heritage will be limited to the construction phase when new excavations into fresh potentially fossiliferous bedrock take place. The extent of the area of potential impact is thus restricted to the project site and therefore categorised as **local**.

6.4 DURATION OF IMPACT

The expected duration of the impact is assessed as potentially permanent to long term. In the absence of mitigation procedures (should fossil material be present within the affected area) the damage or destruction of any palaeontological materials will be **permanent.**

6.5 POTENTIAL SIGNIFICANCE OF THE IMPACT

Should the project progress without due care to the possibility of fossils being present at the proposed site within the Ecca Group the resultant damage, destruction or inadvertent relocation of any affected fossils will be **permanent and irreversible**. Thus, any fossils occurring within the study area are potentially scientifically and culturally significant and any negative impact on them would be of **high significance**.

6.6 SEVERITY / BENEFIT SCALE

The development of the proposed H2 Energy Power Station and associated infrastructure is **beneficial** on not only a local level, but regional and national levels as well. The facility will provide a long term benefit to the community in terms of creating jobs and would thus provide an economical boost to the area.

A potential **secondary advantage** of the construction of the project would be that the excavations may uncover fossils that were hidden beneath the surface exposures and, as such, would have remained unknown to science.

6.7 STATUS

Probability of the impact occurring
There is a possibility that fossil heritage will be recorded in the study area. Probable significant impacts on palaeontological heritage during the construction phase are **high**, but the intensity of the impact on fossil heritage is rated as **medium**.

Intensity
The intensity of the impact on fossil heritage is rated as **medium.**

7 DAMAGE MITIGATION, REVERSAL AND POTENTIAL IRREVERSIBLE LOSS

7.1 MITIGATION

Should fossil material exist within the area proposed for the development any negative impact upon it could be mitigated by surveying, recording, describing and sampling of well-preserved fossils by a professional palaeontologist. This should take place after the initial vegetation clearance but *before* the ground is levelled for construction. Excavation

of fossil heritage will require a permit from SAHRA and the material must be housed in a permitted institution. In the event that an excavation is impossible or inappropriate the fossil or fossil locality could be protected and the site of any planned construction and infrastructure moved.

7.2 DEGREE TO WHICH THE IMPACT CAN BE MITIGATED

The Ecca Group is not known to contain body fossils of vertebrates, but trace and plant fossils have been described from the group. This Group has a moderate palaeontological sensitivity and chances that fossils fill be found is low. Recommended mitigation of the inevitable damage and destruction of fossil heritage within the proposed site would involve the surveying, recording, description and collecting of fossils within the development footprint by a professional palaeontologist. This work should take place after the initial vegetation clearance has taken place but *before* the ground is levelled for construction. However, the significance of the impact following the mitigation will remain low.

7.3 DEGREE OF IRREVERSIBLE LOSS

Impacts on fossil heritage are generally irreversible. Well-documented records and further palaeontological studies of any fossils exposed during construction would represent a positive impact from a scientific perspective. The possibility of a negative impact on the palaeontological heritage of the area can be reduced by the implementation of adequate mitigation procedures. If mitigation is properly undertaken the benefit scale for the project will lie within the beneficial category.

7.4 DEGREE TO WHICH THE IMPACT MAY CAUSE IRREPLACEABLE LOSS OF RESOURCES

Stratigraphic and geographical distribution of Ecca Group fossils is documented in the literature. It is thus **possible** that exceptional fossil material is present on the development area. By taking a precautionary approach, an insignificant loss of fossil resources is expected.

7.5 CUMULATIVE IMPACTS

The cumulative effect of the development of the H2 Energy Power Station within the proposed location is considered to be medium.

8 FINDINGS AND RECOMMENDATIONS

The proposed development site of the H2 Energy Power Station and associated infrastructure (Portion 21; 22 and 23 of Hartebeestspruit 434) is underlain by the metamorphic sediments of the Selons River Formation (Rooiberg Group, 2.06 billion years

old,) and Ecca Group (Early-Mid Permian, 290-266 million years old, Beaufort Group, Karoo Supergroup). The metamorphic rocks are unfossiliferous and thus have an insignificant to zero palaeontological sensitivity. The Ecca Group is not known to contain body fossils of vertebrates, but trace and plant fossils have been described. The Ecca is also well-known for the occurrence of coal beds. This Group has a moderate palaeontological sensitivity. Regardless of the sparse and sporadic occurrence of fossils in this biozone a single fossil can have a huge scientific importance as many vertebrate fossil taxa are known from a single fossil.

An EIA level palaeontology report will be conducted to assess the value and prominence of fossils in the development area and the effect of the proposed development on the palaeontological heritage. The purpose of the EIA Report is to elaborate on the issues and potential impacts identified during the scoping phase. A Phase 1 field-based assessment will be conducted and research in the site-specific study area as well as a comprehensive assessment of the impacts identified during the scoping phase.

9 IMPACT TABLE

Impacts:
There is a possibility that trace fossils, mesosaurid reptiles, palaeoniscoid fish, palynomorphs and petrified wood will be recorded in the proposed development site. Probable significant impacts on palaeontological heritage during the construction phase are high.
Desktop Sensitivity Analysis of the Site:

ISSUE	NATURE OF IMPACT	EXTENT OF IMPACT	NO-GO AREAS
Loss of Palaeontological Heritage:	Construction of the H2 Energy Power Station and associated infrastructure will permanently modify the existing topography and may disturb damage, destroy or permanently seal-in fossils at or below the ground surface and are then no longer available for scientific research or as cultural heritage. Any fossils occurring in the project area are potentially scientifically and culturally significant and any negative	Long term Local impact and limited to the construction phase	At this point in time no-go areas have not been identified

	impact on them would be of high significance. The Rooiberg Group is known not to be fossiliferous. The Ecca Group is especially known for trace fossils. This Group is also known for mesosaurid reptiles, palaeoniscoid fish, palynomorphs and petrified wood as well as for the occurrence of coal beds. The destruction or inadvertent relocation of any affected fossils will be permanent and irreversible.		

Description of expected significance of impact

Significance:
Should the project progress without due care to the possibility of fossils being present at the proposed site within the Ecca Group the resultant damage, destruction or inadvertent relocation of any affected fossils will be permanent and irreversible. Thus, any fossils occurring within the study area are potentially scientifically and culturally significant and any negative impact on them would be of high significance.

Consequence:
The excavations and site clearance will involve substantial excavations into the superficial sediment cover as well as locally into the underlying bedrock. These excavations will modify the existing topography and may disturb, damage, destroy or permanently seal-in fossils at or below the ground surface that are then no longer available for scientific research.

Duration:
The expected duration of the impact is assessed as potentially permanent g term. In the absence of mitigation procedures (should fossil material be present within the affected area) the damage or destruction of any palaeontological materials will be permanent.

Probability of the impact occurring:
There is a possibility that fossil heritage will be recorded in the proposed study area. Probable significant impacts on palaeontological heritage during the construction phase are high, but the intensity of the impact on fossil heritage is rated as medium.

Degree to which the impact may cause irreplaceable loss of resources:
Stratigraphic and geographical distribution of Ecca Group fossils, is documented in the literature. It is thus possible that exceptional fossil material is present on the development area. By taking a precautionary approach, an insignificant loss of fossil resources is expected.

Degree to which the impact can be mitigated:
Recommended mitigation of the inevitable damage and destruction of fossil heritage within the proposed site would involve the surveying, recording, description and collecting of fossils within the development footprint by a professional palaeontologist. This work should take place after the initial vegetation clearance has taken place but before the ground is levelled for construction. However, the significance of the impact following the mitigation will remain low.

Degree of irreversible loss
Impacts on fossil heritage are generally irreversible. Well-documented records and further palaeontological studies of any fossils exposed during construction would represent a positive impact from a scientific perspective. The possibility of a negative impact on the palaeontological heritage of the area can be reduced by the implementation of adequate mitigation procedures, although the significance of the impact after mitigation will still remain low. If mitigation is properly undertaken the benefit scale for the project will lie within the beneficial category.

Gaps in knowledge and recommendations for further study
Regardless of the sparse and sporadic occurrence of fossils in this biozone a single fossil can have a huge scientific importance as many vertebrate fossil taxa are known from a single fossil. It is not possible to accurately assess the exceptional value of fossil heritage at the site, without an EIA.

Cumulative impacts
The cumulative effect of the development of the H2 Energy Power Station within the proposed location is considered to be medium.

Methodology
An EIA level palaeontology report will be conducted to assess the value and prominence of fossils in the development area and the effect of the proposed development on the palaeontological heritage. This consists of a Phase 1 field-based assessment by a professional palaeontologist. The purpose of the EIA Report is to elaborate on the issues and potential impacts identified during the scoping phase. This is achieved by site visits and research in the site-specific study area as well as a comprehensive assessment of the impacts identified during the scoping phase.

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11 QUALIFICATIONS AND EXPERIENCE OF THE AUTHOR

The author (Elize Butler) has an MSc in Palaeontology from the University of the Free State, Bloemfontein, South Africa. She has been working in Palaeontology for more than twenty three years. She has been conducting Palaeontological Impact Assessments since 2014.

12 DECLARATION OF INDEPENDENCE

I Elize Butler, declare that I am an independent consultant and have no business, financial, personal or other interest in the proposed project, application or appeal in respect of which I was appointed other than fair remuneration for work performed in connection with the activity, application or appeal. There are no circumstances that compromise my objectivity in this work.