

REPORT:

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FIELD-BASED INVESTIGATION ON THE OCCURRENCE OF FOSSIL-BEARING STRATA AT VAALBULT 3 IT PORTIONS 1, 9 & 10, CAROLINA MPUMALANGA AND PROPOSALS FOR A FOSSIL IDENTIFICATION PROTOCOL

Compiled for: Mr Mike Harrington

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24th January 2014

Ref: D011211

Declaration

I, DIGBY JAMES COMRIE GOLD, declare that -

- I act as the independent specialist in this application;
- I do not have and will not have any vested interest (either business, financial, personal or other) in the undertaking of the proposed activity, other than remuneration for work performed in terms of the Environmental Impact Assessment Regulations, 2010;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the National Environmental Management Act, 1998 as amended (the Act), regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority and any decision to be taken with respect to the application by the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of Regulation 71 and is punishable in terms of section 24F of the Act.



Signature of the specialist:

24th January 2014

Date:

EXECUTIVE SUMMARY

This report is part of a Heritage Impact Assessment (HIA) for the EMPr being submitted by the Vaalbult Mining Company (Pty) Ltd who is proposing to mine coal on portions 1, 9 and 10 of the Farm Vaalbult 3 IT approximately 13 km west of Carolina (Mpumalanga Province). This report supplements the *Palaeontological Desktop Report* undertaken by Professor Bruce Rubidge (20 January 2014), and relates to a field-based palaeontological assessment undertaken by Dr Digby Gold, at the request of Mr Mike Harrington of Vaalbult mining (Pty) Ltd, as required by the SAHRA correspondence dated 14th and 22nd January 2014.

During the extensive walk-over field investigations at Vaalbult that have been continuous since February 2012 no fossiliferous deposits have been found on site. Only one observed outcrop of Vryheid Formation rocks are observed – a low escarpment of sandstone found adjacent to the large pan which occurs in the northern part of Portion 9 of Vaalbult – these rocks are stratigraphically below the coal and will not be impacted on by mining. In addition, while the coal seams in the area are intersected by the topography, they are not exposed anywhere on Vaalbult i.e. they are covered by soils and possibly by Quaternary deposits which are found in the valley floor. No sandstone or shale partings within the coal seams were observed during exploration drilling.

The proposed mining methods include opencast and high wall mining. Highwall mining does not interfere with the overlying strata at all; therefore any fossiliferous occurrence above the coal would not be impacted on by the highwall miner. However, opencast mining destroys the integrity of the stratigraphy found above the coal deposit, but it allows for exposure of rocks that potentially could contain fossils. Opencast mining will be carried out within areas that have been utilised as commercial crop lands and have therefore already had their surfaces disturbed by ploughing and crop cultivation. A protocol has been recommended for finding and monitoring for potential fossil-bearing sequences. This protocol includes:

- The on-site checks for the occurrence of any fossils of the excavated pit (blasted material, floor of the excavation, as well as the exposed high wall) and stockpiled material (overburden and coal) once a month for the first six months of the mining operation by a suitably qualified earth scientist. The frequency of these checks will be assessed after six months, based on the findings and the planned mining programme.
- The training of at least one senior member of the on-site staff in the observation of fossils / fossil-bearing strata such that the potential for fossil observations is increased during the period between the visits carried out by the qualified earth scientist.
- A procedure to be followed should fossils / fossil-bearing strata be found.

Field-based palaeontological assessment – Vaalbult Mine

Introduction

Dr Digby Gold was requested by Mr Mike Harrington of Vaalbult mining (Pty) Ltd to carry out a field-based palaeontological assessment as required by the SAHRA correspondence dated 14th January 2014.

Background

This report is part of a Heritage Impact Assessment (HIA) for the EMPr being submitted by the Vaalbult Mining Company (Pty) Ltd who are proposing to mine coal on portions 1, 9 and 10 of the Farm Vaalbult 3 IT in the Carolina area (Mpumalanga Province). The proposed colliery will be situated approximately 13 km west of Carolina (Figure 1).

This report supplements the *Palaeontological Desktop Report* undertaken by Professor Bruce Rubidge (20 January 2014), and is compiled by Dr Digby Gold who has been appointed as the exploration geologist and has worked on the project from its onset. Dr Gold graduated with a PhD in structural geology and sedimentology in 1994. He has extensive geological mapping and field experience and has worked mostly in northern KwaZulu-Natal, Mpumalanga and Swaziland. He is a registered geologist with the South African Council for Natural Scientific Professions (Reg. # 400033/06).

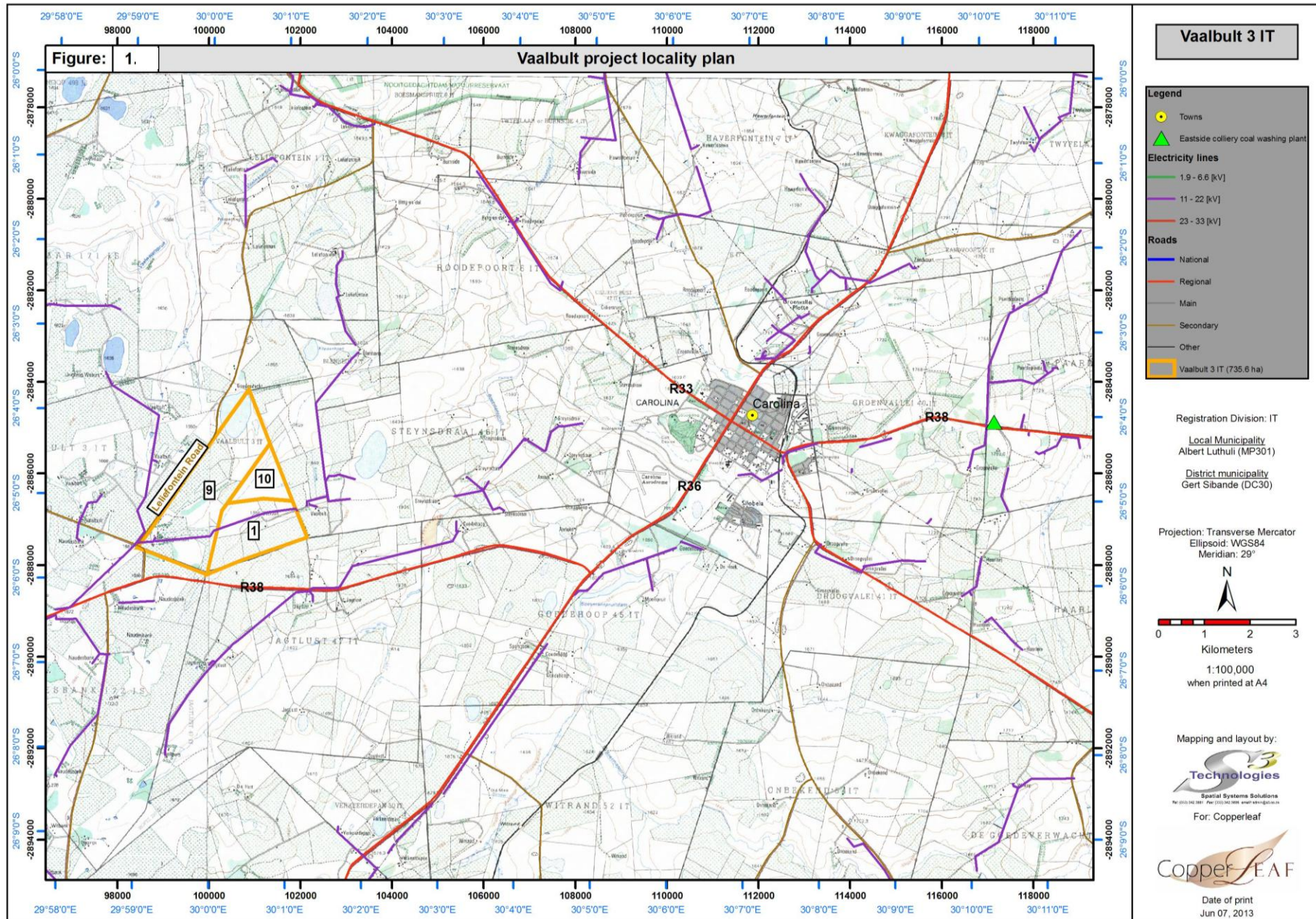
Requirements from SAHRA:

Vaalbult Mining received a letter from SAHRA (dated 14th January 2014) in which the following request was made:

“A field-based palaeontological assessment be completed prior to development in order to determine if any fossiliferous surface exposures will be impacted by the proposed mining activities. This assessment must include a protocol for finds as well as a system for the ongoing monitoring of the fossiliferous fine-grained partings of siltstone and mudstone between the coal layers, and in the sequences above and below the seams. This assessment must satisfy SAHRA's minimum requirements and must be submitted to SAHRA for comment in terms of Section 38(8) of the NHRA”.

This report addresses the above.

The occurrence of Fossil-Bearing Strata at Vaalbult



Proposed Mining Methods

Mining will exploit the D and E coal seams which are found within the Vryheid Formation, Ecca Group, Karoo Supergroup (Figure 2). These sedimentary rocks are of Permian age. Mining will take place between an elevation of 1655m amsl and 1680m amsl. The contact between the Vryheid Formation and the underlying Dwyka Group is found at an elevation of 1625m amsl.

The colliery will utilise two different mining techniques with mining starting on Portion 9 of the Farm Vaalbult 3 IT. Initially there will be an opencast operation that will cover an area of about 30ha (Figure 3). Opencast mining will be carried out in the east (Portion 1) during years 9 to 11. No mining will occur on Portion 10. The second mining method will involve the use of a Highwall miner. This is a technique that has been used extensively in the USA and in India but is a new technique to South Africa. Currently there is only one Highwall miner in the country and that is in use on a mine near Witbank.

It is important to distinguish between the two different mining methods and how they would potentially impact on any palaeontologically significant sites.

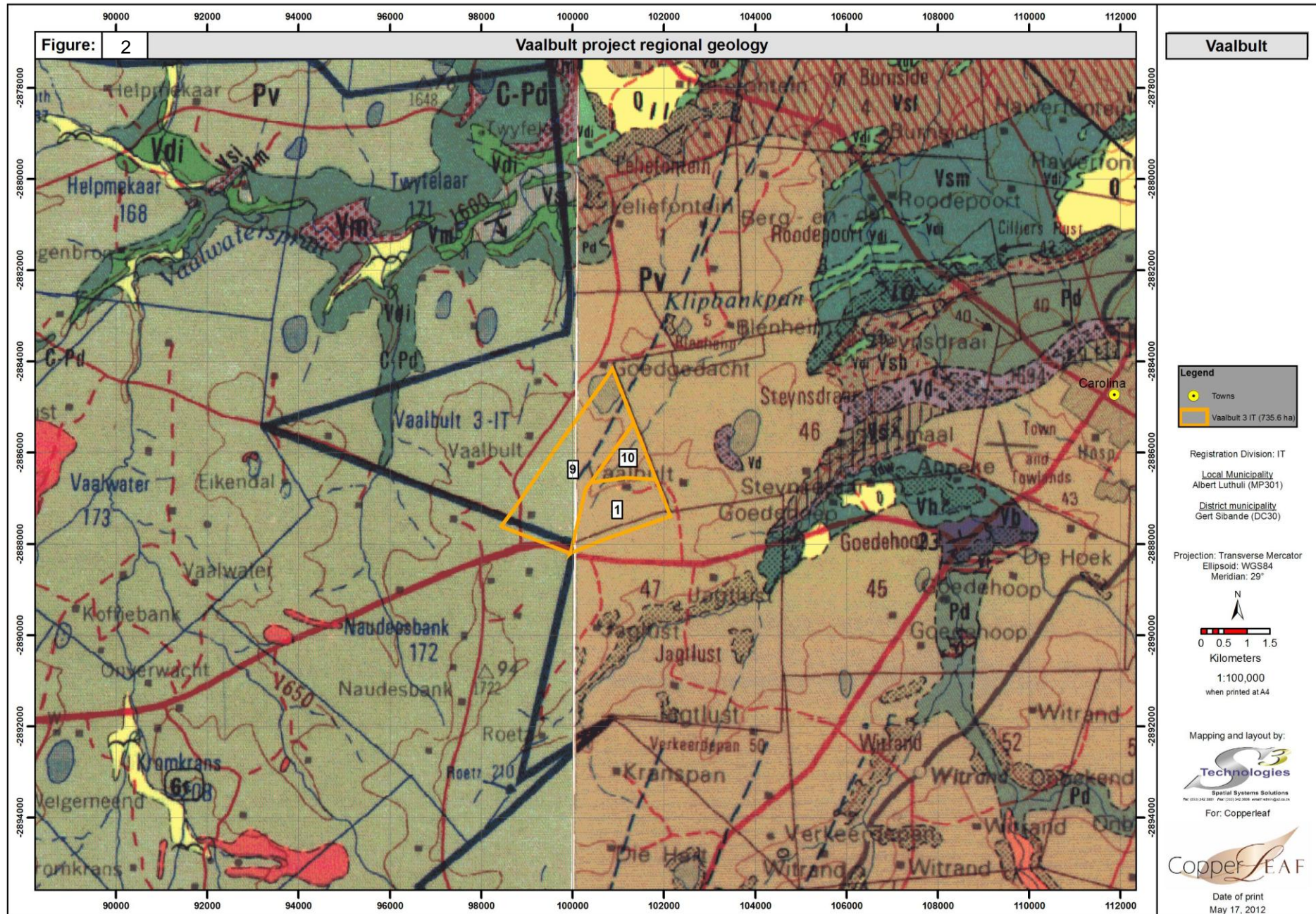
Opencast Mining:

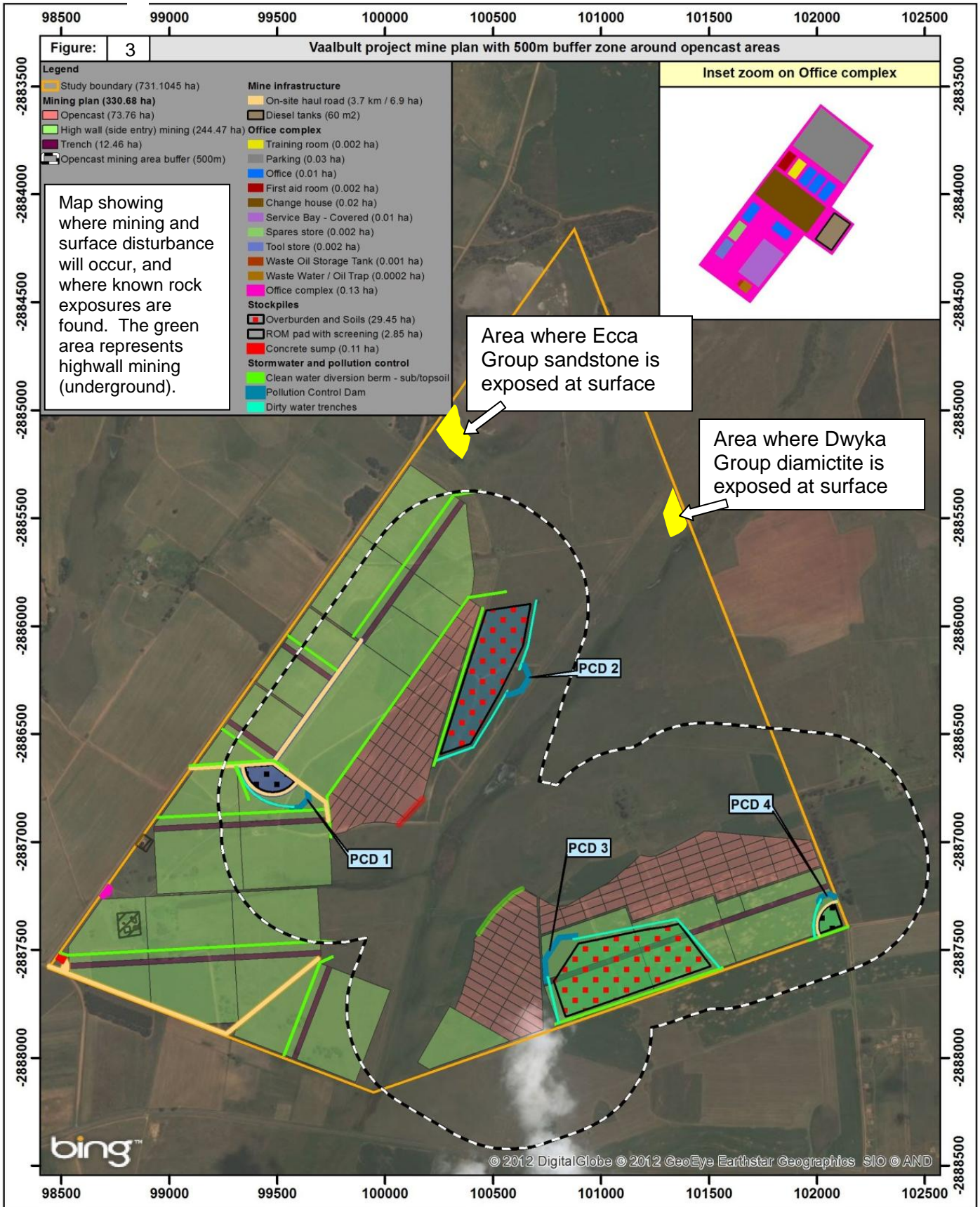
Opencast mining involves the excavation and removal of material. This material is either stockpiled on site, such as the material that is overburden to the coal or it is removed from site – i.e. the coal. An initial box-cut is excavated where the soft material is stripped off with an excavator and trucks and stockpiled separately according to topsoil, subsoil and weathered rock overburden. The remaining hard-rock overburden will be broken up through drill and blast to enable removal with an excavator and truck operation to expose the coal. Box cut material will be stockpiled adjacent to the opencast area.

The coal exposed at the bottom of the opencast pit is then removed. It is expected that much of the coal may be excavated without blasting (free digging). Once the coal has been removed, then the stockpiled material will be used to close the final void of the operation.

In essence, the existing sedimentary succession that currently exists above the coal that will be mined utilising the opencast mining method will be destroyed and this succession will be reconfigured during the backfilling phase.

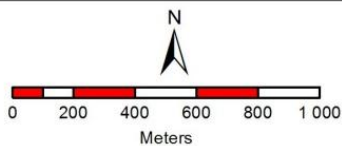
The occurrence of Fossil-Bearing Strata at Vaalbult





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VAALBULT



Copper LEAF

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Highwall Mining:

Highwall mining accesses the coal through the highwall that is created as a result of opencast mining or from the creation of access trenches. Such trenches would be excavated using conventional opencast methods and machinery. On average the trenches are approximately 20 to 30 m wide at the base (point where coal is exposed) with a surface width of approximately 90 m depending on an appropriate slope safety factor. The overburden of successive trenches will be used to backfill the final void of the opencast block or previous trenches in sequence.

Highwall mining results in the extraction of strips of coal using a specialised machine and leaving long pillars of coal as continuous pillars between each successive drive (Figures 4a-c highwall miner). A highwall miner (such as the CAT 320 HWM) is capable of cutting a 3.6 m wide entry for a length of up to 320 m. The height of the cut depends on the coal seam thickness. The highwall miner cuts the coal at the face and transports it to the 'surface' via its linked conveyor system. Highwall mining does not require persons underground and is operated remotely from surface.

Figure 4a: High wall method of mining (source CAT Brochure). The mining machine extends access the coal seam from an excavated highwall and extends underground for a distance up to 320m. Only the coal is extracted and the overlying strata are not disturbed.



Figure 4b: Photograph taken at the Pocahontas Mine, Kentucky, USA, showing how the highwall miner accesses the coal from a highwall. Note the pillars that remain intact between the successive strips where coal is extracted.



Figure 4c: The continuous miner head that is used to cut the coal for the Highwall miner.



The significant difference between the respective mining methods is that opencast mining destroys the integrity of the stratigraphy found above the coal deposit while the Highwall mining does not interfere with the overlying strata at all. In other words, any fossiliferous occurrence above the coal would not be impacted on by the Highwall miner.

The occurrence of potential fossiliferous deposits at Vaalbult

Figure 5 shows a palaeomap which has been extracted from the SAHRA website which shows that Vaalbult is located within an area which is considered to have a very high sensitivity for the occurrence of fossils.

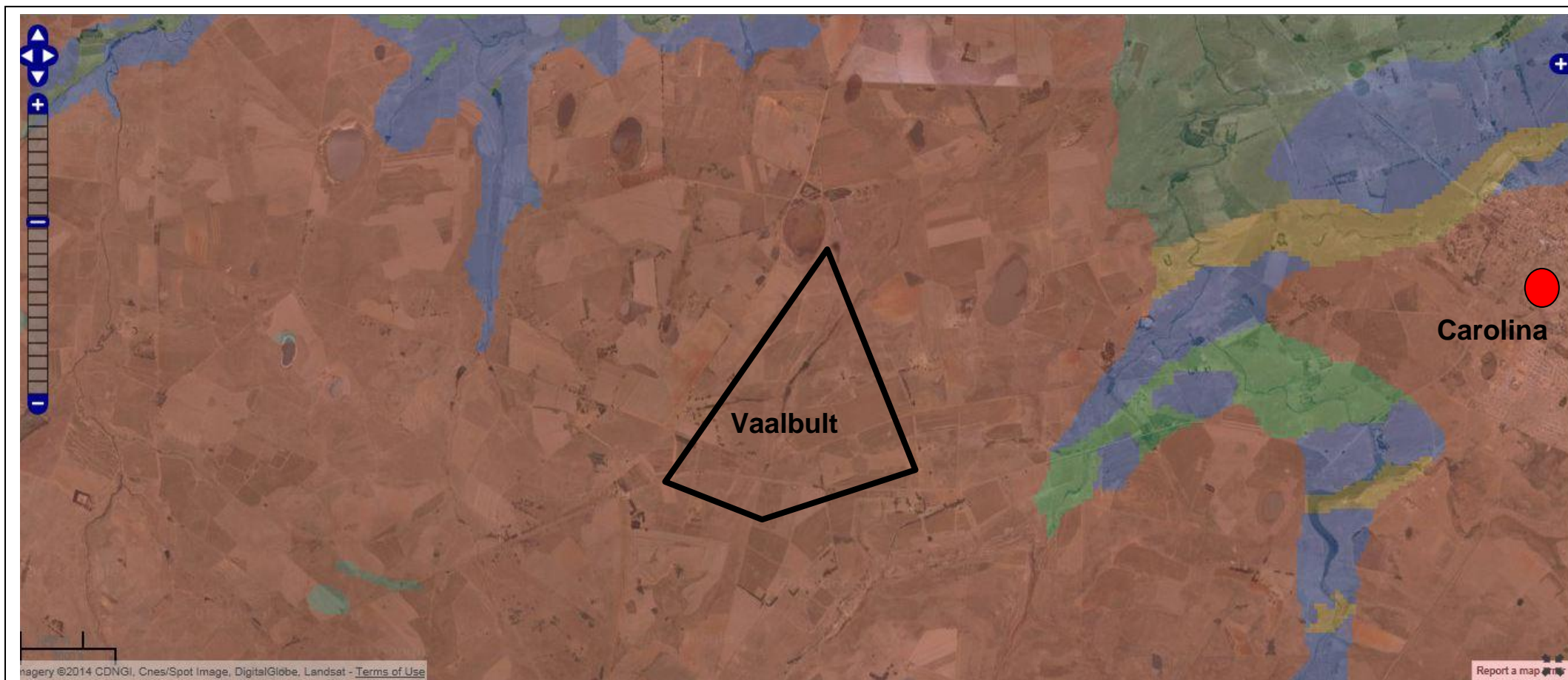
During the walk-over field investigations at Vaalbult that have been continuous since February 2012 the area has been covered extensively by geologists working on the programme. To date, no fossiliferous deposits have been found on site. In fact, there is only one observed outcrop of Vryheid Formation rocks found on site – a low escarpment of sandstone found adjacent to the large pan which occurs in the northern part of Portion 9 of Vaalbult (see Figure 3). An additional outcrop of Dwyka group rocks is found in the extreme north of Portion 10.

It is significant to note that while the coal seams in the area are intersected by the topography, they are not exposed anywhere on Vaalbult. This means that they are covered by soils and possibly by Quaternary deposits which are found in the valley floor.

To date, no sandstone or shale partings within the coal seams were observed during exploration drilling.

The impact of mining on outcropping strata at Vaalbult

It is significant that both the outcrops that have been found are developed stratigraphically below the coal and will therefore not be impacted on by mining. Furthermore, the opencast mining will be carried out within areas that have been utilised as commercial crop lands and have therefore already had their surfaces disturbed by ploughing and crop cultivation.



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Report a map

Colour	Sensitivity	Required Action
RED	VERY HIGH	field assessment and protocol for finds is required
ORANGE/YELLOW	HIGH	desktop study is required and based on the outcome of the desktop study, a field assessment is likely
GREEN	MODERATE	desktop study is required
BLUE	LOW	no palaeontological studies are required however a protocol for finds is required
GREY	INSIGNIFICANT/ZERO	no palaeontological studies are required
WHITE/CLEAR	UNKNOWN	these areas will require a minimum of a desktop study. As more information comes to light, SAHRA will continue to populate the map.

Figure 5: Palaeomap extracted from the SAHRA web site showing the fossil-bearing sensitivity for the Vaalbult area.

Source:
<http://www.sahra.org.za/map/palaeo>

Protocol for finding and monitoring potential fossil-bearing sequences

The SAHRA letter (14th January 2014) also requested that:

“This assessment must include a protocol for finds as well as a system for the ongoing monitoring of the fossiliferous fine-grained partings of siltstone and mudstone between the coal layers, and in the sequences above and below the seams”.

It is recommended that the following protocol be used to ensure that any fossil occurrences within the Vaalbult mining operation are found and recorded:

1. It is important that ongoing on-site checks within the opencast excavations are carried out at regular intervals – particularly at the onset of mining operations. Based on the current mine plan, rate of mining and sequence (as provided by Vaalbult Mining Company (Pty) Ltd), it is recommended that these checks are undertaken once a month for the first six months of the mining operation by a suitably qualified earth scientist.
2. These on-site checks must include the observations of strata that are exposed during opencast mining as well as observations within the coal deposits. Therefore, the site inspection must include observations within the excavated pit (blasted material, floor of the excavation, as well as the exposed high wall). In addition, material that has been removed from the pit and stockpiled must be checked for the occurrence of any fossils.
3. Should any fossils (including trace fossils) be observed then SAHRA must be notified immediately to obtain the required permitting, inputs and comments. All necessary permits must be obtained prior to sampling and destruction.
4. Any observed fossils (including trace fossils) must be recorded, catalogued, photographed, assessed for significance and reported to SAHRA.
5. All fossils must be photographed and a suitable scale must be used. The scale must show centimetre or millimetre graduations.
6. Where fossils are found within the excavated pit (where blasting has occurred) then where possible, they must be removed and stored for assessment.
7. Where fossils are found *insitu* then GPS co-ordinates must be recorded.
8. At least one senior member of the on-site staff must be briefed and trained in the observation of fossils / fossil-bearing strata such that the potential for fossil observations is increased during the period between the visits carried out by the qualified earth scientist. Should the on-site staff member observe any fossils (or any potential fossils), then the appointed earth scientist must be informed immediately.
9. The frequency of the on-site checks / inspection will be reviewed after six months and may change depending on the results of the first six months of observations and the planned mining programme.

Conclusion

There is a high potential for the occurrence of fossil-bearing strata in the vicinity of the proposed Vaalbult Mine. However, no fossils have thus far been found on site. Mining will not impact on any outcrops on the property. The two exposures found at Vaalbult are both located below the coal seams and will therefore not be disturbed in any way by mining.

It is important that the mine operation adopts the protocol for fossil identification and reporting as outlined in this document.