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## Council for Geoscience

**Our Reference:** F3849.4  
Fulcrum Ext 10  
Rem of Portion 81, Rietfontein 128 IR  
Stormwater Attenuation dam  
**Your Reference:** 2014/01  
**Enquiries:** T Oosthuizen  
**Tel:** 012 841 1160  
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**No. of Pages:** 5

**7 March 2014**

Ekurhuleni Metropolitan Municipality  
P O Box 13  
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**ATTENTION: Pilusa Mashamaite**

*By Email: [Pilusa.Mashamaite@ekurhuleni.gov.za](mailto:Pilusa.Mashamaite@ekurhuleni.gov.za)*

Dear Sir,

### **FULCRUM EXTENSION 10: STORMWATER ATTENUATION DAM**

The firm, Dr J P Venter Consulting Services (JPV) submitted their report: "Dolomite stability report of a stormwater attenuation dam for the township Fulcrum Extension 10, situated on the remainder of the farm Rietfontein 128-IR, Ekurhuleni Metropolitan Municipality, Gauteng", dated February 2014, on behalf of their client, Dijalo Property Services (Pty) Ltd, to this office for comment on 4 March 2014. This office acts as an agent to state authorities in reviewing dolomite stability investigations on their behalf.

The following is noted from the report by JPV:

- 1) The area on which the attenuation dam for Fulcrum Extension 10 is to be constructed is situated on dolomitic ground as boreholes around the site show that even though the area is underlain by Karoo Supergroup sediments, the contact with dolomite is often present within

60 m from surface. The purpose of this investigation was to determine the dolomite stability of the area underlying the attenuation dam and to make recommendations regarding the precautionary measures that should be applied.

- 2) A number of boreholes have already been drilled in the area surrounding the dam, the results of these boreholes were used to determine the dolomite stability of the area.
- 3) The purpose of the dam is to attenuate the stormwater flow from the proposed township of Fulcrum Extension 10 which is situated to the east and to the south of the dam. The attenuation dam is situated against the south-eastern boundary of Areas A and B , as shown on Figures 2 – 4 in the JPV report.
- 4) From the geology map it is evident that the site is underlain by sedimentary rocks (mainly mudstone and shale) of the Vryheid Formation of the Ecca Group, Karoo Supergroup. The Vryheid Formation is underlain by the glacial deposits of the Dwyka Group. The Dwyka Group is the lowermost formation of the Karoo Supergroup and was deposited on an uneven topography of the dolomite of the Chuniespoort Group, Transvaal Supergroup.

JPV indicates that the boreholes and the results of the geophysical surveys confirm the presence of a prominent dyke striking at about 150 degrees west of the Rand Water Servitude.

- 5) An extensive geohydrological study of Portion 81 was carried out by R Meyer and is reported on in Report No. 014/2012, dated December 2012. JPV indicates that it is concluded that two distinctly different groundwater levels are present, i) a shallow, perhaps perched water level, associated with the mudstone and carbonaceous shale of the Vryheid Formation and dolerite intrusions; and ii) a deeper water level associated with the tillite and dolomite of the Dwyka and Malmani Groups respectively.

Water levels in the Vryheid Formation range between approximately 2 m and 39 m below ground surface. In terms of groundwater movement, the contour map indicates a flow towards the central and western part of Portion 81 (i.e. Area D and the northern part of Area G) from the north, east and south (the Fulcrum Extension 10 area).

The boreholes close to the attenuation dam show variable conditions as far as the groundwater level is concerned. Some boreholes are dry to the depth of 60 m drilled. In the area of the attenuation pond a borehole drilled into the waste body in Area B shows an elevated water table at 7,4 m in the waste while a hole drilled to 20 m just outside the waste body is dry to the depth drilled. JPV indicates that this shows the low permeability of the Karoo sediments. Some water tables are shallow, probably because of water collecting in the

excavated area south of the dam location. Other water tables vary from 24,5 m to 47,3 m. JPV states that it is highly unlikely that changes in the water table levels will influence the stability the area of the attenuation dam.

- 6) JPV indicates that nine boreholes were drilled within about 200 m from the attenuation dam during previous investigations and these were used to evaluate the stability of the area. The following is noted from Section 9:
- The typical profile is a transported sandy silt of 1 to 1,5 m thickness followed by ferruginised silty clay. The ferruginised silty clay is the top of the residual Vryheid mudrock and usually extends to depths of about 5 to 5,5 m. The ferruginised silty clay is underlain by thick residual mudrock (yellow clay) which extends to depths typically from 20 m to 25 m. Below the yellow clay the profile is more variable with carbonaceous shale and coal being present in various thicknesses. These deposits are lens-like and are not present in all the profiles. These deposits are part of the Vryheid Formation of the Ecca Group and are underlain by tillite of the Dwyka Group. The tillite is almost invariably chert-rich but clayey layers with some chert were also observed at depth, e.g. from 34 m depth in borehole 15/13.
  - In the boreholes surrounding the attenuation pond sample loss occurred in two southern holes, probably in the Dwyka tillite just above the dolomite contact, i.e. in holes 19/17 and V11 at 48,5 m and 37 m respectively. In the other holes to the south and east depths to dolomite are 53 m, 37, and >60 m.
  - All indications are that the cover of the Vryheid Formation mudrocks and the Dwyka Group tillite are close to or more likely to exceed 30 m in the area underlying the attenuation dam. The overburden or blanketing layer materials also have a low permeability and erosion down to the level of the dolomite is extremely unlikely.
- 7) JPV classified the area of the attenuation dam as Inherent Hazard Class 1.
- 8) JPV assigned a dolomite area designation of D2 to the site, according to SANS 1936-1:2012 for IN2 type developments.
- 9) JPV made recommendations for the proposed attenuation dam in Section 11 of the report. Some are highlighted as follows:
- The area is considered suitable for the construction of the attenuation dam.
  - Footprint drilling, is however usually required. Due to the thick cover of Karoo and Dwyka sediments, footprint drilling will not be necessary if the dam is supplied with a proper liner, e.g. a geosynthetic clay liner, which has a very low permeability and will basically seal the dam during the short periods during which the dam stores water. If the dam is not constructed with a proper lining, footprint drilling will be required. (discussed with this office on 26 November 2013).

- Precautionary measures in accordance to the SANS 1936-3 are recommended.
- A Risk Management Plan must be compiled and submitted to this office and the EMM.

The Council for Geoscience would like to comment as follows:

- a) This office is in agreement with the hazard assessment of the site as IHC 1. A thick cover of non-dolomitic material is present in the area surrounding the proposed attenuation dam and we confirm that the general area represents a low hazard for all sizes of sinkholes or subsidences to form in an ingress and dewatering scenario.
- b) According to SANS 1936-1:2012, the proposed attenuation dam classifies as an IN2 type development, which requires a dolomite area designation of D2 for IHC 1 land.
  - ✓ JPV has assigned a dolomite area designation of D2 and this is supported.
  - ✓ This office therefore confirms that the geological conditions are considered suitable for the proposed land use.
- c) It should be noted that no percussion boreholes are present within the dam basin itself. The assessment of the dam is based on available information in close proximity. In our opinion, the geology of the area is relatively uniform, and the conditions within the proposed dam are assumed to be the same. Based on the fact that no site specific information is available, this office recommended to JPV on 26 November 2013 that a conservative approach is taken, and the dam be properly sealed. Should the developer decide not to seal the dam, footprint drilling is required and the results should be submitted to this office for final comment.
- d) JPV's recommendations as listed in Section 11 of the report are supported.

This office therefore confirms support of the proposed attenuation dam at Fulcrum Extension 10, conditional to the points above and the following:

- e) Proof must be provided to this office that the dam will be constructed with an impervious layer. If this requirement is not satisfied, footprint drilling needs to be conducted and the results should be submitted to this office for comment.
- f) The precautionary measures as set out in SANS 1936 Part 3: Design and construction of buildings, structures and infrastructure, must be studied and implemented for a D3 dam site.
- g) The professional team involved, including JPV, shall carefully consider the appropriate precautionary measures and then ensure and finally certify that these have been implemented.

- h) The Local Authority must implement a risk management system. Commenting on the suitability of sites within its jurisdiction is based on the premise that this system will be implemented.

This letter reflects the Council for Geoscience's view and approach to development on dolomite at this time, as reflected by the above date. These comments may not be viewed as open-ended. If a property changes ownership or land-use changes are made, the comment may in part or wholly no longer apply. This Office should be informed of such changes and the Competent Person responsible for the dolomite stability investigation should be given the opportunity to indicate the influence such changes could have on the overall stability.

If you have any further queries, please do not hesitate to contact this office.

Yours faithfully,



**A C OOSTHUIZEN**

**Engineering Geologist**

for Dr S FOYA

**Engineering Geoscience Unit Manager**

**CC:**           **Dr J P Venter Consulting Services**  
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**Attention:**   **Dr. J P Venter**