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The importance of Dwyka Group glaciation with regards to alluvial diamond transportation, concentration and entrapment in South Africa.

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During 2015 the Council for Geoscience launched a program funded by the Department of Mineral Resources on the potential of the alluvial diamond fields in the North West Province, South Africa. This investigation included a high-resolution geophysical survey, remote sensing and field investigation of the diamondiferous gravels. The aim of the investigation was to map and characterize the diamondiferous gravels and their settings to stimulate mining and exploration with focus on supporting the local communities.

Various authors in the past commented on the importance of the Dwyka Group. Harger [1], Wagner [2], du Toit [3], Maree [4] and Moore and Moore [5] believed that the diamonds originated from kimberlite pipes and fissures in the area, but that these diamonds were reworked by Dwyka Group glaciation and fluvial channels or tributaries of the Vaal River. Stratten [6] and De Wit [7] postulated fluvial transport from a source far to the north or northeast of the area while Stettler [8] and Marshall [9] supported a local kimberlitic source with fluvial and pedogenic distribution.

Dwyka Group deposits in sinkholes south of Johannesburg to Vereeniging and the paucity of similar deposits in the sinkholes and runs in the Ventersdorp – Lichtenburg – Bakerville (VLB) area may be explained by the presence of a Carboniferous Dwyka Group ice sheet that covered the VLB area. The presence of polished erratic's on the Magaliesburg east of Rustenburg, west of Klerksdorp and the paucity of glacial deposits related to karstic dissolution in the VLB area supports this hypothesis. The distribution pattern of the Dwyka Group tillite, the overlying Ecca Group and the diamondiferous gravels suggests that the palaeo-Dwyka surface is present in the Lichtenburg– Wolmaransstad –Schweizer Reneke area and that the diamondiferous gravels are closely related to the Dwyka Group tillite. The Vaal River acted as a barrier for the fluvial diamondiferous gravels that were transported southwards. The identification of glacial textures and e.g. Waterberg quartzite clasts shows that a high percentage of the clasts in the diamondiferous gravels are derived from Dwyka Group tillite.

The hypothesis that a large portion of the North West Province was covered by glacial sheet or glaciers suggests that geomorphological features related to glacial environments might have developed in the area. It is therefore possible that eskers and drumlins were the precursors of runs and sinkholes and that some of the present day pans might relate to palaeo-kettles.

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