GEOLOGICAL SOCIETY OF ZIMBABWE SUMMER SYMPOSUIM

FIELD TRIP GUIDE TO UMKONDO DIAMONDS

01/12/12

(See Field notes attached)

Stop 1. Marange Diamonds

The Umkondo stratigraphy where Lower limestone overlies basal conglomerate and in turn, the conglomerate overlying granite are observed. This relationship is the general exploration guide currently for alluvial diamonds in Marange as has been explained earlier at the Marange deposits.

Visit plant

Stop 2. Diamond Mining Corporation (DMC)

The deposit lies west of the outcropping Marange conglomerates. The deposit is generally the recent alluvium.

Visit plant.

Stop 3. Birchenough Bridge Conglomerates.

Along strike the outcropping conglomerate, the weathered crust of k-felspar marking the conglomerate granite contact is clear. The quartz clasts are irregular.

02/12/12 Chimanimani

Activity 1: Overview of the geology of Chimanimani Special Grant by Chief Geologist

The Chimanimani diamond hosting conglomerate is part of the Lower Argillaceous Series. The conglomerate is overlain by argillites and the conglomerate itself overlies arkoses.

This relationship is shown in cross-sections.

Activity 2: Analysis of drill cores at the core shed.

Groups of geologists are shown drill cores.

The stratigraphy is analyzed from the hanging wall argillites, then conglomerate to footwall arkoses.

Activity 3: Observations of the geological outcrops.

The conglomerate and footwall arkoses. The conglomerate has quartz cement.

Activity 4: Tour of the processing plant

The conglomerate is crushed through primary and secondary crushers to recover the diamonds.

Finally, the diamonds are recovered by the x-ray sorters

Geological Society of Zimbabwe: Summer Symposium 2012

Notes on Diamonds in the Umkondo Basin

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Background

De Beers discovered the Marange fossil placer diamond deposit in 2003 during the tenure of their exploration licence (EPO 1523) covering the Marange area. The exploration was targeted at discovering kimberlitic diamonds, but the recovery of rounded diamonds in some heavy mineral samples collected from local streams led to suspicions of a secondary source for the diamonds. A search for the possible source led to the discovery of a mineralized conglomerate.

The discovery attracted informal miners from all over the country and abroad. The chaos that ensued led De Beers to voluntarily abandon the area. The government immediately reserved the ground and introduced measures to bring order. Special licences (Special Grants) were issued to the Zimbabwe Mining and Development Corporation (ZMDC) to systematically exploit the resource.

The influx of illegal miners and the leakage of diamonds to the illegal markets resulted in Zimbabwe being put on the Kimberley Process Certification Scheme (KPCS) agenda in 2006. Several KPCS review missions were made to Zimbabwe to assist the country to comply with the minimum requirements of the KPCS. As a result, the ZMDC was advised to seek strategic partners with requisite capital to exploit the diamonds without compromising conditions of the KPCS.

The Marange diamond area is now secured against illegal mining activities, and four companies are commercially exploiting the resource. Families that have been disturbed by the mining activities have been re-settled.

The discovery of diamonds at Chiadzwa in Marange triggered an unprecedented diamond rush, which culminated in more discoveries. Other discoveries were made on the Chikwakwa plateau under Chief Muusha, and on Charleswood Farm east of Chimanimani. The Charleswood deposit is being evaluated by the DTZ-Ozgeo company.

The Marange deposits

The diamonds are concentrated in a basal conglomerate horizon that sporadically outcrops on the edge of the Umkondo basin in the south-eastern part of Zimbabwe. The conglomerate lying on Archaean granite basement forms base to the 1 100 million year old Umkondo Group rocks comprising over 1 200m thickness of various sediments intruded by basalt and dolerite sills.

The most easily accessible exposure of the basal conglomerate is at Birchenough Bridge where the conglomerate lies on pink granite basement. The conglomerate is in turn overlain by limestone, the so-called lower limestone horizon. This assemblage depicted as ml_1 on the 1: 100 000 scale geological map of the area (Watson 1960) is an important exploration guide for the diamondiferous conglomerate.

The diamonds are imbedded in the conglomerate, and also occur in residual soils on the edges of the conglomerate, and in local streams and creeks that drain the conglomerate (Figure 1).

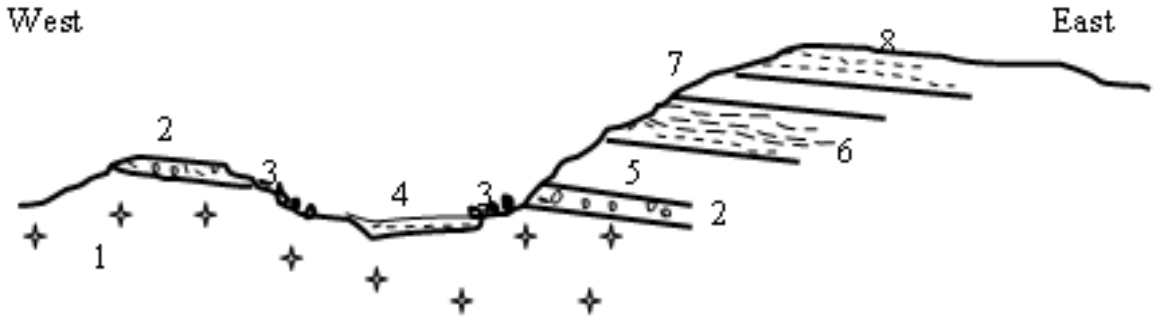


Figure 1. A generalised cross section across the Chiadzwa placer diamond deposit area. 1. Granite basement; 2. Diamond-bearing Umkondo basal conglomerate and arkose; 3. Diamond-rich eluvium shed from the conglomerate; 4. Diamond-rich alluvium; 5. Lower limestone horizon; 6. Lower quartzite horizon; 7. Upper limestone horizon; 8. Upper quartzite horizon.

The conglomerate, which locally grades into a grit, comprises well-rounded quartz clasts supported by an immature arkosic matrix that resembles the local basement granite in colour and texture. This tends to suggest that the provenance of the conglomerate materials was both local and distal.

The conglomerate that shallowly dips to the east is typically 2-3m thick at best, thinning out laterally to a few centimetres.

The primary sources for Marange diamonds have not been identified. Several kimberlites are known to occur within the environs of the Marange area and beyond.

These are however much younger than the age of the Umkondo sediments, and cannot be the sources of the diamonds in the ancient conglomerate. It is however possible that some diamonds in alluvium of current rivers and creeks (diamonds in location 4 in Figure 1) could have come from kimberlites found in the Marange area.

A large percentage of the diamonds are sub-rounded (Plate 1) suggesting that they could have come from a very distal source. Sedimentological studies of the Umkondo sediments show that the basin was fed by rivers coming from the west (Button, 1978), from the Zimbabwe craton. Thus it is envisaged that Archaean or early Proterozoic age kimberlites intruding the craton supplied the diamonds to the Umkondo basin. The diamonds appear to have been deposited in suitable environments on the beaches of an ancient sea of the Umkondo Basin, in a similar way diamonds are currently being deposited on the west coast of Southern Africa.

A unique feature of the Marange diamonds is the brownish colouration on the outer skin of some stones. This is believed to be the result of surface geological processes in the sedimentary environment and the subjection of the stones to radiation emanating from the basement granite, and high heat and pressure as a result of dolerite intrusions ubiquitous in the area, and the Pan-African orogenesis that affected the Umkondo basin. A large percentage of the diamonds are of poor quality as a result. It is estimated that about 10% of the gems are of high quality. Thus the sheer concentration of diamonds locally makes the Marange deposit viable to exploit.

The Marange diamond deposit has not been well studied yet. For instance, the extent and controls of diamond mineralization are not known. Other technical data such as grade mixture, quality and resources of the deposits remain confidential or are not yet known.

The Muusha Deposit

An area upon the summit of the Chikwakwa Plateau under Chief Muusha was invaded by informal miners after some of them discovered conglomerate scree on the foot of the mountain. They followed the scree until they got to a gritty quartzite horizon close to the summit of the mountain. The quartzite that averages 5cm thick was extensively worked for diamonds through adits and open pits. Diamonds recovered by the informal miners are generally smaller than the Marange.

The diamondiferous quartzite lies on granite and is in turn overlain by carbonates and other sediments. Thus the deposit occurs in the same geological unit as the Marange one. However here the conglomerate is not well developed, being only a thin grit

rarely exceeding 10cm in thickness. It would appear this area is distal to the main depositional point and hence smaller clasts and associated smaller diamonds.

Charleswood Deposit

Following discovery of alluvial gold at Tarka Forest in 2004 and subsequent acquisition of a Special Grant over the area by the Zimbabwe Mining Development Corporation, a lot of interest was roused on the gold potential of the Chimanimani area. This resulted in DTZ-Ozgeo, a company specialised in alluvial minerals, securing a Special Grant (SG 4955) in 2007 to explore for gold in an area encompassing Charleswood Farm adjacent to Tarka Forest, about 15 km east of Chimanimani.

The issuance of the Special Grant was coincidental with the discovery of diamonds at Charleswood Farm by artisanal miners. The illegal miners occupied an area about the size of a football pitch where a gritty quartzite body is exposed close to the Haroni River.

Having realised that there could be a potential for diamonds in the area, the DTZ-Ozgeo requested for inclusion of diamonds in their exploration portfolio. This was granted in 2010. Several diamond experts were invited from Russia, South Africa and Namibia to ascertain the potential of this deposit. A small testing plant was set up to process material from area.

The diamonds occur in a gritty quartzite and associated eluvium. The 1:100 000 scale map of the Chimanimani area shows that the quartzite belongs to the sediments of Lower Argillaceous Series of the Umkondo System (Watson, 1969). These rocks lie stratigraphically above the Calcareous Series that host the Chiadzwa and the Muusha diamond deposits. They belong to the Upper startigraphy of the Umkondo basin (Petuxov et al 2012). The discovery of diamonds at Charleswood Farm has therefore far reaching geological consequences.

References

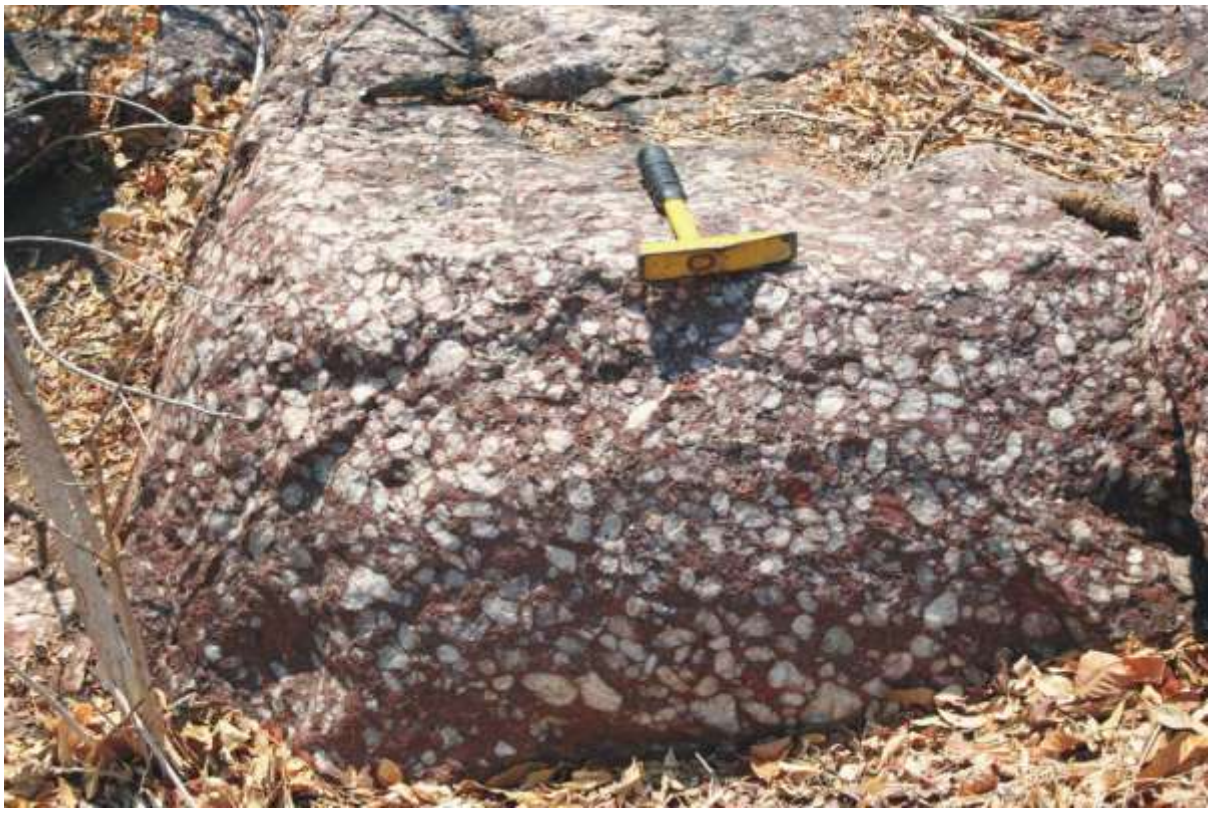
Button, A. 1978. A depositional model of the Umkondo Basin in southeastern Rhodesia. 19th Annual Report (1977), *Economic Geology Research Unit, University of the Witwatersrand, Johannesburg, South Africa*, 13-14.

Watson R.L.A. 1969. The Geology of the Cashel, Melsetter and Chipinga Areas. *Rhodesia Geological Survey Bulletin No.* 60.

Petuxov S.N., Simonova O.Y. and Mupaya F.B. 2012. Geology and petrology of the Umkondo diamond deposits with emphasis on the Chimanimani Deposit. *Geological Society of Zimbabwe Summer Symposium 2012 Abstracts*, p14.

Plate 1. Marange diamonds

Plate 2. Conglomerate unconformably lying on pink granite, Birchenough Bridge



a

b

Plate 3. Typical diamond bearing Marange conglomerate. Note a diamond at the centre of Plate 3b.

Plate 4. The situation before the Marange diamond area was secured for systematic mining

Plate 4. Relocated families settled in modern houses

30 November 2012

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GEOLOGICAL SOCIETY OF ZIMBABWE FIELD TRIP

VENUE: **CHIMANIMANI CHARLESWOOD MINE**

DATE: **02 DECEMBER 2012**

TIME	EVENT
0830-0855hrs	• Welcome at Mine office – Mrs Ngwenya • Introductions - Mr Mupaya & Mrs Ngwenya • Brief overview of MINE operations- Mr. Protopopov • Security and SHE induction- Mr Murehwa
0855:0930hrs	• Overview of the geology of Chimanimani Special Grant by Chief Geologist
0930-1000hrs	• Analysis of drill cores at the core shed.
1000-1100hrs	• Observations of the geological outcrops (conglomerate and footwall arkoses)
1100-1120hrs	• Tour of the processing plant by Mine Manager
1120-1155hrs	• Discussions
1155- 1200hrs	• Vote of Thanks and Departure

We thank you for taking time to be with us today.