



Prospecting History Leading to the Discovery of Botswana's Diamond Mines: From artefacts to Lesedi La Rona

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Introduction

Bechuanaland/Botswana has a long and colourful history in exploration and mining, which can be divided into three main phases: pre-historic, historic and modern exploration and mining. The Motloutse drainage for instance was prospected at least four times, twice in historic and twice in modern times, before the area across the watershed to the west was explored, leading to the important discovery of BK01 in 1967. This was followed by the discovery of almost 400 kimberlites in Botswana with the last one around Orapa (AK25) in 2011. This discovery success resulted in 2 Tier-1, 3 Tier-2 and 3 Tier-3 mines, which have cumulatively produced some 755 Mct, worth US\$39.2B, up to the end of 2016.

1. Pre-historic mining

The first evidence of pre-historic mining and local beneficiation is from 'factory' sites at outcrops of siliceous stone, such as along palaeo-lake shore lines of the major pans and along some of the rivers containing Early (2Ma – 280,000 yrs ago) to Middle Stone Age tools (280,000 – 20,000 yrs ago). Minerals, such as specularite, limonite and later graphite were mined c. 2,000 BP in places like Tsodilo Hills and used as pigment for rock paintings and decorative purposes. Copper was mined near Dukwe and on the Matsitama and Tati Greenstone Belts (AD 1,000 – 1,700) in the Francistown region on the Tati Greenstone Belt (1,000-1,300 AD), and the main source of iron was the Tswapong Hills near Palapye with some smelting sites dating back to c. AD 800-1,000. Mining gold started around AD 1,200 in the Tati and Vuma Greenstone belts.

2. Historic mining and exploration (1867 – 1959)

Henry Harley found gold near the lower Tati River in 1867. A gold rush started at the Tati settlement in 1868 and spread across the Tati Greenstone Belt from 1869 until 1872 after which many prospectors left for the diamond fields in Kimberley. Mining resumed in 1881 and led to the establishment of Francistown in 1897, the same year that the Cape to Bulawayo railway line arrived there.

1887 – 1888 Bangwaketsi Native Reserve (Balkis Ltd, A Roberts)

Two concessions over the Bangwaketsi Reserve (Fig. 1), to prospect for precious stones, were acquired by Balkis Ltd. Gravels were noted but much of the area had already been tested for diamonds without any success (Du Toit, 1934). De Beers had also testing gravels of the Metsimotlhaba River within the adjoining Bakwena Reserve (a British South Africa Company -BSAC- concession), but no diamonds were found (Du Toit, 1934).

1896 – 1898 Ngamiland (British West Charterland Ltd, S Passarge)

Siegfried Passarge was part of the Ngami expedition between 1896-1898 which was led by Sir Frederick Lugard, a close friend of Cecil John Rhodes. This mission was carried out by British West Charterland Ltd, on behalf of Rhodes' BSAC to explore for gold and diamonds in northwest Botswana (Fig. 1). The scientific results were published by (Passarge (1904). Du Toit (1931) acknowledged that the area was mapped and examined 'in minute detail', but that the results were however not very encouraging.

1932 – 1934 Bamangwato Reserve (Victoria Prospecting Company Ltd, AL du Toit)

Although the BSAC had secured the rights to prospect in the Bamangwato Reserve in 1893, Khama's son Tshekedi, objected to the terms of this agreement and after lengthy negotiations with the BSAC a much revised agreement was signed in 1932 (Crowder, 1985).

Du Toit (1931), who was Chief Consulting Geologist to De Beers Consolidated Mines Ltd from 1927 to 1941, felt that kimberlites were undoubtedly present in Botswana and that gravels in the larger rivers in the east may well be diamond bearing. He advised De Beers to join Anglo American Corp (AAC) in the exploration of Bamangwato. In May 1932 the board of AAC, a company which held a large

shareholding in BSAC, approved an 18 month program to which De Beers contributed 20% through Victoria Prospecting Co Ltd. Prospecting started in 1932 mainly by traversing lines some 600 m apart mapping geology and mineralisation, looking for pipes and gravels (Du Toit, 1932). Du Toit refers to a report by Bennett (BSAC engineer) that diamonds had been found in the Motloutse area in 1894 while people were digging Phiri's water well (Bennet, 1911). Bennet had apparently located the 70 foot well in 1911, cleaned it out but found no indications of diamonds (Du Toit, 1933).

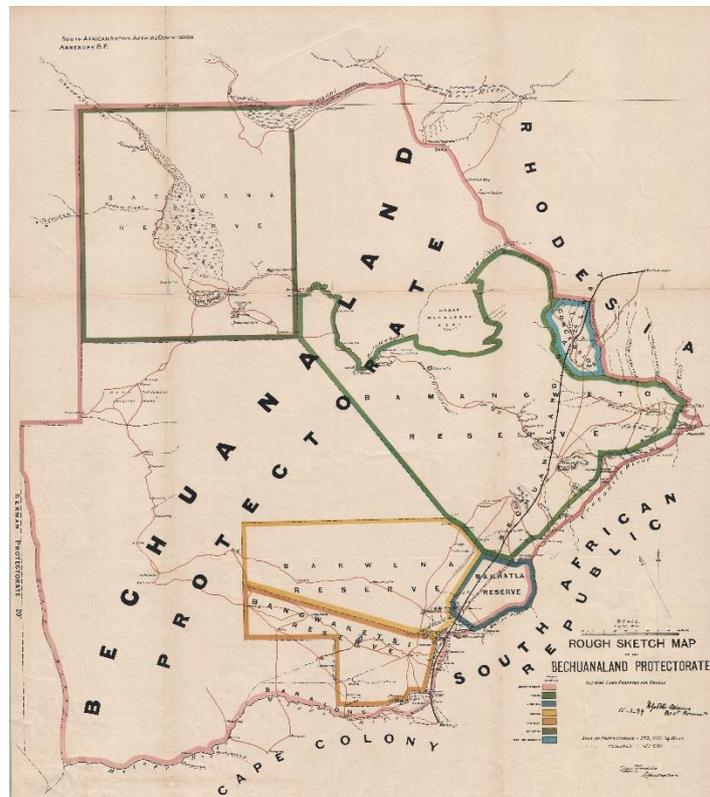


Figure 1. Sketch map of the Bechuanaland Protectorate showing tribal reserves (1899 - UCT archives)

After AAC withdrew from the venture in 1934, Du Toit (1934) convinced De Beers to investigate some of the gravels, and identified the area near the Sisi siding, close to Foley Station, as one of the largest continuous gravel areas in Bamangwato. De Beers washed 200 loads of gravel west of Sisi, close to Phiri's well, but no diamonds and kimberlitic minerals were found.

1930s Other reports of diamonds

The first authenticated diamonds in Botswana were recovered in 1934 at Pitsani along the Ramathlabama spruit, where De Beers had recovered 4 'minute' diamonds from 1163 loads of gravel (Du Toit 1938). Du Toit also refers to Mpayathyutlwa pan, north of Tshabong, where diamondiferous gravel was alleged but the clasts were derived from Dwyka Group tillites. Finally, Du Toit (1939) tried to interest De Beers in returning to Ngamiland as the presence of diamonds and 'rubies' has been reported northwest of Tsau by Colonel Naus. But there is no record that this was ever followed up.

The Geological Survey was established in 1948 with Wayland as the first Director. He felt that there was no geological reason why diamonds would not exist beneath the Kalahari. He suggested that pans form over diamond pipes because claims of diamonds in some of the pans have been strongly maintained, and he proposed a systematic exploration of specific types of pans (Wayland, 1949).

3. Modern exploration and mining

1959 – 1960 Bamangwato Reserve (Consolidated African Selection Trust, JHA Willis)

Tshedeki Khama signed an exploration agreement with Rhodesian Selection Trust Group (RST) in 1959 to mine the copper at Selebi-Phikwe. At the same time Consolidated African Selection Trust Ltd (CAST), part of the Selection Trust Group, obtained a Crown Grant (CG24) valid for a year to explore

the Bamangwato Reserve (Fig. 1) for diamonds. Being familiar with stream sampling, from their West Africa experience, they only covered the eastern part, which had drainage (Willis, 1960). Stream and selected bulk samples were collected from terraces and rivers (Willis, 1960). Only three small diamonds were recovered from the Upper Motloutse River and it was concluded that these were probably derived from Karoo sediments and hence from 'pre-Cambrian' sources (Willis, 1960). Another option considered was that there had been an ancient drainage across the Kalahari connected to the Motloutse, but that 'warping' and erosion had removed any trace. This hinted of kimberlites well to the west but this area was considered unsamplable (Willis, 1960). In 1960 the Geological Survey of Botswana (GSB) carried out a sampling program in the same area to follow-up on CAST's results but also found no kimberlitic minerals and agreed that the diamonds had weathered out of Karoo sediments (Boocock, 1965). Boocock (1965) also reported that pyrope garnet had been found by a mining company carrying out diamond prospecting north-east of Ghanzi and in the Ngwezumba Valley south of Kasane.

1955 – present De Beers Botswana previously Kimberlitic Searches Ltd. (GT Lamont)

In 1955 De Beers was back exploring the Bechuanaland Protectorate with Gavin Lamont. In 1966 they discovered 'para-kimberlites' near Mochudi. Although De Beers had been working in the Motloutse River area since 1962 it was only in 1964 that the idea crystallised, based on Du Toit's (1933) crustal warping, that diamonds may well be sourced from the west. A brief reconnaissance trip to the Letlhakane area in 1966 produced the first positive samples which led to the discovery of the first kimberlite in Botswana - BK01. Jennings, Deputy Director of the GSB, with a background in geophysics, was asked to do ground magnetic surveys at Mochudi and later over AK01 which led to the very first airborne magnetic survey to find kimberlites in 1968. Following the discovery of the Orapa cluster, De Beers found many kimberlites, using mainly soil sampling, of which Jwaneng (1972), the most important kimberlite find of all-times, and Lerala (1991) became mines.

1977 – 1982 Falconbridge (CMH Jennings)

Jennings left the GSB in 1970 and joined Falconbridge Pty. He took charge of Falconbridge's diamond exploration in Botswana in 1974. Drawing on De Beers' heavy mineral results, Falconbridge focussed on applying airborne magnetic surveys and found many kimberlites near Tshabong and Kukong. In 1980 they also completed a heli-borne sampling program in the Central Kalahari Game Reserve (CKGR) and found Gope 25 in 1981, which later became GEM Diamonds's Ghaghoo Mine.

Others

Many companies entered the scene without much success in finding economic kimberlites except Petra Diamonds that discovered KX36, also in the CKGR, presently subjected to a pre-feasibility study. More recently, several companies have re-evaluated some of the early kimberlites discoveries, and turned some of those into mines such as AK06 (Lucara), BK11 (Firestone), BK09 and BK12 (Debswana). With the recovery of the some very large and valuable stones from Karowe Mine (AK06) the industry has turned considerable energy to improved treatment processes to recover such gems as Lesedi La Rona (1,109 ct) without damaging the diamonds, as well as the re-treatment of tailing dumps.

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