

Exploration History and Discovery – Sweet Grass Minettes

Potassium-rich magmatic rocks were discovered in the Milk River area of southern Alberta and northern Montana in 1873 and 1874 by G.M. Dawson, while engaged on a survey of the 49th parallel (Dawson, 1884). Dawson described “mica-trap” dykes that occur in a radial-shaped arrangement as “hornblende-trachyte, rich in plagioclase”.

Since then, several authors have studied the Sweet Grass Intrusives, predominately for mapping and academic interests (Weed and Pirsson, 1895; Kemp and Billingsley, 1921; Williams and Dyer, 1930; Russell and Landes, 1940; Truscott, 1976; Cavell et al. 1993; Kjarsgaard, 1994, 1998; Buhlmann, 1996; Buhlmann et al., 2000). In general terms, the potassic intrusive rock complex north of the Sweet Grass Hills in southern Alberta includes six minette dykes and plugs, which range in age from 48 Ma (K-Ar biotite; Currie, 1976) and 49 to 52 Ma (K-Ar; Hearn et al., 1978). A seventh, westernmost intrusive has been classified as diorite porphyry (Kjarsgaard, 1994).

The early exploration history of the southern Alberta Sweet Grass Intrusives is not well documented. However, metal assays must have been completed, especially with the 1883-1884 announcements of gold discoveries near Middle Butte and East Butte, Montana, and the ensuing short-lived 1860's Montana gold rush. Gavin (1991) postulated that the bulk of the Montana gold-bearing zones are spatially and, possibly, genetically related to intrusions of Tertiary age syenite porphyry sills and hornblende-biotite lamprophyres. Because the later intrusions are similar to the southern Alberta minettes, it is possible that gold may be spatially associated with the Sweet Grass Intrusions by analogy to the situation in Montana.

The results from neutron activation analysis for silver, gold and iridium by Kjarsgaard (1994) indicate low abundances; maximum values for 17 samples were 6 ppb Au and 12 ppb Ir. However, in 1994, Marum Resources Inc. reported that a composite sample from the JD-2 pipe (Pakowki Coulee) contained one g/t Au (Northern Miner 1994; Walker, 1994), and Walker (1994) reported that free gold was observed during processing for heavy mineral separates from the Pakowki Coulee intrusive.

With the discovery of economic deposits of diamonds in Canada during the 1990's, the Sweet Grass Intrusives have received new exploration consideration. In 1990, Burwash and Nelson (1992) collected samples from different phases of Sweet Grass intrusive rock bodies, including xenoliths of basement and mantle material. They reported the possibility that the dykes may contain diamonds because the abundance and mineralogy of the mantle xenoliths suggest a depth of crystallization of 80 to 100 km.

Dufresne et al. (1996) compiled indicator mineral geochemistry from government and industry heavy-mineral sampling in Alberta and reported that a number of areas have high potential for the discovery of ultramafic diatremes. One of these areas, the Milk River Trend, consists almost entirely of samples with kimberlitic garnets (G1 and G2 pyropes), G9 and G11 peridotitic garnets, chrome diopsides and one magnesium-titanium rich chromite. These indicator anomalies are of exploration interest, but the indicator

minerals that have been recovered to date and the work of Kjarsgaard (1994), Kjarsgaard and Davis (1994) and Luth (1994) on the outcropping minettes near the Milk River, indicate low diamond potential based on the lack of deep-sourced xenoliths, sub-calcic G10 garnets, favorable eclogitic garnets or favorable high chromium chromites.

Industry, however, has reported the discovery of two microdiamonds in Recent stream sediment south of the community of Legend, Alberta (Edmonton Journal, 1992; Morton et al., 1993; Takla Star Resources Ltd., 1993a), and the presence of picroilmenites, chrome diopsides, and G9 and G10 garnets with kelpyitic rims and orange peel texture (Takla Star Resources Ltd., 1993b). In addition, Walker (1994) reported that one beige-green diamond chip measuring 100 x 92 microns was culled from a 38.2 kg sample taken from the 450 m long and 200 m wide Black Butte diatreme, located about 150 km east-southeast of Lethbridge.

To September 2002, there has been no known follow up on the gold or diamond results.

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