KIMBERLITES IN SASKATCHEWAN : ONE OF A KIND

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In 1987 Monopros Ltd. discovered the first kimberlite in Saskatchewan. Heavy mineral sampling and subsequent follow up work found the partly outcropping Sturgeon Lake 01 body. Geophysical techniques located other smaller anomalies nearby which are buried under glacial overburden. One of these anomalies, the Sturgeon Lake 02 kimberlite, has been examined by Monopros Ltd., Claude Resources Inc., Cameco Corporation and Corona Corporation. In 1988 Uranerz Exploration and Mining Ltd. discovered the Fort a la Corne (FALC) kimberlite province using geophysical methods. This province comprises at least 70 in situ probable kimberlite bodies (41 confirmed) that range in size to over 100ha. and so probably forms the largest known kimberlite province in the world. These kimberlites have been evaluated together with Cameco Corporation and Monopros Ltd.. Both the Sturgeon Lake and the Fort a la Corne kimberlites contain diamonds. Other diamond-bearing kimberlites have been discovered more recently by War Eagle Mining Company and Great Western Gold Corporation in the vicinity of Candle Lake, approximately 60km north of FALC.

The Sturgeon Lake 01 and 02 kimberlites are estimated as being approximately 190 and 100m in maximum dimension respectively. Both of these occurrences are spacially associated with Cretaceous marine shales (mid-late Albian to Cenomanian) and occur above unconsolidated glacial sediments. Age determinations for the Sturgeon Lake 01 body range from 105 to 95Ma.. These data show that the kimberlite and shale must have been glacially transported to their present location. These bodies therefore represent the first documented glacially rafted blocks (as opposed to boulders) of kimberlite. Variations in the nature of the kimberlite at Sturgeon Lake 01 and the brecciated nature of the shale/kimberlite contacts in Sturgeon Lake 02 show that these occurrences comprise more than one juxtaposed glacial block. Not only is the mode of occurrence of these kimberlites unusual but so are the kimberlites themselves. The kimberlites comprise planar bedded xenolith-poor volcaniclastic kimberlite that are classified as crater-facies. The clasts include vesicular juvenile lapilli which are not documented in kimberlites elsewhere suggesting a different mode of near surface emplacement. These rocks show many similarities to the Cretaceous FALC kimberlites which have undergone more detailed investigation by an extensive drilling programme.

The FALC kimberlites are unusual in many respects. Kimberlite eruptive activity can be shown to have lasted at least some 25Ma.(±119-±91Ma.), a feature which is difficult to document elsewhere. The main craters probably formed during the last 5-10Ma. (with an age determination of 95Ma.). Most of the larger bodies appear to comprise shallow craters usually less than 1300m in diameter which are infilled with volcaniclastic kimberlite. Development of the craters appears to be confined to within, and influenced by, the 200m of poorly consolidated sediments which overlie indurated Palaeozoic carbonates. There has been no development of the intrusive diatreme or associated root zone which is well documented in many other kimberlites. The lack of diatreme development appears to relate to the country rock geology. In turn this supports, rather than invalidates, the classic kimberlite model and a different second model for the near surface emplacement of these kimberlites has been determined. Formation of the craters may be similar to that of maars and could well be of phreatomagmatic origin. The craters were infilled relatively rapidly with primary pyroclastic airfall lapilli tuffs and coarse ash with little or no resedimentation. The styles of eruptions were variable and included lava spatter and lava fountaining. Other more explosive eruptive styles may be specific to kimberlites and can explain the unique mega-graded beds at FALC which range up to at least 90m in thickness. Unusual olivine dominated crystal tuffs also occur here. The differences between FALC and other more common volcanic rocks reflect the unusual properties of these magmas, in particular their low viscosity, high specific gravity and the abundance of carbon dioxide.

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