

The Internal Geology and Emplacement History of the Renard 2 Kimberlite, Quebec, Canada



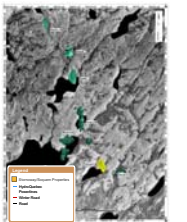
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Introduction

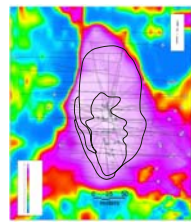
The Renard 2 kimberlite is the largest of 9 bodies in the Renard cluster, located in the eastern James Bay region of Quebec, Canada. Discovered by Ashton Mining of Canada in 2001, these bodies were emplaced into Archean trondhjemite tonalite gneisses of the eastern Superior province at ~640.5 +/- 2.8 Ma. An undetermined amount of erosion has since occurred. Renard 2 is a steep-sided pipe dominated by a massive volcanoclastic kimberlite (MVK) that can be classified as a tuffitic kimberlite breccia. It is characterized by a high proportion of granitoid country rock xenoliths. A second dominant infill is a texturally complex, less diluted coherent kimberlite (CK). Also present are a significant number of hypabyssal kimberlite (HK) dykes and irregular intrusions. Surrounding the body are significant zones of extensively brecciated country rock (+/- kimberlite) referred to as marginal breccias. Renard 2 is comparable geologically to Class 1 kimberlites of the Kimberley area of South Africa (Clement, 1982), the Gachho Kué cluster of Canada (Hetman et al., 2004) and the Pimenta Bueno kimberlite field of Brazil (Masun and Scott Smith, 2006).

Location Map



The Renard cluster. Renard 2 is highlighted in red.

Ground Geophysics

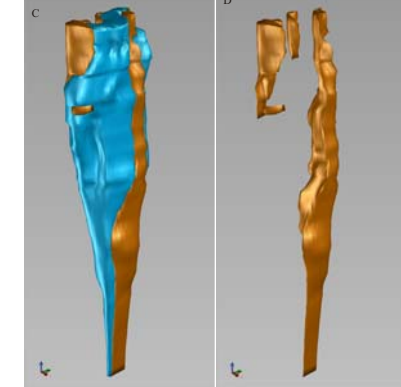
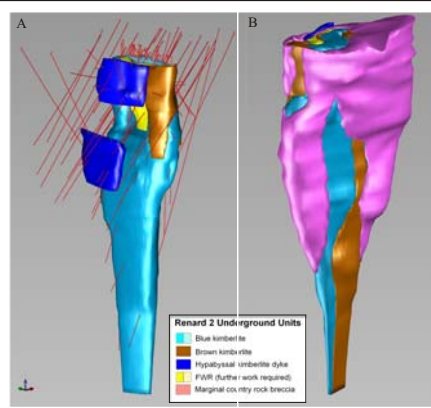


Ground magnetic image of Renard 2 showing drill holes completed. Superimposed on this is the outline of the body (black) and the marginal breccia halo (pink).

Internal Geology

	Blue Kimberlite	Brown Kimberlite	Hypabyssal Kimberlite
Matrix			
Colour	Blue to blue-green	Brown with mottled-green brown patches	Dark green, grey or black
Composition	Clay and/or serpentine	Crystalline to partly crystalline groundmass intermixed with clay and/or serpentine	Uniform crystalline groundmass
Xenoliths			
Type	Granitoid pegmatitic and gneissic	Gneissic and granitoid/pegmatitic	Granitoid and/or gneiss
Abundance	30-70%	25-50%	0-15%
Typical Size	<1cm up to 50cm common	<10cm	<5cm
Shape	sub-angular to rounded	sub-angular to rounded	rounded to irregular
Alteration State	Fresh	Partially altered	Highly altered
Olivine			
Content	10-25%	20-30%	>50%
Size	Medium to coarse, medium common	medium to coarse, coarse more common and rare very coarse present.	medium to coarse with very coarse present.
Replacement	Serpentinized	Typically serpentinized and less commonly fresh	Fresh or Serpentinized
Juvenile Clasts	Present	Rare	Absent
Texture	Pelletal	Magmatic-Pelletal	Migratic

Three-Dimensional Geology Model



Three dimensional geology of Renard 2. Detailed work has revealed that the Brown kimberlite was likely emplaced before the Blue MVK. A significant country rock breccia halo surrounds the body and two large hypabyssal intrusions are also present.

Coherent Kimberlite



(G) Underground vertical dyke (in yellow) emplaced along a contact between two country rock breccias. Dykes are typically 1 m thick.

Marginal Breccia



(H) Marginal breccia characterized by rotated angular, clast supported fragment dipping inwards toward the diatreme.

Diamonds

The grade of Renard 2 is variable, but high by world standards. Diamonds are of high quality in both phases and have good crystal shapes (dominated by resorbed forms) with colours ranging from white to brown. The Brown phase has a higher diamond content than the Blue phase. Generally there is an increase in the abundance of colourless stones with increasing size, which is not typical of kimberlite diamond populations and has a significant positive impact on value.

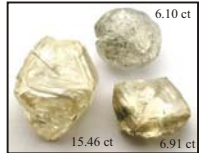
2007 Bulk Sample Results		Renard 2
Stones Treated		2,410
Carats Recovered		1,602
Largest Diamond Recovered (carats)		18.46
Diamond Recovery Range (cpct)		26 to 144
Average Diamond Recovery (cpct)		65
Valuation, with sensitivities: WWWW March 08		US\$121 (\$108 to \$136)
Bulk Sample Rock Value (US\$/tonne)		\$79

*The estimated diamond content, expressed as carats per hundred tonnes, may not be representative of the overall diamond content of the body due to a number of factors, including location and size of the samples.

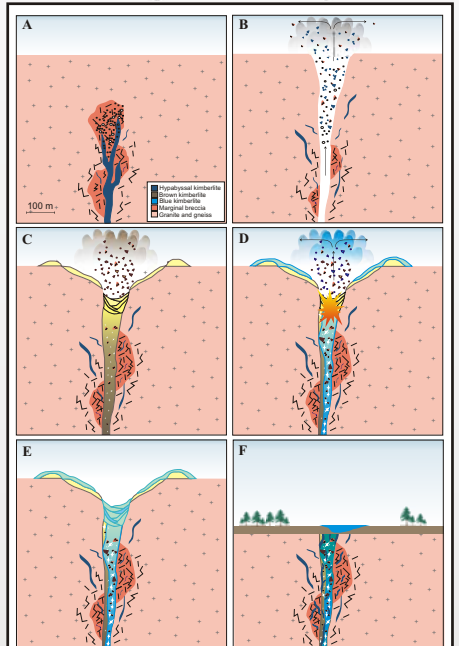
Largest Diamonds from the Blue Kimberlite



Largest Diamonds from the Brown Kimberlite



Emplacement History

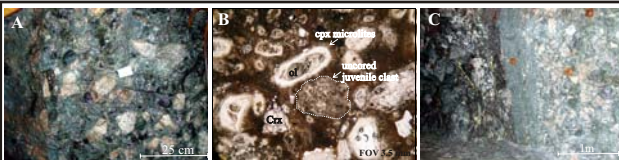


- Pre-conditioning of the country rock by rising magma and volatiles. Formation of country rock breccias.
- Breaching of the surface, explosive degassing of magma followed by breccias falling into the pipe.
- Eruption and infilling of the pipe by the Brown kimberlite.
- Excavation of the Brown kimberlite by the erupting Blue kimberlite.
- Late-stage emplacement of coherent kimberlite in the form of hypabyssal sheets and irregular intrusions.
- Hydrothermal alteration of the kimberlite, particularly the Blue phase. Erosion has also occurred.

Main Kimberlite Phases

Blue Kimberlite

The Blue MVK is a poorly-sorted, loosely-packed and less commonly clast supported phlogopite kimberlite. (A) Underground image of Blue MVK showing high abundance of xenoliths. (B) Photomicrograph illustrating pervasively altered olivine and juvenile clasts. (C) Localized vertical fabrics (metre scale) observed underground.



Brown Kimberlite

(D) Typical Brown kimberlite with a more coherent texture and lower abundance of xenoliths. (E) Groundmass is not uniformly crystalline and olivine macrocrysts are pervasively altered to serpentine ± carbonate. Rare juvenile clasts are observed. (F) A magmatic zone showing uniform crystalline groundmass and highly serpentinized olivine macrocrysts.



Conclusions

The Renard 2 kimberlite is a simple system dominated by two main infills: a Brown texturally complex coherent kimberlite later intruded by a Blue MVK. The body has undergone extensive erosion and represents a lower diatreme to root zone setting.