Ultramafic extrusive komatiite–related Ni-Cu-PGEs

Province Blank
Potential: **Certainty:**

Critical Elements (Assessment Criteria)	**Identified**	**Not Identified, but likely**	**Unlikely**	**Weighting**
Setting • Archaean/Palaeoproterozoic greenstone–granitoid terrain–intracratonic rift zones or extensional zones • Volcanic activity associated with intraplate rift zones or extensional zones • Regionally extensive komatiitic sequences which contain thick olivine cumulate flow units. • Olivine cumulate flow units 5–800 m thick and deposits generally in the lowermost high–Mg flows • Deposits in close proximity to major strike faults and on limbs of major plunging anticlines				
Source (fluid, metal, energy)				
Fluids • Nil *Metals (including sulphur)* • Komatiitic lavas for Ni, Cu • Sulphidic substrate to lava flows for S (sulphidic sediments or sulphidic footwall flows) • Mantle source for S has also been proposed *Energy* • Coeval komatiitic–tholeiitic–felsic volcanic activity	• • • • • • •			

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Fluid/magma pathway				
• Crustal structures for magmas • Flow of lavas along palaeo–topographic substrate or along transgressive channels deepened by thermal erosion of footwall • Preferred lava pathways or lava tubes for mineralised komatiites.				
Trap (any of the following)				
• S–saturation by sulphidic substrate for high–grade massive Ni sulphide deposits at base of komatiitic basalt flows • S–saturation by falling temperatures for disseminated Ni sulphide deposits • Large R factor for basal Ni deposits by large volumes of lava passing over trapped sulphide melt • Transgressive embayment features at base of preferred lava pathway massive sulphide deposits; change in slope or direction of preferred lava flow. •				
Signs of mineralising process (any of the following, but if occurrences have been identified the level of certainty increases) • Komatiitic flow unit containing lava pathways represented by olivine ortho–mesocumulates. • Ni depleted parent lava due to scavenging of chalcophile elements, including PGE by sulphide during ascent or after eruption (Barnes et al, 1995) • Presence of sulphidic flows and or sulphide bearing country rock or wall rock • Evidence of substrata erosion and immediate host rock contamination (elevated LREE, Nd, Zr, Y, Ti, Al, Fe)				

• Coincident Ni, Cu, PGE, Cr soil, RAB, outcrop geochemical anomalies indicative of sulphide mineralisation. • Massive sulphide orebodies are magnetic. • Known occurrences of Ni, Cu deposits with variable Ag, Au, PGM, and Co contents. • • • • •				
Age				
• Age of extrusion of komatiite lavas in the Yilgarn and Pilbara Cratons 3.0–2.7 Ga; ~2.0 Ga at Cape Smith, Canada.				
Preservation				
• Komatiitic lavas need to be preserved.				