Sn SKARNS K06

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Modified for Yukon by A. Fonseca
Refer to preface for general references and formatting significance.
May 30, 2005

IDENTIFICATION

SYNONYMS: Pyrometasomatic or contact metasomatic tin deposits.

COMMODITIES (*BYPRODUCTS*): Sn (*W, Zn, magnetite*).

EXAMPLES: **(Yukon): JC (105B 040)**;
(British Columbia - *Canada/International*): Only three in British Columbia - Silver Diamond, Atlin Magnetite, and Daybreak (104N069, 126 and 134 respectively); *JC (Yukon, Canada), Moina, Mount Lindsay, Hole 16 and Mt. Garnet (Tasmania, Australia), Lost River (Alaska, USA).*

GEOLOGICAL CHARACTERISTICS

CAPSULE DESCRIPTION: Cassiterite-dominant mineralization genetically associated with a skarn gangue (includes calcic and magnesian Sn skarns).

TECTONIC SETTINGS: Late to post orogenic granites emplaced into thick and deeply buried continental margin sedimentary sequences, or sequences in rifted or stable cratonic environments.

AGE OF MINERALIZATION: Most economic deposits are Mesozoic or Paleozoic, but occurrences may be any age (the occurrences in British Columbia are Late Cretaceous). **The JC deposit and other Sn prospects in southern Yukon are mid-Cretaceous, and associated with the Seagull Batholith.**

HOST/ASSOCIATED ROCK TYPES: Carbonates and calcareous sedimentary sequences. Associated with differentiated (low Ca, high Si and K) ilmenite-series granite, adamellite and quartz monzonitic stocks and batholiths (of both I and S-type) intruding carbonate and calcareous clastic rocks. Sn skarns tend to develop in reduced and deep-level environments and may be associated with greisen alteration.

DEPOSIT FORM: Variable; can occur as either stratiform, stockwork, pipe-like or irregular vein-like orebodies.

TEXTURES: Igneous textures in endoskarn. Coarse-to fine-grained, massive granoblastic to mineralogically layered textures in exoskarn; wrigglite skarns contain thin rhythmic and alternating layers rich in either magnetite, fluorite, vesuvianite or tourmaline. Some hornfelsic textures.

ORE MINERALOGY: Cassiterite ± scheelite ± arsenopyrite ± pyrrhotite ± chalcopyrite ± stannite ± magnetite ± bismuthinite ± sphalerite ± pyrite ± ilmenite.

ALTERATION MINERALOGY: Exoskarn alteration: grandite garnet (Ad_{15-75}, $Pyralsp_{5-30}$) (locally Sn, F, and Be enriched), hedenbergitic pyroxene (Hd_{40-95}) ± vesuvianite (sometimes Sn and F-enriched)

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± malayaite ± Fe and/or F-rich biotite ± stanniferous sphene ± gahnite ± rutile ± Sn-rich ilvaite ± wollastonite ± adularia. Late minerals include muscovite, Fe-rich biotite, chlorite, tourmaline, fluorite, sellaite, stilpnomelane, epidote and amphibole (latter two minerals can be Sn rich). Associated greisens include quartz and muscovite ± tourmaline ± topaz ± fluorite ± cassiterite ± sulphide minerals. Magnesian Sn skarns can also contain olivine, serpentine, spinel, ludwigite, talc and brucite.

ORE CONTROLS: Differentiated plutons intruding carbonate rocks; fractures, lithological or structural contacts. Deposits may develop some distance (up to 500 m) from the source intrusions.

ASSOCIATED DEPOSIT TYPES: W skarns (K05), Sn ± Be greisens (I13), Sn-bearing quartz-sulphide veins and mantos (J02). In British Columbia, some of the Sn and W skarn-related intrusions (e.g. Cassiar batholith, Mount Haskin stock) are associated with small Pb-Zn skarn occurrences (K02).

COMMENTS: Sn skarns generally form at deep structural levels and in reduced oxidation states. However, wrigglite Sn skarns tend to develop in relatively near-surface conditions, such as over the cupolas of high-level granites. The three Sn skarn occurrences in British Columbia are all associated with an S-type, fluorine-rich accretionary granite, the Surprise Lake Batholith. However, they are unusual in being hosted in allochthonous oceanic rocks of the Cache Creek Terrane. **The most significant Sn skarn occurrences in Yukon are associated with the mid-Cretaceous Seagull Batholith.**

EXPLORATION GUIDES

GEOCHEMICAL SIGNATURE: Sn, W, F, Be, Bi, Mo, As, Zn, Cu, Rb, Li, Cs and Re geochemical anomalies. Borate-bearing magnesian Sn skarns may exhibit B enrichment.

GEOPHYSICAL SIGNATURE: Magnetic, induced polarization and possible radiometric anomalies.

ECONOMIC FACTORS

GRADE AND TONNAGE: Deposits can grade up to 1 % Sn, but much of the metal occurring in malayaite, garnet, amphibole and epidote is not economically recoverable. Worldwide, deposits reach 30 Mt, but most range between 0.1 and 3 Mt.

IMPORTANCE: Worldwide, Sn skarns represent a major reserve of tin. However, current production from skarn is relatively minor compared to that from placer Sn deposits and Sn-rich greisens and mantos. British Columbia has had no Sn production from skarns.

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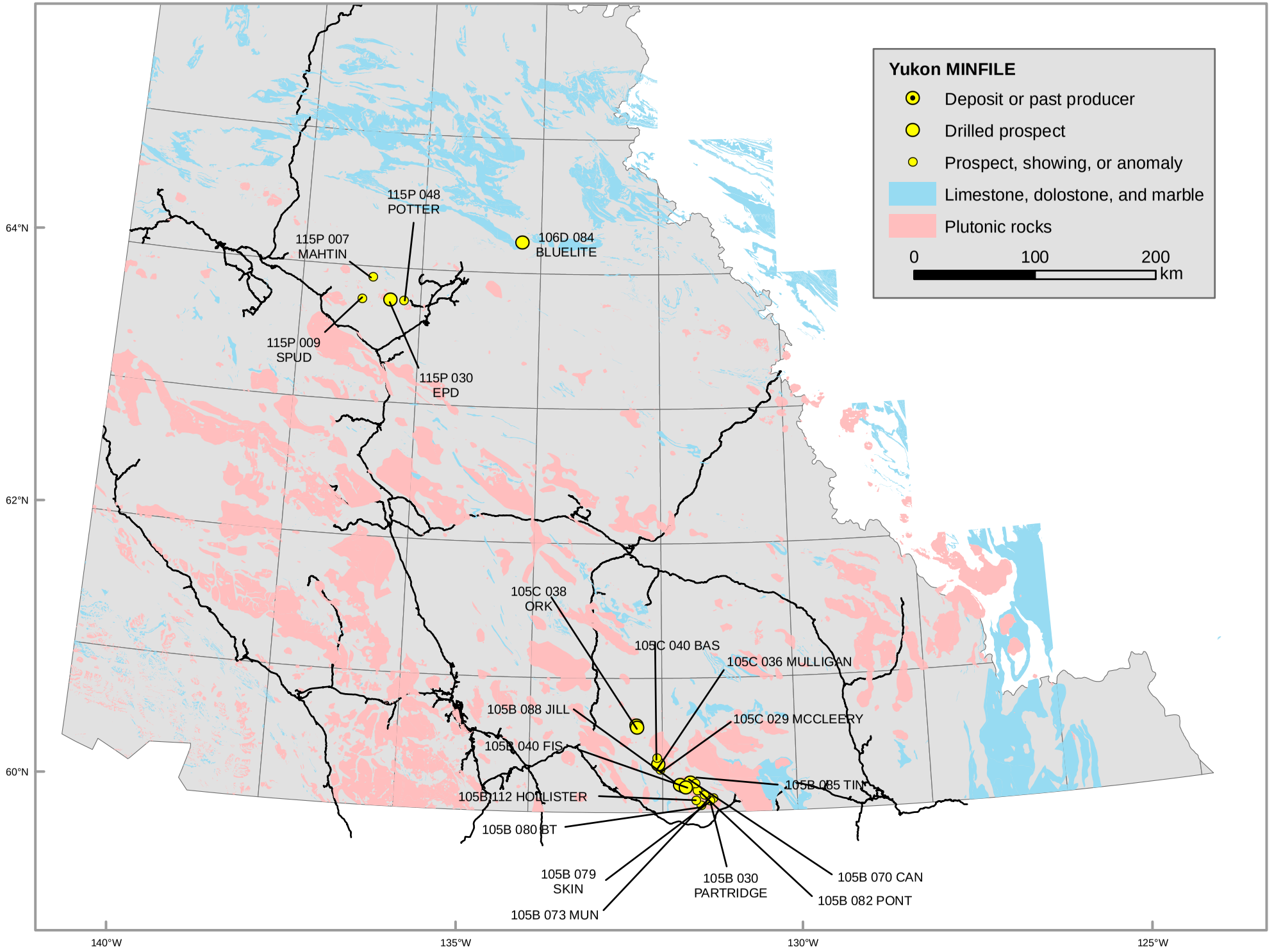
K06 - Sn Skarns - World deposits

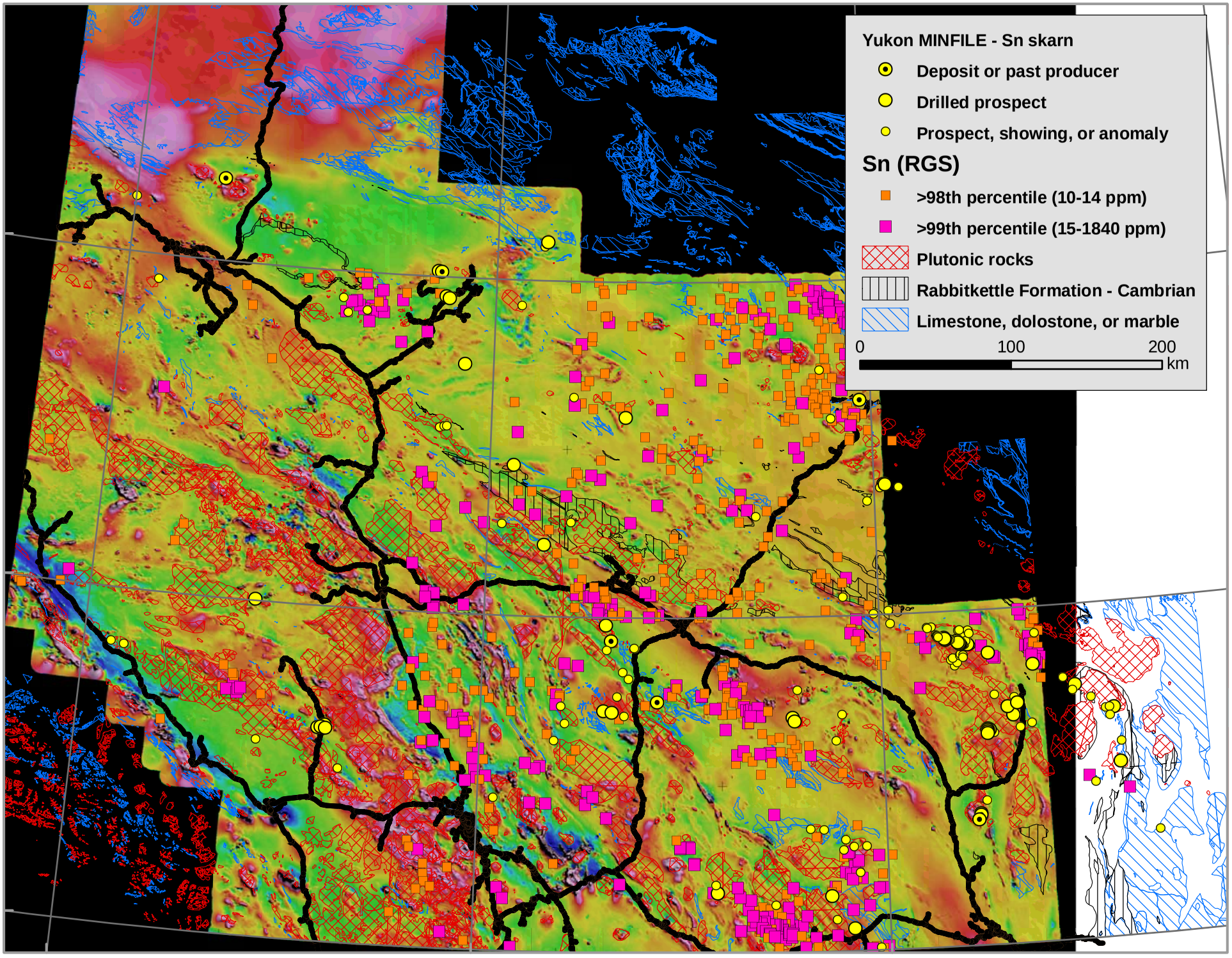
Deposit	Country	tonnes	Sn (%)
JC	CNYT	1 250 000	0.54
Gilliam	AUQS	2 000 000	0.80
Pinnacles	AUQS	4 000 000	0.30
Moina	AUTS	27 000 000	0.15
Lost River	USAK	36 400 000	0.27

Yukon MINFILE

MINFILE	NAMES	STATUS
105B 040	JC, VIOLA, FXE, FIS, FUR	DRILLED PROSPECT
105B 070	CAN	DRILLED PROSPECT
105B 088	SMITH, MC, SWIFT, JILL, SLIDE, SLIP	DRILLED PROSPECT
105C 038	MINDY	DRILLED PROSPECT
115P 030	OLIVER, EPD	DRILLED PROSPECT
105B 030	PARTRIDGE, VAL	PROSPECT
105B 073	CURRENT, MUN	PROSPECT
115P 048	POTTER, BOULDER CREEK, SCHEELITE DOME PROJECT	PROSPECT
105B 080	SLOUCE, BT	SHOWING
105B 085	TIN, CAN	SHOWING
105B 082	PONT	ANOMALY
105B 112	HOLLISTER, VH	ANOMALY
105C 040	BAS	ANOMALY



Map of Yukon showing Sn skarn occurrences and the distribution of plutonic and carbonate rocks



Map of Yukon showing Sn skarn occurrences, Sn geochemistry, regional magnetics, plutonic rocks, carbonate rocks and the Rabbitkettle Formation