GEOLOGICAL MAPPING, ROCK SAMPLING, XRF ANALYSIS AND PETROGRAPHY/MINERAGRAPHY OF SKARNS ON THE VAL PROPERTY, 105B-3

By: T. Liverton and W.D. Mann

Claims: Val 1 to 4 (YD11151-11154)

Owner: T. Liverton

60°06'N, 131°14'W.

Watson Lake Mining Recorder's District

Fieldwork: 26th. August 2013

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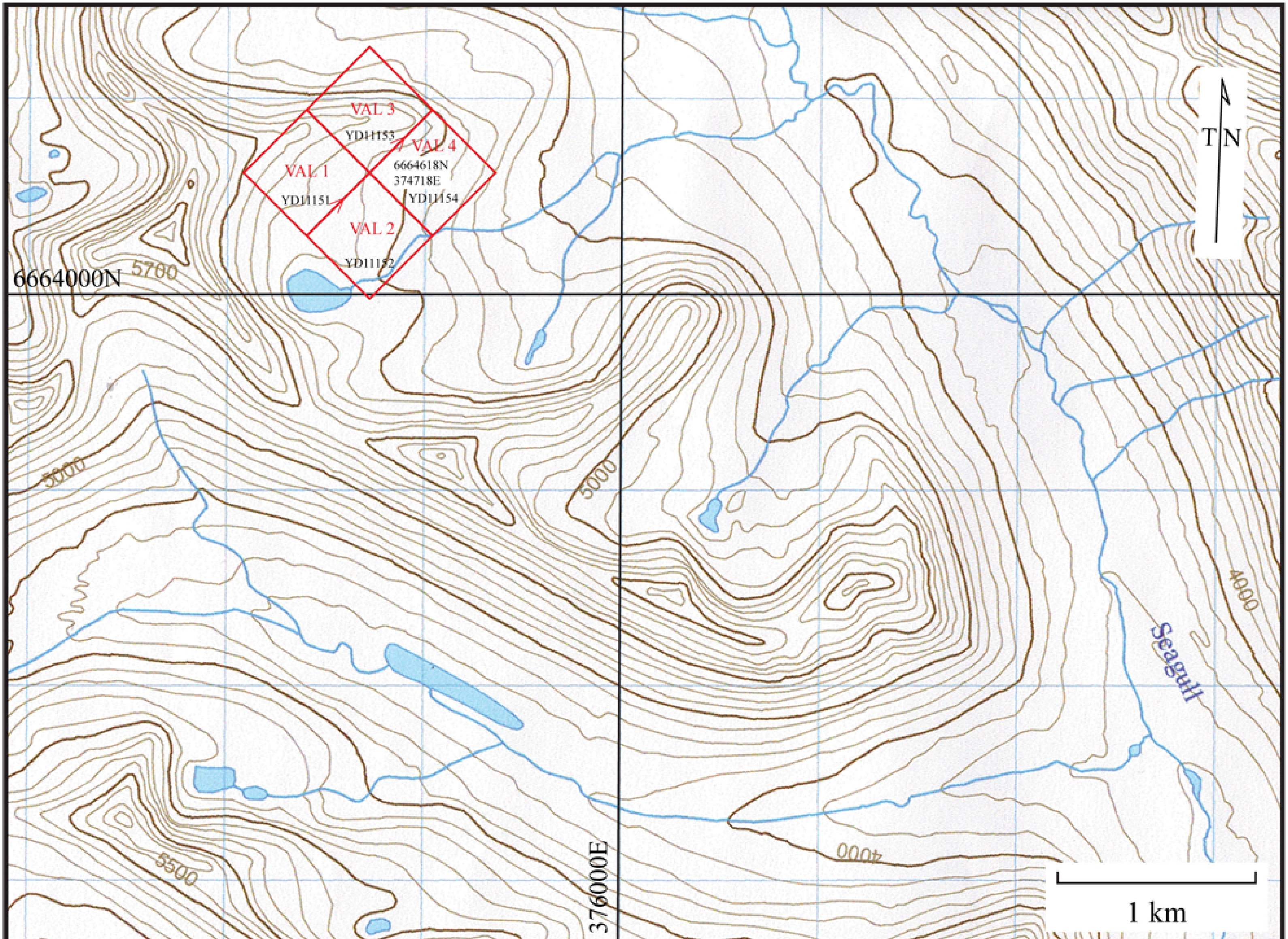


PORTION OF MAP SHEET 105B-3 SCALE 1:30,000

Location of the Val 1-4 claims at the headwaters of Seagull Creek.

INTRODUCTION

The Val property (Minfile 105B030) consists of a marble and quartzite roof pendant within the Seagull batholith, close to its northeastern margin. The marbles have been metsomatised to calc-silicate skarns which in places have been greisenised to fluorite-phengite- and fluoborite-bearing mineralogies. Tin is the metal of economic interest in this property and this present work was aimed at identifying the mineralogy of the skarns and in particular to determine whether tin is present as cassiterite or as one of the fluorine / boron or silicate minerals (vonsenite-ludwigite, hülsite, burtite or nordenskiöldine) that would be refractory to smelting.

CLAIMS

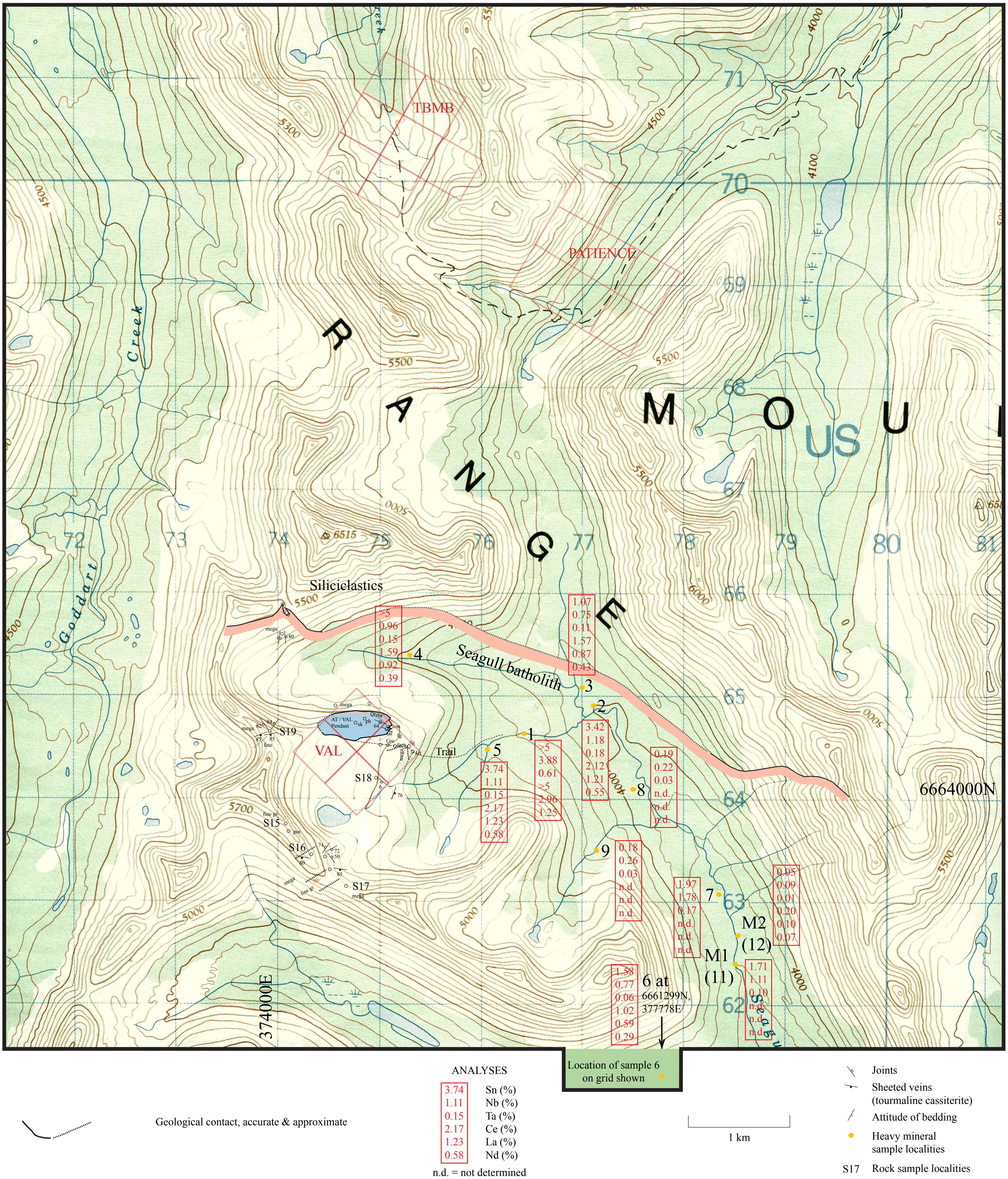
The Val property consists of four quartz claims, Val 1 to 4 (YD 11151-11154), held by T. Liverton with anniversary date 7th. September. The centre of the claims is at 60°06’N, 131°14’W.

ACCESS

The Val claims, also known as the Partridge or At showing, is road-accessible by means of a four-wheel-drive trail that connect to the road from Pine Lake airstrip and the Swift river valley. The portion of the trail that passes the Mod (Patience) property is usually blocked by snow accumulation until July and fresh snow may fall any time after mid September, so the workable season is short.

VAL PROPERTY HISTORY

- 1978 - Staked as Val cl (YA28773) in Jun/78 by Klinkit JV (DuPont of Can EL & Duval Corp), which conducted mapping and sampling.
- 1979 - Klinkit JV conducted mapping and sampling.
- 1982 - Klinkit JV conducted mapping and sampling, VLF EM and mag surveys.
- 1983 - Klinkit JV performed bulldozer trenching in 1983.
- 1984 - Klinkit JV drilled 6 holes (248 m). The DuPont interest was transferred to CSA Mls Inc
- 1985 - The DuPont interest was transferred to Goldsearch Inc.
- 1990 - Grant Stewart restaked the property as the AT claims (YB33699).
- 1992 - Grant Stewart performed roadwork in Sep/92.
- 2010 – Tim Liverton restaked the VAL showing.



PORTION OF MAP SHEET 105 B-3 SHOWING LOCATION OF THE AT / VAL PROSPECT, GEOLOGY, ROCK SAMPLING & HEAVY MINERAL SAMPLING OF CREEKS

(FROM 2010 YMIP REPORT, WITH ADDITIONS 2013)

FIGURE 2.

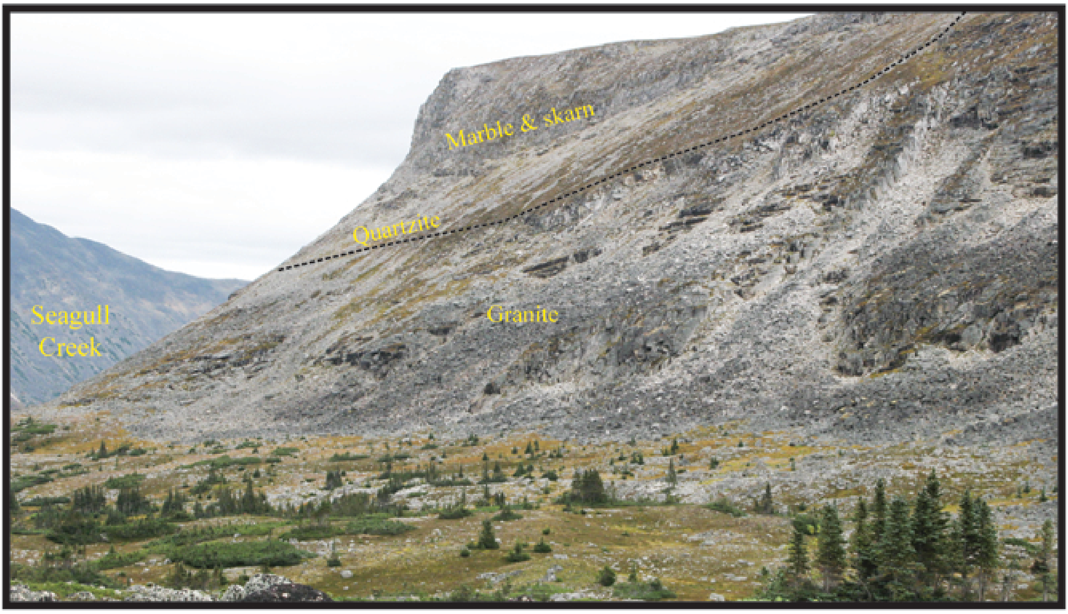
Sheeted vein system
Seagull batholith
Val marble pendant
Western sheeted vein system
Marble
Bedding
Skarn
Magnetite skarn
Granite

GEOLOGY: THE SEAGULL BATHOLITH

The Seagull batholith is the largest of five granite (sensu stricto) plutons that were recognised as being distinct from the rest of the 100± Ma old Cassiar intrusions. They were described as a sub-suite ("Seagull-Thirtymile") of the Cassiar Suite (Liverton 1992, Liverton and Alderton 1994) and have since been recognised as the separate Seagull Suite (Rasmussen, 2013). The mineralogy, chemistry and metallogeny of these intrusions is akin to that of anorogenic granites (Liverton and Botelho, 2001). The Seagull batholith is a biotite-only monzo-to syenogranite that is noticeably enriched in F and B. The presence of tourmaline and fluorite in nearly every thin section examined from the batholith plus occasional topaz attests to this chemistry. The outcropping granite shows frequent miarolitic cavities and decimetre-scale orbicules of schorl. Depth of emplacement was very shallow (possibly < 2km below the palaeosurface). The granite on either side of the Val pendant shows E-W striking near vertical sheeted vein systems (Fig. 3) that carry cassiterite and much tourmaline (see YMIP report 10-051). Columbite-tantalite is also to be expected and this mineral has been recognised from placer below the Val cirques. The granites (three lithofacies are recognised, but no regular distribution that can be mapped regionally is seen) are distinct in having very rare zircon and no apatite. Instead, phosphorus is present in abundant accessory monazite. The rare earths are also present as occasional fergusonite crystals. The B and high F content of the magma would have allowed a fractionation towards modal albite rather than quartz enrichment and melts would have had a solidus temperature < 700° C. These conditions have allowed the granites to become 'ultrafractionated', enriched in the alkalies (chemical Rb/Sr ratios to 3000 in the suite), producing hydrothermal fluids that were enriched in halogens and high field strength elements (HSFE), particularly Sn, Nb, Ta and to some extent, U.

GEOLOGY: THE VAL SKARNS

Since the Val marbles form a roof pendant in the batholith it is understandable that they show high temperature primary skarn assemblages. Adjacent to the granite contact melilite is common and elsewhere diopside-hedenbergite (of quite varying Fe content judging by colour) is ubiquitous. Throughout the limestone/marble unit various bedding layers and crosscutting veins are filled with the pyroxene (Fig. 4). A greisen overprint ("greisenized skarn": Kwak, 1987) is evident by introduction of much fluorite in the pyroxene skarns with alteration to chondrodite, phengite and fluoborite. Magnetite often accompanies this F-rich mineral assemblage and forms "wrigglite" texture (e.g., Kwak and Askins 1981). These rhythmically banded rocks are the common host for the tin on the property. It is notable (and economically significant) that the only tin mineral noted is cassiterite, rather than vonsenite, hülsite, burtite or nordenkiöldine, that would be metallurgically refractory.



The VAL marble pendant. Looking south.

Veins of diopside-hedenbergite & bedding-parallel skarn in the VAL marble

Figure 4

VAL 1-4 CLAIMS: NTS SHEET 105B-3
Geological mapping of granite contact
and sampling of skarns

Mapping: W. Mann & T.Liverton,
August 2013

RESULTS OF ANALYSIS OF HAND SPECIMENS WITH PORTABLE XRF UNIT

XRF Number	TS	As	Ba	Ca	Cd	Fe	K
382	V8	22			16	423k	
383	V5	1313			44	815k	
384	V7				17	370k	
385	V10	29		3370		193k	12k
386	V9			91k		108.4k	20k
White CS marble			678	180k	27	12.5k	
388	? V2	110		2604	40	2M	

XRF Number	TS	Mo	Mn	Pb	Sb	Sn	W	Zn
382	V8		3745	26	73	435		1836
383	V5		4813	35	133	7437	912+/_372	44.8k
384	V7		7972	17	50	2231		1270
385	V10		2230	104		94		1067
386	V9	9	617	56		1379	31.8k	3137
White CS marble			764	11	107	171		459
388	? V2		28.5k	398	123	551		637

Values are in ppm. Note that these results are semi-quantitative. High Sn in V9 and V5 is confirmed petrographically and high W in V9 is consistent with scheelite noted in hand specimen.

2013 WORK

The 2013 season's work consisted of detailed mapping of the granite contact around the south side of the Val pendant with sampling of skarn exposures. This work on the quartz claims complements the examination of heavy minerals in streams and mapping of sheeted veins as carried out in 2010 under YMIP grant (number 10-051). This year's work has concentrated on the skarns. Hand specimens were semi-quantitatively analysed using a portable XRF instrument and thin or polished thin sections were cut by Vancouver Petrographics for petrography / mineragraphy. Offcuts from thin section preparation were examined under shortwave ultraviolet light.

The NE contact of the Seagull batholith as mapped in 2010 and 2013 is shown on Fig. 2. A map of the natural exposures and old dozed trenches showing sample localities is presented as Fig. 5. The skarns are developed around the southern side of the carbonate pendant across the dip slope within about 10m of the granite contact. Exposure is limited, but it is evident that the skarn is discontinuous along strike. Magnetite-rich skarn is found along the contact of the pendant at the eastern tip, at the centre and close to the western limit of the carbonate. It is difficult to assess the thickness of the skarn other than at the eastern end, but it does not exceed 3 metres at any one exposure. Specimen localities are shown on Fig. 5 and Table 1 gives the XRF results. The XRF analyses consisted of scanning unprepared hand specimens with the instrument, so values are semi-quantitative. High tin in V5 and V9 is confirmed petrographically, zinc as sphalerite in V5, and tungsten as scheelite in the V9 hand specimen. The cassiterite mineralization seen in this study is confined to the 'wrigglite' greisenised skarns, although not every magnetite-bearing skarn has shown the mineral.

DISCUSSION

The Val pendant contains tin mineralization in discontinuous skarns developed close to the granite contact on the down-dip side of the marble/limestone unit, with no mineralization being recognized in the upper part of the marble/limestone exposures. The only tin mineral seen was cassiterite and none of the 'refractory' tin phases were found. Although the tonnage of tin-bearing rock (in the skarn) is obviously too low to be of economic interest as a hard-rock prospect, the sheeted vein systems in this region do deserve further prospecting along strike to the west. The amount of cassiterite and possibly also scheelite from skarns would contribute to placer concentrations in the adjacent streams and the upper part of Seagull Creek. The sheeted vein systems are likely to be the main contributor of these minerals. Investigation of possible placer concentrations is ongoing.

Headwall of the cirque WNW of the marble pendant showing sheeted vein system in the granite.

Figure 6

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Figure 7. Thin section of specimen V8 under crossed polarisers. ‘Stitched’ mosaic of > 80 photomicrographs to show the complete length of the slide.

APPENDIX 1: VAL PETROGRAPHY

TS = standard thin section (26x46mm), LTS = large thin section (50x75mm),
PTS = polished thin section

V1 PTS Main showing {374980E, 6664870N}

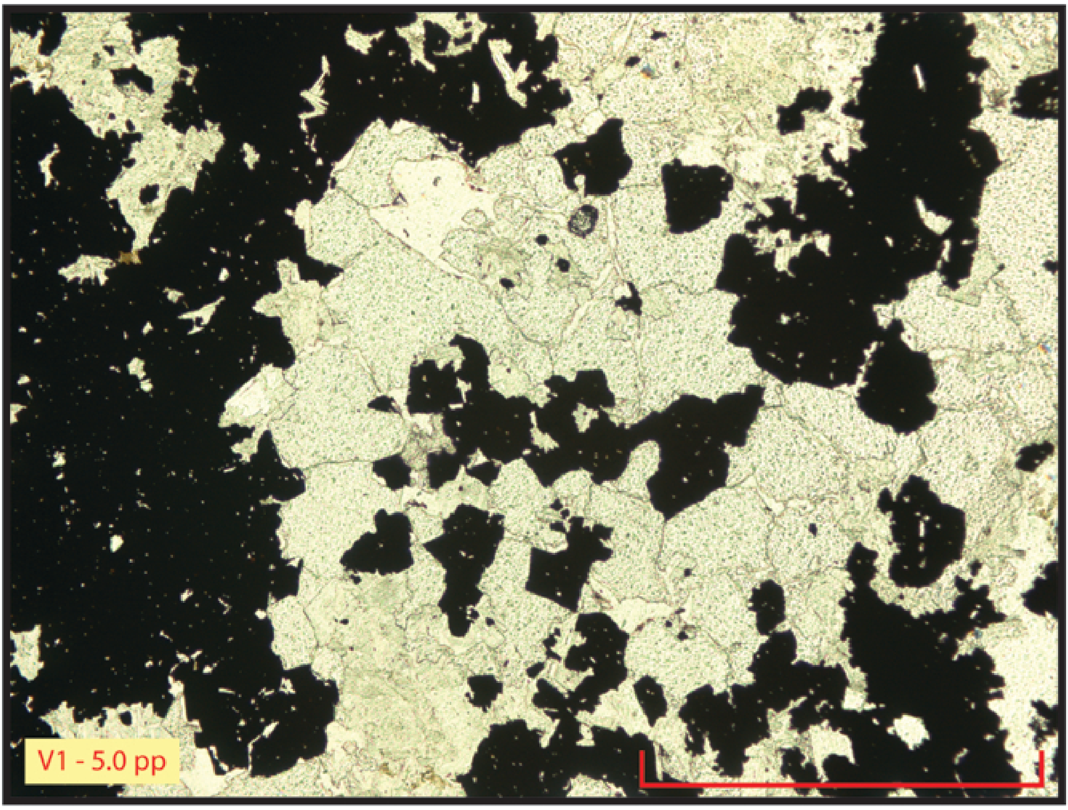
This is a magnetite-fluorite rich ‘wrigglite’ greisenised skarn. Magnetite forms ≈ 60% of the rock in layers to 9 mm thick of subhedral crystals. Fluorite (25%) is interstitial with phengite (15%) as pale green ‘flakes’ to 0.5mm long. The fluorite varies from colourless to faint purple. No sulphides or cassiterite were noted.

V2 TS (‘Calc-silicate hornfels’ above main skarn) XRF 387

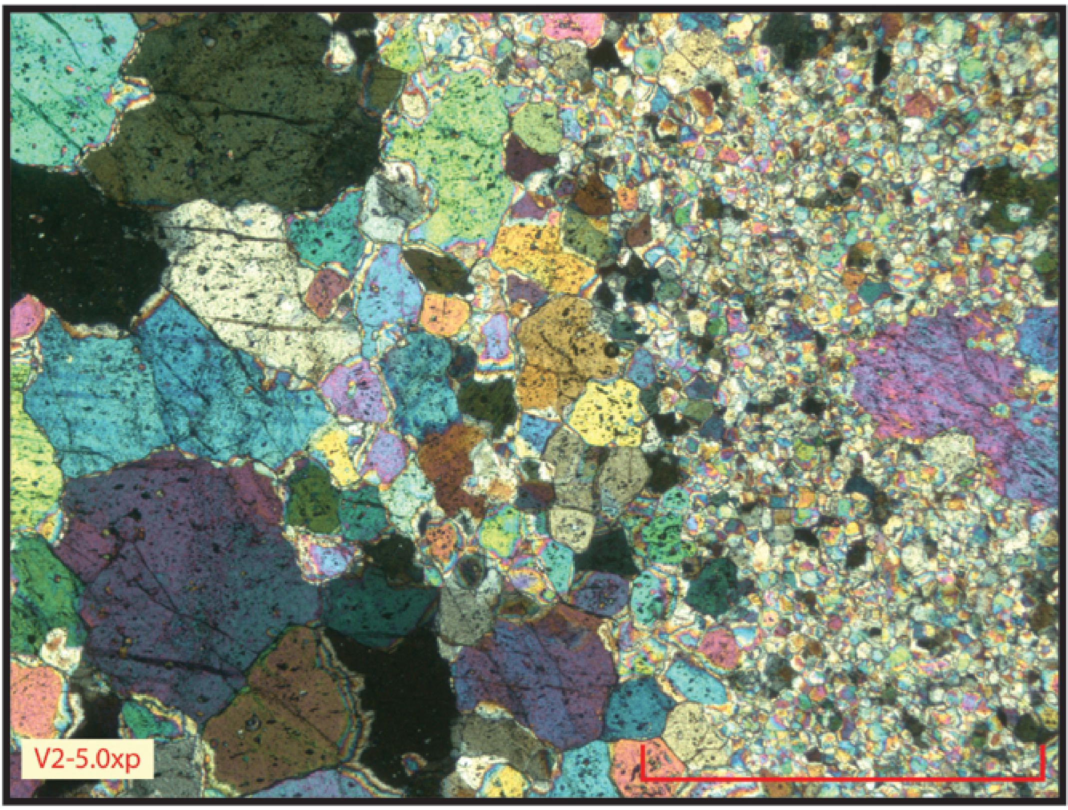
This rock is a diopside skarn. It has irregular fractures that are filled with fluorite. The pyroxene (colourless) is in anhedral grains to 5 mm. Fractures cutting the rock are irregular, randomly oriented and typically to 0.25 mm wide. One fracture widens to 5mm at an intersection with another at 60°. It is filled with a granular aggregate (0.02-0.04 mm) of possibly kotoite with a little interstitial fluorite. Chondrodite is found mostly at the margin of the wide fracture within the diopside and constitutes < 10% of the rock.

V3 PTS Main showing {374980E, 6664870N} XRF 388

This rock, somewhat weathered and iron-stained, is a greisen-skarn with some magnetite. It contains mostly phengite with quartz and calcite and a little remnant pyroxene. The phengite is an aggregate of 0.1 mm subhedral crystals with subhedral to euhedral magnetite crystals in one portion. A few ragged (replaced) grains of diopside are present. Calcite and quartz fill the interstices between phengite crystals (25-50% depending on the field). No sulphides or cassiterite were noted.

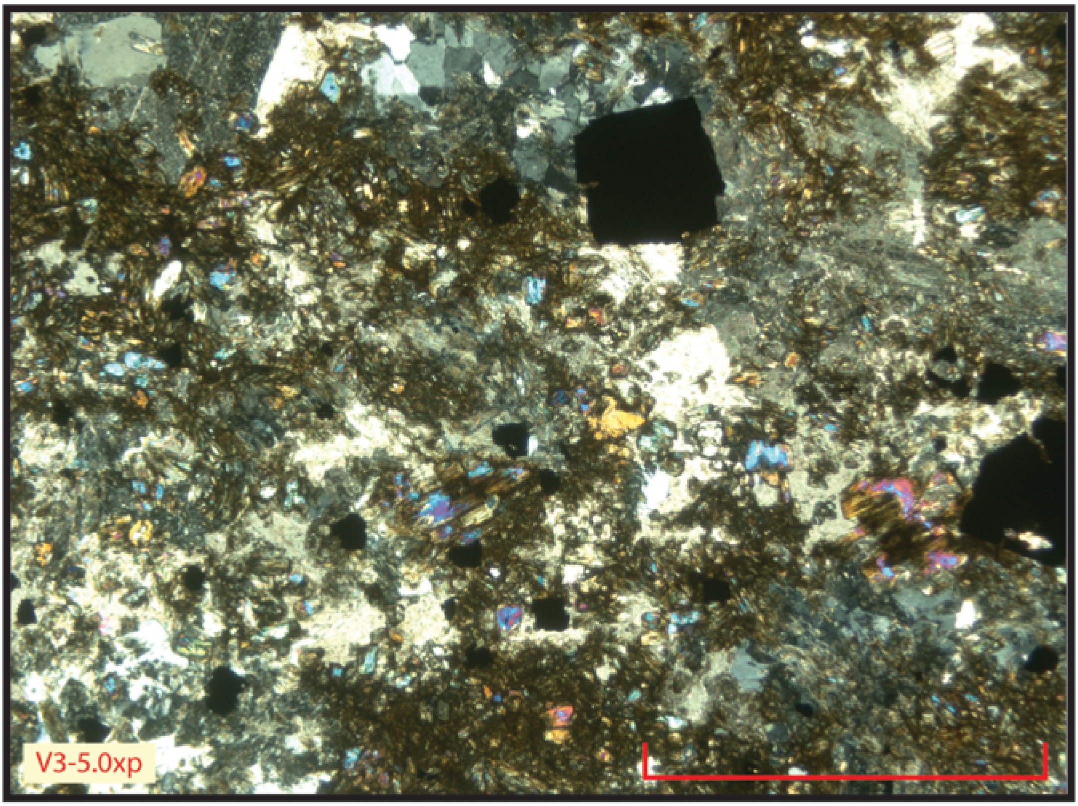


V1: Magnetite and fluorite. PP transmitted light, 1mm scale bar.

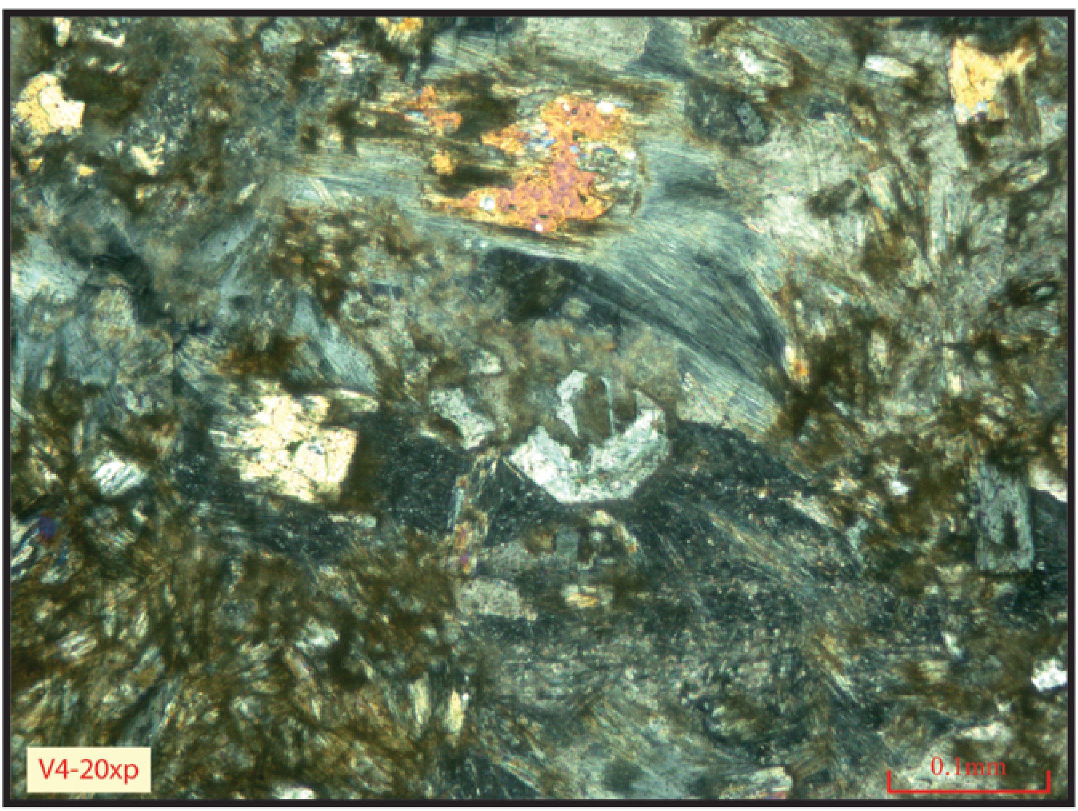


V2: Diopside and kotoite. Crossed polarisers, 1mm scale bar.

Figure 8.



V3: Diopside-hedenbergite, quartz & magnetite. Crossed polarisers, 1mm scale bar.



V4: Diopside-hedenbergite and phengite. Crossed polarisers, 1mm scale bar.

Figure 9.

V4 **TS** Main showing {374980E, 6664870N}

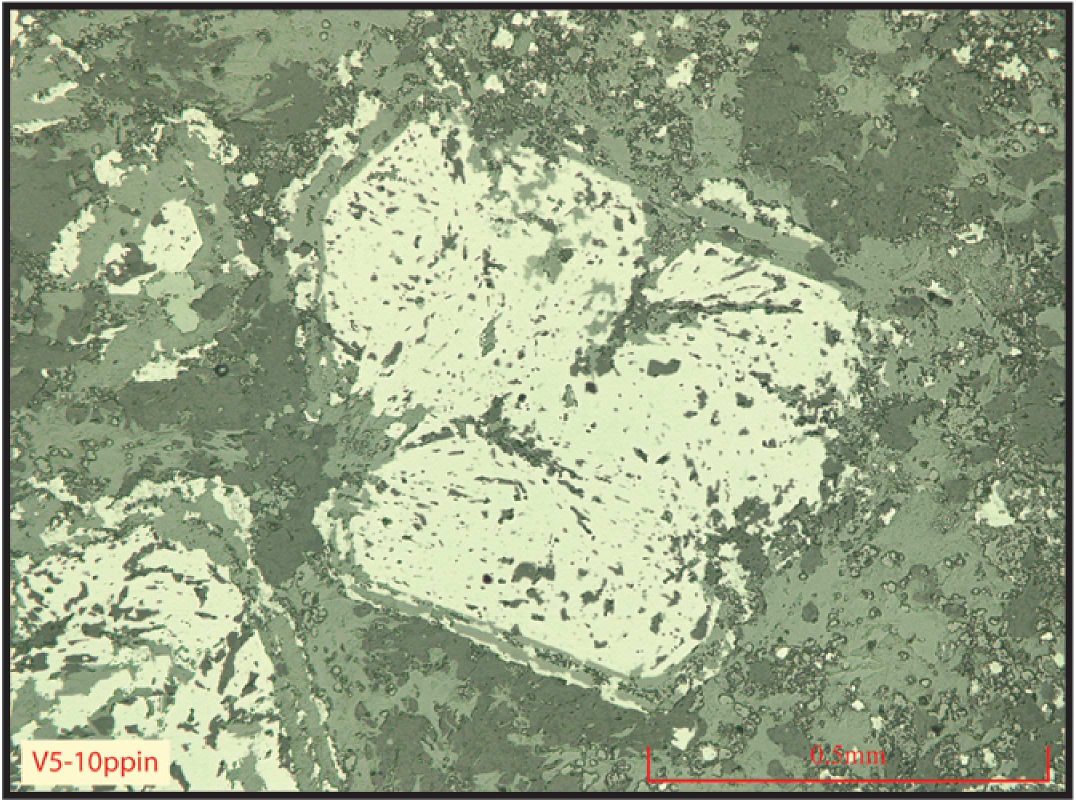
This is a greisenized pyroxene skarn (somewhat weathered and iron-stained).
It shows diopside/hedenbergite in anhedral forms to 0.2mm long with 'ragged' outlines. Quartz and recrystallized carbonates fill some irregular shaped fields to 5mm across. Subhedral to euhedral magnetite crystals to 0.3mm are also present (< 1% of the bulk of the rock). A few very corroded pyroxene crystals are also present as are tiny acicular ? phengite crystals to 0.2mm long within quartz masses.

V5 **PTS** {374960E, 6664840N} XRF 383

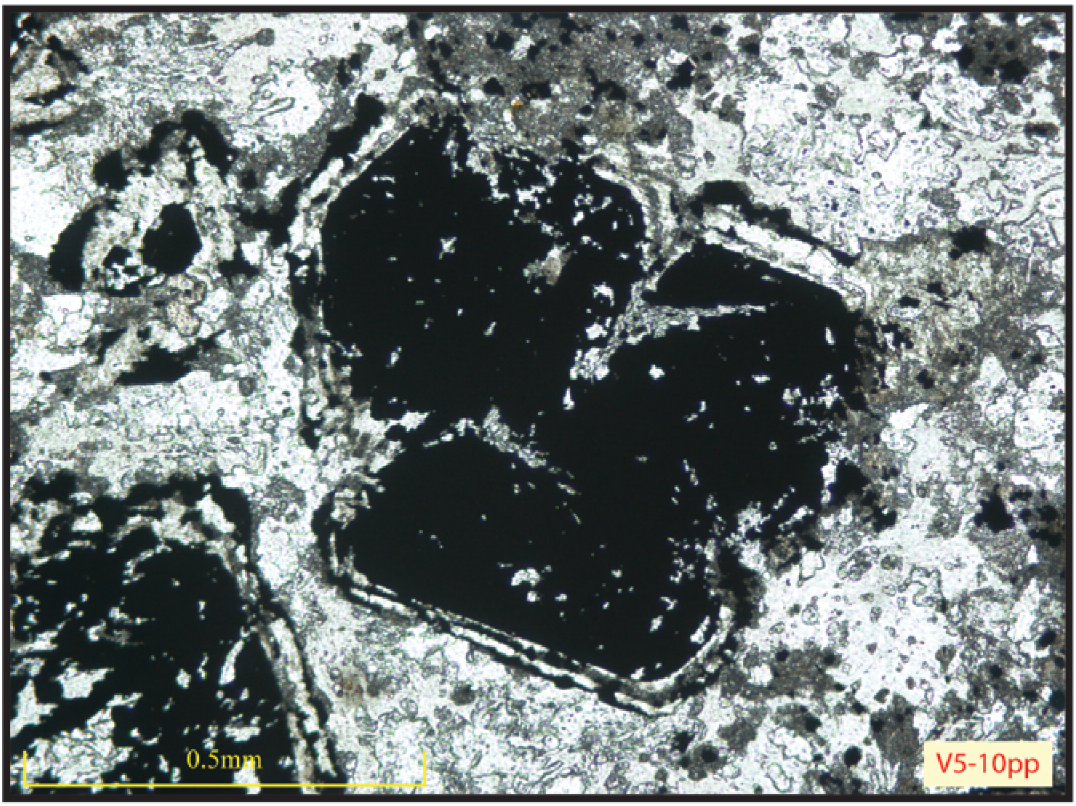
Wrigglite: consists of 1.5mm bands of radiating chains of chlorite and often euhedral magnetite crystals with granular 0.08mm quartz between and some distinct patches of fluorite. A little phengite is present within the chlorite masses. Sphalerite is present as anhedral yellow masses, often rimming the magnetite crystals, but it tends to be concentrated in certain 2-3mm thick wrigglite bands. Some 0.5mm long yellow-brown subhedral cassiterite crystals are present with the quartz. A few remnant deep green grains (V5-20pp & V5-20pp2) which have high refractive index and are isotropic include opaque minerals. These are associated with acicular ? rutile, 0.05mm long and a few cassiterite grains. The green isotropic mineral is possibly gahnite.

V6 **TS** Main showing {374980E, 6664870N}

A massive diopside/hedenbergite skarn with a little larnite. Also has a few patches of fluoborite alteration to 3mm across. Contains 1mm masses of carbonate showing a few larnite crystals along their margins. Rare chondrodite grains were noted within the pyroxene adjacent to the fluoborite.

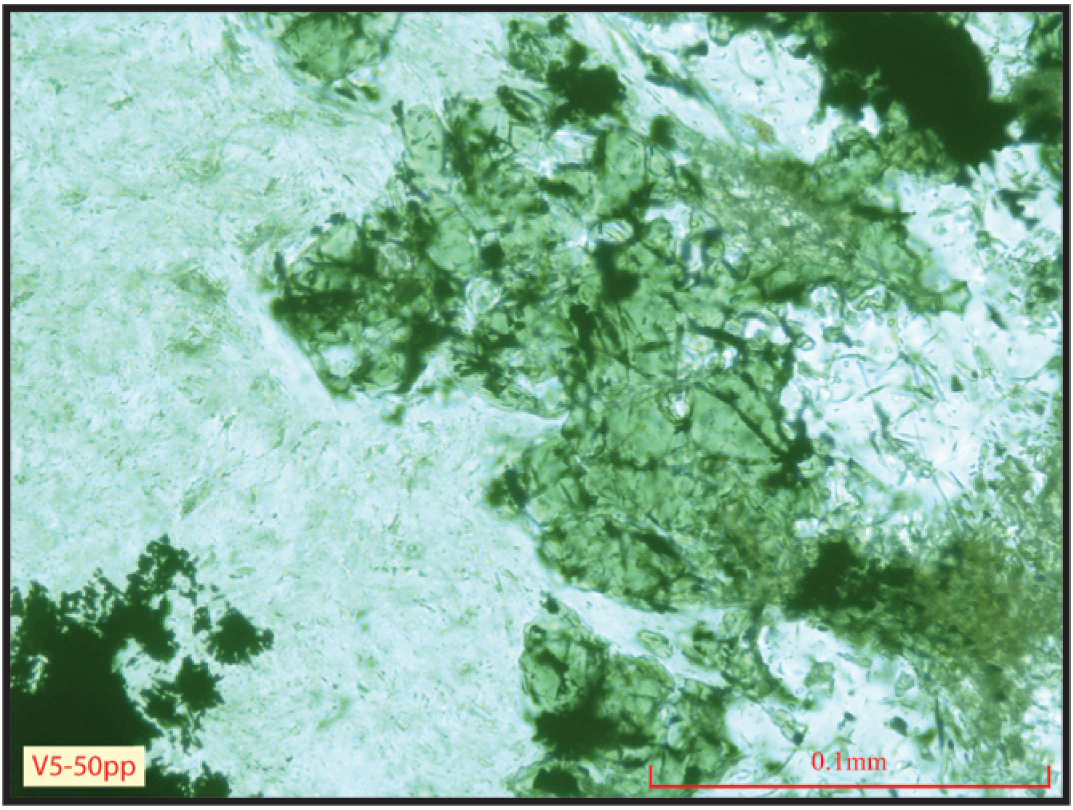


V5: Diopside-hedenbergite, quartz & magnetite. Reflected light, 1mm scale bar.

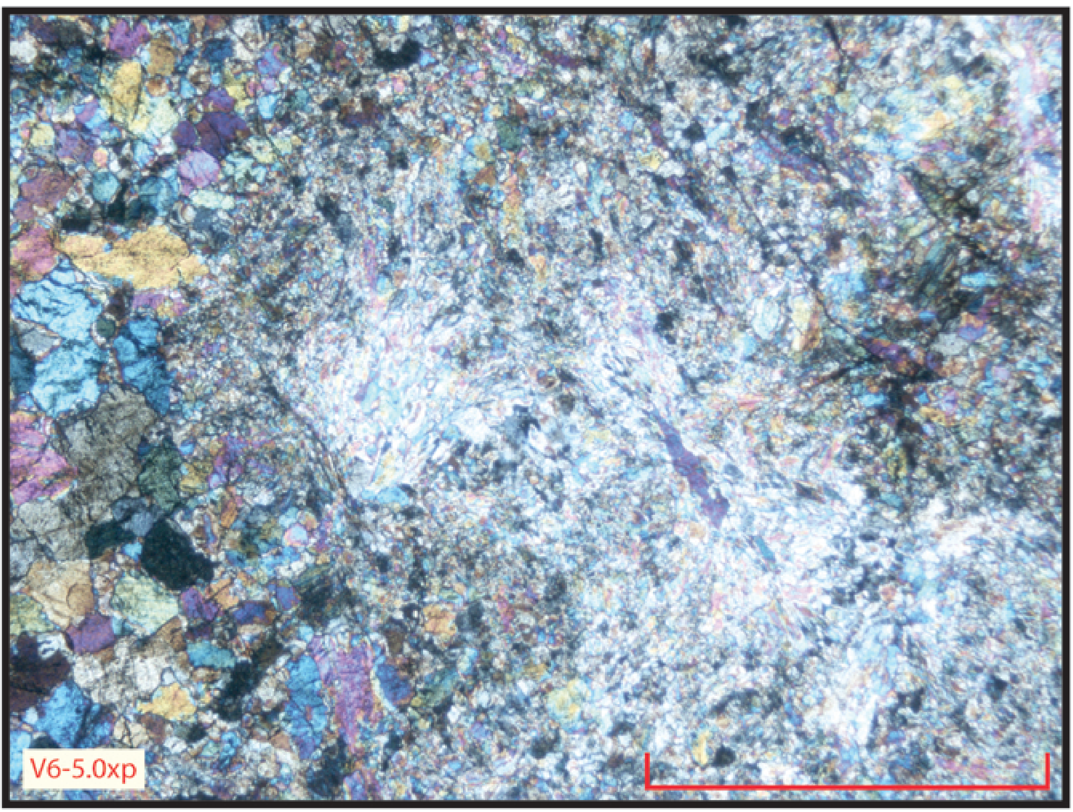


V5: Diopside-hedenbergite, quartz & magnetite. PP transmitted light, 1mm scale bar.

Figure 10.

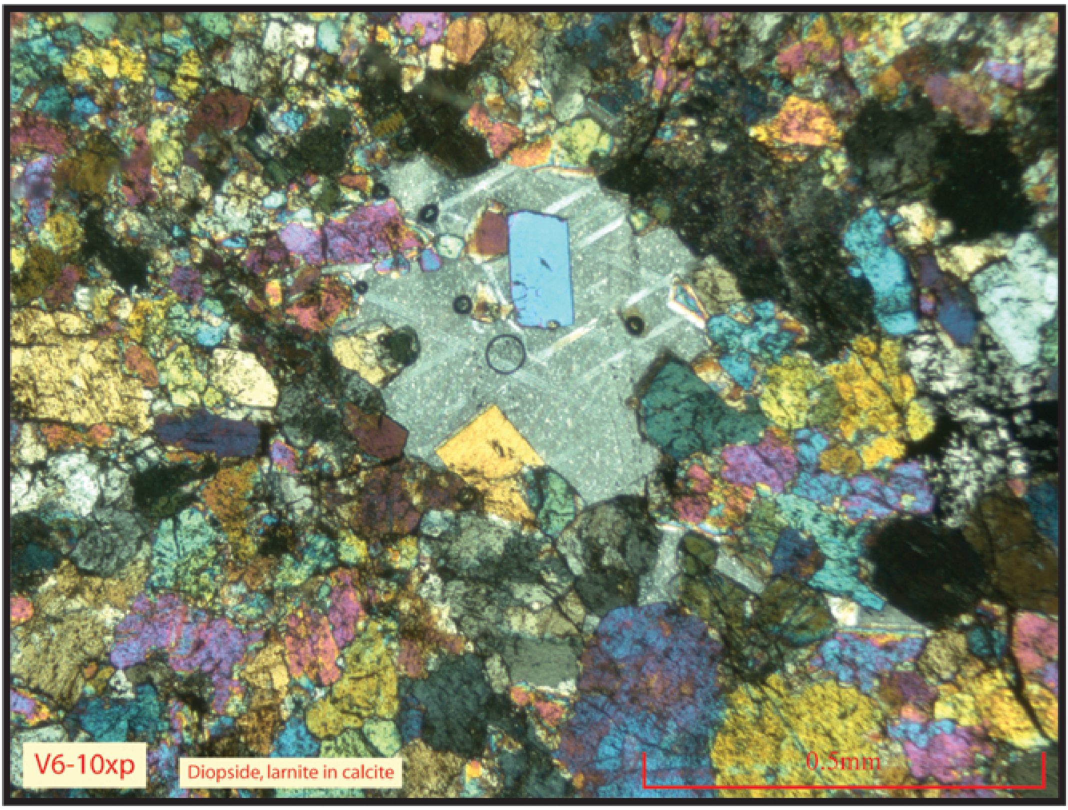


V5: Opaque inclusions in (?) gahnite. PP light, 1mm scale bar.

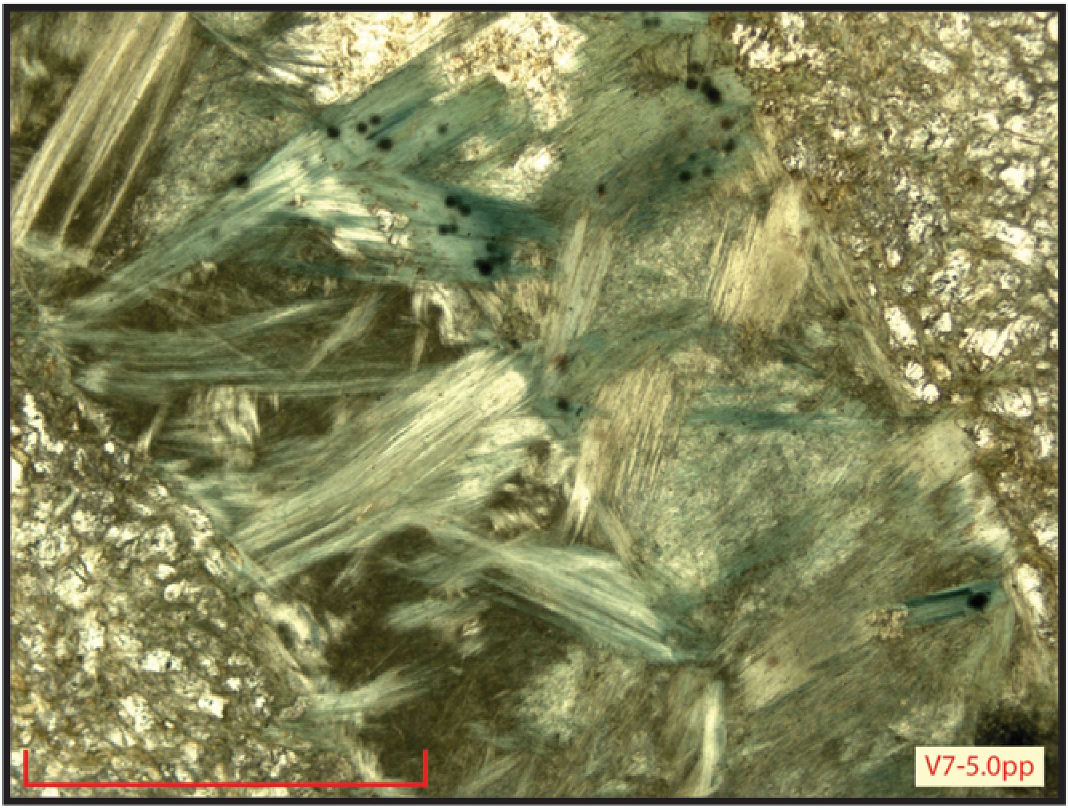


V6: Diopside-hedenbergite and fluoborite. Crossed polarisers, 1mm scale bar.

Figure 11.



V6: Diopside-hedenbergite, carbonate & larnite. Crossed polarisers.



V7: Phengite vein in diopside. Note pleichroic halos. Pp light, 1mm scale bar.

Figure 12.

V7 LTS {374707E, 6664752N} XRF 384

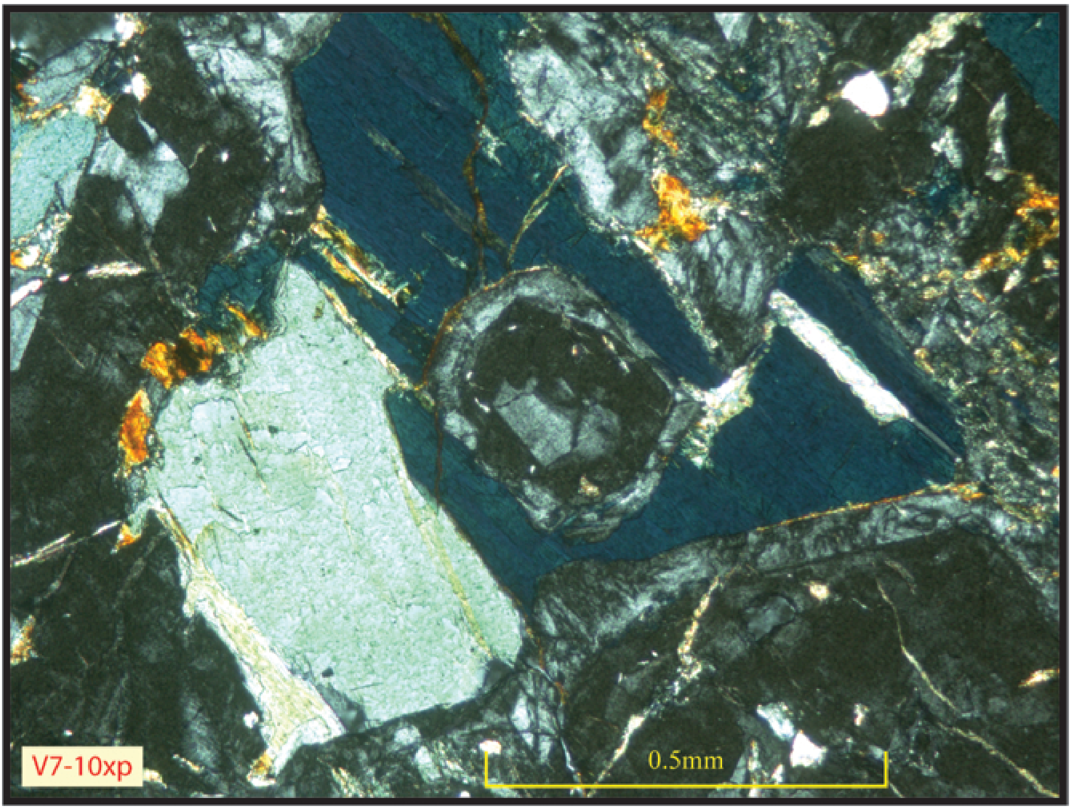
This slide has sampled the contact between primary diopside/hedenbergite skarn and retrograde actinolite skarn. The pyroxene skarn is a granular aggregate of mostly 0.4mm anhedral grains. Rare pyroxene laths reach 2.2mm long. Some irregular masses of brown carbonate are present at the contact with the amphibole, which is sharp. The amphibole skarn is in crystals to 5mm long, with 10% interstitial, pink, slightly birefringent garnet for 5mm, then it continues as massive garnet (> 7mm) and amphibole. Some 2mm patches of remnant pyroxene remain within the amphibole. A little phengite alteration and also fluorite are seen, particularly as veins. Some of the vein phengite contains monazite inclusions that have produced distinct pleichroic halos.

V8 LTS {374339E, 6664808N} XRF 382

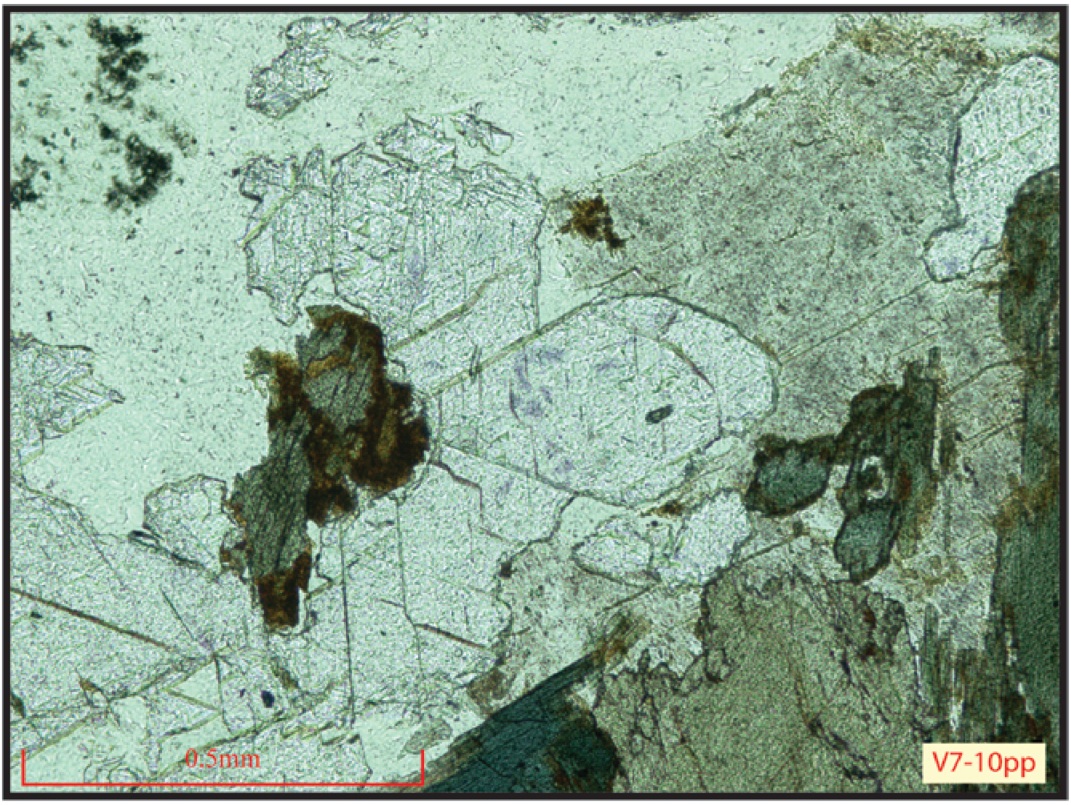
A melilite garnet diopside/hedenbergite skarn in contact with actinolite skarn. Melilite is in subhedral crystals to 22mm long accompanied by pink garnet (1.5mm) and very pale green pyroxene. Some actinolite is interstitial to the pyroxene and also is seen along cleavages in the melilite. A layer (11mm thick) of granular distinctly green pyroxene follows (< 0.2mm grain size), then actinolite in a 18mm layer. This layer also contains some 1.5mm long subhedral brown amphibole (barkevikite ?). The last 5mm of the amphibole layer contains up to 10% anhedral magnetite, < 0.4mm across. Colourless pyroxene and magnetite follow, with some amphibole replacing the pyroxene along cleavages. No cassiterite was noted.

V9 PTS {374610E, 6664770N} XRF 386

A magnetite-fluoborite greisenized skarn (wrigglite). It is composed (50%) of skeletal aggregates of subhedral magnetite crystals < 0.2mm (with about 1% pale yellow anhedral to euhedral cassiterite) arrayed in layers 5-10mm thick, although not as regularly as the V5 wrigglite. The interstitial material is 3mm long laths of fluoborite with occasional < 2mm anhedral phengite that varies from being fresh to quite (?) clay altered. No sphalerite was noted. Examination of the offcut slab from the thin section showed two 1-2mm grains of scheelite on faces perpendicular to the section.

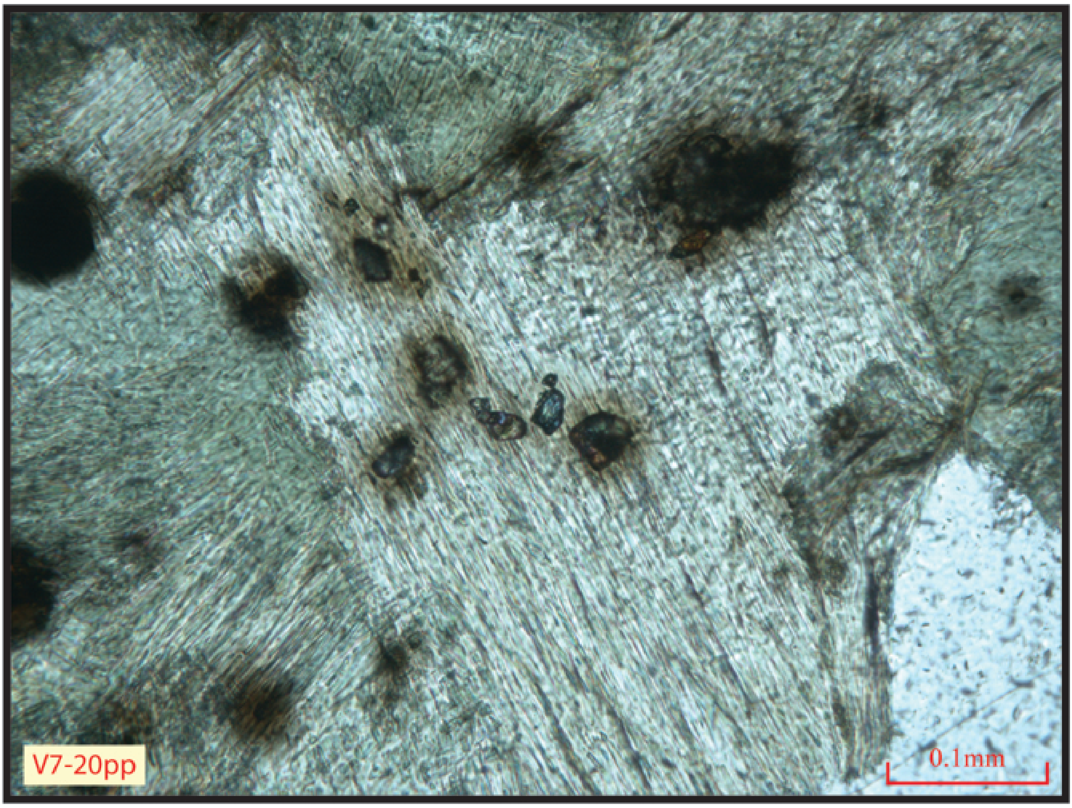


V7: birefringent garnet & actinolite. Crossed polarisers.

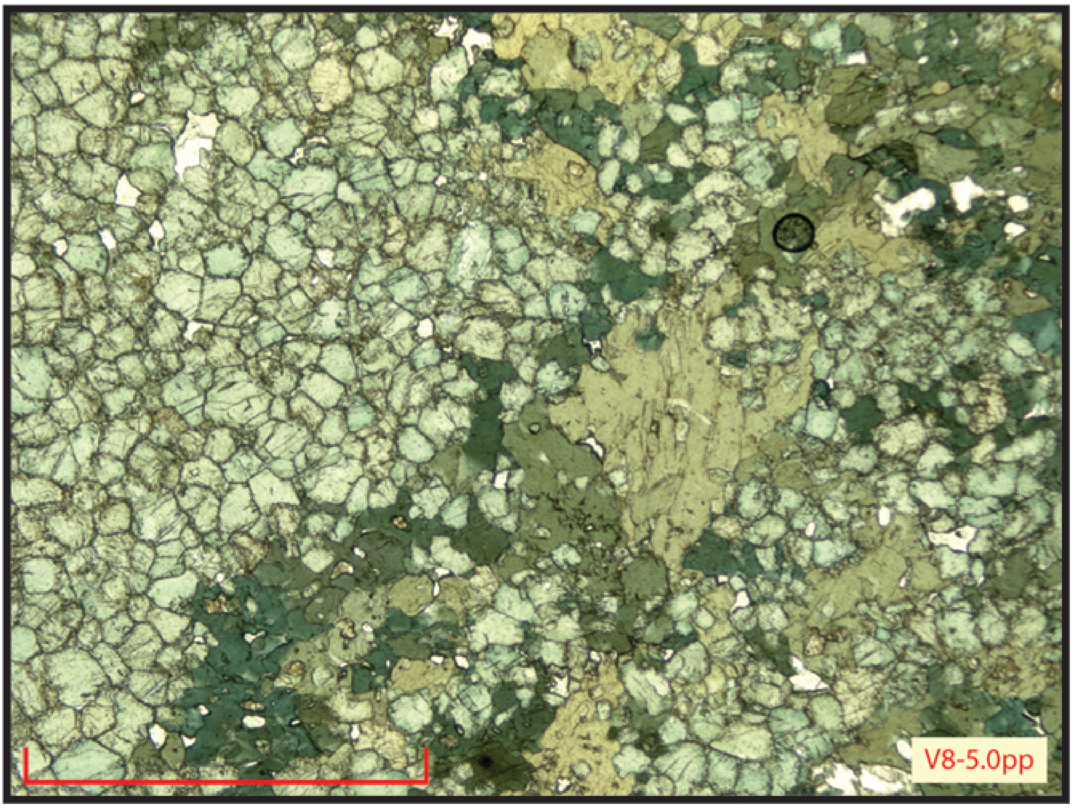


V7: fluorite & actinolite. Pp transmitted light.

Figure 13.

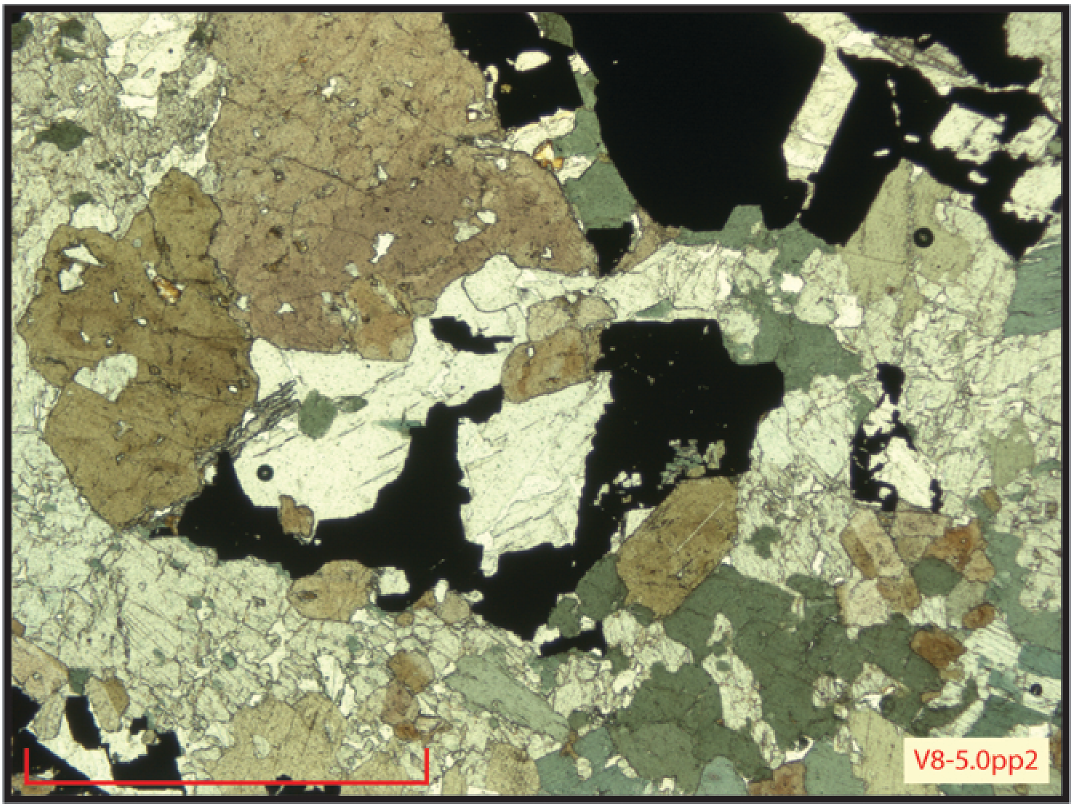


V7: monzite inclusions in phengite producing pleichroic halos. Crossed polarisers.

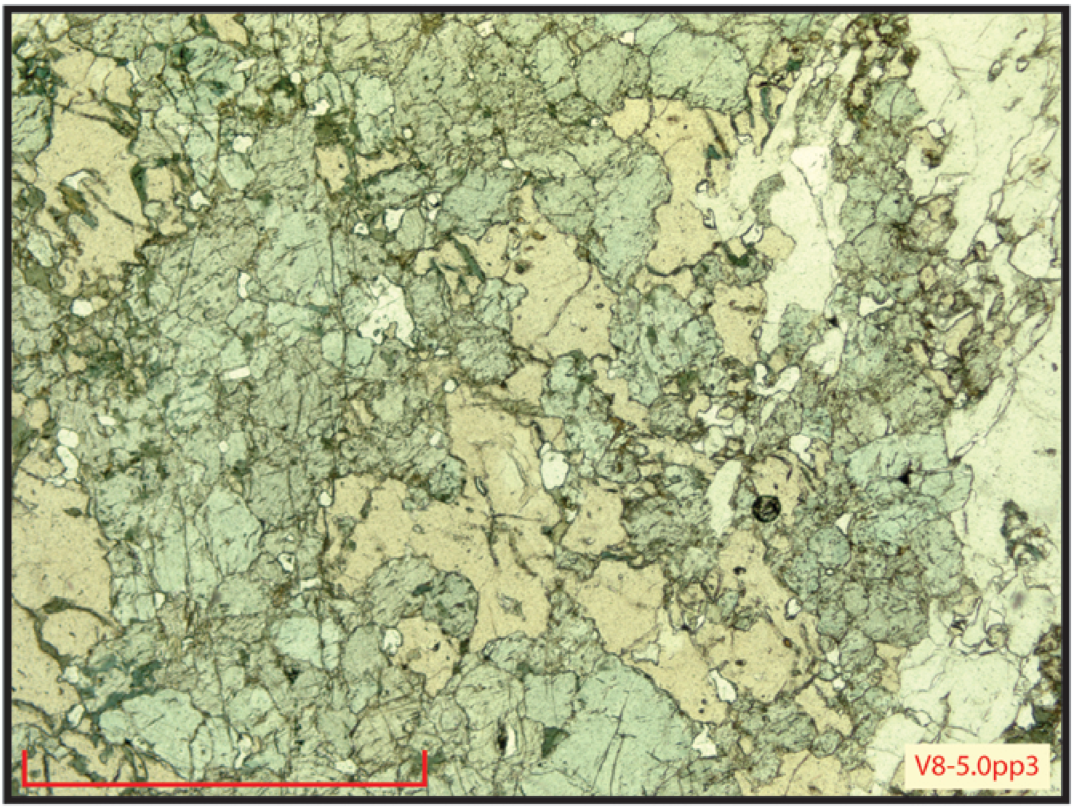


V8: contact between pyroxene skarn and amphibole skarn.
Pp transmitted light, scale bar = 1mm

Figure 14.

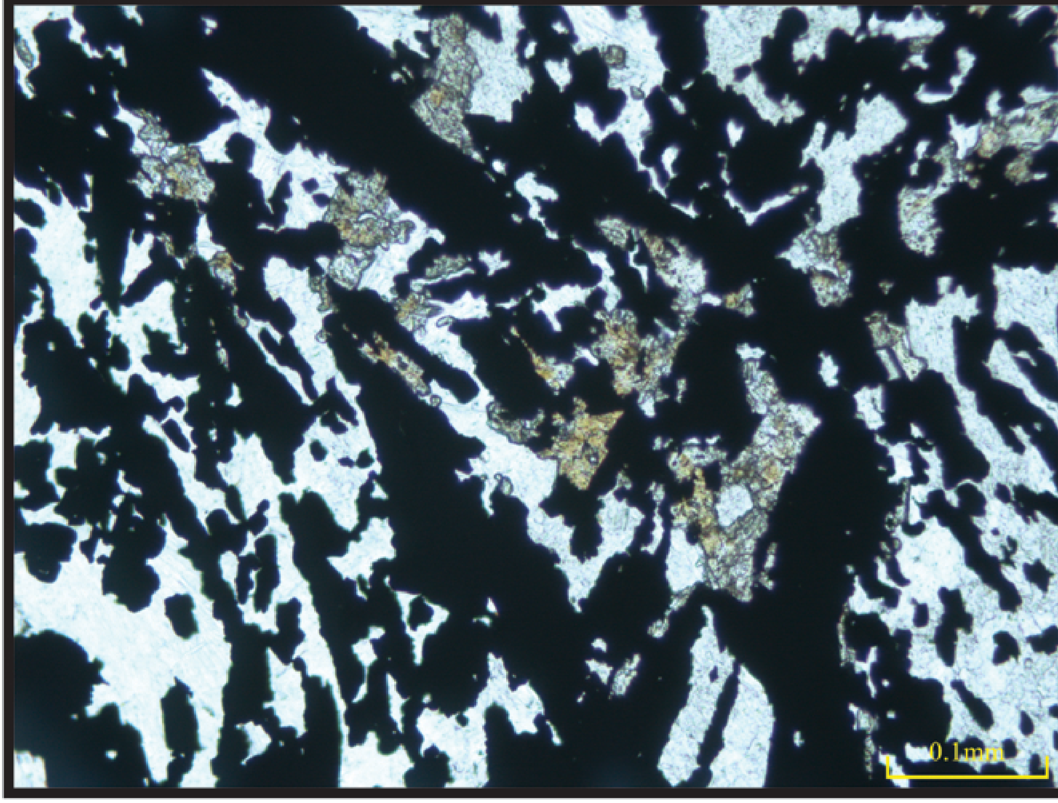


V8: barkevikite in actinolite with pyrrhotite. Pp transmitted light, 1mm scale bar.

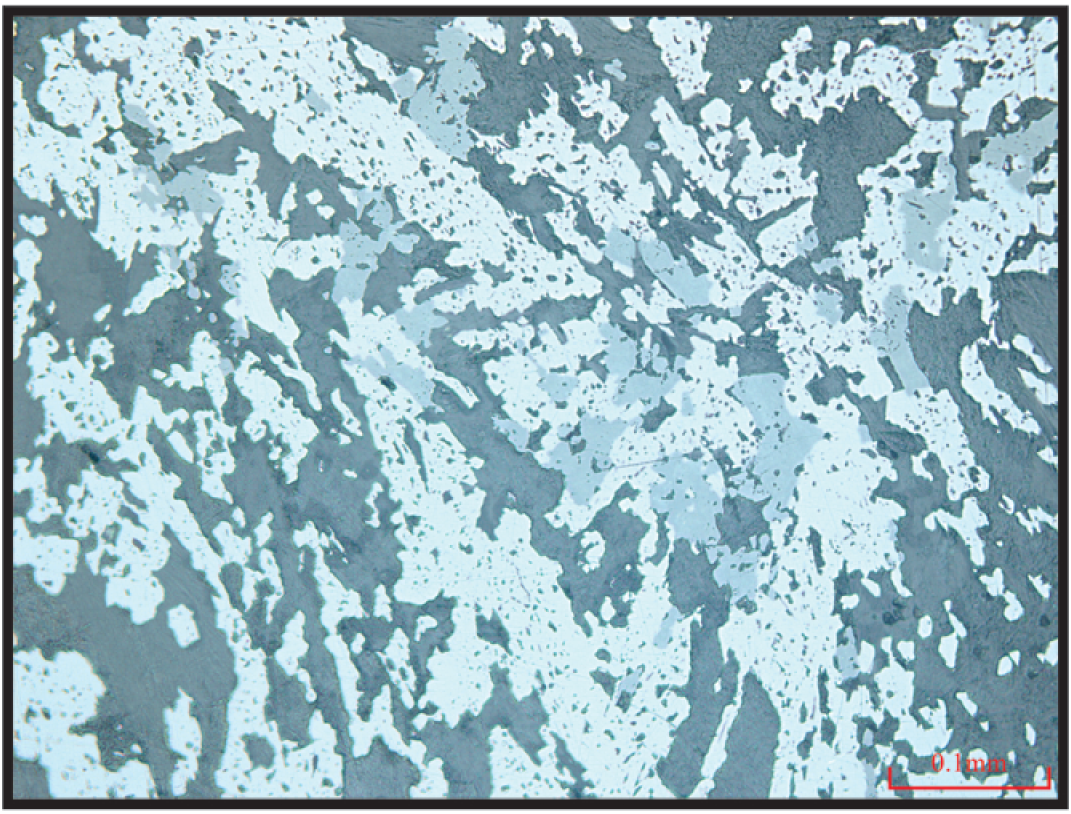


V8: actinolite, garnet and melilite. Pp light, 1mm scale bar.

Figure 15.



V9: Magnetite & cassiterite in fluoborite. Transmitted pp light.



V9: Same field as above. Reflected pp light.

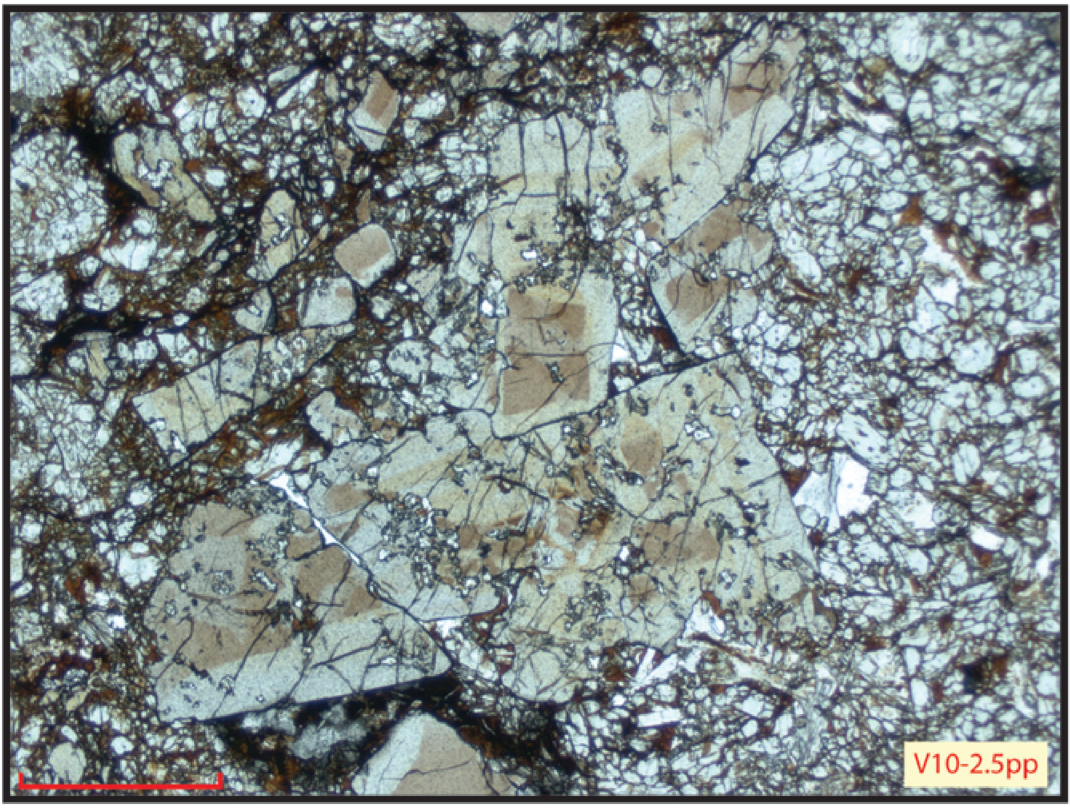
Figure 16.

V10 TS Main showing {374980E, 6664870N} XRF 385

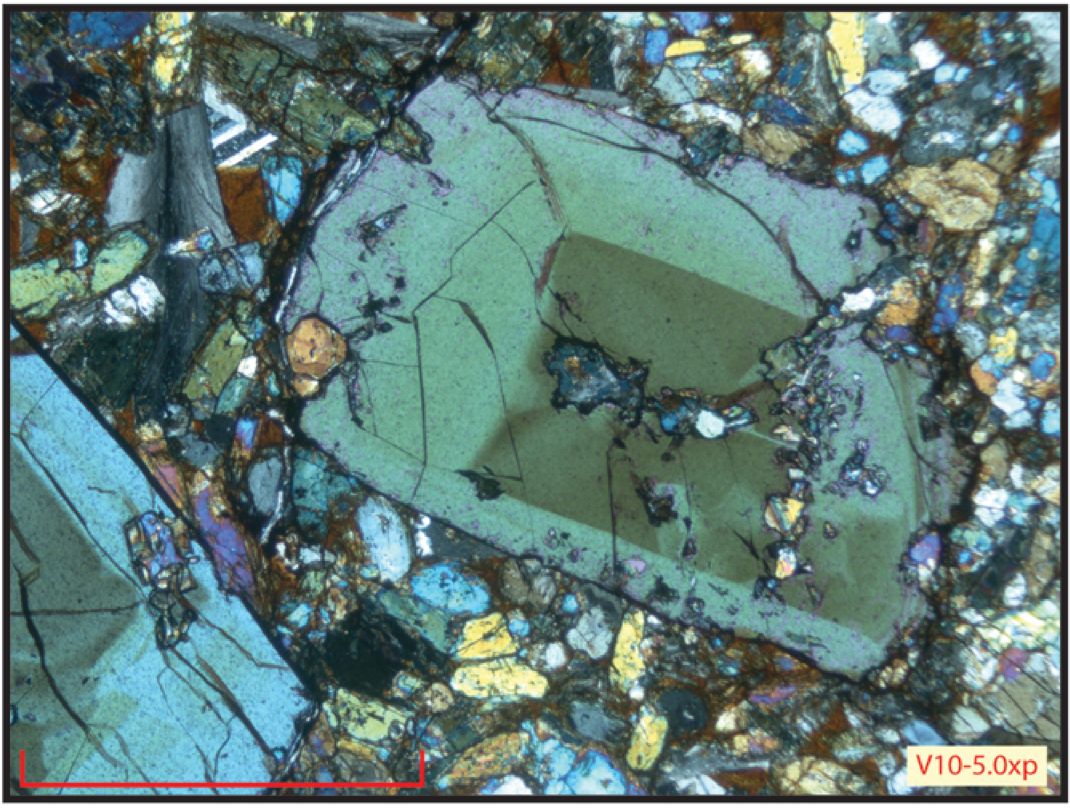
A coarse-grained melilite-diopside/hedenbergite skarn. It contains melilite as euhedral crystals to 4mm size in a matrix of anhedral diopside/hedenbergite of < 0.2mm grain size. A little carbonate is found within the pyroxene mass. No mineralization was noted.

Note:

Only specimens V5 and V9 show cassiterite. Both are greisen-altered skarns with high fluorine content, either as fluorite or fluoborite. V1, however, is a magnetite-fluorite skarn without cassiterite.



V10: zoned melilite crystals in pyroxene. Pp transmitted light, 1mm scale bar.



V10: melilite in diopside-hedenbergite. Crossed polarisers, 1mm scale bar.

Figure 17.

COST STATEMENT

Fieldwork:

W. Mann, travel and mapping,	2 days @ $550.00	$ 1100.00
T.Liverton, travel and mapping,	2 days @ 550.00	$ 1100.00
Camp supplies:		$ 150.00
2 Vehicles (Whitehorse & Watson Lake):		
1046km @ $0.45,		$ 470.70
Specimen preparation (Vancouver Petrographics)		$ 498.75
Petrography & report preparation,	4 days	$ 2200.00
Total:		**$ 5519.45**

STATEMENT OF QUALIFICATIONS

TIMOTHY LIVERTON, PH.D., C.GEOL., F.G.S.

BOX 393, WATSON LAKE, YUKON, Y0A 1C0

1. I am a Graduate of The University of Sydney 1964 (B.Sc. in Geology and Geophysics), the University of Adelaide 1967 (B.Sc. Hons. Economic Geology) and Royal Holloway, University of London 1992 (Ph.D. in Structural Geology, Petrology & Metallogeny)
2. I am a Fellow of the Geological Society, London and am validated as a Chartered Geologist.
3. I have worked in the mining and mineral exploration industry since 1965.

Timothy Liverton

STATEMENT OF QUALIFICATIONS

WILLIAM D. MANN, M.Sc., P.Geo.

19 HAYES CRESCENT, WHITEHORSE, YUKON Y1A 0E1

1. I am a member in good standing of the Association of Professional Engineers and Geoscientists of BC, Licence #31907.
2. I am a Graduate of Queen's University, 1986, with a Master of Science Degree in Mineral Exploration Geology.
3. I am a Graduate of the University of British Columbia, 1983, with a Bachelor of Science Degree in Geology.
4. I have worked in mineral exploration and mining continuously since 1979.
5. I participated in the work program on the VAL Project in 2013.
6. I hold no interest in the VAL property.

January 21, 2014

PROFESSIONAL
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William D. Mann, M.Sc., P.Geo.