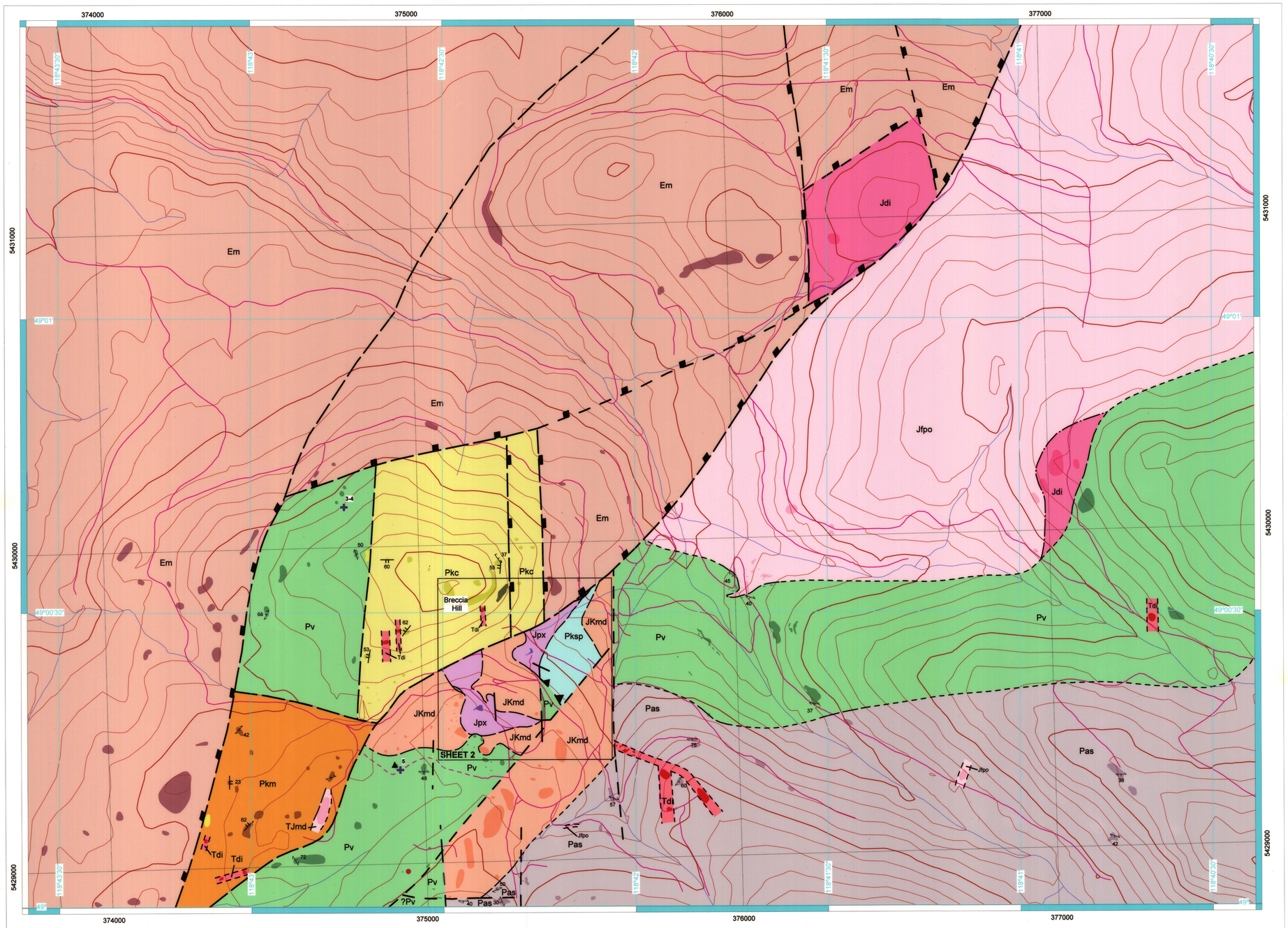


Geological Survey Branch

OPEN FILE MAP 2002-7

SHEET 1 of 2

ALKALINE-HOSTED CU-PGE MINERALIZATION: THE SAPPHO ALKALINE PLUTONIC COMPLEX, SOUTH-CENTRAL BRITISH COLUMBIA

NTS 82E/2

Mapping and Compilation
by Graham T. Nixon

Scale 1:5 000

0 250 500
metres

Legend

Tertiary (Eocene)
Marron Formation

- Em — sparsely porphyritic (plagioclase-pyroxene-biolite) volcanic rocks
- Tdi — diorite

Jurassic or Cretaceous

- JKmd — diorite-monzodiorite (minor monzonite)

Jurassic
Sappho Alkaline Complex

- Jpx — clinopyroxenite and minor melanocratic monzonite

Lexington Intrusions

- Jfpo — feldspar porphyry (minor quartz phenocrysts)
- Jdi — diorite

Triassic or Jurassic

- TJmd — monzodiorite

Permo-Carboniferous
Attwood Group

- Pas — argillite, phyllite and metasiltstone

Knob Hill Group

- Pkc — chert-argillite/schist
- Pksp — serpentinized ultramafic rocks (+/- talc-carbonate alteration)
- Pkm — penetratively deformed phyllite, mica schist, metachert and minor calc-silicate schist
- Pv — variably deformed, mafic metavolcanic rocks (actinolite-feldspar schist with minor chert-argillite/schist)

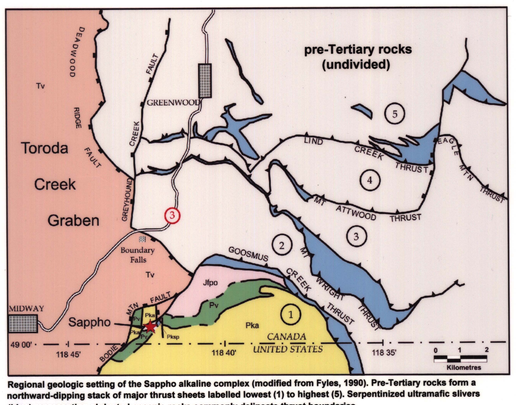
Symbols

- Bedding attitude, facing unknown
- Foliation attitude
- Foliation attitude, vertical
- Syenite dike (attitude unknown)
- Fault breccia
- Quartz vein flooding
- Minor fault attitude
- Gossan
- Assay location (Sheet 2 Table)
- Geological contact, normal
- Geological contact, gradational
- Geological contact, inferred or assumed
- Fault, normal, approximate
- Fault, normal, inferred or assumed
- High-angle fault, approximate
- High-angle fault, inferred or assumed
- Pre-Tertiary thrust fault (inferred)
- 100m Contour
- 20m Contour
- Road
- River

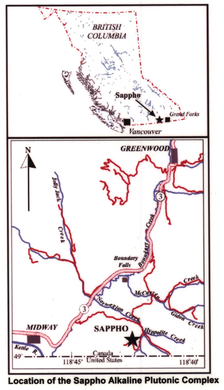
Digital cartography by A. Dow
Digital base maps (1:20 000 TRIM) from B. C. Ministry of Environment, Lands and Parks

North American Datum 1983 (NAD83)
Altitude in metres above mean sea level
Contour interval 20 metres

Approximate mean magnetic declination 2001 for the map area: 18 ° 17' E decreasing annually 8.5'



Regional geologic setting of the Sappho alkaline complex (modified from Fyles, 1990). Pre-Tertiary rocks form a northward-dipping stack of major thrust sheets labelled lowest (1) to highest (5). Serpentinized ultramafic slivers (blue) representing obducted oceanic rocks commonly delineate thrust boundaries.
Pka, Permo-Carboniferous Knob Hill and Attwood groups.



Location of the Sappho Alkaline Plutonic Complex

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GEOLOGICAL SYNOPSIS

The Sappho mineral occurrence in south-central British Columbia (MINFILE 082ESE147) is part of the Boundary mining camp and one of a number of Cu-Ag-PGE(±Au) prospects associated with alkalic intrusive complexes in the province. Historical production in 1916-1918 yielded 102 tonnes of ore with an average grade of 5.6 wt. % Cu and 61.7 g/t Ag. Further development work in 1927-1928 produced 9 tonnes of chalcopyrite-pyrite ore; a grab sample assayed 3.2 % Cu and 1.03 g/t Pt.

The Sappho alkaline complex which hosts the mineralization comprises hornblende-biotite clinopyroxenite and minor melanocratic garnet monzonite/syenite cut by porphyritic syenite dikes carrying potassium-feldspar megacrysts up to 4 cm in length The complex intrudes deformed and metamorphosed Late Paleozoic basaltic and serpentine-talc-altered ultramafic rocks along its eastern margin, and is bordered to the south and west by (?)Jurassic-Cretaceous diorite/monzodiorite, and to the north by a northeasterly-trending fault which separates the plutonic rocks from Eocene lavas of the Marron Formation. The basaltic rocks were tentatively regarded as Triassic (Brooklyn Formation) by Fyles (1990). However, because of their uppermost greenschist- to lowermost amphibolite-grade of metamorphism, these rocks have been reassigned here to the Permo-Carboniferous Knob Hill Group which represents fault-bounded slivers of an obducted ophiolitic assemblage. Northerly-trending, high-angle Tertiary faults near the eastern margin of the Toroda Creek Graben are locally associated with fault breccias and thin gouge zones, and are intruded by younger Tertiary dikes. These structures are also observed cutting clinopyroxenite and syenite dikes at the main Sappho showing.

Cu-Ag-PGE mineralization occurs in gently-dipping, semi-massive to massive pods and veins of chalcopyrite-pyrite-magnetite ore and as blebs and disseminations in clinopyroxenite and syenite. Assays of mineralized bedrock have confirmed anomalous abundances of platinum-group elements with grab-sample values up to 8.5 g/t Pt, 1.5 g/t Pd, 126 g/t Ag, 0.6 g/t Au and 7.3 wt. % Cu. (see Table). The majority of the mineralization at surface is fracture-controlled and appears intimately associated with syenite dykes and veins. A new isotopic date on igneous hornblende separated from Sappho clinopyroxenite yields a minimum age of 156 +/- 3 Ma (Late Jurassic) for emplacement of the complex and associated Cu-Ag-PGE mineralization.

ACKNOWLEDGMENTS

Gold City Industries Ltd. made available proprietry geochemical and geological information for the Sappho property; and in particular, Alan Raven is thanked for field discussions and Linda Caron for providing geological observations. Any errors or omissions are the sole responsibility of the author.

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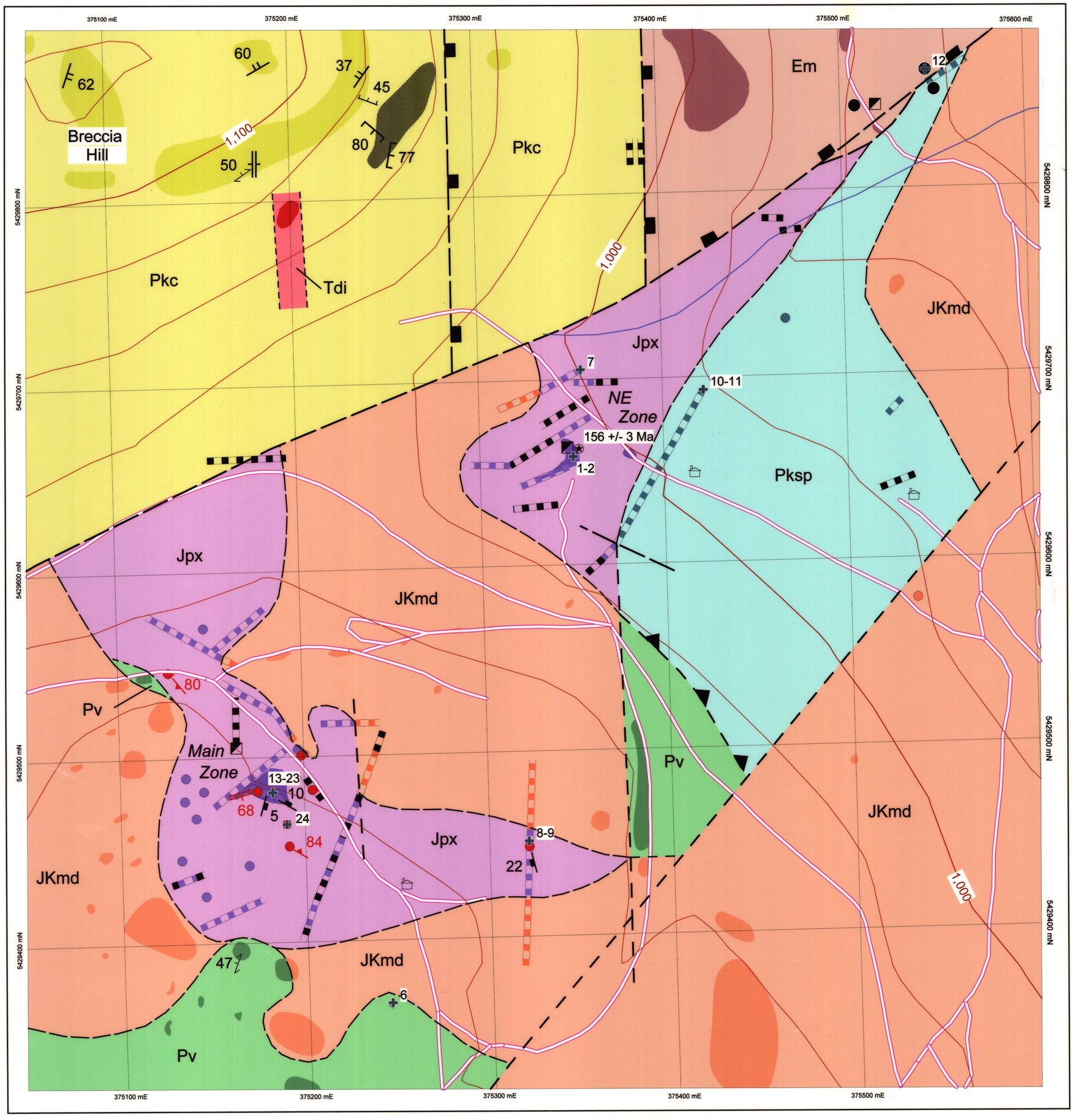

Geological Survey Branch
Ministry of Energy and Mines, Energy and Minerals Division
OPEN FILE MAP 2002-7
SHEET 2 of 2

ALKALINE-HOSTED CU-PGE MINERALIZATION: THE SAPPHO ALKALINE PLUTONIC COMPLEX, SOUTH-CENTRAL BRITISH COLUMBIA

NTS 82E/2

Mapping and Compilation
by Graham T. Nixon

Scale 1:1000

0 50 100
metres

Legend

Tertiary (Eocene)
Marron Formation
- Em — sparsely porphyritic (plagioclase-pyroxene-biotite) volcanic rocks
- Tdi — diorite

Jurassic or Cretaceous
- JKmd — diorite-monzodiorite (minor monzonite)

Jurassic
Sappho Alkaline Complex
- Jpx — clinopyroxenite and minor melanocratic monzonite

Permo-Carboniferous
Knob Hill Group
- Pkc — chert-argillite/schist
- Pksp — serpentinized ultramafic rocks (+/- talc-carbonate alteration)
- Pv — variably deformed, mafic metavolcanic rocks (actinolite-feldspar schist with minor chert-argillite/schist)

Symbols

- Bedding attitude, facing unknown (60)
- Foliation attitude (60)
- Foliation attitude, vertical
- Tertiary dike attitude, vertical
- Syenite dike attitude (68)
- Minor fault attitude (37)
- Syenite dike (attitude unknown)
- Flow lamination in syenite dike (80)
- Cu-Ag-PGE vein (80)
- Fault breccia
- Assay location (Table) (5)
- Geological contact, approximate
- Geological contact, inferred or assumed
- Fault, normal, approximate
- Fault, normal, inferred or assumed
- High-angle fault, approximate
- High-angle fault, inferred or assumed
- Pre-Tertiary thrust fault (inferred)
- pit, adit, trench (coloured where bedrock originally exposed)
- 156 +/- 3 Ma — $^{40}Ar/^{39}Ar$ date (material dated = hornblende; 2 sigma error)
- 100m Contour
- 20m Contour
- Road
- River
- Cabin

Digital cartography by A. Dow
Digital base maps (1:20 000 TRIM) from B. C. Ministry of Environment, Lands and Parks

North American Datum 1983 (NAD83)
Altitude in metres above mean sea level
Contour Interval 20 metres

Approximate mean magnetic declination 2001 for the map area: 18 ° 17' E decreasing annually 8.5'

LITHOGEOCHEMICAL ANALYSES OF MINERALIZED ROCKS

				wt. %			ppm											ppb							ppb *		
No	Sample	Rock Type	Alteration/Mineralization	S	Cu		Cu	Mo	Pb	Zn	As	Sb	Bi	Tl	Ga	Cd	Se	Te	Re	Hg	Ag	Au	Pt	Pd	Os	Au	Pt	Pd	Rh
1	01GNX 1-1-2	clinopyroxenite	carbonate + magnetite + disseminated sulphide	0.43			12954	0.83	2.4	245	4.2	1.13	0.24	0.12	8.3	5.27	1.6	0.19	1	19	12685	118	147	279	< 1	120	348	254	0.59
2	01GNX 1-1-2D	clinopyroxenite	carbonate + magnetite + disseminated sulphide	0.42			12923	0.86	2.5	244	4.2	1.13	0.23	0.12	8.2	5.26	1.5	0.19	< 1	13	13176	128	184	245	3	98	307	247	< .05
3	01GNX 5-15-1	actinolitic schist + epidote	disseminated pyrite	0.22			72	0.7	1.3	66	0.3	0.09	0.02	0.1	8.3	0.11	0.1	0.02	< 1	< 5	55	1.7	< 2	< 10	1	< 1	0.2	< .5	0.07
4	01GNX 5-15-1D	actinolitic schist + epidote	disseminated pyrite	0.18			86	0.43	1.6	61	0.5	0.11	0.02	0.09	7.7	0.09	0.2	0.02	1	< 5	63	0.9	< 2	< 10	< 1	< 1	< .1	< .5	< .05
5	01GNX 6-4-1	silicified greenschist + gossan	limonite + hematite + sulfide	1.75			380	12.6	16.7	34	66.3	1.86	0.64	0.03	13.5	0.02	6.8	0.47	20	< 5	1071	7.6	5	10	1	6	6	6	0.4
6	01GNX 8-2-1	gossanous gabbroic rock	limonite + hematite + carbonate + chlorite + pyrite	0.28			89	1.1	4.8	109	1.8	0.16	0.06	< .02	18.1	0.31	0.7	0.05	< 1	< 5	132	3.6	< 2	< 10	1	< 1	< .1	< .5	0.11
7	01GNX 8-7-1	carbonate-altered clinopyroxenite	disseminated chalcopyrite + pyrite	3.22			46347	1.7	2.5	359	2.7	1.8	0.55	0.05	12.7	9.28	12.4	0.27	1	13	19561	83	33	374	10	85	231	306	1.7
8	01GNX 9-2-4	sulfide vein	magnetite + chalcopyrite + biotite + apatite	1.86			94052	9.1	6.8	634	18.8	1.4	1.01	< .02	11.4	9.68	61.1	0.33	1	71	28470	58	289	< 10	6	72	713	96	2.7
9	01GNX 9-2-5	sulfide vein	magnetite + chalcopyrite + biotite + apatite	1.99			77964	11.9	5.3	498	9.7	2.47	0.79	0.02	12.6	8.36	36.2	0.5	2	33	36324	102	344	180	< 1	105	761	206	0.92
10	01GNX 11-5-5	hornfels	talc + carbonate + disseminated sulfide	0.33			981	2.6	2.2	12	0.5	0.39	0.13	0.02	2	0.23	0.4	0.07	1	< 5	692	5.7	4	< 10	< 1	7	3	2	< .05
11	01GNX 11-5-6	clinopyroxenite	carbonate + pyrite	0.27			250	0.82	1.0	68	1.3	0.25	< .02	0.09	8.1	0.08	0.2	0.02	< 1	< 5	115	0.7	5	20	< 1	< 1	10	20	0.15
12	01GNX 12-1-1	feldspathic clinopyroxenite	carbonate + chlorite + epidote + magnetite + apatite + chalcopyrite	0.2			1966	0.87	1.0	47	1.1	0.22	0.03	0.05	7.4	0.19	0.4	0.05	1	< 5	561	11	68	249	< 1	12	115	245	0.2
13	01GNX 12-2-1	sulfide vein	limonite + magnetite + chalcopyrite + carbonate	6.74			69175	12.4	6.5	1628	33.2	2.42	1.29	0.09	9.9	24.55	60.1	0.68	2	102	56337	155	409	273	< 1	189	567	729	1.2
14	01GNX 12-2-2	sulfide vein	limonite + sericite + epidote + magnetite + apatite + chalcopyrite + carbonate	8.78			86734	13.2	8.4	1089	38.5	2.98	2.39	0.12	8.7	12.65	85.1	0.83	< 1	252	>99999	612	624	1455	< 1	609	981	1226	1.9
15	01GNX 12-2-2**	sulfide vein	limonite + sericite + epidote + magnetite + apatite + chalcopyrite + carbonate		8.29																107900								
16	01GNX 12-2-3	sulfide vein	limonite + magnetite + chalcopyrite	4.53			>99999	14.0	8.5	1802	10.7	4.52	1.16	0.13	3.2	26.19	142.8	2.55	2	326	>99999	1881	424	986	< 1	2263	2017	938	2.9
17	01GNX 12-2-3**	sulfide vein	limonite + magnetite + chalcopyrite		25.63																254500								
18	01GNX 12-2-4	sulfide vein	limonite + magnetite + chalcopyrite + sericite + carbonate	5.02			>99999	10.6	8.5	1728	9.3	5.34	1.23	0.16	3	25.36	162.4	2.22	1	360	>99999	1608	526	528	< 1	1876	3099	454	2.1
19	01GNX 12-2-4**	sulfide vein	limonite + magnetite + chalcopyrite + sericite + carbonate		24.51																311700								
20	01GNX 12-2-5	sulfide vein	limonite + magnetite + apatite + pyrite + chalcopyrite + sericite + carbonate	25.94			76480	18.7	13.7	2633	31.6	2.93	2.86	0.09	2.4	64.64	120	0.62	3	446	>99999	705	1842	1080	9	641	8507	1519	3
21	01GNX 12-2-5D	sulfide vein	limonite + magnetite + apatite + pyrite + chalcopyrite + sericite + carbonate	21.57			71339	16.7	12.5	2521	25.2	2.64	2.42	0.08	2.3	50.81	96.9	0.58	6	276	>99999	610	882	859	26	618	3078	1397	3
22	01GNX 12-2-5**	sulfide vein	limonite + magnetite + apatite + pyrite + chalcopyrite + sericite + carbonate		7.39																126200								
23	01GNX 12-2-5D**	sulfide vein	limonite + magnetite + apatite + pyrite + chalcopyrite + sericite + carbonate		7.21																128900								
24	01GNX 12-4-2	garnet-bearing syenite	chalcopyrite + sericite + chlorite + carbonate + epidote + quartz	0.18			6491	2.4	1.1	298	1.7	0.38	0.04	0.1	24.4	2.65	1.5	0.05	1	< 5	2742	13	39	205	< 1	11	165	184	< .05

Analyses done by Acme Analytical Laboratories Ltd., Vancouver; aqua regia digestion of 1g sample (-150 mesh; steel mill; quartz wash) and ICP-MS/ES finish, ** high-concentration method;
* Fire assay (15-30g sample) with ICP finish; D, duplicate analysis; wt. %, weight percent; ppm, parts per million; ppb, parts per billion

ACKNOWLEDGMENTS

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