Location/Identification

MINFILE Number: 092L 044
National Mineral Inventory Number: 092L6 Fe1
Name(s): **MERRY WIDOW 5 (L.1533**
L.1543), EMPIRE, SIDEHILL FRACTION, QUATSINO COPPER, RAVEN COPPER, KINGFISHER, COPPER KNOB
Status: Past Producer
Mining Division: Alberni, Nanaimo
Mining Method Open Pit
Electoral District: North Island
Regions: British Columbia
Resource District: North Island - Central Coast Natural Resou
BCGS Map: 092L034
NTS Map: 092L06W
UTM Zone: 09 (NAD 83)
Latitude: 50 21 19 N
Northing: 5579591
Longitude: 127 15 13 W
Easting: 624230
Elevation: 770 metres
Location Accuracy: Within 500M
Comments: Location of open pit, on far west side of Lot 1533 (Minister of Mines Annual Report 1960, Figure 9), is 1.5 kilometres west of Benson River, 3.0 kilometres south of Benson Lake. See also Kingfisher (092L 045).

Mineral Occurrence

Commodities: Magnetite, Iron, Copper, Gold, Zinc, Cobalt, Limestone, Arsenic, Silver

Minerals
Significant: Magnetite, Bornite, Gold, Chalcopyrite, Sphalerite, Arsenopyrite, Pyrrhotite, Pyrite, Marcasite, Cobaltite, Erythrite, Cuprite
Significant Comments: Cuprite occurs as chalcotrichite.
Associated: Pyroxene, Calcite, Quartz
Associated Comments: Calcite, quartz lenses.
Alteration: Epidote, Garnet, Actinolite, Diopside, Chlorite
Alteration Type: Skarn
Mineralization Age: Unknown

Deposit
Character: Stratabound, Massive, Vein
Classification: Skarn, Igneous-contact, Replacement, Industrial Min.
Type: K03: Fe skarn, I05: Polymetallic veins Ag-Pb-Zn+/-Au
Shape: Tabular
Dimension: 150x100x50 metres
Comments: Mineralization strikes north along intrusive contact. Deposit dimensions are approximate.

Host Rock

Dominant Host Rock: Sedimentary

Stratigraphic Age	Group	Formation	Igneous/Metamorphic/Other
Upper Triassic	Vancouver	Quatsino	------
Lower Jurassic	Bonanza	Undefined Formation	------
Jurassic	------	------	Island Plutonic Suite

Isotopic Age	Dating Method	Material Dated
225 Ma	Fossil	225 Ma
200 Ma	Fossil	200 Ma
178 +/- 8 Ma	Potassium/Argon	Phlogopite

Lithology: Limestone, Garnet Epidote Actinolite Skarn, Diorite, Gabbro, Tuff, Pyroclastic, Greenstone, Mafic Dike, Andesite, Granodiorite

Comments: Ammonites from Alice Lake; mollusks from Quatsino Sound; phlogopite from Empire Mine (Geological Survey of Canada Paper 74-8).

Geological Setting

Tectonic Belt: Insular
Physiographic Area: Vancouver Island Ranges
Terrane: Wrangell

Metamorphic Type: Contact
Grade: Hornfels, Amphibolite

Inventory

Ore Zone: KNOB
Year: 2020
Category: Assay/analysis
Report On: N
NI 43-101: N

Sample Type: Channel

Commodity	Grade
Silver	28.4 grams per tonne
Gold	9.77 grams per tonne
Copper	2.35 per cent

Comments: A channel sample of the Copper Knob occurrence yielded 9.77 grams per tonne gold, 28.4 grams per tonne silver and 2.35 per cent copper over 10.5 metres of semi-massive pyrite-chalcopyrite mineralization.

Reference: Assessment Report 39420

Ore Zone: SOUTH
Year: 2020
Category: Assay/analysis
Report On: N
NI 43-101: N

Sample Type: Grab

Commodity	Grade
Silver	11.5 grams per tonne
Gold	6.1 grams per tonne
Cobalt	0.088 per cent
Copper	0.116 per cent

Comments: A grab sample of gossanous material, located approximately 30 metres south of the Merry Widow open-pit and referred to as the South Pit zone.

Reference: Assessment Report 39420

Ore Zone: KNOB
Year: 2019
Category: Assay/analysis
Report On: N
NI 43-101: N

Sample Type: Rock

Commodity	Grade
Silver	518.0 grams per tonne
Gold	24.8 grams per tonne
Cobalt	0.147 per cent
Copper	17.10 per cent
Iron	29.10 per cent
Zinc	0.349 per cent

Comments: Four rock samples (Y993765 through Y993768) containing semi-massive chalcopyrite from the Copper Knob occurrence, located near the northern edge of the Merry Widow pit yielded from 13.9 to 24.8 grams per tonne gold, 74.1 to 218.0 grams per tonne silver, 7.22 to 17.10 per cent copper, 0.039 to 0.147 per cent cobalt, 10.65 to 29.10 per cent iron and 0.102 to 0.349 per cent zinc.

Reference: Assessment Report 38855

Ore Zone: MAIN **Year:** 2019

Category: Assay/analysis **Report On:** N

NI 43-101: N

Sample Type: Rock

Commodity	Grade
Silver	78.7 grams per tonne
Gold	24.8 grams per tonne
Cobalt	0.469 per cent
Copper	5.77 per cent
Iron	50 per cent

Comments: Seven rock samples (Y993751 through Y993756) from the Merry Widow pit yielded from 1.1 to 24.8 grams per tonne gold, 1.1 to 78.7 grams per tonne silver, 0.12 to 5.77 per cent copper, 0.006 to 0.469 per cent cobalt and 19.95 to greater than 50 per cent iron.

Reference: Assessment Report 38855

Ore Zone: MAIN **Year:** 2008

Category: Combined **Report On:** Y

Quantity: 960,000 tonnes **NI 43-101:** Y

Commodity	Grade
Silver	5.64 grams per tonne
Gold	2.03 grams per tonne
Cobalt	0.013 per cent
Copper	0.34 per cent
Iron	16.1 per cent

Comments: Measured plus indicated using a 0.50 gram per tonne gold cut-off grade.

Reference: Giroux, G.H. (2008-11-30): Technical Report on the Copper-Gold Resource for the Merry Widow Property

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Ore Zone: MAIN **Year:** 2008

Category: Inferred **Report On:** Y

Quantity: 120,000 tonnes **NI 43-101:** Y

Commodity	Grade
Silver	2.77 grams per tonne
Gold	0.19 grams per tonne
Cobalt	0.008 per cent
Copper	0.13 per cent
Iron	16.2 per cent

Comments: Using a 0.50-gram per tonne gold cut-off grade.

Reference: Giroux, G.H. (2008-11-30): Technical Report on the Copper-Gold Resource for the Merry Widow Property

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Summary Production

	Metric	Imperial
Mined:	3,371,815 tonnes	3,716,789 tons

	Milled:	3,434,693	tonnes	3,786,100	tons
Recovery	Iron	1,676,060,554	kilograms	3,695,081,013	pounds

Capsule Geology

The Merry Widow deposit is located on the northeast slopes of Merry Widow Mountain, approximately 800 metres south of Newt Lake.

Regionally, the area is underlain by basaltic volcanic rocks of the Upper Triassic Karmutsen Formation (Vancouver Group), which are overlain sequentially by limestone of the Upper Triassic Quatsino Formation (Vancouver Group); limestone, mudstone and siltstone of the Upper Triassic Parson Bay Formation (Bonanza Group) and mixed volcanic and sedimentary rocks of the Lower Jurassic LeMare Lake volcanic unit (Bonanza Group). The volcanic and sedimentary rocks have been intruded by gabbro to quartz diorite of the Lower to Middle Jurassic Island Plutonic Suite.

The deposit occurs as 3 stacked lenses containing massive magnetite within Lower Jurassic Bonanza Group volcaniclastics and underlying Upper Triassic Vancouver Group, Quatsino Formation limestone. The occurrence lies several hundred metres east of the diorite to gabbro Coast Copper or Benson Lake stock of the Early to Middle Jurassic Island Plutonic Suite.

The sediments and volcanics are north to northwest striking and west dipping. The intrusion has locally modified attitudes. The north striking intrusive contact dips 90 to 70 degrees eastward; but in the vicinity of the open pit it dips only 55 degrees east. Contact metamorphism of limestone is limited to recrystallization, with destruction of bedding features. The volcanic rocks (clastics, pyroclastics and flows) are hornfelsed with local lenses of garnet- epidote-actinolite-diopside-chlorite skarn. Intrusive greenstone sills, dikes and masses, and crosscutting dikes of andesite, alaskite, diabase and granodiorite are present. Northeast trending faults, dipping south, predominate.

The upper lens of the main deposit occurs as two distinct ore zones, separated laterally by about 30 metres of un-mineralized skarn. The upper lens measures 104 metres in diameter, is 17 metres thick and dips 30 degrees east. Limestone abruptly terminates the mineralization down dip.

The middle lens is separated from the upper by 12 metres of barren, skarned volcanic rock through which passes a flat-lying thrust fault. The middle lens is 85 metres wide and 9 metres thick.

The lowermost lens lies along the gabbro contact and separated from it by a thin skarn rind. It has been explored for 165 metres down dip, where the lens thins considerably from a 12-metre maximum width near its upper limit (Property File - J.C. Lund, 1966).

Magnetite mineralization in the lenses is massive, with sharp contacts when enclosed by limestone. Contacts with volcanic and intrusive rocks are less distinct, with disseminated magnetite occurring at some distance away from the massive lenses, giving a gradational change in magnetite distribution. Bedding structures can in places be traced into magnetite. Ore locally passes outward into stringers along bedding planes or follows dikes and sills in limestone. Botryoidal structures are present, suggesting emplacement at low pressure and temperature by "gel metasomatism" (Open File 1988-28, page 44).

Small amounts of arsenopyrite with pyrrhotite, sphalerite, marcasite, cuprite, chalcopyrite and calcite are reported. A north striking fault south of the open pit hosts small amounts of iron and copper sulphides and cobaltite with cobalt bloom (erythrite). Minor pyrite, chalcopyrite and pyrrhotite accompanied by quartz are present. Jefferey (Minister of Mines Annual Report 1960, page 97) believes this latter mineralization to be later than the magnetite, and that the orebody is the result of successive mineralizing periods of silicates (skarn), oxides, sulphides and carbonate emplacement. Commercial ore has developed where the intrusive contact has locally the lowest dip, and where the bulge in the intrusion has caused a change in the strike of the layered rocks. In addition, northeast striking faults are believed to localize mineralization (Minister of Mines Annual Report 1960, page 97).

The limestone in the vicinity of the magnetite bodies is white to grey in colour and calcium high calcium in composition. Three limestone samples collected by Taywin Resources Ltd. in 1990, while exploring for precious metal bearing skarn zones, analyzed as follows in per cent (Industrial Mineral File - J.M. Huber Corp., 1990):

CaO	53.67	54.57	52.89
MgO	1.81	0.10	2.32
SiO2	0.45	0.14	0.02
Acid Insol.	-	2.22	0.60
Al2O3	0.06	-	-
Fe2O3	0.06	-	-
MnO	0.02	-	-
K2O	0.01	-	-
Na2O	0.01	-	-
P2O5	0.01	-	-
TiO2	0.11	-	-

Brightness:			
Green Filter	-	91.8	93.8
Blue Filter	-	92.2	93.6
Amber Filter	-	89.0	91.1

An article in the George Cross Newsletter No. 80 (1989) indicates the presence of gold and silver values. Dixon (1989) reports the presence of tellurobismuthite. Gold is found in pyrrhotite-pyrite-rich veins and pockets that postdate the magnetite. A sulphide-rich sample assayed up to 17 per cent copper, 2.9 per cent zinc, 0.2 per cent arsenic, 0.16 per cent cobalt, 200 grams per tonne silver and 32 grams per tonne gold (EMPR Bulletin 101, Appendix 4A).

Production between 1957 and 1967, was from both surface and underground, and included ore from the Kingfisher (MINFILE 092L 045) and Raven (MINFILE 092L 046). From 3,371,015 tonnes of ore mined, 1,676,060,554 kilograms of iron concentrate was shipped. Annual reports detail yearly ore produced. Iron content was about 58 per cent.

In 1989, sampling of the Lower North Wall assayed up to 4.9 per cent copper, 79.3 grams per tonne silver and 41.3 grams per tonne gold over 1.2 metres (Sample 19133). Sampling of the Upper north Wall assayed up to 145.5 grams per tonne silver, 27.4 grams per tonne gold and greater then 9.99 per cent copper over 1 metre (Sample E44058; Assessment Report 19178).

In 2006, diamond drilling intersected a skarn assemblage containing magnetite and massive sulphide mineralization over a strike length of 76 metre with intersected widths of up to 50 metres and down dip extensions of 128 metres. Assayed sections included:

Drill Hole (No.)	From (metres)	To (metres)	Interval (metres)	Gold (g/t)	Silver (g/t)	Copper (per cent)
DDHMW06-01	4.78	7	2.22	6.37	6.96	0.13
DDHMW06-01	50.97	56.74	5.77	5.10	12.81	0.86
DDHMW06-02	4.67	6.42	1.75	4.28	5.02	0.35
DDHMW06-02	13.46	31.66	18.2	4.98	6.73	0.32
DDHMW06-02	37.43	46.72	8.18	5.02	8.43	0.45
DDHMW06-02	55.53	60.35	4.82	6.13	4.87	0.22
DDHMW06-03	12.21	17.50	5.29	15.49	12.47	0.63
DDHMW06-03	31.85	38.41	6.56	2.38	7.07	0.40
DDHMW06-04	5.24	6.25	1.01	95.20	21.00	1.01
DDHMW06-04	26.15	27.97	1.82	18.63	10.28	0.40
DDHMW06-04	61.98	64.04	2.06	11.53	2.06	0.71
DDHMW06-05	1.45	72.66	71.21	1.80	5.93	0.35
DDHMW06-06	1.15	34.40	33.30	1.87	4.89	0.32
DDHMW06-07	0.50	100.00	99.55	2.81	4.96	0.28
DDHMW06-08	1.53	87.48	85.95	3.83	4.94	0.26
DDHMW06-09	28.85	63.09	34.24	5.06	9.61	0.51
DDHMW06-10	26.88	64.63	37.75	3.03	4.28	0.20
DDHMW06-11	28.45	37.7	9.31	7.02	9.83	0.39
DDHMW06-12	35.50	63.80	28.30	2.25	4.71	0.26
DDHMW06-13	34.54	40.75	6.25	1.12	5.90	0.38
DDHMW06-14	35.84	40.19	4.35	7.40	5.82	0.17
DDHMW06-15	26.88	64.63	47.32	5.16	23.48	1.47
DDHMW06-16	26.88	64.63	49.31	4.56	18.73	1.14
DDHMW06-17	20.02	70.44	50.32	6.51	21.93	1.38
DDHMW06-18	19.33	69.00	49.67	3.26	15.02	1.02
DDHMW06-19	63.50	66.78	3.28	7.10	5.67	0.25
DDHMW06-20	57.12	58.81	1.69	16.05	8.80	0.27
DDHMW06-21	21.51	63.09	41.58	1.99	30.15	1.82
DDHMW06-22	23.47	63.98	40.51	2.46	8.75	0.51
DDHMW06-23	25.65	66.66	41.01	2.13	11.17	0.67

(Assessment Report 28863)

In 2007, diamond drilling on the Old Sport Horizon intersected massive magnetite mineralization. Assayed sections included:

Hole ID (No.)	From (m)	To (m)	Length (m)	Gold (g/t)	Silver (g/t)	Copper (%)	Iron (%)

MW07-48	583.32	590.79	7.47	0.27	1.02	0.45	24.05
Including	583.32	587.53	4.21	0.40	1.44	0.62	35.98
Including	584.00	587.53	3.53	0.45	1.47	0.63	40.69
Including	584.00	584.76	0.76	0.79	3.40	1.27	>50.00
MW07-52	176.98	178.48	1.50	0.28	7.40	0.71	8.23
MW07-52	199.03	200.65	1.62	0.54	8.94	0.52	29.60
MW07-53	386.00	386.97	0.97	0.13	3.70	0.71	9.60
MW07-53	673.96	678.48	4.52	<0.05	<0.50	0.01	34.12
MW07-54	710.82	711.45	0.63	1.20	31.00	5.25	11.30
MW07-54	721.95	736.19	14.24	0.12	0.99	0.29	5.32
Including	732.70	735.70	3.00	0.43	2.35	0.64	7.96

(Assessment Report 30002)

In 2007, Drilling on the Copper Knob area yielded intercepts of:

Hole ID (No.)	From (m)	To (m)	Length (m)	Gold (g/t)	Silver (g/t)	Copper (%)	Iron (%)	Cobalt (%)
MW07-90	50.20	54.45	4.25	0.53	0.25	0.05	38.83	0.004
including	53.94	54.45	0.51	1.48	0.25	0.04	37.20	0.003
MW07-80	55.49	57.54	2.05	2.24	5.18	0.40	32.01	0.043
MW07-80	61.23	65.46	4.23	1.52	5.97	0.30	16.69	0.004
including	61.23	62.52	1.29	4.87	17.90	0.84	41.88	0.009
MW07-88	38.40	48.64	10.24	4.01	4.43	0.25	13.04	0.007
including	44.00	45.94	1.94	19.39	19.48	1.06	12.86	0.023
MW07-90	50.20	54.45	4.25	0.53	0.25	0.05	38.83	0.004
Including	53.94	54.45	0.51	1.48	0.25	0.04	37.20	0.003

(Assessment Report 30002)

In 2007, rock sampling of the South Pit area assayed up to 9.73 grams per tonne gold, 11.4 grams per tonne silver, 0.179 per cent cobalt, 0.235 per cent copper and 30.6 per cent iron (Sample D104347; Assessment Report 30002).

In September 2007, a measured plus indicated resource of 950,000 tonnes grading 2.0 grams per tonne gold, 5.6 grams per tonne silver, 0.34 per cent copper and 0.013 per cent cobalt with an additional 120,000 tonnes inferred grading 1.2 grams per tonne gold, 2.8 grams per tonne silver, 0.13 per cent copper and 0.008 per cent cobalt, using a 0.5 gram per tonne gold cut-off grade, was reported for the Merry Widow deposit (Giroux, G.H. (2007-09-04): Technical Report on the Copper-Gold Resource for the Merry Widow Property).

In November 2008, an updated resource for the Merry Widow deposit was reported at 960,000 tonnes measured plus indicated grading 2.03 grams per tonne gold, 5.64 grams per tonne silver, 0.34 per cent copper, 0.013 per cent cobalt and 16.1 per cent iron plus an additional inferred resource of 120,000 tonnes grading 1.19 gram per tonne gold, 2.77 grams per tonne silver, 0.13 per cent copper, 0.008 per cent cobalt and 16.2 per cent iron, using a 0.50 gram per tonne gold cut-off grade (Giroux, G.H. (2008-11-30): Technical Report on the Copper-Gold Resource for the Merry Widow Property).

In 2019, seven rock samples (Y993751 through Y993756) from the Merry Widow pit yielded from 1.1 to 24.8 grams per tonne gold, 1.1 to 78.7 grams per tonne silver, 0.12 to 5.77 per cent copper, 0.006 to 0.469 per cent cobalt and 19.95 to greater than 50 per cent iron (Assessment Report 38855). Also at this time, four rock samples (Y993765 through Y993768) containing semi-massive chalcopyrite from the Copper Knob occurrence, located near the northern edge of the Merry Widow pit yielded from 13.9 to 24.8 grams per tonne gold, 74.1 to 218.0 grams per tonne silver, 7.22 to 17.10 per cent copper, 0.039 to 0.147 per cent cobalt, 10.65 to 29.10 per cent iron and 0.102 to 0.349 per cent zinc (Assessment Report 38855).

In 2020, a channel sample of the Copper Knob occurrence yielded 9.77 grams per tonne gold, 28.4 grams per tonne silver and 2.35 per cent copper over 10.5 metres of semi-massive pyrite-chalcopyrite mineralization, while a grab sample of gossanous material, located approximately 30 metres south of the Merry Widow open-pit and referred to as the South Pit zone, yielded 6.1 grams per tonne gold, 11.5 grams per tonne silver, 0.116 per cent copper and 0.088 per cent cobalt (Assessment Report 39420).

Work History

The area was originally explored in 1897 and by 1911 a group of six claims were staked to cover the immediate area of Merry Widow Mountain. During 1916 through 1931, Cominco completed approximately 8 kilometres of underground development along the Old Sport horizon. In the 1930's, Quatsino Copper Gold Mines explored the claims.

In 1956, Empire Development was formed to mine the Merry Widow magnetite deposit. During the period 1957 to 1962 the open pit was mined to its economic limits. In 1964, the Kingfisher Adit, which had been driven under the ad

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Date Coded:	1985/07/24	**Coded By:**	BC Geological Survey (BCGS)	**Field Check:**	N
Date Revised:	2022/06/24	**Revised By:**	Karl A. Flower (KAF)	**Field Check:**	N