HEART PEAKS PROSPECT
(104K/9E)

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INTRODUCTION

The Heart Peaks precious metals prospect, consisting of 120 units (Hart 1-6, is located approximately 117 kilometres west of Dease Lake at latitude 58 degrees 36 minutes north and longitude 132 degrees 3 minutes west. A brightly coloured group of 'domes' on the western flank of Heart Peaks forms a prominent landmark that is visible for miles. Two local basalt domes underlie Heart Peaks to the east. During 1984, access to the property was by helicopter from either Dease Lake or Atlin. The writer visited the property on August 22 and 23. Kerr Addison Mines Ltd. conducted an eight-hole diamond-drill program under a joint venture agreement with Newmont in 1984. Work between 1980 and 1982 by the Newex Syndicate (Newmont, Lornex, and J. C. Stephen Ltd.) and during 1983 by Kerr Addison and Newmont discovered several precious metal anomalies in silicified and pyritized trachyte-rhyolite units and related breccias.

PROPERTY GEOLOGY

Most of the Hart claims are underlain by rhyolitic and trachytic lavas, tuffs, breccias, and by lower basalt flows (Heart Peaks Formation). The extreme eastern edge of the property is underlain by interlayered alkaline basalt flows (Level Mountain Group) which conformably overlie the Heart Peaks Formation. Heart Peaks Formation rocks are Pliocene in age; Level Mountain Group rocks are Plio-Pleistocene in age. The Heart Peaks basalt centre is part of an inferred line of centres which trends 030 degrees and includes Mount Edziza. Locally, trachyte domes show a less obvious north-northeast trend but probably lie along an old fracture system which controlled the location of late stage phreatic explosion breccias and associated vein mineralization.

The oldest rocks exposed on the property crop out in the western portion and consist of shales, siltstones, and sandstones of the Lower Jurassic Takwahoni Formation.

The Plio-Pleistocene volcanic rocks (Heart Peaks Formation) are comprised dominantly of three general lithologic types, which include in decreasing order of abundance; trachyte, basalt, and rhyolite. The trachytes form flows, domes and, locally, breccias. Fresh flows have a light grey, aphanitic matrix enclosing small light grey tabular phenocrysts of alkali feldspar, which comprise up to 20 per cent of the rock, and rare books of biotite and small rounded blebs of quartz; flow laminations are locally well developed. Pervasive silicification imparted a very dense hard character to the trachyte. Quartz veinlets and quartz-lined vugs are locally abundant.

The lower basalts are dark green to purple hawaiites with abundant lath-shaped 2 to 3-millimetre phenocrysts of plagioclase. The upper basalts are also hawaiites but contain large olivine crystals in addition to the phenocrysts of plagioclase. The rhyolites include massive to slightly flow foliated rocks along the sides of Tarfu Crater, southwest of Top Dome, west of Bug Basin, and underlying North Crater trachytes. Rhyolitic welded tuff (locally spherulitic) occurs locally, especially east of the main trachyte area, and on the east flank of Opal Dome. The stratigraphic positions of these various lithological units within the Heart Peaks Formation on the property is described in detail in *B.C. Ministry of Energy, Mines & Pet. Res.,* Assessment Report 11141.

A distinctive polymictic phreatic explosion breccia contains angular clasts of trachyte showing a wide variety of textures, as well as shale and siltstone clasts of the Takwahoni Formation and uncommon basalt clasts. The main exposures of breccia occur along a northerly trend from the Top Zone through to the Mogul Zone; perhaps they reflect a deep-seated structural control.

The Level Mountain Group consists of massive flows of dark grey to black, fine-grained basalt. Some contain vesicles or amygdules of aragonite or chalcedony. The thicker flows are porphyritic with plagioclase laths up to 75 millimetres in length. The Castle Ridge basalt member, characterized by its content of large olivine crystals and black glass fragments, conformably overlies the Heart Peaks Formation; north-northeasterly trending basalt dykes cut the Heart Peaks Formation.

STRUCTURE

Regionally, young volcanic centres occur in a northerly to north-northeasterly trend. Locally, trachyte domes show a more subtle north to north-northeasterly trend. A fracture system at 015 degrees, developed within the trachytes, may have controlled emplacement of late phreatic explosion breccias and associated vein mineralization. Basalt dykes with north to north-northeasterly trends probably fill fractures which opened during post-extrusive Plio-Pleistocene extension.

No obvious large scale faults have been observed on the surface.

ALTERATION

Three styles of alteration are observed: (1) pervasive silicification (±pyrite), (2) argillation, and (3) opalization.

Widespread silicification occurs in trachytes and explosion breccias associated with the Top, Mogul, Dog, and King Domes, as well as at the Quartz Hill and Steep Showings. These silicified rocks host all the exposed veining of potential economic interest. Altered host rocks consist primarily of quartz, K-feldspar, and minor pyrite. Textures in phreatic explosion breccias indicate multiple episodes of brecciation and silicification.

Argillic alteration occurred in many areas including South Dome, Dog Dome, and Opal Dome. Zones of phreatic breccias including the Steep, Quartz Hill, End, and Mogul Zones also have undergone post brecciation.

Opalization is most prominent at Opal Dome where grey opal replaces trachyte and trachyte breccia. Locally green patches and veinlets of tridymite with K-feldspar and kaolinite are common.

Secondary alteration products identified by X-ray techniques include:

(i) rozenite ($FeSO_4 \cdot 4H_2O$) (for example, DDH-83-1-45m) and melanterite ($FeSO_4 \cdot H_2O$) (for example, DDH-84-3-75m) occur as rare fracture linings in silicified trachyte. Melanterite is translucent green-blue in colour but partially dehydrates within a few days to rozenite which is colourless to white;

(ii) illite [$2K_2O \cdot 3(Mg, Fe)O \cdot 8(Al, Fe)_2O_3 \cdot 24SiO_2$] (for example, DDH-84-1-278m, DDH-84-3-190m) appears to be the dominant clay alteration mineral, predominantly after K-feldspar. It occurs as late stage fracture fillings and replaces feldspars;

(iii) scorodite ($FeAsO_4 \cdot 2H_2O$) (for example, DDH-84-4-102m), which is pale leek-green in colour, occurs as rare fracture coatings in silicified trachyte;

(iv) jarosite occurs as fracture fillings;

(v) tridymite, associated with K-feldspar and kaolinite, occurs as veinlets in the zone of opalization;

(vi) kaolinite occurs in trace amounts in clay altered zones.

MINERALIZATION

Mineralization, associated with banded and/or vuggy quartz and rare amethyst veins, occurs locally along a north to north-easterly trend from Top Dome (including Top Zone, Quartz Hill Zone), through the Steep Zone, to the End and Mogul Zones, a length of approximately 2 kilometres (Fig. 123). With the exception of the Top Zone, the quartz veining is intimately associated with the phreatic explosion breccia, cutting either it or adjacent silicified trachytes. Precious metals are associated with quartz veins in trachytes in silicified breccias, and in open space fillings. Except for minor amounts of local pyrite and rare arsenopyrite there are no base metals present. Pyrite is locally abundant (up to 20 per cent) within altered, silicified trachytes, and also replaces clasts in breccias. Minor stibnite-opal veining occurs near the Mogul Zone (Fred Daley, personal communication, 1984).

The Top Zone consists of an area approximately 100 metres by 200 metres of intensely silicified trachyte with crosscutting banded and vuggy quartz and minor amethyst veins. The veins trend east-northeasterly to northeasterly, nearly at right angles to the overall trend of mineralized zones. Visible ruby silver (pyrargyrite, Ag_3SbS_3) occurs as disseminations in very fine-grained clay-layers within well-banded quartz veins up to 1 metre in width. The highest assays received from grab samples with pyrargyrite taken by Kerr Addison were 31.5 grams per tonne (0.92 ounce per ton) gold and up to 345 grams per tonne silver. Four diamond-drill holes were completed in 1984 on the Top Zone (Fig. 123). Grab samples taken by the writer are shown in Table 1.

TABLE 1
GRAB SAMPLES OF ALTERED ROCKS FROM THE HEART PEAKS PROSPECT

	Sample Number	Description	Mineralized Zone	Au ppm	Ag ppm	Hg ppb	As ppm	Sb ppm
1.	HP-84-1	Banded and vuggy quartz vein with pyrargyrite	Top	0.7	400	78	<8	124
2.	HP-84-2	Banded quartz vein with crosscutting greyish silica veinlet with minor disseminated sulphides	Top	1.4	1408	190	<8	600
3.	HP-84-4	7.6-centimetre-wide coarse amethyst vein in silicified trachyte	Top	<0.3	<10	146	191	38
4.	HP-84-8	Grey chalcedonic trachyte breccia	Top	0.3	15	210	880	21
5.	HP-84-13	Banded white to blackish chalcedonic silica	Top	3.4	529	100	28	97
6.	HP-84-16	Silicified trachyte with quartz veinlets	Top	0.3	<10	544	102	8
7.	HP-84-17	Silicified trachyte with disseminated pyrite (5%)	Top	<0.3	<10	108	56	8
8.	HP-84-22	Silicified trachyte with disseminated pyrite (4%)	Quartz Hill	<0.3	<10	42	376	<3
9.	HP-84-24	Silicified trachyte breccia with disseminated pyrite (2%)	Quartz Hill	1.4	502	20	0.49%	29
10.	HP-84-26	Silicified trachyte breccia with quartz veinlets and argillized fragments	Quartz Hill	<0.3	<10	189	126	<3
11.	HP-84-36	Silicified breccia with pyrite	Dog	<0.3	<10	-	20	<3

The Quartz Hill Zone consists of open space filling, coarsely crystalline quartz veins within polymictic breccias and silicified trachytes. The veins show distinctive cockscomb and platy internal structures; individual quartz prisms are commonly zoned from clear interiors to milky white exteriors. The veins form stockwork mineralization with an average north to northwesterly trend. Two diamond-drill holes were drilled in 1984 on this zone (Fig. 123). Pyrite and trace arsenopyrite were the only sulphides observed. Grab samples taken by the writer are shown in Table 1.

The Steep Zone is hosted by a pyritic, silicified explosion breccia and blocks (?) of trachyte. Quartz veins up to 1 metre across trend north-northeasterly and north-northwesterly and exhibit cockscomb textures, with large euhedral quartz crystals ranging up to 5 centimetres in length, and platy replacement textures. Two drill holes were completed in 1984 on this zone (Fig. 123).

Other zones of interest include the Mogul Zone, where quartz veins cut explosion breccias and silicified trachytes with associated pyrite and minor stibnite, and the End Zone, where quartz veins cut explosion breccias.

WORK DONE

During 1984, Kerr Addison diamond drilled eight holes totalling 1972.3 metres - four on the Top zone, two on the Quartz Hill Zone, and two on the Steep Zone.

COMMENTS

Alteration and mineralization on the Heart Peaks property appears to have occurred at a very high level within an epithermal system. Features which indicate this include: the presence of opal; extensive development of silica±sinter; the presence of amethyst; low base metal content; anomalous amounts of arsenic, antimony, and mercury; cockscomb textures, including some double terminations of quartz crystals; development of large euhedral quartz crystals; good rhythmic banding of quartz veins; and common vuggy quartz veins. It should be noted, however, that the silver to gold ratio is very high relative to the hypothetical epithermal model. Phreatic explosion breccias, probably caused by massive steam eruptions, are located along a north-northeasterly trending zone of weakness (crustal extension?); they exhibit sharp contacts with altered trachytes. Significant quartz veining and associated precious metal mineralization occur in close spatial association with these breccias. Later circulation of magmatic and meteoric waters through the hot permeable zone may have given rise to the veining and related mineralization. The very young age of the host rocks and thus the mineralization (that is, younger than 4 Ma) is significant in terms of metallogenic models and future exploration targets.

ACKNOWLEDGMENTS

The writer would like to thank Kerr Addison Mines Ltd., and particularly Fred Daley, for logistical support, for access to the showings, and for their kind hospitality and openess while on the property.

REFERENCES

B.C. *Ministry of Energy, Mines and Petroleum Resources*: Assessment Reports 11141 and 11233.

Souther, J. G. (1971): Geology and Mineral Deposits of Tulsequah Map-Area, British Columbia, *Geol. Surv., Canada*, Mem. 362.