093C/09
Clisbako

THE UNIVERSITY OF BRITISH COLUMBIA

821100

Mineral Deposit Research Unit (MDRU)
Department of Geological Sciences
6339 Stores Road
Vancouver, B.C. Canada V6T 1Z4
Tel: (604) 822-6136
Fax: (604) 822-6088

SEP 3 1992

September 1, 1992

Ian Pirie
Minnova Inc.
311 Water Str., 3rd Floor
Vancouver, B.C.
V6B 1B8

Dear Ian:

I would like to thank Minnova Inc. for the hospitality and help extended to me during my stay in the Clisbako camp from August 6th to 23rd. Enclosed is a copy of my fieldwork summary report on the Clisbako Project. Discussions with Dave Heberline, Peter Thiersch and Steve Blower on the study were both informative and constructive.

As outlined in the initial proposal (6/5/92), I plan to undertake detailed XRD, whole rock and trace element geochemistry (concentrating on alteration), whole rock K-Ar dating and fluid inclusion work on host rock, alteration and vein samples from Clisbako. Most of this work will be accomplished this fall and winter with reports to follow on each aspect of the work as it is completed.

Thank you for your support in this project.

Sincerely

Kathryn Dunne

Kathryn Dunne
Research Coordinator, MDRU

cc: Dave Heberline
Peter Thiersch
John Thompson

To: Dave Heberline
Peter Thiersch
John Thompson

August 21/92

FIELDWORK SUMMARY REPORT - CLISBAKO PROPERTY

KATHRYN DUNNE

PROJECT OBJECTIVES

The aim of this project is to define and classify precious metal epithermal mineralization on the Clisbako property by documenting precious metal and alteration mineralogy, constraining pressure/temperature conditions and identifying variations in fluid compositions with depth. The integration of available and new data at Clisbako may lead to new models for precious metal epithermal exploration in the Interior Plateau.

FIELDWORK OUTLINE

Field mapping and sampling on the Clisbako property was carried out between 6/8/92 and 21/8/92. Over 200 samples were collected for detailed fluid inclusion studies, polished section work, whole rock and trace element geochemistry, X-ray diffraction analyses, scanning electron microscopy, K-Ar dating, palynology and macrofossil identification. Work was carried out in cooperation and consultation with Project Geologist, Peter Thiersch, and Geologist Steve Blower who is currently completing regional mapping on the property as part of a Min-Ex (Queen's) paper.

TRENCH AND DRILL CORE MAPPING AND SAMPLING

Trench mapping and sampling was undertaken at the North (Bucket and Knob areas), Central, Discovery, Trail, South, West Lake, Pond and Gore Zones. Maps of the zones were produced at 1:500 or 1:100 scales (except for Pond and Gore Zones = 1:5000).

Drill holes CL91-01,02,04,15,16,17 and CL92-03 were systematically logged and sampled. Other drill core sampling was undertaken at specific from-to intervals in holes CL91-05,12,18 and 19. Sample locations are marked in the core boxes by small wooden blocks with KDCL - series sample numbers on the blocks (see Table 2 for details).

FLUID INCLUSION SAMPLING:

Samples for fluid inclusion work were taken from areas of monolithic and heterolithic hydrothermal breccias, massive vein quartz, bladed vein quartz after calcite, banded vein quartz, quartz stockwork, quartz-pyrite stockwork and drusy vug-fill quartz. Emphasis was placed on proportional representation of samples from the whole property as well as detailed trench sampling across specific veins, breccias or stockworks.

WHOLE ROCK AND TRACE ELEMENT GEOCHEMISTRY SAMPLING:

Whole rock and trace element samples were collected proximal to distinct veins and breccias as well regionally on the property to try and distinguish alteration trends. Detailed hangingwall and footwall sampling of South, North, Central and West Lake Zone veins was undertaken on spacings of 0.5, 1.5 and 3m from the veins. Sixty-three samples were submitted to Min-En Labs, North Vancouver for whole rock XRF + Y, Zr, Nb (20/8/92). Of these, four were relatively unaltered regional samples.

XRD SAMPLING:
Thirty-six samples of argillic(?), jarosite (?) +/- alunite, chlorite and sericite (?) altered rock, breccia matrix and clay were sampled for XRD. Other specific samples included: pink adularia (?) crystals (1-2mm long) in bladed quartz from the West Lake Zone, pale yellow radiating zeolite (?) coating quartz vugs from the West Lake Zone, green altered "phenocrysts" (possibly sericite) within altered andesite (?) from the South Zone and scoradite within altered crystal tuff (?) from the North Zone knob.

SEM SAMPLING:
Banded and bladed quartz samples with high sulphide contents were collected for detailed polished section and possibly scanning electron microscope work. Hopefully the sulphide, sulphosalt (?), gold (?), adularia (?) and barite (?) may be distinguished on a microscopic scale.

K-AR SAMPLING:
A fine grained massive andesite from just east of the Gore Zone on Old Smokey mountain was sampled for K-Ar whole rock analysis (KDCL-50). This unit is part of a mixed stratigraphic sequence comprising andesite, feldspar-quartz crystal tuff and fine bedded tuff that underlies much of the south and west part of the property (Blower, personal communication). This sequence may be distinguished from an overlying (?) felsic volcanic package of pyroclastic breccia, lapilli and feldspar crystal tuff and balliferous rhyolite exposed over much of the north-central and eastern (?) part of the property (Blower, personal communication). Unfortunately, the only fresh exposures of the felsic volcanic package are devitrified perlite and flow-banded rhyolite (KDCL-138; east of Discovery trenches) which are not reliable for K-Ar dating due to possible argon loss.

FOSSIL SAMPLING:
A variety of plant fragments were sampled from a thick-bedded mudstone or subaqueous fine tuff (?) with fine argillite partings. This unit only crops out in one location (KDCL-1), west of the Discovery Zone, and is nowhere truly in place. There appear to be at least three different types of plant fragments: ferns, broad leaves and internal stem casts (Calamites or Cordaites?). A possible pine cone(?) was sampled by S. Blower and will be included with the suite. Hopefully either G. Rouse (UBC), H. Tipper (GSC) or P. Smith (UBC) may be able to identify and place age constraints on these fossils.

PROPOSED PARAGENESIS

Based on detailed hand sample observations of crosscutting relationships on surface and in drill core a preliminary working paragenesis is proposed:

1) Argillic (?) alteration of flow-banded rhyolite, lapilli tuff, feldspar crystal tuff, balliferous rhyolite (North, Central, West Lake Zones); amygdaloidal andesite flows (South Zone)

2) Hydrofracturing of andesite and felsic volcanic package with formation of fine-grained clear to white quartz stockwork

3) Opaque grey banded chalcedony (South and West Lake Zones)

4) Formation of barren ? bladed quartz 10-15cm veins in previous stockwork zones (South Zone - main trench, east side)

5) Continued bladed quartz veining contemporaneous with pink adularia?. Formation of microcrystalline banded clear to white quartz (1 to 3 cm veinlets) in vein selvages (West Lake Zone - south trench) + pale blue opal vein selvages

6) Intrusion of microcrystalline banded sulphidic quartz (10 to 30 distinct bands observed) into previous early bladed quartz and banded quartz (West Lake Zone - south trench)

7) Infilling of sulphide banded vugs by buff porcellaneous quartz

8) Black fine-grained sulphide and sulphide-quartz stringers (to 1/2cm wide) crosscut previous stockwork and bladed quartz vein zones (North Zone - DDH91-02)

9) Blue colliform opal replaces? crosscuts? sulphide stringers

10) Black matrix monolithic breccias with angular fragments of veins in disseminated to massive sulphidic chalcedonic matrix (South Zone, North Zone knob area)

11) Coarse-grained pyrite/marcasite? bands occur in cores of stringers and seem to replace rhyolite "balls" (North Zone)

12) Brecciation of fine-grained black sulphide stringers, massive quartz veins and wallrock; cementation by grey/clear chalcedonic quartz into heterolithic breccia. Blue opal seen incorporated in breccia at South Zone (South Zone - Main Trench, west side)

13) Late clear euhedral drusy/comb/cockade/vug-fill quartz (~1mm crystals)

14) Coating of drusy quartz vugs by Fe-oxides (Gore Zone), zeolite formation (West Lake Zone - south trench), yellow-brown clay filling of vugs (North Zone knob).

Supergene alteration: goethite +/- hematite +/- jarosite +/- alunite?? within ~15 metres of bedrock surface and +/- 5 metres on hangingwall and footwall of faults. Rare narrow (1cm) supergene alteration haloes developed around sulphide stringers (DDHCL91-02).

COMPARISON TO OTHER DEPOSITS

The Clisbako property has many similarites to deposits in the Great Basin of Nevada such as Paridise Peak, Sleeper and Freedom Flats. These deposits are hosted by Oligocene to Miocene rhyolite dome flow complexes with associated pyroclastic breccias and fine tuffs. Generally, the high grade veins are banded quartz-(adularia,+/- barite)-sulphide/electrum/native gold veins. Breccias vary from white silica matrix to black matrix (3 to 30 g/t Au) and stockwork zones are usually hundreds of metres wide with < 3 g/t Au. Hypogene hydrothermal alteration: silicic, argillic and propylitic is typically intense and destroys most primary textures. Supergene alteration is often characterised by alunite-jarosite +/- hematite +/- opal.

At Clisbako, massive veins of bladed, banded or massive quartz as well as grey sulphidic matrix breccias (0.5 to ~5 m wide) occur in broad (50-100 m) stockwork zones within rhyolite flow/pyroclastic breccia, tuff and andesite. The paragenetic relationships imply increasing dilatency with time from initial hydrofracturing of wallrock to massive vein formation, sulphide precipitation (as stringers and in banded quartz veins) and subsequent brecciation. The best grades of mineralization certainly seem to be associated with banded quartz-sulphide veinlets (~8 g/t Au). Detailed polished section, SEM and fluid inclusion work should help to determine the composition of these bands. The occurence of framboidal or colliform pyrite (?) in grey -black matrix breccia from the North Zone knob (CL-8; K. Dunne June 26/92 report) may indicate rapid deposition of pyrite at low temperatures. Alteration appears to be dominantly argillic and silicic. There does not appear to be a distinct hypogene reaction selvage adjacent to veins or breccia zones at Clisbako based on visual field inspection. However, detailed whole rock and trace element analyses collected this month may show indicator elements or gains/losses proximal to certain veins and breccias. Supergene alunite-jarosite alteration may possibly be present (several samples have been taken for XRD).

TABLE 1: LIST OF SAMPLES SUBMITTED TO MIN-EN FOR WHOLE ROCK XRF
(MAP WITH EXACT LOCATIONS TO FOLLOW IN VANCOUVER)

SAMPLE #	ZONE/DDH	HOST	ALT?
KDCL-6	south/91-16-127.3	monolithic mafic lapilli tuff	N
KDCL-9	south/91-16-129.8	monolithic mafic lapilli tuff	Y
KDCL-11	south/91-16-133.5	heterolithic black matrix bx	Y
KDCL-13	south/91-16-143.8	amygdaloidal andesite flow bx	N
KDCL-30	west lake	feldspar crystal tuff	Y
KDCL-32	west lake	feldspar crystal tuff	Y
KDCL-33	west lake	balliferous rhyolite	Y
KDCL-35	west lake	feldspar crystal tuff	Y
KDCL-37	west lake	feldspar crystal tuff	Y
KDCL-44	north-knob	crystal tuff	Y
KDCL-48	gore	quartz-feldspar porphyry	Y
KDCL-50	gore	amygdaloidal andesite flow	N
KDCL-52	north-knob	amygdaloidal andesite flow?	Y

KDCL-53	north-knob	amygdaloidal andesite flow?	Y
KDCL-54	north-knob	feldspar crystal tuff	Y
KDCL-57	north-bucket	flow banded rhyolite?	Y
KDCL-58	north-culvert	flow banded rhyolite?	Y
KDCL-59	north-bucket	feldspar-quartz porphyry	Y
KDCL-60	north-bucket	balliferous rhyolite	Y
KDCL-63	north-bucket	balliferous rhyolite	Y
KDCL-64	north-bucket	balliferous rhyolite	Y
KDCL-66	north-bucket	feldspar-quartz porphyry	Y
KDCL-67	north-bucket	feldspar-quartz porphyry	Y
KDCL-68	south-main	monolithic amyg andesite bx	Y
KDCL-69	south-main	monolithic amyg andesite bx	Y
KDCL-72	south-main	monolithic amyg andesite bx	Y
KDCL-74	south-main	amygdaloidal andesite flow	Y
KDCL-76	south-main	amygdaloidal andesite flow	Y
KDCL-78	south-main	amygdaloidal andesite flow	Y
KDCL-80	south-main	amygdaloidal andesite flow	Y
KDCL-81	south-main	monolithic amyg and bx	Y
KDCL-83	south-main	amygdaloidal andesite flow	Y
KDCL-87	south-main	amygdaloidal andesite flow	Y
KDCL-88	south-main	amygdaloidal andesite flow	Y
KDCL-91	south-92-tr	amygdaloidal andesite flow	Y
KDCL-92	south-92-tr	amygdaloidal andesite flow	Y
KDCL-93	south-92-tr	amygdaloidal andesite flow	Y
KDCL-95	south-92-tr	amygdaloidal andesite flow?	Y
KDCL-98	south-92-tr	amygdaloidal andesite flow?	Y
KDCL-101	south-92-tr	monolithic amyg and bx	Y
KDCL-102	south-92-tr	amygdaloidal andesite flow	Y
KDCL-105	south-92-tr	amygdaloidal andesite flow	Y
KDCL-106	south-92-tr	amygdaloidal andesite flow	Y
KDCL-110	south-nth-tr	amygdaloidal andesite flow	Y
KDCL-112	south-nth-tr	amygdaloidal andesite flow	Y
KDCL-114	south-nth-tr	amygdaloidal andesite flow	Y
KDCL-115	south-nth-tr	amygdaloidal andesite flow	Y
KDCL-119	south-nth-tr	amygdaloidal andesite flow	Y
KDCL-120	south-nth-tr	amygdaloidal andesite flow	Y
KDCL-132	south-nth-tr	amygdaloidal andesite flow	Y
KDCL-133	south-nth-tr	amygdaloidal andesite flow	Y
KDCL-135	south-nth-tr	amygdaloidal andesite flow	Y
KDCL-136	south-nth-tr	amygdaloidal andesite flow	Y
KDCL-138	discovery	flow banded rhyolite	N
KDCL-147	discovery	feldspar crystal tuff	Y
KDCL-149	central	lapilli tuff	Y
KDCL-151	central	lapilli tuff	Y
KDCL-158	central	lapilli tuff	Y
KDCL-162	north-knob	feldspar crystal tuff	Y
KDCL-165	north-knob	feldspar crystal tuff	Y
KDCL-166	north-knob	feldspar crystal tuff	Y
KDCL-176	south/91-15-112	flow banded rhyolite	Y

TABLE 2: LIST OF DRILL CORE SAMPLES

SAMPLE #	DDH	METRES	REASON FOR TAKING
KDCL-2	91-16	23.1	XRD
KDCL-3	91-16	41.9	T.S.
KDCL-4	91-16	47.0	T.S
KDCL-5	91-16	124.2	XRD
KDCL-6	91-16	127.3	WR
KDCL-7	91-16	128.0	P.S.
KDCL-8	91-16	128.6	F.I.
KDCL-9	91-16	129.8	WR
KDCL-10	91-16	131.1	F.I.
KDCL-11	91-16	133.5	WR
KDCL-12	91-16	136.1	XRD/T.S.
KDCL-13	91-16	143.8	T.S/WR
KDCL-14	91-18	49.0	H.S.
KDCL-15	91-18	50.1	H.S.
KDCL-16	91-17	31.0	T.S.
KDCL-17	91-17	35.2	XRD
KDCL-18	91-17	37.3	F.I.
KDCL-19	91-17	40.0	XRD/F.I.
KDCL-20	91-15	72.5	XRD
KDCL-21	91-15	75.5	F.I
KDCL-22	91-15	79.0	F.I
KDCL-23	91-15	84.4	F.I
KDCL-24	91-15	87.1	XRD
KDCL-25	91-15	88.2	P.S.
KDCL-26	91-15	92.6	T.S.
KDCL-167	91-01	16.1	XRD
KDCL-168	91-01	27.6	XRD
KDCL-169	91-01	31.4	T.S
KDCL-170	91-01	35.0	F.I
KDCL-171	91-01	37.7	H.S
KDCL-172	91-01	46.9	P.S./F.I.
KDCL-173	91-01	47.6	P.S./F.I.
KDCL-174	91-01	49.8	F.I.
KDCL-175	91-01	80.8	P.S./SEM
KDCL-176	91-15	112.0	WR/K-AR(SER)
KDCL-177	91-02	25.0	P.S./F.I./XRD
KDCL-178	91-02	20.9	XRD?
KDCL-179	91-02	28.8	H.S.
KDCL-180	91-02	34.0	H.S.
KDCL-181	91-02	38.1	F.I./P.S.
KDCL-182	91-02	38.5	XRD
KDCL-183	91-02	41.5	XRD
KDCL-184	91-02	47.4	F.I/P.S.
KDCL-185	91-02	49.7	F.I./P.S./SEM
KDCL-186	91-02	59.0	XRD
KDCL-187	91-02	66.2	H.S.
KDCL-188	91-02	67.5	F.I.
KDCL-189	91-02	71.5	F.I./P.S.
KDCL-190	91-16	98.4	F.I.
KDCL-191	91-19	44.0	carbonized wood?
KDCL-192	91-05	70.7	H.S.