896433

1984

FIELD NOTES

MCMILLAN

1984 Contents

Contents (cont'd)

Contents (cont'd)

Contents (cont'd)

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* Diary notes April 29 - May 3 @ end

25 April 84

Beaverdell

100 TPD Mixed jobs

Mining started in area late 1890's
Wallace Mtn area - 1936 two
larger deposits amalgamated
1950 built mill
Reserves - essentially there are
none - attempts to increase to
300 TPD unsuccessful.
Bk Even ~8 oz Ag ~9.00 so okay
for now

Target 1000 ounces/day

Mill - will change because ore
changing from mainly Ag to
mainly Au (0.3 ounces/ton)

Boundary flt - ore offset
700' down
Lowest adit 2900
Ore dips into Mtn
DDH's hit 8' of 120 ounces across the fault

2900 level - one mile in to ore

now working out upper workings - 2 more years?

- Staff - only 6 people

will go back to lower mine later when mill changes

5-6' ms

= Ag Au some Cu

Ore brought down by contract trucker

mill 24 hrs 360/yr

Mine 5 days 1 shift

Drilling E size ~1200'

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MADE IN B.C.

veins avg dip 60°   84-2

Geology   Flting reduces it to 30°

DIORITE

WALLACE SEDIMENTS / never been dated - altered

Beaverdell Stock Q Monz 50 my

~~Ws~~ DIORITE GD ~165 My

CAPPED BY VOLCS / SEDS

ORE BEST NEAR CONTACT

CLOSELY FAULTED = MANY OFFSETS

VEINS avg 1½' wide loc - 5 or 6'

mine stringers to 2-3 inches

veins pinch / swell / finger

BELL & CASS MINES

NE/SW   E-W veins

Minimum mining width 3'

open stoping mine method

avg 10 ounce millheads

Dump muck has provided

signif prodn - last

5-10 years

Mill - Don Bain
Manager Bruno
Mine Supt'd Tom Richards

Miners ~20 underground

29/66 Troy ounces / ton

Mix with flux / fuse
sulphide rich - add
oxidizer
Sometimes add reducer
use 'beaker' to absorb
lead - leaves silver
bead
Heavies collected by a jig ie
native ag, etc
Silver -
6/1 in lead vs zinc conc
Tails 1.2 - 1.4 oz Ag

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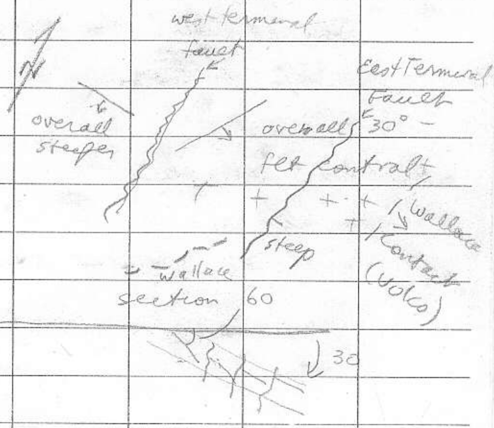
sample (1) Beaverdell Stock
megacrystic @ Mon
in gravel pit near Carmi

sample (2) 2900 Dump Gd
West Kettle gd

Mine Model
veins E-W
NE-SW / SE dip



multiple veins form a zone chopped up by faults

- Dykes - offset like the ore so useful as guides to working out offsets in faults -

Colen

- Constriction points - changes more saline water

[deepen]

more grd water cooler less saline ∴ lower gold

[above]

Read ages here ~ 50 ma consistent

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Underground Tour
George Babet

STOP 1 (1) wallrock sample
veins swing steep to flat

yesterday 15 oz today 5
825 stope (8 level)
parallel to the vein

'Vein' is a series of stringers
with sulphides at edges or
in certain veins +
peripheral to veins for
a short distance -

little signif CR altn

9-20 Vein qal sphal
etc - native
cont to 9 level

Old 801 Stope —
backfill left runs
5-8 oz/ton — but you
see almost nothing

Mine 100 - 114 TPD
1000 oz Ag avg

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84-5

April 26/84

TROY SILVER

- In Revali (Creston) Group
  rx
- Tryg - no Creston-age mag-
  matic event - silver/cu
  source uncertain

silver → cpy → py
bn

8500 TPD room + pillar mining

Personnel Dir
Ted Rawlins
Mine Supt
John Howard
Environmental problems >5yrs
to get thru permit process

Prodn started ~1980

Underground opening 60' high

8000' long, 60 thick

1800' main

next prospect - Rock Creek

longer + richer than Troy

- partly in the Wilderness area so big trouble but every claim validated so can drill anyway (unless the Wilderness area trumps) Ventilation shafts run on E + W perimeters of the orebody.

cut off by E-W fault that leads to a north + a south orebody - now on north deposit

- uniform, stratebound

$90M pre-prodn costs

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personnel 360
50 salaried, rest hourly
mostly local people
non-union
work 4 x 10 hrs then off
3 days
mill - staggered shifts
so two crews cover 24 hours

Plant start up 1981
Discovery hole 1964
Bear Creek Mining
Asarco leased it in 1973
5 yrs to get permits

1982 4.2 million
oz ag 20000 tons Cu
3 mi of ore projected

Other Props

Rees Point
stratabound

Star Gulch
stratabound
—dropped—

Rock Creek
- good poss
lower Revette Fmn
21-2200' thick

TROY
deposit under NA
Vernon

* ore o/c

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Orebody

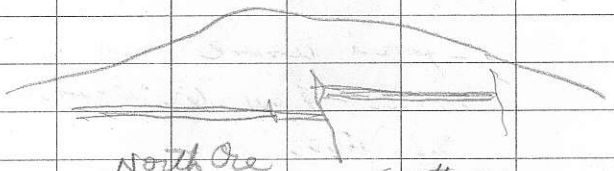
7700 X 1800 X 60 avg

Major X Flt

Send up 230'

East Fault cuts off ore

Work goes out



Take off top 20' Form

top pillars then mine

lower 40'

Crusher underground

Ore 1.5 oz Ag

.75 Cu

mainly bn cct + Ag

Top slice - 2 boom
atlas copco machine

Ore blasts easily

use air bags to split
off slabs on pillars

8 35 ton underground
trucks loaded by front
end loaders

Mining height 45 - 80'

Winter - heat air
up to 10 000 gallons of
propane daily

Underground crushed to
6 - 7"

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Secondary crushers
Cone → ½"
Fine ore bin

2 Ball mills
Flotation

2 Tailings lines 6 miles

Return water pumped back up to the circuit

Final Conc
1000 oz Ag 40% Cu

Bear Creek gets 25%
Royalty after profit

mining / milling costs ~~$!~~ secret

West boundary - get lead + pyrite when you get ~~away~~ to the edge of the ore

Recovery 90 - 91%

Possibly may recover some of the pillars eventually

30% pillars

Ore 64MT blocked out expect to get 48MT (16 yrs)

Grade - varies a lot -
~~1 to 2 oz Ag~~
1 to 6 oz Ag

Holes 600 - 800 / apart
~150 holes outlined the deposit

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Lee McKinney

1½ # balls / ton ore

Grind 55–60% – 200 mesh

– 5/8" from cone crushers

Ball Mills 3–3½

add xanthate collector

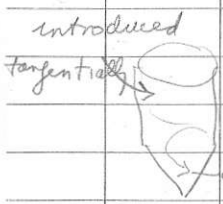
– makes sulphide hydrophobic

3 Flotn Banks 500 ft³ cells

agitator air adder + keep in suspension – air bubbles pick up sulphides

pine oil as a frother

CYCLONE 26" ϕ cylinder & conical section



rubber lined

conc < 2% lead

gold minimal

Concentrate

45% Cu
10% Fe
low S

like to have a bit extra Fe

a 'cold' concentrate

smelters not always happy with it

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DURABAK WATERPROOF
MADE IN U.S.

84-10

Stop after lunch — along Hwy 2 east 1 hr with. Hwy 56 (6km)

Phillips Gateway

Bonner

STOP Mt Shields

Purcell Lava

MISSOULA

NICKEL CREEK FAULT

KITCHENER

carbonate

RAVALLI

CRESTON

REVETT

aldridge

PRITCHARD

Mt Shields - source to SW
sheet wash alluvial fans
hundreds of miles across

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84-11

April 27/84

Sullivan

Mill Tour — Trevor Henderson

Initial step — -3" passes through galena slurry (SG 2.95) to remove light fraction which goes out (25-30%)

Heavy fraction to then ground in Rod ~~mill~~ mills — oversize not recirculated — it goes to waste dump

step 1 separate coarse lead to use as medium in intial sink (float process [crushing jaw + cone crushers underground]

→ Ball mills → cyclone → Ball mills until it gets fine enough to go to the float cells

Float -

Lead roughers - mids (from Conc tanks go back to regrind then back to roughers again)

ROUGHER 15 Pb 15 Zn / tails to zinc

Conc → 1ST CLEANER - tails to regrind

Scav. Conc → 2ND CLEANER

Pb 50% Zn Higher

Float zinc - sink lead as final cleanup

tailings back to 1ST cleaner

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MADE IN B.C.

Tail from Pb rougher add copper sulphate
x xanthate + leave to raise
pH pH 10.5
copper sulphate coats zinc
then you float it
feed steam heated
ZINC ROUGHER ~20%
Pb <1%
* time important - cu sulphate
needs time to react with
the zinc
at far end - pull more Fe -
then recycle that to re-
grind.

cassiterite is the tin mineral

a lot of cu in the Pb
- make their own copper sulphate
silver in Pb conc
also Cd Sb Hg some Au

Tin 25% recovery - get ~1 ton
daily

* solids to float cells
40 - 45% solids
silver: mill feed 1.8 - 2.0

lead conc
Pb 60
Zn 3.5
Fe 10.5
metal assays

Silver

zinc conc
Zn 48.5
Pb 3.4
Fe 10.5

Recovery 95%

Fe circuit
Conc 50% Fe
xanthate pH 4.5 - 5
daily take conc from first half -
scavenger product goes to tailings (but special ponds)

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Tin Circuit

gravity concentrate

make cu sulphate - xllize ct, bag + sell the crystals $700/tonne

- residue cleaned washed + used to supply cu sulphate for mill.

Copper from Trail smelter as a 'waste' product

H_2SO_4 from Kimberley fertl. plant.

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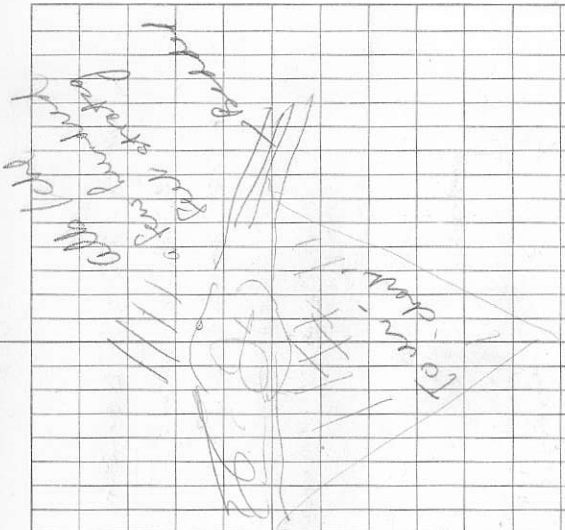

Pit

H & I ore bands
dissem mineralzn ~ 80'
but includes both &
waste between
SW fringe of orebody

ore 300

Kimberly Flt NW side
E-W 10000' offset
dips 45°E strateg. {last movement / or lateral
N-S flts small offset

Sullivan Flts N-S / W side down
small movements

Haulage - 3700 level
from below - goes up by
conveyer belt
crusher on 3800 level

following ore down dip it
tails out into pyrrhotite

~~Western ore 80 Tonne~~

160 MT prodn + reserves
10 % combined

Pit – way out to the south

Sulphides in a large 'trough'?

Geochem Halos –
Mn – but only Pb + Zn
have been shown to be
good ore indicators
Pb Zn Fe or sulphides + Ag

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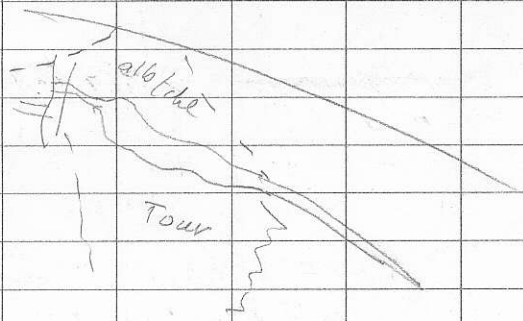
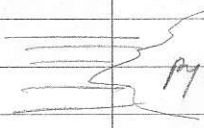
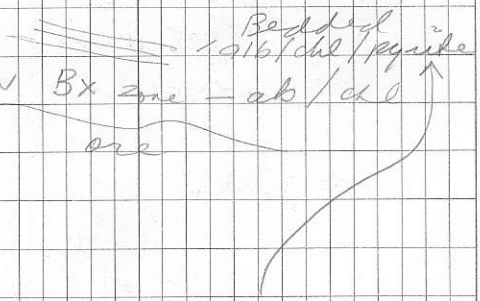


Breccia zone - dewatering event?
at least one is a slump deposit

some areas massive pyrrho
vaguely layered - some galena bands
bedded galena in pyrrhotite
layered galena cut by pyrrhotite dykes



layered western ores
(Creek ores are redeposited from stuff dissolved below)



in detail these X cut
- probably replacement

Tour - layers looks strataform

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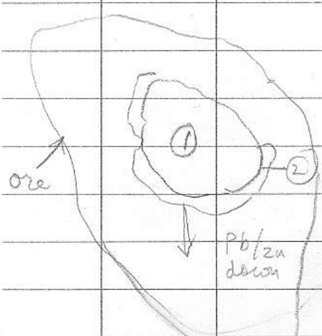
DURO-PROOF
MADE IN B.C.

Transition zone
A ~~layer~~ Band - less well layered
than elsewhere (east ores)

Ore zones
H U ⌐ H, I
D Band - well layered
C " ago layers
B Triplets
Main Band

FW tourmalinite
FW mineralized rock
① core pyrrho - rich stockwork
② ~~fl~~ fringe sph / gal stockwork
+ pyrrho



Ag best in the
western ore
Tin - west ores
+ Xtn zone
mainly

Sb - poor database - but forms a 'halo'
on Xtn zone

Bob Howser

strateg up
East ore Pb & Zn decrease
West ore (ten parallel)
Pb + Zn increase upwd

Alb/chl late

Post - ore gabbro dykes

Tourmaline ~100 °C
Alb / chl ~250°C
(Nesbitt ?)

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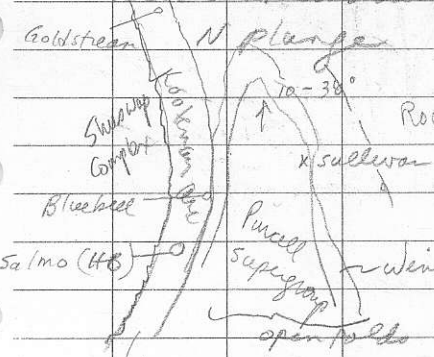
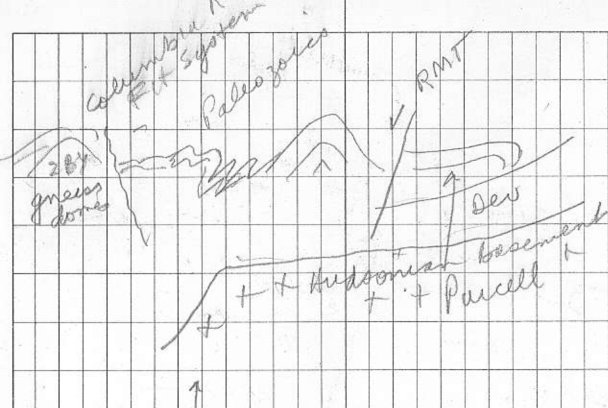
Purcell anticlinorium (series of folds)



→ all thrust eastward
med-Mesozoic to Tertiary

Purcell Supergp rx thrust east of Rocky Mtn trench locally on Kerwin Thrust



crumpled against

'Rift'?

Rockies change orientn

major X faults

become thrusts in the

Rockies

Tectonic High south

of Moyie Fault

[Dev over PreЄ to

south ~~North~~ — thick Є to north ~~south~~]

Purcell age in Windermere

— GROWTH FAULTS —

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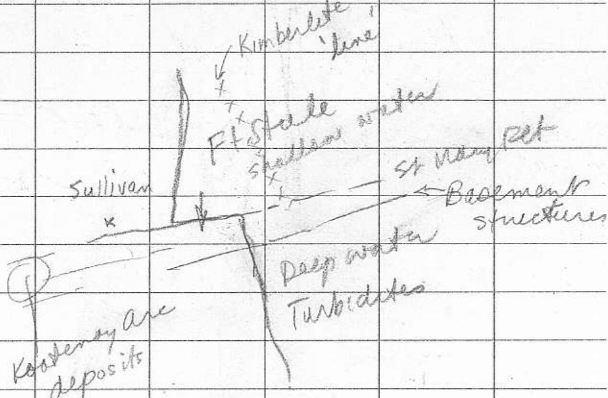

Enroute to Cranbrook

- waterfall stop
  well bedded pyrrhotite -
  rich destal turbidites -
  Lower Alldridge

This package intruded by
the Gabbroic sills
up to halfway through
middle Alldridge

– Stop to see middle Aldridge
marker
siltstone – alt dk
and light – carbon – rich
+ poor.
Match over 100+ km

Formation – cut + scoured
by turbidites
pattern of thicks to thins
to critical
Hiawatha Horizon

Turbidites can 'split'
a marker ie as an interbed
in it

– Stop to see Gabbroic Sill
go for 10's of kilometres
supposedly need 5000'
of cover

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Said to be related to Purcell Lavas

sills oldest date 1.43 Ga

Alternate Interpretation — sub-volcanic sills into wet, un-consolidated turbidites

10's – 100's of feet below seawater/sediment interface

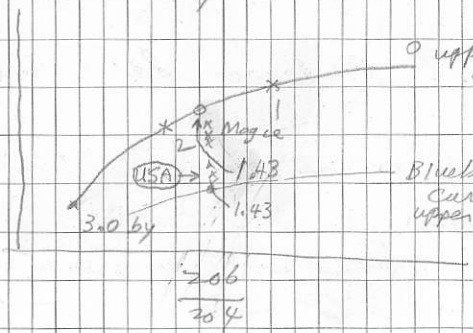
If lithified – why no recrystallizing?
These represent considerable thickness

alternate – sed. pore water boiled off, no thickening results

CONCLUDE a middle Aldridge event — not Creston.

Basal margin cg zone
Basal flame structures
Altn in throughgoing cracks
Vein type Cu ~~alt~~ minlzn

Lead Isotopes



206 & 207 from U decay

Mayo intrusions — lead more primitive —

Sullivan — more lead likely from shales (sediments)

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MADE IN B.C.

April 28/84

Kimberley → Rivondel →

STOP 1. Kitchener lst - molar tooth

Formerly Kitchener - Siyeh - now Siyeh where not split + Kitchener + Van Creek where split

STOP 2 Creston - centre to subtidal extensive tidal flats with pro-delta model overrides mud cracks, rip-ups, etc

Green siltstones; maroon, gray siltstones

Derived from the east

model -

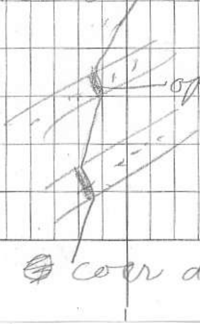
oxidized siltite couplets cm's thick graded from more dessicn cracks

reduced silt/org couplets thicker, further out

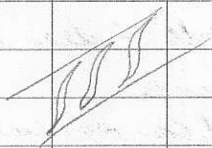
further out still - darker argillites
or carbonates
algal component
still supra - intertidal
odd to lensy sand bars

<u>Cliff</u> Siltite/arg - sometimes
one cs reduced, one oxidized
green/mauve couplets

STOP 3 St Eugene Mine
Qtz vein
~1 MT 10% Pb 1% Zn
200 gm/tonne Ag
Sigmoid veins
middle Aldridge
veins cut layering



Same as Coeur d'Alene



width ~10 m but massive
mentation W other
gal sph cpy pyrrho
magnetite
garnets - chl

Call Aurora system
across ~~the~~ Moyie lake

Continue upward to
base of Creston

Midway Mine -
small hq? gold

Enroute to Riondel

Kootenay Arc -
Isoclinal folds
multiphase

Stop is beyond the Bayonne Batholith

? { Kaslo
Slocan
Milford

Devono-Miss: ~~~~~~ Cariboo(an) Orogeny
Antler

Lardeau Gp

Index Fmn LA1B

Badshot (Reeves) Lst

Xtn Mohican or Trueman Є ↑ ↑ ↑

Hamill Gp } Qtzites + pelites

Horsethief Ck Fm

Windermere Fm

Toby Cgl ~~~~~~ Cariboo(an) O?

Purcell Supergroup East Kootenay orogeny

Mt Nelson
Dutch Ck

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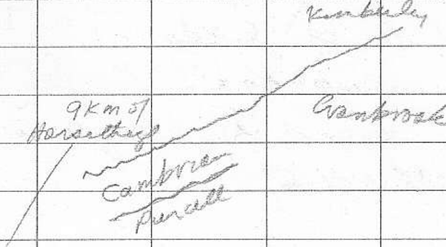
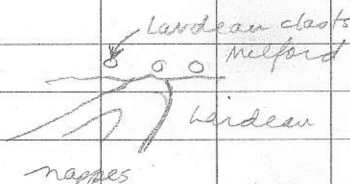


4 km of Purcell removed
GROWTH FAULT

major defmn - Mesozoic

Bluebell - Riondel Nappe -
cariboodan ? younger ?



STOP 1

Toby Cgl – clasts deformed + elongated

– tillites? Conglomerates?

Nelson Batholith

175 Ma Doup Archibald

STOP 2 Calc Silicate Gneiss

Isoclinal phase 2 fold

at stop

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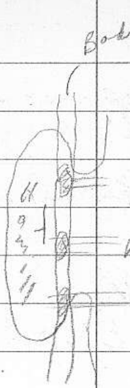

- west limb of antiformal syncline
- plunges north

underlimb of nappe - upside down

Minlzn late? but older
stratabound & metam.
metam 80-100 Ma

Pb Isotopes

Growth Curve derived from Stratabound Sedex shale hosted deposits

'SHALE CURVE'

When galena formed in ore – no Uranium there so composition 'frozen'.

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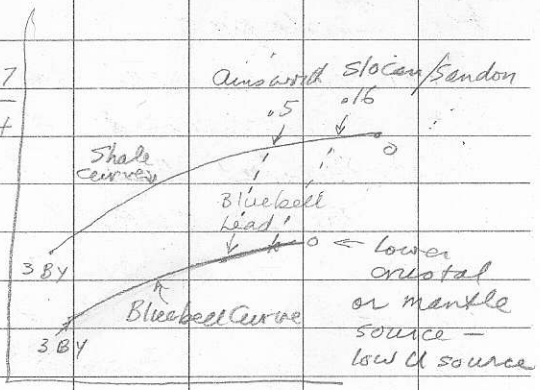

Bluebell ~ 500 Ma old
perhaps remobilized in
Tertiary?
- lead from deep
source — not sed. derived

* assumption - age of Blue-
bell 500 Ma - calc curve
then checked to see
if mixing curves
worked.

Photo

Hemlock Ridge

galena pyrrhotite

Mohican

Badshot

Sample of knebelite → actinolite?

X RAY - gave results to Shawn (Westmin)

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DURABRAK WATERPROOF
MADE IN B.C.

84-25

Sunday April 29/83

Creston → Skyway Route

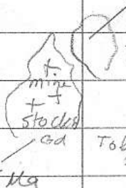
Road passes through Aldridge? rocks across

Fault then Dutch Ck and Mt Nelson to unconf + basal Windermere (Toby Fmn) ⌐ ME Nelway 1st

LE ~~Reeves~~ Laib member (Badshot) SALMO CAMP

Quartzites - Hamill (Qtzite Range here)

Summit Stock 100 Ma
Granite?



Three Sisters (Horsethief)

Monk Fmn? or still Toby?

Toby? ← Irene volcs

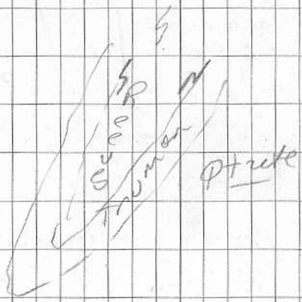
Toby

Mt Nelson

Toby: cgl sst + other layered rx

Going down - Reeves onward anticline so section repeated

Nelway - bank carbonate goes to deep water Lardeau to the north



Tryg
Early Karstemp ?

* some dol zones are
not minlzd
fringe zone to ore
pyrite, layered

Pb isotopes –

84-26

Reeves MacDonald Mine

Ore in isoclinal syncline in dolomitized lst (Reeves)

Plunges ~~south~~ 50-60 North

1957 2MT ~1% Pb 3% Zn

fraction of ounce ag

core Reeves (Badshot)

Limbs Truman (Mohican)

2nd phase structure

Mealzn in core of fold in dolomitic envelope

& Late Replacement Deposit

Menlzn py sphal galena

some: bx

: along layering

: X cutting

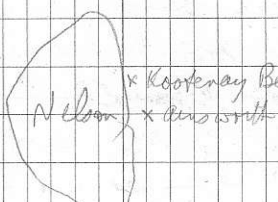
Sangster [menlzn localized deform?]

Synsedimentary — in depressions in carbonate basins [in contrast with sedex in shale basins]

pyrite 'stratiform'
coarse carbonate + honey
sphalerite in late veins

Rare lamprophyre dykes

graphite - often in
pulled-apart 'blocks'
- fine



slates phyllites
✓ strites lst tuffac units
(MINLZN) Slocan Group Triassic
unconf?
Kaslo volcs Tr? Lake
Paleo?
Milford

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DUKSBAK WATERPROOF
MADE IN B.C.

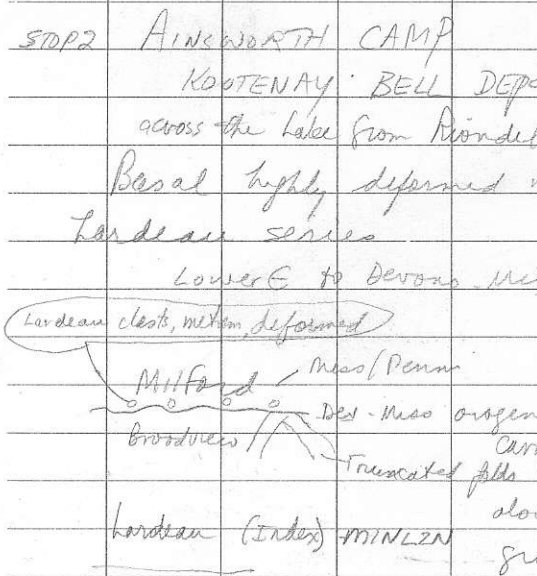
84-27

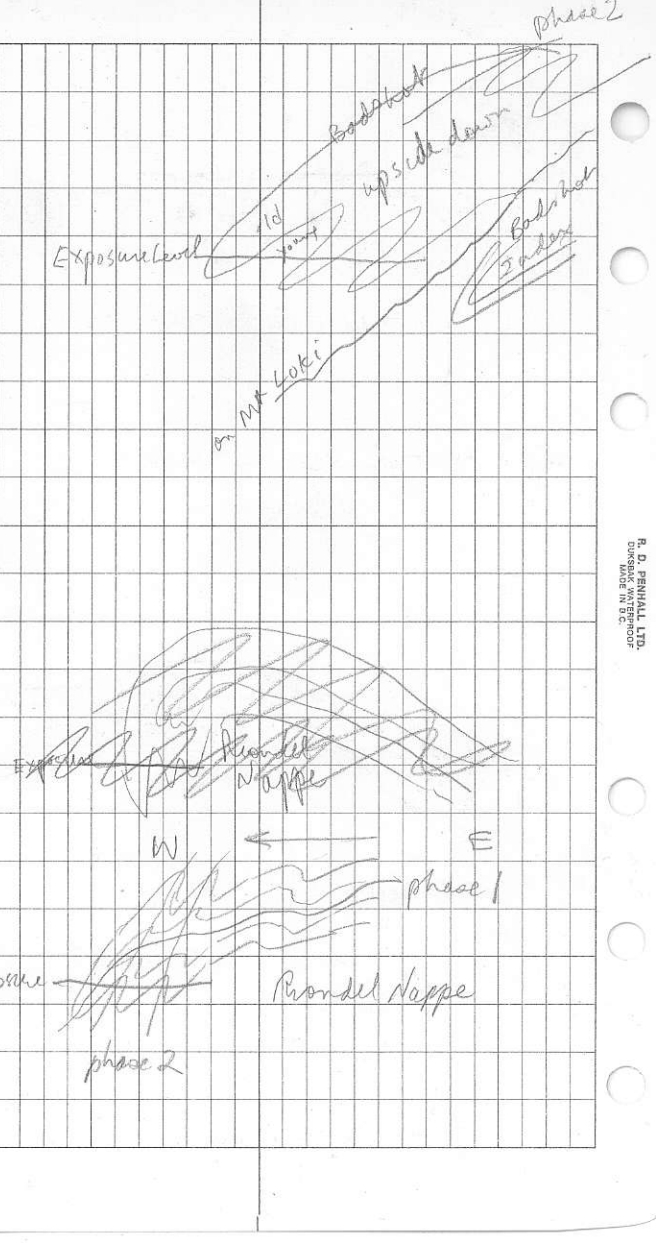
April 30/84

Travel to Ainsworth / to Nakusp

STOP 1 Megacrystic (kspar) Nelson gd
mafic - rich matrix with
epidote + garnet (local, in blks)

STOP 2 AINSWORTH CAMP
KOOTENAY BELL DEPOSIT
across the Lake from Riondel
Basal highly deformed metam
Lardeau series
Lower ∈ to Devono Miss ?





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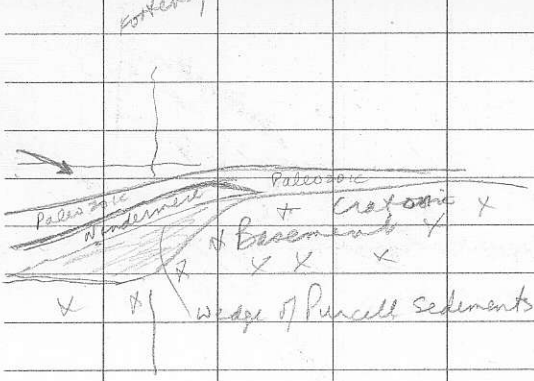
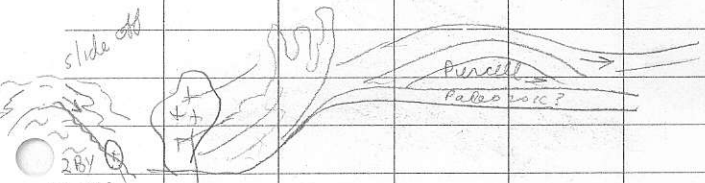
84-28



First Westerly derived material - Jurassic



sealed at 90+ My - Athalmer Bay Stock

Columbian Orogeny

collision - mid Jurassic

East Assemblage of Kootenay Terrane –

Milford / ~~Kaslo~~ Slocan

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Kootenay Bell
Florence

Lead same as Bluebell

Veins along fault

Replacements of 'fractures'

OR Lst of Lardeau Gp

Replacement ones have Bluebell mineralogy

Denison Mines
- Steve Phillips
- Dave Makepeace

Old Ruth Mine 900' early
then extended to get to
Vermont & later again
driven further west
#5 level
1967 licked into ore zone

MAIN LODE
Includes
Slocan Star
" Kemp
Richmond Eureka
Other end supposedly
over the ridge 5 miles
away at Silverton

Silverton - Standard
Mine 1½ MT
Mammoth
Carnation
etc

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Silvana Mine

across the valley - numerous portals

over 100 properties have been shippers of ore

Most lodes E/W most dip 30-35°S

Bends - locally swings 90° then back again

splits - strands of main lode into footwall

Crosscut geology @ high $

very complex structure

Cairns & Hedley - good references 1951

ore in three strands - ore moves from strand to strand

Underground
S ~ ½ mile in FW
Turn W 11 to lode
+ into lode
argentite + arg sulfosalts
- stratigraphy discontinuous

on nose of recumb
fold?

Silic. near lamprophyres
also porph etc

74-76 Followed leads
76/77/78 Back into good
grade
new development
70 000 tons more → 1982
① Porphyry dyke FW
Qtz veins near contact
② Pajama rock
'Skarn'

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Lode - a fault structure
reverse flts?
10 - 70° avg 25° dip
sinuous
minlzn as veins - remnl
graphitic shears

Galena gneissic locally
elsewhere not stressed

Shearing wraps around upper
parts of Nelson intrusion
Diorite a buttress?

Ore Galena silver
CR grays contained
Run of Mine ore will
probably run 13-14 ounces
Ag Pb 5% Zn 5%
~ 450 000 tons mined

new ore ~ 2 yrs @ 100 TPD

Main altn
silicificn
graphitizateon

silic
Lst → / emerald grn or
brown, competent,
arg-qtzite → little
change when silicified

Diorites →silic look like
Qtzites

- strands small but richer

new orl zone rich
silver 2 - 100 oz

(3) Further down the drift
Diorite - some places
in graphitic shear
zone - shear follows
diorite contact
for hundreds of feet

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80' above here
Main lode - sheer later
cuts it

Edges of lode sheared
generally

Biot ppy carbonate
altered

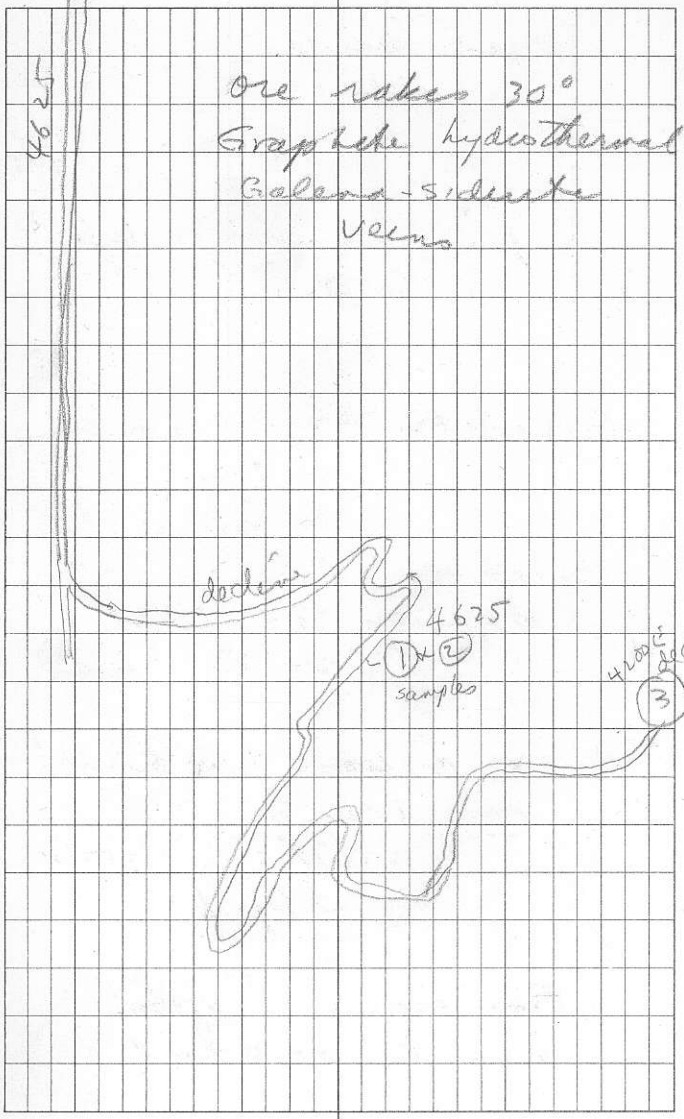
Biot ppy dykes cells
blobs

Pb 30
Zn 50

Mill 100 TPD
Persons 50-85
Mine 5 days/wk
Mine cost $120/ton
Mill Mine 5 days/wk
∴ 700/5 = 140 TPD

Coldstream
Geochem of soils not effective
- carbonate abundant
& fluvial deposits - ∴ Minimal movement

Portal Plan Silvana Mine



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Dykes - diorites
porphyric "
lamprophyres

For geology see Matt Hedley's Bulletin

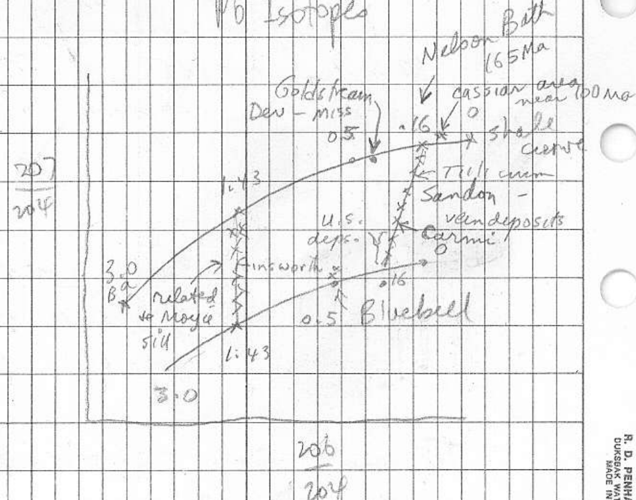
Concentrates — 75 - 200 oz/t in concs
Zn 50%
Pb 90%
Last year of operation 1983
Ag 10 oz
Pb 3%
Zn 3%

New orebody (not diluted)
Proven 8 - 10% Zn
3 - 5% Pb
14 oz Ag
} ~60 000 Tons

Fair amount of pyrrho in fr in the ore & the FW.

1

Pb Isotopes



Bluebell curve - assume age 500 Ma

calculate curve

* There are deposits with excess radiogenic lead - epigenetic (Epigenetic intrusion-related)

e perhaps Qtz Lake Midway Reno Hed

(ie) Can date rx in Selwyn basin

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May 1

Travel Nakusp to Revelstoke then
to Thanksgiving showing.
16 miles - 500 yds south of
(STOP) Revelstoke Dam La Forme Cr Bridge

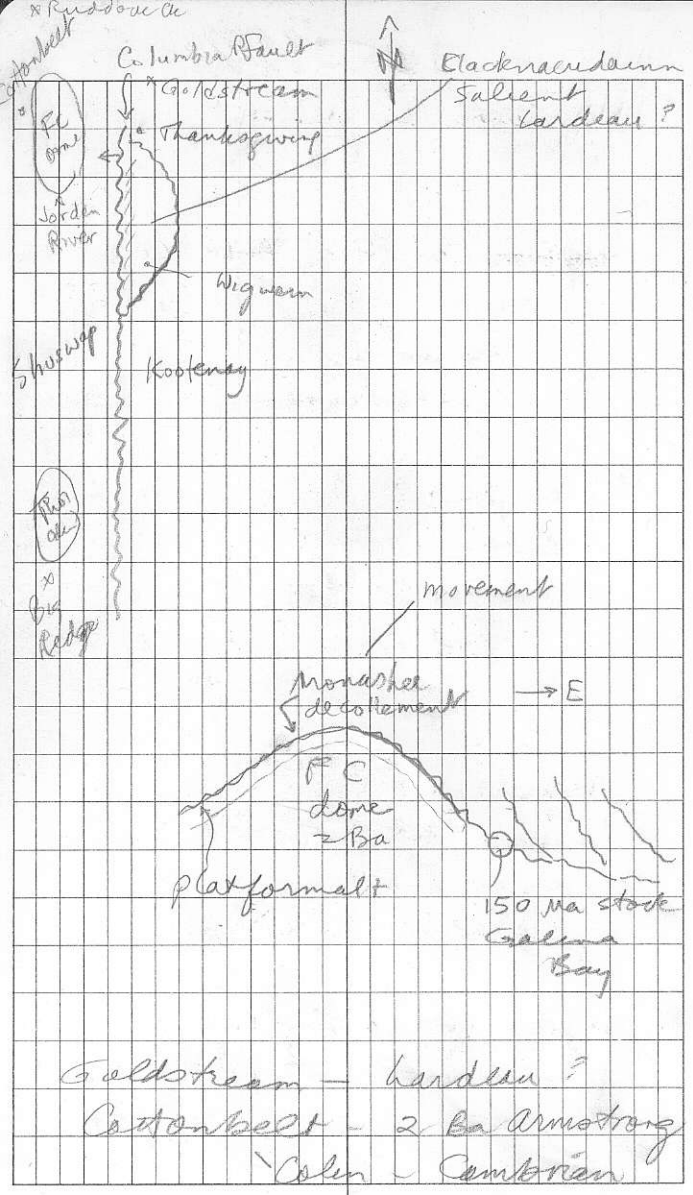
Sandon Lead - linear array
argues mixing of lower crust
and crustal leads

Tulliam 160 mg - skarn related?
vein deposit

Shale Wave,
Howards Pass - Silurian pt
Tom - Jason, Cirque
Dev - Miss pt

Cost/ANALYSIS Edmonton $250⁼

applications -
i) can distinguish Beaverdell
+ Carmi types



Goldstream — Cardeau ?

Cottonbelt — 2 Ba Armstrong

Colen — Cambrian

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Ruddock Ck - younger?

Deposits 5-20 MT but then
so not generally economic
Pb Zn Ag
3-6% combined & <1oz Ag

CK property similar
Rebar
J & L - Mohican?
gold silver sedex? deposit
in arsenopyrite

Thanksgiving Property
near Col R. Fault
basal Lardeau?
scheelite in skarn

Samples garnet diopside
vesuvianite scheelite
skarn

GOLDSTREAM May 2/84

Geologist — Norm Berg

Unit 7 ser schist

Footwall 6 Graphitic ~~Phyllite~~ LSF schist

5 ORE ZONE

4b chl ser gtz phyllite → gtzite cpy stringers

4a Grey banded LSF

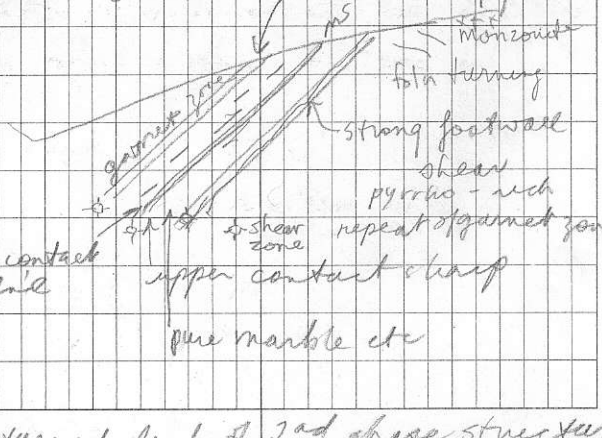
3 Garnet zone - dirty

2 Calcareous 'phyllite' (Graphitic zone)

Hanging wall Unit 1 gtz sphalerite cpy banded cpy m/s

* remember - sequence inverted

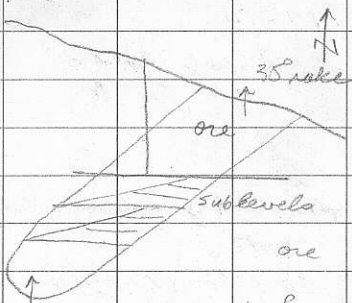
ore stratiform -



overturned limb of 2nd phase structure

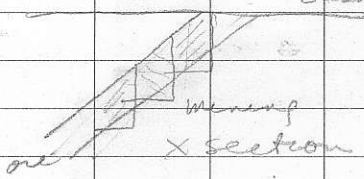
R. D. PENHALL LTD. DURSPAK WATERPROOF MADE IN B.C.

84-36



Pumpeo bifurcate

LONGITUDONAL SECTION



X Section

Colin - Why can't the garnet zone = to manganeferous chert so ore on right way up?

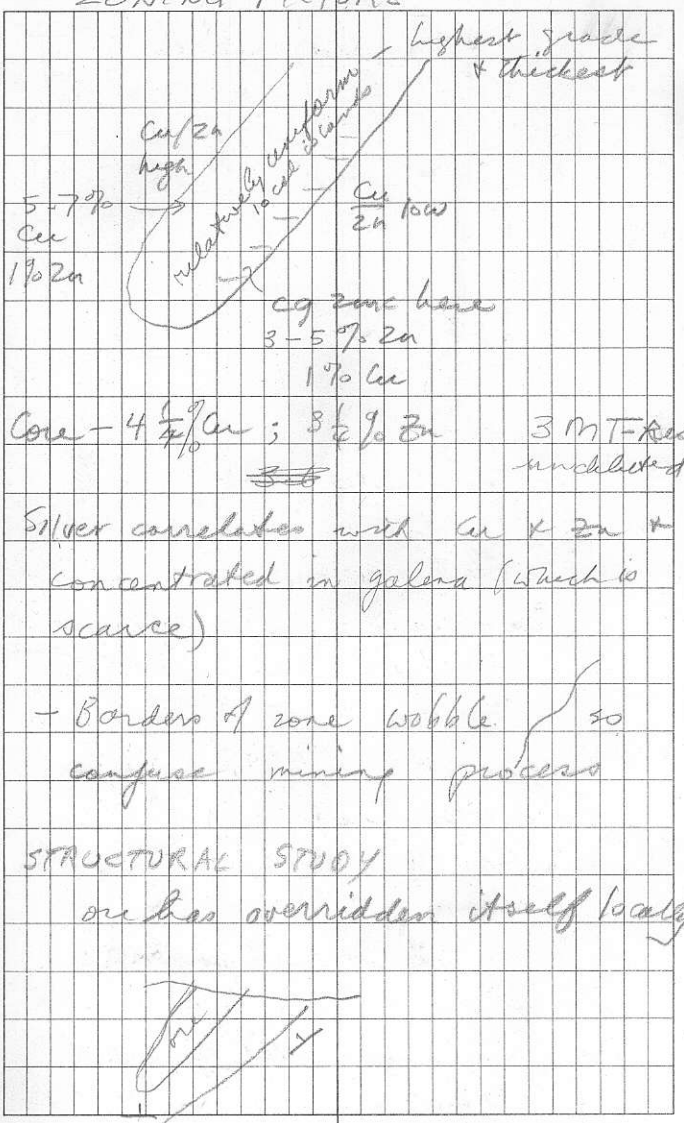
Trygve These are distal ore deposits & chert can occur in the footwall also

Structural arguments argue for inversion (though not definitive)

- very sheared - shape due to diapirism.

- HW - local pods + disc. sulphides

ZONING PICTURE



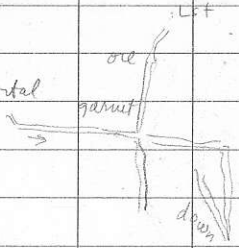
Publication - Econ Geol - Sept '84

R. D. PENHALL LTD. DURABAK WATERPROOF MADE IN B.C.

Tour - 700 Elev bcol

Ok banded phyllites

walk to 1st ore sill 700 Elev



down to 655 + exit back up ramp

can see footwall also

Mining

1500 Tons/day Head Grade 3.5% Cu 2% Zn

(1360 Tonnes) Cu >90% Zn 30% (intergrown with pyrite very fine grained)

Dilution 25%

Reserves 3.6 MT Tonnes diluted 3.5% Cu 2% Zn

Concentrate grades

23% (Cu) 200 TPD | Zn (49%) 50 TPD

Portal ok banded phyllite

(unit 2)

STOP (1) contact with garnet zone

menemp ferm

Follows ore 'sill' east

stop 2
X cut

sulphides

Banded silica rock
'exhalite ?'

Lower grade
sulphide - rich

Lots of small scale folds

Lots of CK clasts in the ore - highly strained - more clasts in areas near fingers of orebody

P & T Plan to mine
300 000 Tons -
have taken 200000 Tons so far.

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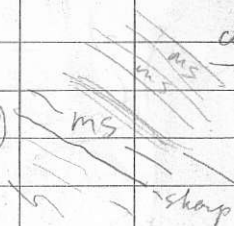
MADE IN B.C.

Corbett-type deposits

Ni/Co ratios ~ 1 — some as Coldstream

50 ppm Beaubi

~200 " Coldstream



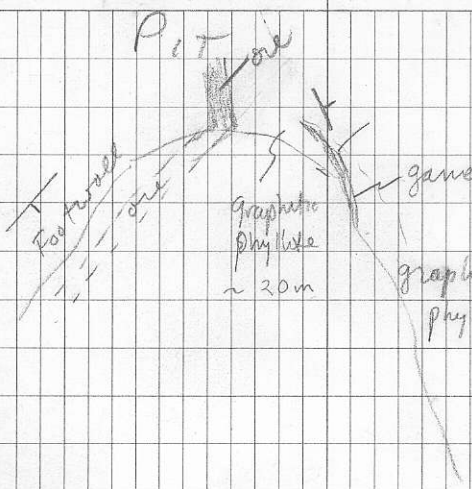
Return to main drift. Turn head west down ramp

STOP 3 at ore/footwall contact

Contact deformed

West limit of ore - follows 17° decline down

Goldstream



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MADE IN B.C.

1984 NOTES 84-39

Afton (1) May 3/84

Iron Mask

Small deposits asso... with pict picrite (olivine basalt)

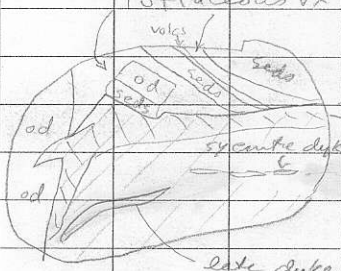
Lorne Bond

Afton Tour GREG REID

Pistons Cpy / bn

Oxide zone Cu + CCF

Tour 1800 ELEV BENCH



Test sedo

'arkose' - SSb anyway

Tuffac Rx - swells & forms to mud in water

Local carbonatized trees

(Xerox)

Sunday 29/04/84

Left Creston 10 AM via the Skyway - stopped and looked at Toby cgl cut by Irene volcs.

To Reeves MacDonald mine then to Salmo for lunch - after lunch (4PM) Tryg + I split + went to Nelson - looked at Pillowed Rossland augite porphyrytic basalts near Ymir.

In Nelson, worked on talk preparation, ~~and~~ ran for 27 minutes and completed my talk preparation.

The group got in ~ 8PM - we had an illegal beer in the lobby - then to a steakhouse for dinner

Got in ~ 11 30. - chatted with Colin - to bed ~ midnight

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AFTON (2)

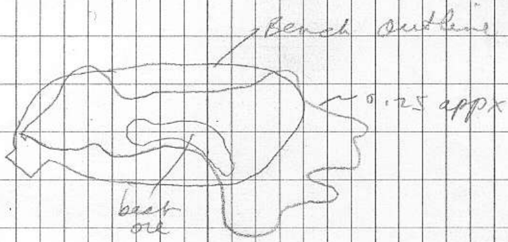
altn -

magnetite - apatite veins

orange diorite - looks like syenite
probably albitized, no
Kspar

Qtz + MoS2 deficient

West side - zone plunges SW
East End - most of present ore
0.6 - 0.7 % Cu avg
Cutoff 0.25 % Cu
Gold .02 oz/ton
Gold assoc with Cu but not
1:1 correlation



1750 Bench

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Reserves (original 30 MT)
10 MT in pit
10 MT underground
/ (1% Cu)
not presently viable

Pink Diorite - albitized

North Sounding fault
>2000' offset - reverse
movement
magnetite - opaque vein
— magmatic origin?

Pyrite halo
at south end of ore

(ore)
Pyrite halo

altn.

potassic altn local
(Eastern side)
mainly propylitic altn

- Swelling clay in tuffs bump up
wall stability on the north
- having to lower wall slope.

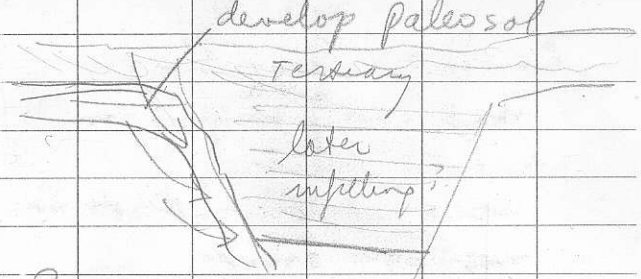
Strip ratio now 5/1
ultimate 4.5/1

* Lake in stage 1 pit

- Prodn 8000 tpd now
mining + milling
~ $14/ton

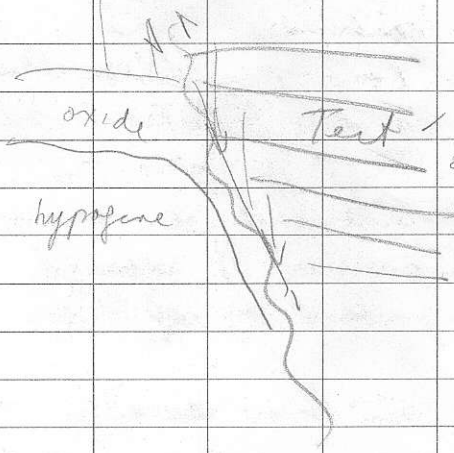
PHOTO

zone here bounded by faults -
ore keeping going to 1700' depth (+)
ore zone - keel
plunges west ~60°



Paleosol PRE-TERTIARY ?

LATER FAULTING



P.7 STOP 1 East End

magnetite / apatite veining in
chloritized diorite
Colin interprets it to be
a magmatic event

- STOP 2 Magnetite showing
host rock biotite diorite
(POT HOOK PHASE)
mag - apatite dyke cut
by carbonate veins
Border zones have what
looks like spinifex texture

- check with John Kwong re
composition of altered
amphibole (?) crystals

Has been variably called
a vein, a skarn and a dyke

Many subsidiary mag stringers
in the adjacent rocks.

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argue that magnetite
Preceeds

Afton S isotopes near zero
⇒ magmatic origin for
mineralization at Afton -
related to late stage
hydrothermal fluids

Local late stage chalcedonic
veins occur in the magnetite

Colin evidently thinks John K's
altn story is incorrect but
approves of his supergene
interpretation

Conc. Cu 50%
Au ~1 oz
Ag ~7 oz

Iron Mask Meta

Picrite - chemically it is like komatiite (Mg-rich basalt)

copper toward bottom of picrite?

some remobilized magmatic?

Cpy main mineral

alter - epidote chlorite

Gypsum intergrown with ep & cpy & py

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84-44

Lornex Tour

May 4/84

430 Mt .37 % Cu

.013 % Mo

Cu Eq = 5 x Mo + Cu

L x Fet

Bland gauge

30-300' wide

Dips 85° W in south

85° W in north

start up 1970/71

Low grade .16 - .23 Cu Eq

Waste < .16

Expansion 1979 $160M

Prod

R. D. PENHALL LTD.
DUKEBAR WATERPROOF
MADE IN B.C.

Shovels 5 @ 15yds
4 @ 22 "

Trucks 120
235 11
170 22
↑
will go to these only
in time

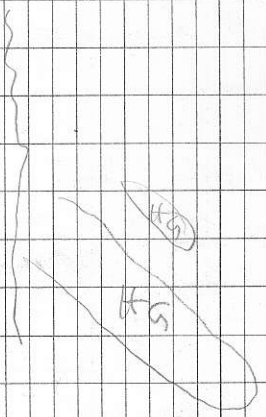
now 87000 TPD
.356 Cu) april
.017 Mo)

ser/qtz altn zone
adjacent to dyke
Dyke lower grade
~.33 Cu

Hardness
soft. 3-500 T P Hour
grinding

Drilled @ 335
Fault dip 57° W

Beat Mo on East side



Trend point toward Highmont

S End -
more disseminated sulphides - up to 25% of ore

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altn
potassic - not well defined
phyllic altn -
qtz sericite pervasive
argillic
propylitic ep carb
hem chl
silic
300 - 400 TPH
Diorite
wk altn 800 TPH
mod " 1200 "
intense " 1450 "
avg 1200 - 1800 TPH
throughput

Mining costs - Nelson does not know
Lost $5.1 M last quarter
@ 67¢ Cu

Mill recoveries

Cu 90% +

Mo 78%

Concentrate

28-29% Cu copper conc

55% Mo moly conc

(north end of deposit Bn > conc 33% Cu)

Benches 40'

Slope 36°

Core drill program just completed — mainly in west wall.

Holes 4-6" ϕ 300-600' long

Ore Blending based on ore bench mapping (by mapping observation intensity) — # assigned to 100 x 100' blocks

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TRY TO GET UP THIS SUMMER
TO SEE THE NEW DRILL CORE
7 HOLES 5500'
(may be 6)

Ore keel plunges ~ 24° NW

PHOTO Colina @ Lx Fault
(dips 80° W here)

MILL TOUR

85,000 TPD
.35 Cu
.015 Mo

30% + 100 mesh
Bulk flotation 1st pass
pH elevated slightly
to knock out py

Collector Xanthate
Frother Pine Oil

sodium hydrosulphide to
depress copper
but I feel it as a
collector for Mo
sink is the Cu → concentrated

Mo leached to get <0.2% Cu
(floatn 1-2% Cu)

COLUMN FLOTATION ← Mo float
Cu sink
34' high 2-3' ⌀
replace 10-20 float cells
advantage 24" feed in just below
deeper froth gives better
cleanup - froth column
washed. Eliminates
problem of transporting
material
MoS_2 froth to slurry
conversion is difficult

Clay problem - keep ~~slur~~
slurry at low density if
possible - blending done to limit the problem

Clay – mainly fouls up viscosity
– absorption effect can be
overcome

Prodn	25000 TPMonth Cu concentrates
Cu	88% recovery
Mo	65% "
Conc	Grades
	.53% Mo
	28-29% Cu
Gold	below
Silver	same pay
Rhenium	no pay

84-48
May 4/84

Valley Copper

Mined 7 MT in 1983
.52 Cu
89.5% recov
Conc 44.4% Cu
Strip .97/1

Reserves
709 m Tonnes @ .47% Cu

Holes 2500' deep ended in ore

Copper
Declines 0.02% Cu higher than drill indicated results

Add SiO_2 / CaO / etc
Deplete Na_2O / CaO / etc

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Valley plan some fill-in holes this summer

Kspar veins generally with cpy

What was dated for the lamprophyre? redo it?

84-49
May 8/84

WESTMIN

Known strike length 19000'

Thelwood Valley

Myra Mtn ~5500'

Myra Valley - long narrow valley
main mine site

Phillips Mtn ~5500'

Local relief ~4500'

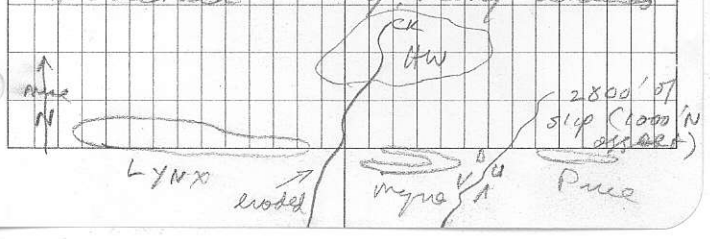
Mine north - N45E

Ore zones hand mine E-W
(NW-true)

Three mineral areas
segments of one zone
- LYNX
- MYRA
- PRICE - not yet a producer

Main Mine

In detail - many many lenses



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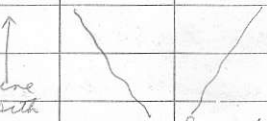
Fold Mine E-W
horiz plunge

Three surface showings

Main centre on South wall
Zone, Lynx

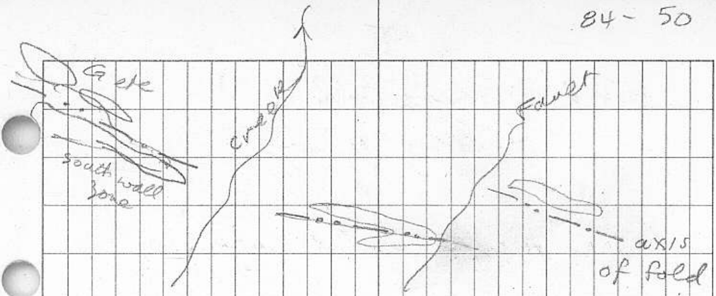


other faults — Mine EW - 45° N
Dip slip offset on HW

Anticline
ORE In or on contact of rhyolite

strong deform ~180 Ma ?
Greenschist metam)
Faults post - metamorphic

84-50



Rhyolite - mainly volcaniclastic
- LT to tuff
- fairly well sorted
- local lamina. to thick graded beds
- sections on west end have multiple graded beds ~ 10-15' thick that make up ~ 100' S/section
- quartz eyes sought to call a sericite schist ~~rt~~ rhyolite

LYNX

Fold limbs vertical to overturned on south limb ~ 45°N on north limbs

Rhyolite is a sheet - not a linear structure

* ALL DIRNS REL TO MINE N

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Lynx dip length ~3000'

Myra dip length ~ 1500'

Price " " ~ 500'

over strike length ~ 4 miles

@ Rhyolite lens (+ one)

taper out eastward

LYNX / MYRA / PRICE - one horizon

HW - on a lower horizon - HW Rhyolite

HW Rhy 400 - 500' below main productive rhyolite

HW Rhy more extensive + thicker + not yet well explored

Another rhy horizon that can be correlated over fair distance - to 400 - 500' above the main one. Prospective but not sure if this one - carries M/S clasts

MINE SEQUENCE ~1500' thick
Contains all known rhyolites & M/S occurrences.

Lots of little discontin rhy feeders - carry minlzn but too erratic to make tonnage needed for mine

Qtz eyes - three textural types mapped based on % qtz + grain size

Jasper - relatively uncommon - some related to rhyt ore - some are not - not a reliable exploration guide

STRINGER ZONE -
mainly under HW orebody - py-qtz veins

Chloritic alt - perhaps locally in Lynx (so-called serpentinite) Chert occurs in the sequence

Main alt qtz-sericite

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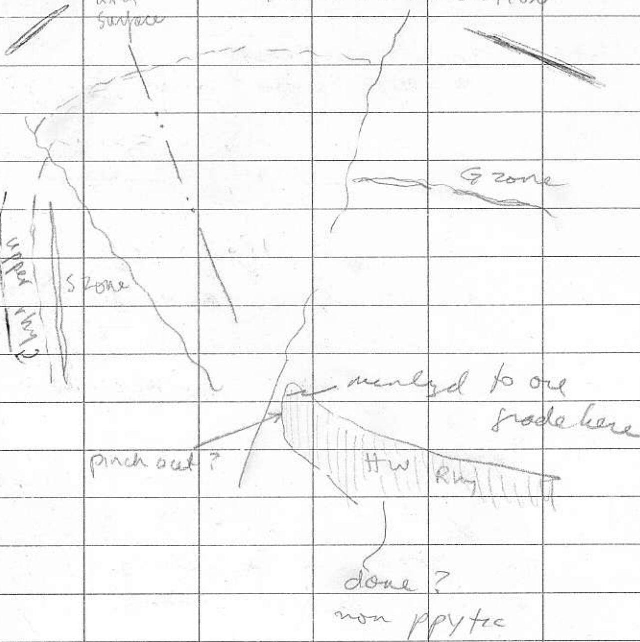
LYNX MINE SECTION



84-52

Buttle Lake Lst

—— // —— // ——

~4000' higher to lst ↑

'sharp banded tuff'
andesitic tuffs + chert, + diabase including sills?

upper Rhyolite QFP usually

— local jasper beds
purple + green mixed clastics } usually on Lynx hanging wall

ore clast bx, loc rhy, etc

basalt or and. flows

— ore mainly at top, loc @ bottom
Lynx Myra Price Rhyolite fragmental

West snd - andesites locally pillowed

some m/s clasts — mixed clastics < bas and dac / sed rhy

mafic + fs ppytic andesite

* mafic Rock

HW Rhy

* mafic rock - tholeiitic basalt ?

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Mullen's Sediment sill -
mainly argillite, locally
chert etc
— NOT SEEN IN THE
MINE AREA.

* ore clast breccias - ore
clasts gen. < 1%

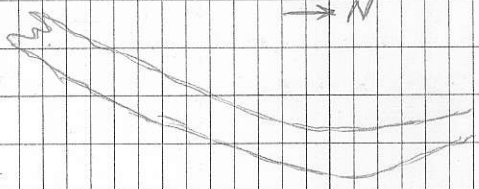
Locally can get basaltic
'mafic flow' over G & south
wall zones

HW rhy - locally has black
arg interbeds

Exploration Drilling logged &
plotted at 1" = 50'

Ducke - silica, fs ppyhc - not
qtz ppyhc - tricky to distinguish
from rhyolite

Section 77+60E HW Rhyolite
has a trough.



Graded beds probably
turbidite - coarser more
proximal

- Source area - copper high
zones - zinc not fringe

HW 0.07 oz/ton gold - doesn't
vary much

General gold range .05 to .29

Sulphides sedimentary

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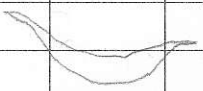
Ore types

polymetallic 4 MT in HW
aog close to 3 oz Ag

pyrite blende type
gold more erratic
next to no silver

Barite in marginal phase
Lead " "

Myra mine - 124+00 E
fold right here



84-54

Lynx Myra Price higher grade than Hw

Hw 15MT (so far)

Same ore types as Hw + others but proportions vary significantly

Lynx etc 'old' polymetallic

Prodn so far ~ ?

Reserves 1.4MT

(increased by 22% in 1983) -

major new ore bens found

Mining ~ 270 - 300 000 Tons/year

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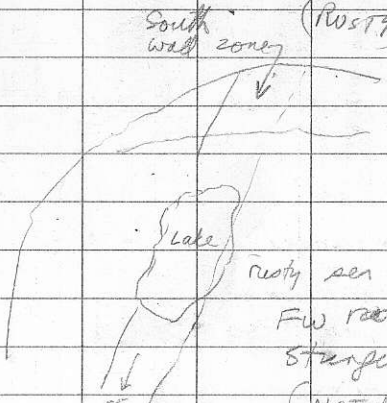

Sample FW South zone Lynx Stumpen Zone

Fringe zones
Hw au - no change
ag increase
Myra locally fringe
ore has higher au + Ag

zinc moss (photo 2) 84-55

west side of pit

banded sulphide - uppermost of three (photo) √③

Ø ore lens - photo of MS⑤ + photo NW to pit wall④ (white zinc bloom on M/S layer)

zone up to 40' wide here

Hanging Wall samples

* purple fragmental

* yellow - brn rusty wthg rock - flow? dyke?

qtz veined py Sr bx
sheared - looking

photos ⑥⑦⑧ (all poor)

Face MS - banded - 'top' has a lensy siliceous layer (exhalite?) then cherty layers in rhyolite - very pyritic layers also (3 photos)

ie pyrite silica ash

'AZUFRON'

Ø ⑩ photo of folded cherty rhyolite

Jasper - above Lynx
horizon but not with
ore

Chert extremely common
through Sicker group

- 'chert' over M/S is
uncommon.

Mixed elastics ~
Lynx Rhy position
in centre

84 - 56

HW Core

HW andesite has rhyolite zones
with red sphalerite
local welded zones
epidotized zones
local sulphide clasts

* Qtz black + glassy

look for on dry face

Greener more epidotized volc +
volcaniclastic

HW Rhyolite photo (11)

sulphides - vfg py sphal
cpy

Clastic rocks

Stringer zone photo (12) (?)

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Hole P13 - 301

andesite

Rhyolite zone - 90 Ken sphal in qtz veins

Pyritic stringer

TIME BREAK — Black 'mud' rocks
carbonaceous

'azufron' - gray silic pyrite

cpy-rich M/S

'azufron' - exhalite

~~photo~~ (?) M/S zone

ankeritic (?) lens

M/S

sericitized — ankeritic stringer zone

~~azufron~~ (?) " "

stringer zone
- sericitized rock

bleached, sericitized rhyolite.

(12) photos - stringer zone

(13) (14) 2 of 'azufron'

Portal Zone – Lynx

200' stratig above pit
south zone

- upper rhyolite horizon
chert / arg / qwke rhy /
qtz ppy tuff
noted glassy qtz eyes
- variably 50 – 400' above
the Lynx G zone
2 samples – one graded
ø photo (15)

STOP on road – sharp banded
tuffs (volcanic wackes ?)
ø (16) photo – graded beds, black dyke
may eventually become
part of the mine sequence

STOP – SICKER LST
chert replacements locally

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84 - 57A

Pillows with gtz 'ledges'

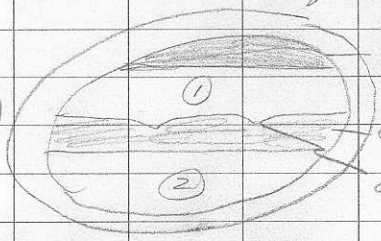


photo 17

① Lava with drains - ledge / shell

② Lava with drains - ledge 2 forms

Chetwynd area

Tour with Ward Kilby 28/06/84 84-58.1

Stop 1

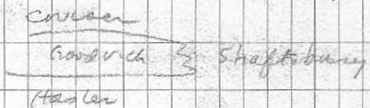
- Hasler Fm
- Tb - lam silty sh / siltstone

2-3 mm turbidite layers

marine

Stop 2 Goodrich SST

channel sands on delta plain



cream + grey laminated sandstone

X beds locally - trough cross beds

X beds locally 2-5 cm scale

marine - below wave base ?

(1) PHOTO Trough X bed

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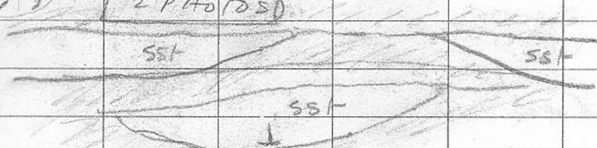
STOP 3 - Cruisin Shales
✓ ~~Similar to Hasler~~
Hasler

Dunvegan
SST in channels
in siltstone sequence

(2)(3) [2 PHOTOS]



Overview
photo (4) (5) across Pine R to Hasler Ck
gas plant
Hills capped by
Dunvegan sands - can
see 'flat' lines of
trees.

stop 4 Boulder Creek
walton member
photo Conglomerate
(6)(1) waterfall - crudely stratified
(in Camoshun Creek)
coarse sand to pebble cgl
Peters out E + N but extends
beyond Quintette to south

Walton Member
STOP 5 + Quartzite channel deposit
grades finer upward →
pale colored zone full of
roots then coal above
photo (8) [PHOTO] cgl just below
↓
clean poorly bedded
sandstone unit
marine - pelecypods
↓
marine mudstones -
Hulcross

[Gradual zone - sand layers
in mudstone with coaly layers
+ lenses

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STOP 6
Drove highway + new road
to Bluesky o/c on
power line
cobble + pebble cgl -
unusual - looks like
Cadomin
Clasts weather in relief
(9) PHOTO

STOP 7 Grizzly? o/c - SSE
coal on anticline
alternating sand and
thin mudstone (often carbon-
aceous, locally → coal)
Sands - x beds, up-up,
local chert cgl layers

Moosebar - marine muds

- Long trip along powerline -
Fisher Creek - to see
Tonsteins - most of
route in Gething

Tonsteins in 2 bands
3 below 2 above
contain plant fossils

10 Photo Sample

photos
11-36 Bullmoose coal loading / Quintette
plant / Town Hall Tumbler Ridge

→ Photos from air of Quintette

Photos - Bullmoose

Pit visit

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(Hasler) a good ride (cruiser) or

you'll get the Shaftsbury & go

to Dunvegan

D unvegan

cruiser C
Goodrich G > Shaftsbury
Hasler H

B oulder Creek
H ullcross
(G) ate
M oose — bar
(G) eth
C ad

Cad Geth Moose bar Gates

you (cad) (get) the (moose to bar) the

(Gate) or you go to (Hull) a (cross)

(Boulder Creek)

PARTIAL CRETACEOUS SECTION

Dunvegan sst/sh

cruiser shale

Goodrich sst — Shaftsbury

Hasler shales

sst/coal Boulder Ck

cgl

sst

Hulcross - marine shales

GATES * Bullmoose/Quintette

Moosebar - mainly marine

ooo oooo Bluesky

GETHING

oooo Cadomin Cgl

Minnes Group

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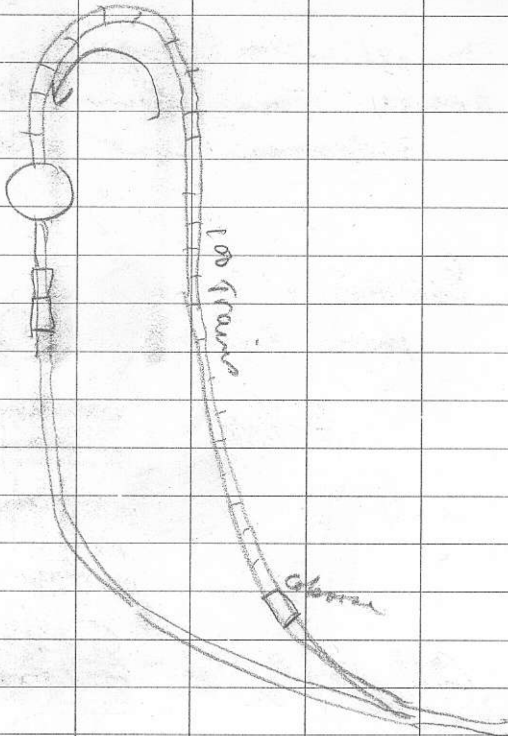

84-63 5
June 29/84

Travelled to Bullmoose area
3 photos Train loading - electric
Bullmoose coal loadout

Bullmoose
photos from Breaker NE

In Pit

All coal in Gates ~~[illegible]~~

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Geologist Rod Comeron

Trip with Andre Panteleyev/ Vic Preto/ Ted Faulkner — 84-64 — July 9/84

QR Tour

N side of Quesnel River, poor access by road - N of Quesnel R - Moirhead Ck junction

Quesnel Trough - NW ~15 km wide

syn volc alk. stocks

Eureka Peak - in phyllites, qtz veins

Alkalic stock Prosp. Program ~1972 - Pete Fox
Goldfields + Dome Lacks
- locate stocks on aeromag
- geology
- soil sampling

QR first found 1976 Geochem
40 ppb on one line
diorite stock nearby
so followed up

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1977 First pc holes

River cliff exposure
stock + siltstone but underlying
basalt not exposed - mainly

Reserves
~1 M Tons of 0.2 oz Au
OPEN PIT
metallurgy sample (pulim test)
West zone
same setting but 1 km away
geometry different -
small
then fairly flat-lying,
tabular ~100000 tons @ 0.2 also

Grades
Sample to sample high variance (1 m spacing)
overall rel. constant
60 m Krieg radius

Have discovered
Nyland
Gering Ck
Canteen Ck - will drill this fall on IP anomaly [mainly to get geology]

USE REGIONAL AEROMAG
follow up with grd mag surveys
stocks
Diorite rims → monz cores
very strong mag kick on edges

FIELDWORK 1976 - Dave Bailey

Felsic rocks mainly near stocks - away are epiclastics / lsts / etc.

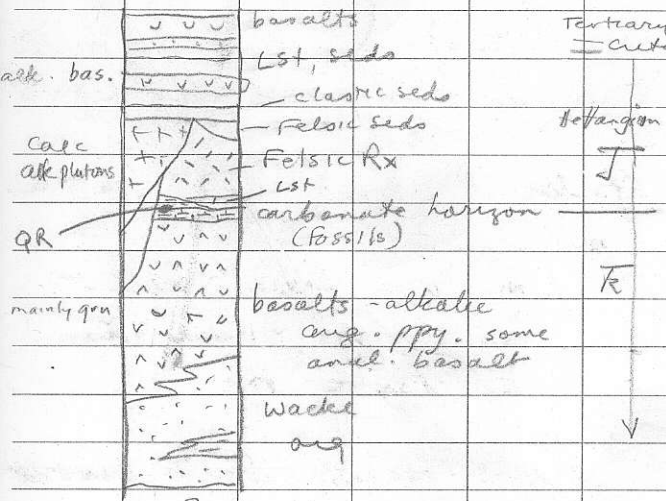
Basalts fissure eruptions
Stocks have assoc eruptions and facies in assoc flows + pyroclastics - can lead back to stocks ie clasts in flows + pyro. [?]

VOLC Rx

Low TiO ~ <1%

Hyp alkalic $Na_2O + K_2O$ ~ 5%

Nepheline normative ~5%



BOOTJACK LAKE

Neph sy → dior stock

see Dave Lefebvre thesis 84-66

COMPARABLE TO PAPUA NEW GUINEA CHRISTEN & KUNA

– OCEANIC RIFT VOLCANICS –

Basalt dips dwg 45 - 50° fault blocks, no penetrative deform

Stocks crudely ⊙'r 1 - 2 km or less in own felsic pile - clasts go ~1 km then Epiclastic rx

Local pillow basalts in F basalt package

R. D. PENHALL LTD. DUKSBAK-WATERPROOF MADE IN B.C.

Mafic Qx

propy. altn u. near stocks so can be used for prospecting
augite ppy

augite bx. calc cement
"Klinker"

pseudoleucite ppy (~1cm)

Maud Property

CANTIN - ep altn, dk purple gray basalt
aeg → chl
minor plag phenos
locally amyg

Felsic Rx

Epiclastic monz clasts, basalt clasts, hematitic matrix
- compsn similar but less aug some hb more fs

Lst dk grey

Hb fs ppytic trachy-andesites
ie NYLAND

stock
Diorite fg CI 30 strong attraction for magnet
mafic pyrox or hb if altered

Monzonite mg CI 15 less magnetic mafic Hb or Biotite

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GERIMI DK - flow layered
Hb B ppy
Ep/cal knots

MAUD
Dioxde
Pseudoleucite ppy
gray 'andesite'

Cariboo Bell

pink overtone fg monzonite

fs ppy (epid altn)

mag - cpy skarn

Kspar (?) - ep altn

Diorite w mag / cpy fr

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QR Geology

1:5000 geol. map

Dave Melling - Carleton - BSc Thesis

~ 1982

(worked mainly on carbonate unit)

C

siltstone / argillite - calc, pyritic, thin bedded

~ petro basalt - fumerolic phase

calc bas. + massive carbonate unit (4+5)

fumerolic pyrite

basaltic wacken lapillistone

aug bas - auto by pillow bx

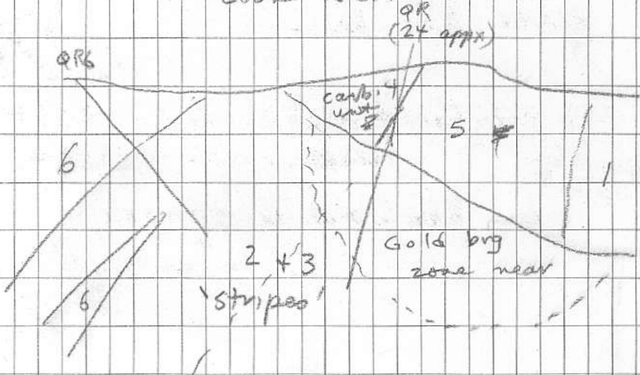
(uncommon)

propylitic altn front crudely
concordant to stock —
dips N on N so X cuts beds

bas → Epid cal py chl

3 massive propylite - no orig. textures
2 propylitic rx - can see "

Look west



Gold zone tabular ~ flattened
cigar shape - rakes easterly
+ cut off by Walley's Fault

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mafic volcs
fissure eruptions
late fumerolic events
NO GOLD
Felsic Volcs
central eruptions
Deep → shallow plutons

GOLD - possibly some exhalative
— some epigenetic

Faulting Hydrothermal Altn
GOLD depsn
subaerial flows
TIMING - probably late stage of
Felsic volcs

Idealized Section

QR avg 200 ppm Cu

Silver low

Geochem

Kicks in As / Go W

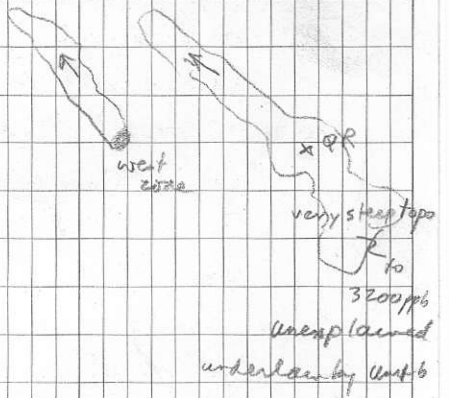
Till, organic mucky, poorly devel. soil so difficult

40 m → 80 m spacing

Ice dirn NW

Anomalous 20 ppb + up

Very pronounced ice trains



Arsenic

Threshhold 20 ppm

west zone - good ice dispersion trail

+ down-slope ~~dis~~ anomaly

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* GETTY did compilation of RGS - shows good As anomaly in the Diorite/ alk volc belt

Arsenic also kicked over the 'unexplained' anomaly

Mag - ground surveys

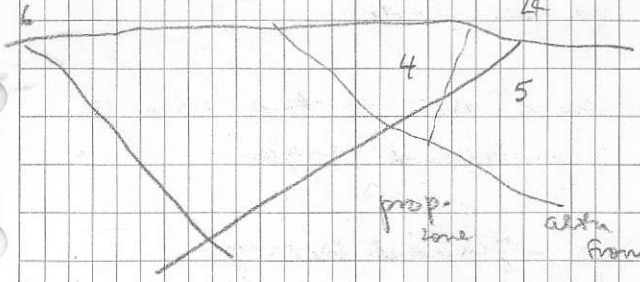
Avg overburden 15-20'
loc. to 60'

IP - picks out favorable pyritic zones but not the mineral zones as such

STOCK cuts siltstone

AGE OF GOLD MINLN - mid Jurassic?

HOLE 24 then QR 6



#4 grey rel fq amg ppy with weak patchy ep-py altn and calcite veinery

~54m - strong patchy epid altn produces pseudobox - can still recognize host - so unit 2
Box 8

Box 12-16 unit 3 patches - pervasively altered - epid + carb.

NO CORRELN Au grades with Py content

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Dykes - several ages
early ser alt, later don't
usually Ab Fs ppy dykes

Main alt'n avg 4-5% py

West zone - some garnet

Highest assay 5oz over 1m.
Best intersection 40m @ 0.2

Drilling avg 250' a shift
Total cost ~$40/foot - includes
assay costs, etc.

Project has cost ~$5-6M so far

Mineralization starts first back from the
alt'n front

May be 2 or more? episodes
of Py fg diss, coarser

Hole 6

siltstone - pyrite fr common
cut by Hb ppy dykes
shot thru w diss py.
Gwke / argillite
cal veinlets; py fractures

WEST ZONE

gray green chlorites basalt -
little pyrite little ep tour
0.2 oz au (loc to 1 oz) - difficult!

- also has normal propylitic zones
with lots of py + some pyrrho

Nondescript altn holes are confusing
but still mean well - assay every-
thing!

Helicopter Trip to QR

✓ 2 Photos Quesnel + Diatreme Quarry

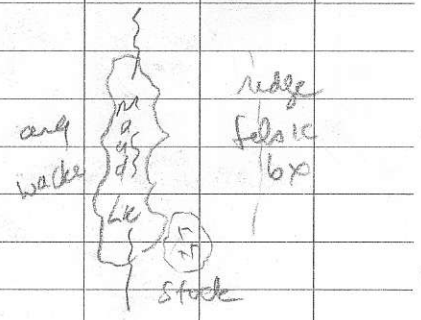
✓ 1 Placer Op @ mouth of Canton Creek

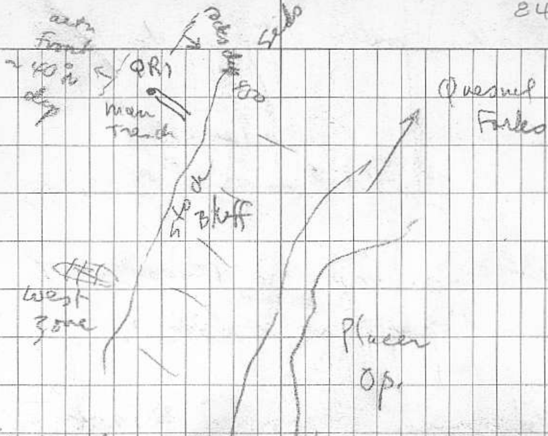
✓ 2 ~~Quesnel~~ Geremi Stock - (area of fresh logging cuts) Felsic stocks w/r in relief

✓ 1 Photo

Ridge road + aeromag proposed NYLAN STOCK

✓ 1 photo

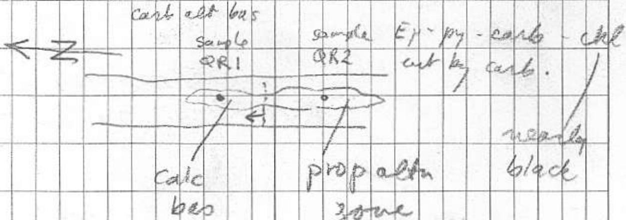




Landed on flat near QR1

✓ Pilot Larry Davidson - photo of Takeoff

✓ photo in trench on QR1



Zone

300 m long x ~50 wide ~50 m down dip

√ Photo - full profile
East trench

QR3 Samples calc bas - unit 4
QR4 pyrotic bas. - unit 5

QR5 Trench on knob to NW
Dyke rock or basalt
if angular part more dyke
QR6 Fragmental basalt -
bottom units 1 + 5
Volc autobx?

Generalization - pale grey basalts have fresh-looking matrix but are calcareous (ggg) and fragmental.

84-74

Drove over to Wells / Barkerville

Summit Creek (Frank Nester)

photo - placer operation

Then to 8 Mile Lake

Central Northern Mining

8 man crew

~8 photos

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Geol ERIC DUSSEL

MARCEL GUIGUET

84-75
10 July 84

Mosquito Creek Mine Tour

Dark package - Rainbow
4 bands
carb arg + qtzite
BC Argillites - struct. FW
Black arg.
Mines all along contact
N51°W / 50 NE
of Rainbow / Baker
Baker rocks
Lt colored qtzite Q Ser Schist

all prodn so far within 100 m
of contact

* contact could be metasomatic

Cariboo Gold Qtz
Prodn from Qtz veins in Rainbow
some in replacement ore in Baker

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Mosquito Creek
- Most intercepts $1\frac{1}{2}$ - 2 oz
  mxf after diln ~ .47 - .48
- mining replacement ore

Baker member - 1st ~100 m from contact
getting up to 120' thickness
HOST TO REPLACEMENT ORE

Local 'chert' layers - between 1st + contact

ORE - mostly struct cntl but some not
- dams against pre-ore faults

* Island Mtn - mainly replacement ore near the end of its life

84-76

Fold axes trend N 45 W to N 5 W
- slightly off bedding trend

Folds prob. pre - ore - drags related to faulting

Mosquito Ck since 1980
~80 000 Tons @ 0.48 oz Au

ore zones stacked en echelon

- avg size 30 Ft² X section
100 Ft plunge
5000 - 6000 Tons avg
up to 30 000

access Shaft
all track development
Hoist ore out
Mill ~100 TPD now note #150

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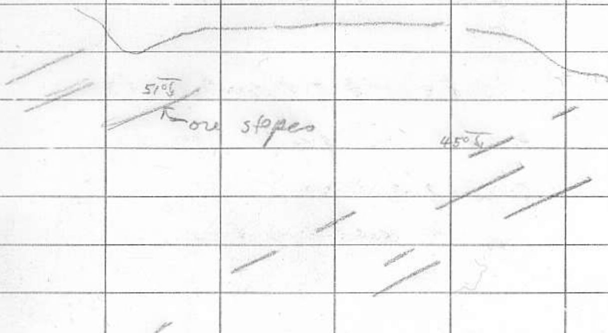
Long. Section



Big North striking faults
right hand throw

+ C fault
Jack of Clubs flt (cuts
Aurum Flt
'gouge 2-20'

Fault gouge does not
run unless ore dragged
into it

Qtz vein mat'l in gouge
could be syntectonic

cgl / graded in Baker
but also in Rainbow

- open stope - ore remnants
massive py - fine
grained lead
+ ankerite
STOPE 2E?

Black finely banded lst -
zebra rock

Chert
Strong lin folia
small fold closure

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Cariboo Hudson Mine Tour

Steve Quinn Imperial Metals

Underground workings in Baker (light rocks)

Vein type up hill ~~type~~

Replacement type lower

Mined 12000 Tons 0.44% Au

shut down 1939

8000' of drifting on 5 levels

no drilling done

most veins // schistosity

local follow shears

at 45° to fold

Cariboo Hudson Vein

6'-10' width 1½ oz

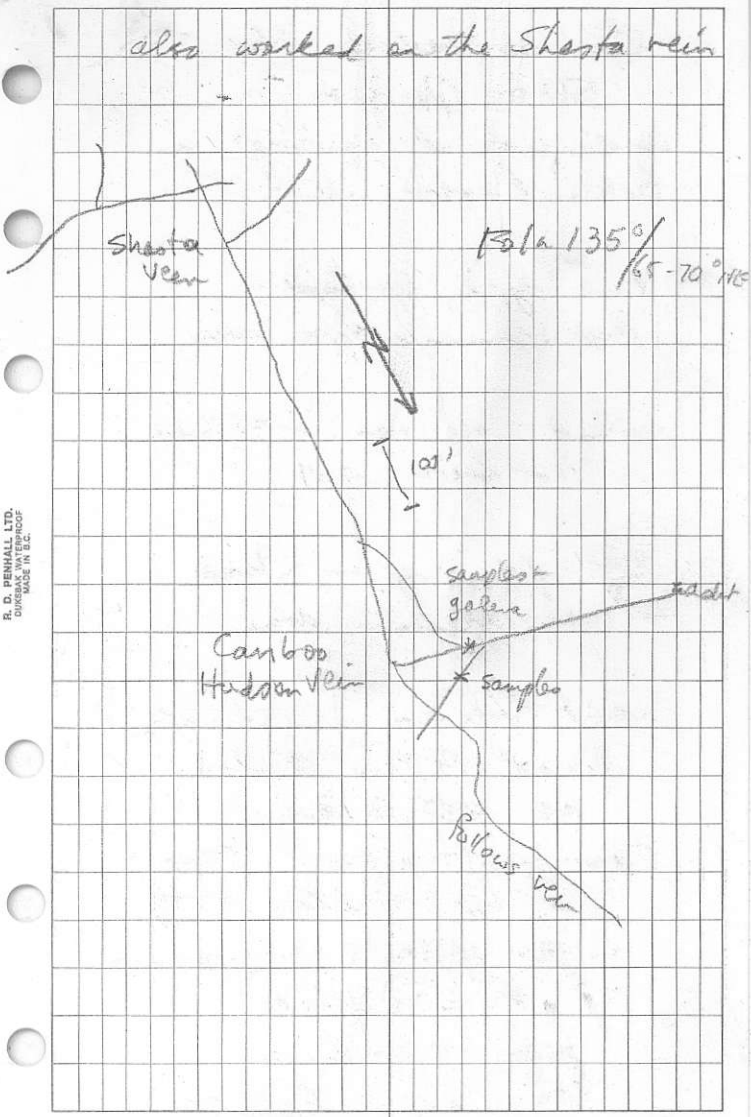
py + cpy, gal arsen

Fe carbonate

pods of galena

(sampled by Gold Quinn)

84-78



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Veins are barren on surface

Shasta up to 18' wide at max (so far)

Caribou Hudson Extension surface avg .25 - 0.40

√ Photos westwd from above old Workings to old Bunkhouses, etc

Qtz - Scheelite Vein was investigated by Dept Mines

Veins mainly ∥ to schistosity

Peter's Gulch Sulph. Showing

pyrrho. gal ± sphal

au 0.1

ag 5-10 oz

Galena - Pb ~25%

m/s pods in limestone -
thinly banded, argillaceous

second type (photo) has thin
py layers in laminated
silic. argillite

CR ser schist with limy pods
+ layers

The scheelite showing - is ~ 200 yds
up the creek
(work by Dept of Mines)

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Comments by Steve Quinn
RGS –
because of our survey
Imperial Metals
~~[illegible]~~ had a very aggressive
program + had 10 men
staking for one month
last year + our survey also
indicated the area that they
staked.

Canamex and Selco were
also active last yr
* to confirm - talk to H Morris

84-80

Gibraltar Dates (Andes)

203	Hb
87	Bio
103	Bio (Andes)
~ Dev or 165	Zircon

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11/07/84

Caribou Bell Property

110 M Tonnes @ 0.32 Cu

0.45 gm/tonne Au

Six phases of laccolithen complex

K/Ar 184 Ma

Rocks v sm. % Galore

3 monzonite ppy's

pseudoleucite 'golf ball' ppy

syenodiorite

lamprophyre dykes

Intrusive breccia - two bodies on a steep W plunging pipe that are discordant to beds

Beds dip E or NE

Suite of Rocks

Altered and/latite tuff - pale pink alt'n / pyritic

Monz Ppy 1 pink kspar matrix - 25% fg fs phenos
mag veinlets & fr.

Monz ppy 2 aphanitic to vfg matrix but gray not pink - phenos of plag complexly zoned

Monz ppy 3 m-coarse kspar (?) laths in ppy tic matrix that resembles monz ppy 1
some fine, bluish qtz

Breccia - locally frags in magnetite matrix

Breccia - dissem mag & incipient magnetite, rock v. kspar - rich

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pyroxenite gabbro
dk gray green

syenodiorite
dk gray green, fg - cut
by fractures with assoc.
kspar altn.

Breccia - west zone has
garnet - epid altn

Intrusive bx loc has bio
kspar altn + may be
cracked also
- matrix → kspar
- bio - mg, in rugo

carbonate veinlets
epidote fx
local aug lamprophyre dykes

Frasergold Creek Property ↓ 84-82

Placer op - below Bullion Pit

2 photos of separator

several photos - Bullion Pit

(18) Photo looking southerly to Amoco Camp, Frasergold Property

photo of Eureka Peak

Tour after Dinner Geologist Paul Brown

near Cayuse Ck - in Slide Mtn

Gp volcanic rx

strongly foliated ~~(brittle ...?)~~ kinked, pale

or green bio musc phyllite → schist

with dissem golden brn carbonate

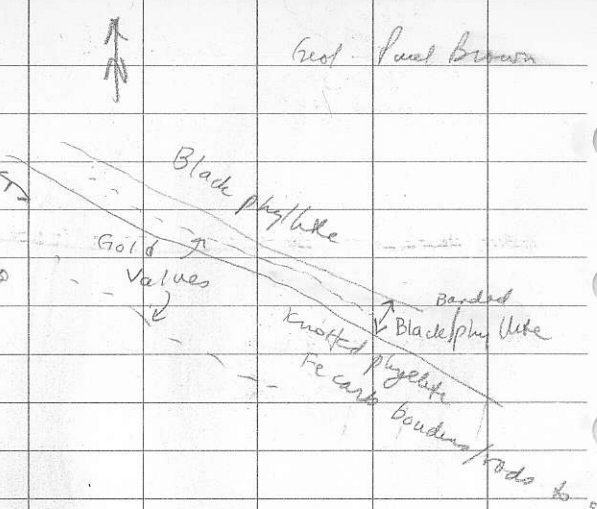
crystals (rusty wtrg)

locally bedded

around the corner

alt [illegible] [illegible] [illegible]

black strongly foliated phyllite



Gold in Qtz veins - in my view best potl is for oreshoots in fold closures.

Local silic. seds

tracable for 450m perhaps

Black Banded phyllite has interbanded graphitic phyllite

Pyrrhotite as layers & stringers

Qtz as boudins

1cm - 2m across

plunge 10 - 15° NW locally

84-83

chap 60

Bdo 45
look NW

one locality

Drill holes - 5 - oriented NE/45°

Qtz veins

Subparallel to 15-20° to foln

generally

CORE

Hole 83-1

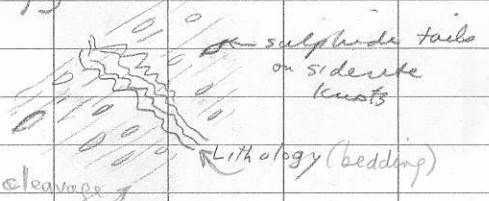
Rock is knotted phyllite - lithol.
layering defined by darker and
browner layers - many small scale
crenulations -

done July 84 | Carbonate staining - method tested

Veins qtz - carbonate - both
in + X cutting foln

- carbonate in veins fizzes better

Silic sediment - 'chert' interbedded with knotted schist - cut by qtz - carb - pyrrho [pyrrho from siderite probably]



Mnrlyd zone - similar rock - qtz veins carry some pyrrho / py as well as carbonate

vg intergrown with pyrrhotite in one qtz vein

At this point bedding is disentangled & partly Xpsd into folm

Some 'knots' are probably derived from pull-aparts of carbonate-rich layers

photo look NW - folded
qtz veins

Qtz veins folded, folded
// to ⊥ 1

Photo #5 Road Large Qtz Knot
ran 1½ oz Au Paul + Andre

Photos - Boss Mtn
Qtz - MoS_2 in granodiorite host
+ in breccias
2 pits mined out
250 000 Tons 0.3 % Mo
1 250 000 Tons 0.22 % Mo
underground also
Third pit ready to be
mined 0.11% Mo but mine
shut down
Shown around by Garth Lea

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— DIARY NOTES 1984 —

Tuco

April 24

Met Troy at Western Exchange then got Ron (eventually) at Woolco (mixup in meet spots).

Unable to get on Ferry — due to overload — finally got 11AM ferry.

Drove to Rock Creek — had dinner at Osoyoos (after some time in the bar).

At Rock Creek, went to pub after Colin + group arrived. We were OK but half the people were flooded out by backed up toilets.

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Wed April 25

Breakfasted en masse then headed up to Beaverdell to visit the Mine.

Had a mill tour, a beer + sandwich lunch, then an underground tour. Excellent hospitality - I was given ~~some~~ two wire silver samples + a slabbed vein.

Afterward we headed south and eventually got to TROY, MONTANA.

The rest of the people were behind us, we ate in Castlegar then carried on.

In Troy we went to a bar. The managress came over to talk to me - she was incoherently drunk. A patron (women) also chatted - she was 42

and 'celebrating' (drunk).
— memorable.

THURSDAY April 26

Breakfasted en mass then went up to the Troy Soppa — Silver mine.

Had a talk then drove underground in a bus — were not able to get out unfortunately.

At the Discovery zone we got a few samples.

Had lunch in Troy then visited scott creek + stromatolite horizons.

Had to cross a suspension bridge over the river — exciting.

Then drove to border — stopped at a bar — and onward to Kimberley.

Tiny + I ran before dinner — very hard.

Had a slow dinner with Ron S.

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FRIDAY April 27

Ate early (en mass, we paid) then up to Sullivan Mine for a tour — several of us had a mill to ourselves — fascinating! — it took several hours!

Then we went to the open pit before coming back for a Cominco supplied lunch.

Later we travelled south of Cranbrook & looked at aldridge rocks & a Mayie Sill.

Tryg & I ate a chek & beer dinner in Cranbrook then had a vanilla slice each.

Back in Kimberley, found that Ron had hurt his back. He decided to go home.

Went to the bar after

later — the band was good but way too loud — very smoky.

SATURDAY April 28

Headache all day — nicotine hangover.

Toured south of Cranbrook — Creston Fruit, St Eugene, Medway, Tourmalined zone, — had truck trouble so decided to stay in Creston overnight —

Travelled to Riondel and visited the Bluebell Mine area.

Got back late and had a light dinner in a small cafe with Trygg + Mike.

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(Xerox)

Sunday 29/04/84

Left Creston 10 AM via the Skyway - stopped and looked at Toby cgl cut by Irene volcs

To Reeves MacDonald mine then to Salmo for lunch - after lunch (4PM) Tryg + I split + went to Nelson - looked at Pillowed Rossland augite porphyritic basalts near Ymir.

In Nelson, worked on talk preparation, ~~and~~ ran for 27 minutes and completed my talk preparation.

The group got in ~ 8PM - we had an illegal beer in the lobby - then to a steakhouse for dinner

Got in ~ 11 30 - ~~chatted~~ with Colin to bed ~ midnight

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Monday 30/04/84

Paid for breakfast

Visited ministry of Mines office briefly, met inspectors, then travelled toward Nakusp stopped to look at Nelson ge, passed Ainsworth & stopped at Kootenay Bell — met Alberta field school R J St Lambert.

Bought materials & ate enroute to Sandon and Silversmith Mine — van got a flat tire (again).

At New Denver, looked at maps, etc then beered ate a hamburger & played pool — Then drove up to Nakusp.

At check in, drunk Hydro type was obnoxious.

Played ping pong & pool Then went to the bar until 12:45 am

Talked with Shawn Dykes till 2 AM

Tuesday May 1/84

Got a late start - 10 AM to catch Nakusp hot springs opening at 1030. Van B missed the turnoff so we (snivel) had to stay in the pool for 1½ hours.

Left the pool at noon drove 50 km to ferry across (Shelter Bay) to Galena Bay. Road is just west of Kuskanux Bath (178 Ma / 165 Ma) in R Slocan seds and late Paleozoic Kaslo volcs. West of the lake the Monashee decollement places Kaslo + Slocan rocks over the Thor Odin dome - decollement east dipping - cuts Kuskanux east of Upper Arrow Lake. Continued 50 km thru Shuswap Rx to Revelstoke.

Checked in, had a snack then drove to Thanksgiving W showing - back in Revelstoke ~ 7 PM we saw the hockey game (Edmonton won)

~~Goldstream~~ Tuesday

then had a pizza/beer dinner & took in the last strip show – Tryg was closely involved – pulled off stripper's "slacks" & caught her as she leapt off the stage – amusing!

Wednesday May 2/84

Breakfasted at ABC Restaurant – Tryg & I paid $55 each

Cloudy to raining – drove to Goldstream for a tour – road now goes along Downie Creek part way – it is flooded –

HW pyritic biotite chlorite sulphide bands

– To crusher

Prodn – $70M cost

Break Even 90¢ Cdn – copper

Dilution – prob ~ 30%

Mining method –

stage 1 – with front end loaders

mine downward

COLIN Graphitic HW common.

General Costs

Freight 17¢ / ton mile
for conc.

THESIS

Sherpa
Gordon Leask
(Colin's student)

Paper by Pearce
should come from
Shaun Dykes

Ken Pride Cominco
Ste 700 409 Granville
V6C 1T2
copy of litho figure paper

PAID FOR BKFST

Kimberley me 40
Nelson me ~~50 each~~ 25
Revelstoke me 55
lunch ~ 15

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Wednesday (partly cloudy) May 2

Rain in morning, showers later (some heavy)

Breakfasted at the ABC Restaurant ($5.00 each to pay for breakfast)

Mailed card to Emma.

Traveled to Goldstream (1½ hours) – Downie Ck is now flooded at the mouth).

Good underground & put down at Goldstream.

We got Gale & Revelstoke & Trygg was given a thanks bottle.

I gave & spud at 3 Valley Gap (banded volc. flows metam to amphibolite gneiss) in paragneiss.

Drove to Kamloops – truck just barely started several times.

Had fruit salad for dinner then set up the feeders for tomorrow. sacked out 2450 hrs.

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Thursday May 3/84

Breakfasted at McDonalds in Kamloops - arrived at Afton about 8:30 AM — tour from Lorne Board + Greg Reid.

Visited the pit and the magnet skewcap.

Back to McDonalds to lunch then stopped at ~~Magnetech~~ Iron Mask Mine dump enroute - Colin suggested that mineln is magmatic and related to the picrite (comatiite?) I still don't quite get the sense of the controversy.

Arrived at Logan Lake - road rerouted so missed Ford showing on the way in. Got lunch and went back to the FORD.

Also visited the Borden phase outcrop and Skeena o/c near the Bethlehem turnoff.

Checked in at Copper Valley motel 6PM and had a beer while watching the last period of the hockey game.

Thursday (cont'd)

afterward we had dinner then I gave a talk on the Gruchon Bathurst + its ore deposits.

Then we went back to the bar until ~ midnight. Myron Oswick won the hockey pool so he bought the beer.

Snowed intermittently in the afternoon and evening.

FRIDAY May 4/84

Got up at 6:30, showered, packed, then got breakfast.

We got organized then went to Lornex — Nelson gave a talk then a pit tour. He then turned us over to a 'mill man' for a trip around the mill.

Lunched in a snowstorm at Qualtanton Lake — it continued for several hours!

Went to Valley Copper (at the former Bethlehem office). Kevin Newman and John Collins (now on grade control) gave us

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a town — after Kevin gave a slide presentation.

I had to take off after stop 1 at 2:50 — John took me back to my truck at the gate (with a huge sample).

I drove down to Ashcroft, out of the storm, then headed for the ferry.

Stopped at Hale — for a take-out coffee — and for gas near Langley. Got to the ferry slip at 7:45 PM. — almost 5 hours exactly —

Luckily, there is a special 8:30 PM sailing — unexpected but nice!

Met a student (John) from the prospecting class on the ferry — he was very impressed with the course.

Home ~ 11 PM.