880791

BIG MISSOURI

- 1938 to 1942 822,000 tons ore @ .0775 g/t Au
- Reserves - 1.9m tonnes @ 2.46 g/t Au + 27.7 g/t Ag
- Andesitic to rhyolitic tuffs, agglom. + flows - E. to mid Jur. Hac. Gp.
- strike SE + dip SW.
- several periods of faulting (+ schistosity)
- Mineral occurrences: qtz. veins, stockwk vein replacement zone + lenses, lenses of exhalative strat bound M.S., + strata bound horiz. of dissem. + stringer sul.

Property - 10 units - all sig. min. in Unit 5 of Upper Sequence.
- Unit 5 ~ 500m thick ~ green ands. flows, tuffs + agglom. - sep. by thin (up to 5m) cherty tuff horizons. (Silica-rich beds cont. sericite + silic. (bleached) ands. frags., occas. round chert frags, + carb + sul.
- footwall ands - commonly bx + filled with qtz + carb
- hangingwall " - " M. grey, silic, + sericite (envelope?)

Lowermost Min. Zone - cherty tuff beds are carbonaceous + 8 to 10m apart.
Middle " - " -ab. carbonate + 20 to 25 m apart
Upper " - " " - thickest + minor carbon +/or carbonate.

Faulting - trend N mainly + dominant NW fltn in rx.

Depositional History

- facies rel. suggest syn-depositional faulting controlled distn.
- subaerial basin (to Unit 4) + then subsidence (Unit 5) = renewed cycle of volcanism.

Stratbound Precious-Base Metal Mineralization

- stratbound, semi-massive to massive lenses, pods, + stringer zones of py, ZnS, PbS + cpy (+ Au - Ag) occur within + at contact of thin cherty tuff beds.

footwall ands = silic. + ser + chl + py
Hangingwall ands = more intensely sericitized + silic. - ab. ZnS+PbS in qtz stringer zones

- 3 stratabound min. horizons consisting of several cherty tuff bands
  i) Lower - ab. black carbon
  ii) Middle - " carbonate
  iii) Upper - minor carbon + carb. — ands. more intensely sericitized.

Note: cherty beds occur throughout ands. seq - but only 3 min. Zones.
- apparent lateral thinning of sulphides.

Mineralogy Py + ZnS (= 80% of sul.). Local PbS + cpy
- electrum, native Ag, argentite + freibergite

- 2 distinct precious-base metal rel.
  i) Native Ag + argentite assoc. with PbS + cpy
  ii) Electrum assoc. with ZnS

Lower Horizon eg. Dage Zone - ~~ab. carbon~~ ab. carbon
- south end of prop. - one of main near surface zones — carbon rich
- 3 min. cherty tuff beds in ands. (1-5 m thick) → bleached
- veins + veinlets of remobilized cherty tuff
- total sul. (5-10%) + ubiq. dissem. py.
- higher grade Au + Ag assoc. with PbS + ZnS (as electrum along grain boundaries)

Middle Horizon eg. 51 Zones - ab. carbonate
- 3 distinct cherty tuff beds 1-2m thick ~ 20m apart. in ser. + silic. ands.
- intense footwall bx beneath each cherty tuff bed.
- locally, massive to semi-massive sul. at base of beds.
- all sul. closely assoc. - esp. Au + Ag as electrum with ZnS & PbS

Upper Horizon - eg. Province Zone - general lack of carbon or carb. + well-dev. chlorite footwall
- thick (1-7m) beds of cherty, tuffs + ands. - intensely bleached ands. in H.W.
- decrease upwards in precious-base metals. Au-Ag defined in F.W.

Alteration + Geochemistry: chl-ser-qtz-carb-sul. (chl.-F.W.; ser + silic.-H.W.)
→ increase in SiO_2, $K_2O + H_2O$; loss of CaO, FeO total + MnO cf. Britannia + Miocene Green Tuff region (Japan). ← difference = lack of MgO enrich. at Big Mo

Genesis of Precious-Base Metal Deposits - B.C. Missouri

- developed as a result of precip. from hydroth. fluids at or near seawater-rock interface
- various min. zones rel. to large hydrothermal system active throughout extrus. of Unit 5.
- Cherty tuff + assoc. stringer min. devel. as result of episodic exhalation of hydroth. fluids during periods of quiescence. The variation in alt'n + sul. min. reflects the depositional envir. at pt. of exhalation.

- Structurally controlled restricted basin, devel. early in volc. history, controlled dep. of submarine ands. units. — may have created area of crustal weakness for hydroth. fluids
- On reaching near surface unconsol. rk. zones, upward moving fluids migrated laterally + precip. silica, sul. + carb. in interstices between frags creating footwall bx zones.
- Siliceous + sulphidic chemical sed. or cherty tuff beds were deposited when fluids reached seawater-rock interface. - Thickness + extent of zones depend. upon duration of volc. ~~activity~~ quiescence, vol. of fluids + paleotopo traps.
- Renewed volc. activity blanketed tuff horiz.
- Fluid circulation cont'd resulting in silic + sericitiz. of newly dep'td ands. units.
- Silica, carbonate + sul. - either remobilized from cherty tuff beds into newly deposited ands. or precip. from ongoing exhalative activity

- Numerous veins with qtz, cal, K-spar-chl-sul. = evidence of circul. fluids.
- Elsewhere - larger alt'n zone formed with extensive bleaching of ands. + fmn. of fn. gr. diss em. py. + sul. stringers.

Paper 2 — 2:30 p.m.

Geology of the Big Missouri Property, Stewart, British Columbia.

S.M. DYKES, A. GALLEY and H.D. MEADE, Westmin Resources Ltd., Vancouver, B.C.

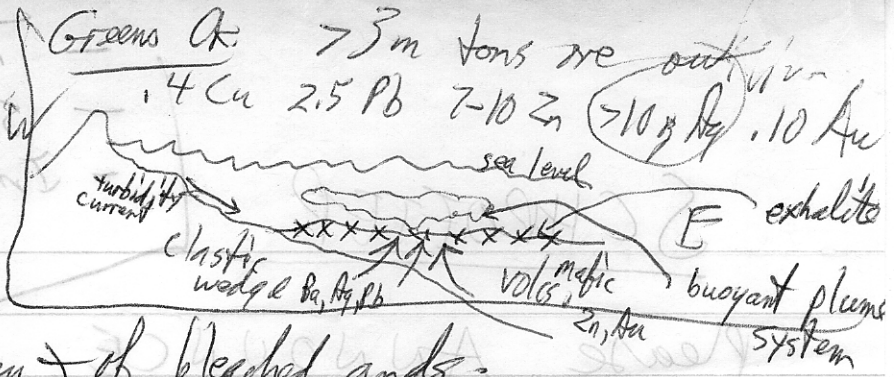
(Speaker: S.M. Dykes)

The Big Missouri Property, near Stewart, British Columbia, is underlain by a southwest-facing, moderately dipping sequence of rhyolitic to andesitic volcanic and volcaniclastic rocks of the Lower-Middle Jurassic Hazelton Group. Pyrite, sphalerite, galena and chalcopyrite with significant gold and silver mineralization occur in siliceous cherty tuff layers that separate individual silicified and sericitized andesite flow, tuff and agglomerate units. The andesite unit overlies a mixed volcaniclastic and rhyolite fragmental sequence. Three mineralized horizons consisting of several cherty tuff layers with fine disseminated to semi-massive lenses of pyrite, sphalerite, galena and chalcopyrite are recognized.

The gold-silver-lead-zinc cherty tuff mineralization and the silica and sericite alteration are interpreted to have formed as a result of submarine exhalative activity occurring during periods of relative quiescence in andesite volcanism. Several generations of quartz-carbonate veining have resulted in redistribution of gold and silver in the cherty tuff to form zones of lower-grade mineralization potentially amenable to open-pit mining.

District 6
CIM
Victoria
Oct. 30/81

BIG MISSOURI



1) Rago
3 cherty tuff bands
(~6 metre in between) of bleached ands.
20-30° dip SW

Fn. py, ZnS, PbS (+Au+Ag) in cherty tuff + qtz
.15-.2 Au 1-4 oz/t Ag in cherty tuff
erratic .03-.05 Au .5 oz/t Ag in bleached ands

2) Siff Zone (Middle Horizon)
- in footwall to cherty tuff - in qtz-carb veins
-4-5 m bx. ands + fn. dissem PbS + ZnS (+Au-Ag)
traced 600 m downdip to u/g zone
4-5 m zone around all 3 horizon
.1-.15 Au .25 Ag

3) Province Zone
6-7 m cherty tuff band
-weakly alt'd ands ftwall + cherty tuff + bleached HW
av. .1-.15 Au .3 Ag cherty tuff band

-3 horizons X-cut by qtz-carb veins = remob.

SCHROFFER

- Timing
- Slides
- Imparting geol. info - interesting + informative

9 am Sat.

Please ANNOUNCE

Telephone messages at Message Board (Registration Desk)

FOR. MR. LEIGH PAN
MR. TERRY MULLIGAN

PREPRINTS ~~20~~ in total

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5 INCLUDES GEOLOGY PAPER #S 22, 24, 26, 47, 49

~~CANCELLATION~~

ABSTRACT

TITLE : GEOLOGY OF THE BIG MISSOURI PROPERTY, STEWART, BRITISH COLUMBIA

AUTHORS: Dykes, S.M.; Galley, A. and Meade, H.D.

The Big Missouri Property is underlain by a southwest facing, moderately dipping sequence of rhyolitic to andesitic volcanic and volcaniclastic rocks of the Lower-Middle Jurassic Hazelton group. Pyrite, sphalerite, galena and chalcopyrite with significant gold and silver mineralization occur in siliceous cherty tuff layers that separate individual silicified and sericitized andesite flow, tuff and agglomerate units. The andesite unit overlies a mixed volcaniclastic and rhyolite fragmental sequence. Three mineralized horizons consisting of several cherty tuff layers with fine disseminated to semi-massive lenses of pyrite, sphalerite, galena and chalcopyrite are recognized.

The gold, silver, lead, zinc cherty tuff mineralization and the silica and sericite alteration are interpreted to have formed as a result of submarine exhalative activity occurring during periods of relative quiescence in andesite volcanism. Several generations of quartz-carbonate veining have resulted in redistribution of gold and silver in the cherty tuff to form zones of lower grade mineralization potentially amenable to open pit mining.

SMD:dt.

May 22, 1981

Production Stages

① 1918 - 1942 incl. Big Missouri, Premier, Indian, Dunwell, Prosperity - Porter Idaho

②

③ ~~Recent~~ 1971 → 19 incl. Granduc, Goat
1973 - 1978 [NDP]

④ Recent (1981 →) incl. Scottie Gold

EXPLORATION STAGES

① Placer Au on Sulphurets (1870's?)

② 1910 - 1920 / Depression

③ 1934 - 1942 / War

④ 1955 - 1965 / Porphyries
1973 - 1978 [NDP]

⑤ Recent (1979 → Pres)

Eg. Big Missouri
Silbak Premier
Scottie Gold
Sulphurets
Cons. Silver Butte
Tide Lake area
Porter - Idaho

PRODUCTION – STEWART 'CAMP' [1910 – Oct. '83]

Gold (@ $500) = 2,228,480 oz = $1,114,240,000

Silver (@ $1/0) = 481,951,050 g = $ 481,951,050

Copper (@ .65) = 385,354,053 = $ 250,480,135

Lead (@ .30) = 65,621,976 = $ 19,686,593

Zinc (@ .52) = 28,485,096 = $ 14,812,250

Total (1984 prices) = $1,881,170,028

~ $1.9 billion

EXPO 86

Pacific Western

STEWART 'CAMP'

Harlan Meade - Feb 14/86

-Big Missouri

- 'stratabound' mineralization in 3 separate 'horizons', each deposited over a very short interval of time.
- deposition took place on sea floor i.e. 'system' vented i.e. marine setting - possibly a graben bounded environment
- mainly massive flows with minor interealated tuffs
- chert 'horizons' have undergone greenschist metam & recrystallization - incl. gts. stkwk.
- no regular metal zoning either vertically or laterally cf. epithermal

BIG MISSOURI

Oct. 17/83

- talk with Shawn Dykes by tel.

— Quartz vein at Montana prospect is near contact of Premier porphyry & Hazelton (not recognized before & ∴ confidential)

Significance → Premier porphyry is more widespread than thought & mineralization in qtz. vein at Montana is definitely younger (cross-cutting) ∴ what about all the carbon in vein? Where from?

- Also drilling (1983) (77 holes) on ridge between Montana & Martha Ellen intersected maroon volcs. (low down in the section? (à la Premier)).

- Looks like we're dealing with a tremendous complex section of hydrothermal (epithermal) activity with, so far, little direct evidence for venting (as suggested by Westmin.

BIG MISSOURI

eg. Province claim defined a near surface gently dipping zone of sig. Au-Ag-Pb-Zn min. with 0.10 to 0.15 g/t Au and up to 0.35 g/t Ag.
ex. surface trench on part of Province cl. over 22 metres in length ⊥ to strike of zone = 0.10 g/t Au and 0.93 g/t Ag with assays as high as 0.37 g/t Au & 2.87 g/t Ag.

eg. Dago 50 level
56.5 metres panel sampling U/G = 0.13 g/t Au and 3.62 g/t Ag

- 200 ft. wide zone of "porphyry" = cataclastic

750 ton mill U/G

Production 1927-1942
847,615 tons - 58,384 oz Au
52,677 oz Ag
2712 lb Pb
3920 lb Zn

Geology: Interbedded siliceous or recrystallized cherty units (not continuous laterally) in Hazelton Gp. rx. consisting mainly of andesitic pyroclastics & flows (green variety vs maroon).

-talk with Harlan Meade

Mar. 13/83

WESTMIN — STEWART PROJECT

1. Annual Rpt. to be released in early April
2. Added ~ 300,000 tonnes of reserves to Martha Ellen Zn
   ∴ Total on big Missouri in 4 zones
   (Jago, 51, Province, Martha Ellen)
   ~ 2.2 m tonnes @ 0.1 g/t Au equiv.
3. all open-pitable
4. Mining rate (confidential) — 2000 tpd
5. Annual rpt. (to be released) will give reserve figures for Silbak Premier ("highly unusual after only 1 yr. of work")
   - again, all open-pitable, incl.
   ~70,000 tons of .07 g/t Au equiv. on BC Silver Dump
6. Power — a. generate own using lakes
   b. tie into new B/C Hydro grid
   Caution: Westmin prefers a. but asked not to say so by Steward

Eg.	
Buttle lk.	B.C.
¼¢/kw	5¢/kw

7. Mining — not contingent on Granduc road
   - access — a. from Granduc rd.
   b. from Bear R. rd.
   - Westmin prefers a.
9. No land sought as yet in Stewart
8. Preliminary mine planning — "number crunching".
   - 1984-85 — feasibility; 1985 — pit prep. + rd. constr.?
   1986-87 — Mining? [Optimistic]