THE USE OF PERSONAL COMPUTERS AND OPEN FILE GEOCHEMICAL
DATA TO FIND NEW EXPLORATION TARGETS

By George G. Addie

ABSTRACT

In Geological Fieldwork, 1980, Paper 1981-1, a program was presented for
calculating moving averages using a Wang 2200A computer (Church, et al.,
1981). The same program slightly modified has been used with a TRS-80
Level II computer.

PROGRAM MODIFICATION

The individual values are multiplied by a factor of 1/Log R where 'R'
is
the radius from the sample value to the centre of the computer window.
This has the effect of reducing the anomaly size.

NELSON-YMIR-SALMO - Ag

An interesting anomaly is found to the south of Salmo and mostly west of
the Salmo River, an area relatively unexplored. The geology indicates
Nelson granite in contact with sediments. Magnetic anomalies are
associated with this granite. This is an excellent area for skarn and vein
deposits.

GRAND FORKS - Cu

This approach certainly would have found 'Phoenix Copper' if used prior to
discovery.

GRAND FORKS - Mo

A very subtle molybdenite anomaly exists to the east of Phoenix Copper. Is
a porphyry environment present?

GRAND FORKS - Ag

A low level silver anomaly exists to the south of Phoenix Copper. Is this
the centre of a porphyry model?
Figure 1. Moving average contour map of silver values in stream slits from Nelson-Ymir-Salmo mining camp.
Figure 2. Contour plot using moving average method of copper in stream silts from Grand Forks area.

Figure 3. Contour plot of molybdenum in stream silts in Grand Forks area using moving average method.
CONCLUSION

The use of the computer can identify low level anomalies that are not obvious from data plots only. It is on this basis that new target areas can be found in old mining camps.

REFERENCES

TABLE 1. TRS-80 Level II Computer Program

GRAND FORKS
FEB 23, 1981 BY GEORGE G. ADDIE, P. ENG., P. GEOL.

5 LPRINT "GRAND FORKS"
6 LPRINT "FEB 23, 1981 BY GEORGE G. ADDIE, P.ENG., P.GEOL."
10 LPRINTCHR*(29)""
20 CLS
40 T=0:S=0:F=0:C=0;E=0;F=0;H=0;J=0;L=0;M=0;N=0;
   D=0;X=0;W=0;Y=0
50 INPUT "COORDINATES OF CENTER OF FIRST CIRCLE";A,B
60 INPUT "EASTING AND NORTHING INTERVALS";G,K
70 Z=A;Q=B
80 LPRINT TAB(0)"E";TAB(8)"N";
90 LPRINT TAB(15)"Z";TAB(25)"A";TAB(35)"F";
100 LPRINT TAB(45)"C";TAB(55)"J";TAB(66)"G";
110 FOR I=1 TO 8:READ A(I):NXT I
120 IF A(2)=-1 THEN 180
130 IF SQRT((A(1)-Z)^2+((A(2)-Q)^2)>100 THEN 110
132 IF R<=1 THEN R=1.1
135 U=1/LOG(R)
140 S=S+1;T=T+LOG(A(3)*U)
150 C=C+LOG(A(4)*U)
160 D=D+LOG(A(5)*U)
170 E=E+LOG(A(6)*U)
171 L=L+LOG(A(7)*U)
172 W=W+LOG(A(8)*U)
175 GOTO 110
180 IF S=0 THEN 280
190 Y=EXP(T/S)
200 F=EXP(C/S)
210 H=EXP(J/S)
220 J=EXP(E/S)
230 M=EXP(L/S)
255 X=EXP(W/S)
260 LPRINT TAB(0)"Z";TAB(6)Q;TAB(11)Y;TAB(19)F;TAB(27)H;
270 LPRINT TAB(35)J;TAB(43)X;TAB(55)M
280 Z=Z-50:S=0:T=0;C=0;D=0;E=0;L=0;W=0;Y=0;F=0;H=0;
   J=0;M=0;X=0
290 IF (A-Z)>G THEN 310
300 RESTORE;GOTO 110
310 L=W;W=0;S=0;T=0;C=0;D=0;E=0;L=0;W=0;Y=0;F=0;H=0;
   J=0;M=0;X=0
320 IF INT(P/2)=P/2 THEN 340
330 Z=(Z+G+50);GOTO 350
340 Z=A
350 IF (B-Q)<K THEN 380
360 LPRINT "THE END";END
500 DATA 3760,4520,35,14,5.1,1,10.7
INTRODUCTION

When logarithmic values of mineral production were plotted it was found that various mines formed distinct groupings of 'populations.' Individual mines from each group can then be studied for criteria which would lead to discovery of similar deposits elsewhere in the area.

In this study log Au is plotted against log Ag for production from camps: (1) Sheep Creek, (2) Ymir, (3) Keystone Mountain, and (4) Hall Forty-nine Creek.

The mines studied are all past producers and occur in the Nelson-Ymir-Salmo area. 'Location of Mines in the Nelson-Ymir-Salmo Area' includes gold mines as well as the zinc-lead deposits of the 'Kootenay Arc.'

The mines of the Sheep Creek Camp (Figure 1) seem to fall into three natural groups based on the production figures. The same 'phases' have been used for Ymir (Figure 2), Keystone Mountain (Figure 3), and finally Hall and Forty-nine Creek (Figure 4).

Mines related to the three phases of mineralization found from the above graphs are located on the individual maps designated 'Phase 1,' 'Phase 2,' and 'Phase 3' (Figures 5, 6, and 7).

TARGET AREAS

It is proposed that mines in the same 'phase' are somehow related. When they are close together a dashed line has been used to show their possible relationships. It is on these theoretical lines or projections that I would recommend prospecting.
Figure 4. Plot of log Au against log Ag for mines in the Hall and Forty-nine Mile Creek areas.

Figure 3. Plot of log Au against log Ag for mines in the Keystone Mountain area.
Figure 1. Index of location of former mines of the Rossland mining camp; first phase - location of mines on Phase 1 line from graph 2; second and third phase - location of these phases from graph 2; geology of the Rossland mining camp after Fyles, et al., 1973; aeromagnetic map 84836 of the Rossland mining camp at 58,000 gammas.
A NEW LOOK AT THE ROSSLAND AND BOUNDARY MINING CAMPS

USING LOG Cu (lb.)/Log (Au + Ag)(oz.)

FROM PRODUCTION DATA

By George G. Addie

INTRODUCTION

Up to 1967 gold production from the Rossland Camp ranked second and that from the Boundary Camp, fourth, of all the mining camps in British Columbia (Grove, 1971, p. 94). In the Rossland Mining Camp (this paper) three 'phases' of mineralization are indicated while the Boundary Camp has one (Addie 1975). At Rossland the distribution of the mines by 'phase' indicated a concentric distribution more or less centred on the Rossland monzonite. Similar zoning was identified by Thorp (1967). He points out (p. 11) 'the Rossland District, then produced a very rare type of gold ore.' This paper proposes that the Boundary Camp has similar ore.

The Rossland monzonite also has a coincident magnetic anomaly (Figure 1) which seems to be connected to a large magnetic anomaly to the west that is associated with the contact zone of the Coryell Batholith. The Rossland monzonite has also been intruded by the Coryell, which may contribute to the magnetic anomaly. The Rossland monzonite may have acted as a buttress against which the Carboniferous and Jurassic volcanic and sedimentary rocks were broken to give the vein structures. Thrusting in the area may be related to emplacement of the Trail granodiorite (49.5 - 50.5±1.5 Ma) and/or the Rainy Day Stock (48.7±1.5 Ma). Fyles (1973) suggests that the mineralization is related to one of the plutonic masses, probably the Trail Batholith. All authors (Brock, 1906; Drysdale, 1923; Little, 1963; Fyles, 1973) agree that the mineralization is Tertiary. The only question is the source of the mineralization. This author proposes that the Coryell intrusions should be examined more closely. It is clear from the literature that Coryell pulaskite dykes were emplaced both before, and after, the mineralization. This is important because we now have a direct link to the Coryell Batholith, at least for timing, as a potential cause, if not the source, of the economic mineralization. The presence of weak molybdenite mineralization suggests the Coryell as a possible source of the Rossland molybdenite deposits.

In the Boundary Camp, the Phoenix Copper ore zone is cut off by a pulaskite dyke (Coryell). The dyke intruded along a fault plane which has had repeated movement, before and after some of the mineralization (Addie, 1964). Recent geochemical data from Geological Survey of Canada Open File 409 indicates a molybdenite anomaly adjacent to the Phoenix Copper area (Addie, 1981). Tertiary diorite (McNaughton, 1936) is just to the north of the Phoenix Copper pit and contains a showing of mineralization similar to the mine, that is, the precious metal/copper
Figure 2. Boundary district, log Cu (lb.) versus Log (Au + Ag) (oz.).

Figure 3. Rossland, Log Cu (lb.) versus Log (Au + Ag) (oz.).
Figure 4. Comparison of Boundary and Rossland, log Cu (lb.) versus log (Au + Ag) (oz.).
ratios are identical (Addie, 1964). These Tertiary intrusions (see also Church, 1970) therefore deserve a closer scrutiny for other skarn deposits, porphyry deposits, or another mining camp similar to Rossland.

SOURCE OF DATA

Production data are from 'Index 3 to Publications of the Department of Mines.' Note that 20 of the mines shown on Figure 1 are not used in our study because no copper production was reported.

CONCLUSION

The copper/gold plus silver mineralization at Rossland seems to be identical to that at the Boundary Camp except that more phases are involved. Geologically and from argon age dating it is clear that the mineralization at Rossland is Tertiary (Fyles, 1973). This paper proposes that the Boundary area be examined in this light and that the Coryell intrusions, especially the edges, be examined for new mining camps. As at Rossland, these may be identified from the aeromagnetic maps.

REFERENCES

Feir, Gordon (1964): Identification of 'Daonella' (Triassic): Fossils in the Brooklyn Limestone, files, Phoenix Copper Division, Granby Mining Co.


Thorpe, R. (1967): Controls of Hypogene Sulphide Zoning, Rossland, British Columbia, thesis submitted to the Graduate School of Univ. of Wisconsin, University Microfilms, Ann Arbor, Michigan, U.S.A.

Figure 1. Geological setting of the TILICAN gold property (▲); after Hyndman (1988, Geo1. Surv., Canada, Map 1234A).

LEGEND

Quaternary
- Glacial, lacustrine and fluvialite gravel, sand, silt and clay

Cretaceous and/or Jurassic
- Lower Caribou Creek stock: quartz monzonite, granodiorite, quartz diorite and granite
- Goat Canyon-Halifax Creek stock: quartz monzonite, minor quartz diorite and granodiorite
- Snowslide Creek stock: quartz monzonite, quartz diorite and granodiorite
- Ruby Range stock: quartz diorite, diorite, quartz monzonite, monzonite and syenodiorite
- East Caribou stock: quartz monzonite and quartz diorite

Jurassic
- Roseland Group
  - Andesite and basalt flows and tuffs

Lower Jurassic (?) and Triassic
- Slocan Group
  - Andesite to dacite, tuffs and flows
  - Undivided argillite, shale to siltstone, tuff and pelitic to silty phyllite and slate

Triassic
- Kaslo Group
  - Amphibole-metavolcanic rocks

(? ) Pennsylvanian to Triassic
- Milford (?) Group
  - Pelitic schist and calc-silicate metasedimentary rocks

▲▲▲ Thrust fault
- Fault
- Geological contact