Bergvesenet

Postboks 3021, N-7441 Trondheim

Rapportarkivet

Innlegging av nye rapporter ved: John

Bergvesenet rapport nr	Intern Journal nr	Internt arkiv nr	Rapport lokalisering	Gradering
5617				

Kommer fra ..arkiv	Ekstern rapport nr	Oversendt fra	Fortrolig pga	Fortrolig fra dato:
Grong Gruber AS		Grong Gruber a.s.		

Tittel

Joma Mine Stopes

Forfatter	Dato	År	Bedrift (oppdragsgiver og/eller oppdragstaker)
Reinsbakken, A.	27.8	1986	IAGOD ekskursjon

Kommune	Fylke	Bergdistrikt	1: 50 000 kartblad	1: 250 000 kartblad
Royrvik	Nord-Trøndelag		19241	Grong

Fagområde	Dokument type	Forekomster (forekomst, gruvefelt, undersøkelsesfelt)
Geologi		Grongfeltet

Råstoffgruppe	Råstofftype
Malm/metall	Cu, Zn

Sammendrag, innholdsfortegnelse eller innholdsbeskrivelse

Geologisk beskrivelse i strossene 375, 385, 387, 416 - 429 og i dagbrudd nivå 580.

JOMA MINE STOPS (IAGOD excursion, Aug.27/86).

By A. REINSBAKKEN

Stop 1: level 375 (375 m above sea level)
375 ØF synk - at bottom of incline.

A thick unit of dark chlorite schist occurs folded into and lying above a thick lens of tectonically layered, Cu-rich, massive pyritic ore. Much chalcopyrite and pyrrhotite occurs remobilized as fracture fillings and as matrix to anglur pyritic ore fragments along tectonic zones. Minor layers of dark amphibole needles also occurs in the Cu-rich pyritic ore facies.

The dark chlorite schists are rich in disseminations and tectonic layers of chalcopyrite and pyrrhotite. Pale fragments rich in albite and quartz plus minor biotite are visible in the lower parts of the chlorite schists and may represent original pillow-breccia fragments (tectonic?).

A well-banded, Zn-rich, semi-massive pyritic ore facies occurs between the chlorite schists and an epidote- and calcite-bearing pale greenstone (the younger FW greenstone), which grades quickly up into a laminated volcaniclastic-tuffaceous sequence. The FW greenstones occur here above the main ore zone caught up in a large upright D_3 fold structure which dominates in the western limb of the Joma orebody.

The Zn-rich, semi-massive pyritic ore is typically medium to coarse-grained and banded, with the individual layers being rich in sphalerite, chlorite and carbonate. These minerals are also matrix minerals to the coarser pyrite. Remnants of early, D_2 isoclinal minor folds are seen within the sulphide-chlorite rich zone.

Stop 2: Level 387 ØST LIGG
Profile X95000 passes through this section at ca. 42 m (see Fig.).

This stop is to demonstrate the strong hydrothermal alteration within the pre-ore (HW) volcanites, here represented by two distinctly schistose units. One is a strongly foliated, pale, schistose unit rich in albite, Mg-chlorite, sericite and carrying distinct actinolite needles and pyrite disseminations and veins (unit B_4). The other unit is a darker coloured, greyish-green, slightly more massive unit rich in albite and dark Fe-chlorite and carrying characteristic coarse grains of disseminated pyrrhotite (unit B_3).

Lenses of magnetite and minor pyrrhotite-bearing dark quartzite (recrystallized chert) are seen within the pale schists truncated by the upper massive sulphide breccia ore horizon (4-8 m).

This locality lies along the long, stretched limb of a major D_2 isoclinal structure and is thus dominated by a strong, pervasive flat-lying penetrative schistosity (S_2) which parallels the main ore-schist boundaries. A zone of pyrite layering (veining) within the pale schists (8m) is truncated both above and below by thin zones of strong S_2 penetrative schistosity. A major thrust marks the base of the hangingwall schists and is occupied by a conspicuous chalcopyrite-pyrrhotite breccia ('durchbewegt') ore horizon which contains fragments of chlorite schist, magnetite and fine-grained pyritic ore. Isoclinal (D_1 - D_2?) fold hinges have been noted in the chlorite schist fragments.

THe breccia-ore filled thrust zone separates the hangingwall schists from a dark chlorite schist unit and a thicker Cu-rich massive pyritic ore facies rich in chalcopyrite + pyrrhotite and dark amphibole needles. Layering of dark amphibole needles and detached layers of dark magnetite are typical for this ore facies (c. 40-42 m).

Stop 3: Level 385 (385 v.f. s.strosse).

This room is situated at the lower ore level on profile B_2-11 (see Figs).

Stop 3A. This stop demonstrates the interfolding between the massive sulphides and the internal silicate layers. Remnants of early fold hinges and the cutting out of some of the silicate carbonate stratigraphy along marked shear planes (S2) within the sulphide ore horizon, (i.e. albitite-chlorite schists (20-30 m) and limestone plus amphibole rich grennschists) attest to an early (F_1-F_2) imbrication - inthrusting origin for some of the silicate layers within the massive sulphides. The marked layering within the sulphides, as well as in the enclosing greenschist/-greenstone sub-parallels the dominant S_2 foliation.

The dark quartzite (chert) fragments within the massive sulphides (8-10 m) are remnants of a more compitant magnetite-rich cherty layer which has broken up and rotated during D_2 isoclinal folding and thrusting. The lineations (L_2 at contacts of the fragments) trend to the NNW, roughly parallelling the major F_2 folds. A major D_2 thrust forms the base of the massive sulphide horizon at this level, below which lies the epidote- and calcite--bearing, post-ore footwall paler greenstones. Quartz-calcite-epidote segregations form characteristic veins and fracture fillings along the D_3 crenulation cleavage surfaces within the pale greenstones.

Several sulphide facies are found in this ore horizon:

1) Cu-rich, massive pyrite-pyrrhotite-chalcopyrite ore with numerous thin layers of chlorite and isolated lenses of magnetitic quartzites (chert).

2) Medium-grained, Zn-rich pyritic ore, with carbonate matrix and thin limestone layers and zones of dark amphibole needles. Fragments of a fine-grained pyritic ore facies are seen (3-5 m).

3) Chalcopyrite-pyrrhotite breccia ore ('durchbewegt') above chlorite schists (28-30 m).

4) Small concentrations of pyrrhotite ± sphalerite found remobilized in the F_3 fold hinge at 3 m on right-hand side.

Stop 3B: This wall trends parallel fo profile B_3-11 (see fig. and).

This locality demonstrates the effect of D_3 on the massive sulphide-footwall greenstone contact. A large, assymetric, crenualtion type D_3 structures brings the bottom contact of the massive sulphide ore down into a sharp wedge within the massive to somewhat layered pale footwall greenstones, terminating in a typical 'piercement' structure in which chalcopyrite-pyrrhotite and quartz-calcite mobilizates penetrate down into the greenstones. Numerous quartz and calcite-filled fractures and lenses are also found within the S_3 crenulation cleavages which is axial planar to the large D_3 structures in the footwall greenstones.

The layered chlorite schist - albitite horizons within the massive ore is also affected by D_3, folding and detaching the horizons along flatter structures. The steep NW dipping S_3 cleavage flattens out up into the massive ore and the upper contact of the massive sulphide ore horizons shows little to no effect of D_3 folding.

Stop 4: 416 - 429 levels.

This stop is to observe the Zn-rich parts of the thick massive pyritic ore facies which dominates this level. The Zn-rich ore facies contains in part much carbonate as both matrix and individual layers. Several large, white limestone marble layers

(>1m thick) are infolded within the massive ore in large SW trending flatlying, isoclinal fold structures (D_3?).

Stop 5: Open pit area (surface level 580 m a.s.l.)

Stop 5A: This stop is located at the north-east edge, overlooking the open pit. A sequence of massive, less deformed, younger (FW) pale greenstones are here folded up over the main ore zone in a large D_3 structure. Close-packed pillowed structures are visible with their typical dark green pillow-rims (Fe-chlorite-rich) and pale epidote-calcite concentrations (knots) near the pillow centres. A prominant NW, steeply dipping S_3 crenulation cleavage cuts across the main trend (S_2) of the outcrop best observed cutting the epidote knots.

Stop 5B: is located at the southwest edge of the open pit, looking at fine-grained, flinty Cu and Zn-rich massive pyritic ore. Here the fine-grained pyritic ore has a tectonic brecciated structure, the fractures and fragments often infilled with quartz. Near the western contact of the massive ore, a zone rich in dark amphibole needles, sulphide-breccia structures and chlorite-rich layers occurs, all rich in Cu. CLoser to the contact with the silicates, a thin carbonate bearing ore band occurs rich in Zn. Minor sulphide fragments (slump-breccia?) is also found within the thin carbonate (Mn-rich) rich ore unit.

Between the western ore contact, stop 5B and west towards 5C, one passes through a sequence of pale, white-mica, Mg-chlorite, and albite-rich schists with much pyrite veins and concentrations and minor layers of thin quartzite (chert?).

Stop 5C is situated in a thick unit of dense, hard, pale albite-rich rock (albitite) characteristized by a interconnected network of pyrite and quartz veins. This albite-rich rock represents the central parts of the hydrothermal 'feeder-zone' at this level.

It grades quickly into an albite, white mica, Mg-chlorite and actinolite bearing schists also rich in pyrite veining and carrying minor calcite.

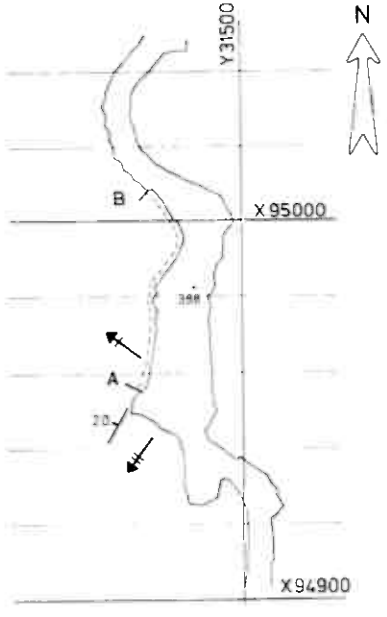
Further north, along the western edge of the open pit, rounded, pillow-like structures are seen, set in a strongly altered pyrite-rich chlorite schist. These rounded, pale, albite-rich fragments probably represent a highly altered pillow-breccia and hyaloclastite sequence.

Stop 5D: located at the west side of the road leading northwest up from the open pit area, near the road junction (see fig.).

The outcrop lies within the pre-ore greenstones (hangingwall) represented here by a less altered, less sulphidized, pillow-breccia unit west of a thicker pillowed sequence. The isolated, pale, albite-rich, pillow-breccia fragments, with their noticable epidote knots, are set in a dark green (Fe-chlorite) chloritic altered hyaloclastic matrix.

At this level, lower in the lava pile, the only sulphides present are pyrrhotite $\pm$ minor chalcopyrite disseminations, generally within the dark chlorite schists. The lavas at this level are characterized by their darker colour (Fe-chlorites), their epidote content as visible knots and veins and their disseminations of pyrrhotite.

JOMA LEVEL 387 Ö LIGG

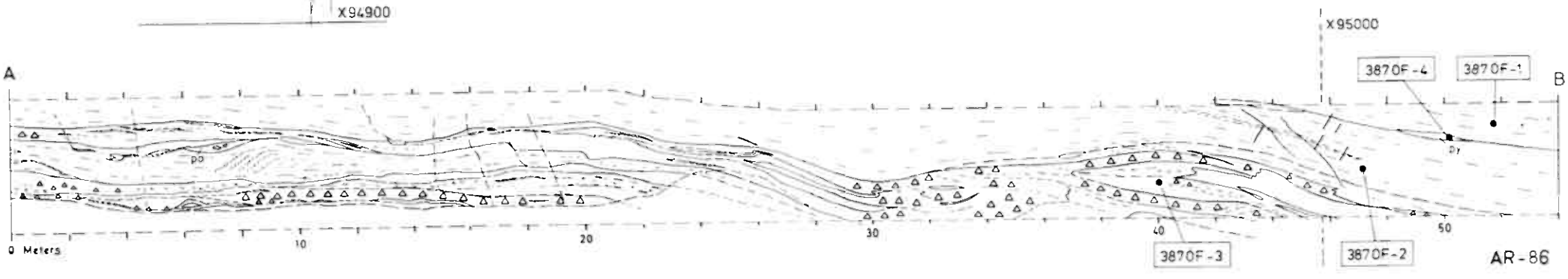


LEGEND

- (C_1) pale footwall greenstone
- (B_4) pyrite-bearing ab+chl+ser+act rich pale schist
- (B_3) pyrrhotite disseminated, ab+Fe-chl rich mod green schists
- (B_{6d}) dark Fe-chlorite schist, chalcopyrite-pyrrhotite dissem
- (II) Cu-rich, massive pyritic ore facies, py+po+cp with mt and amf rich layers
- (III_a) Cu-rich massive cp-po breccia, with fragments of chlorite schist, massive pyrite and magnetite ore
- (Q) dark magnetite-bearing quartzite (recrystallized chert)

po = pyrrhotite, py = pyrite bearing

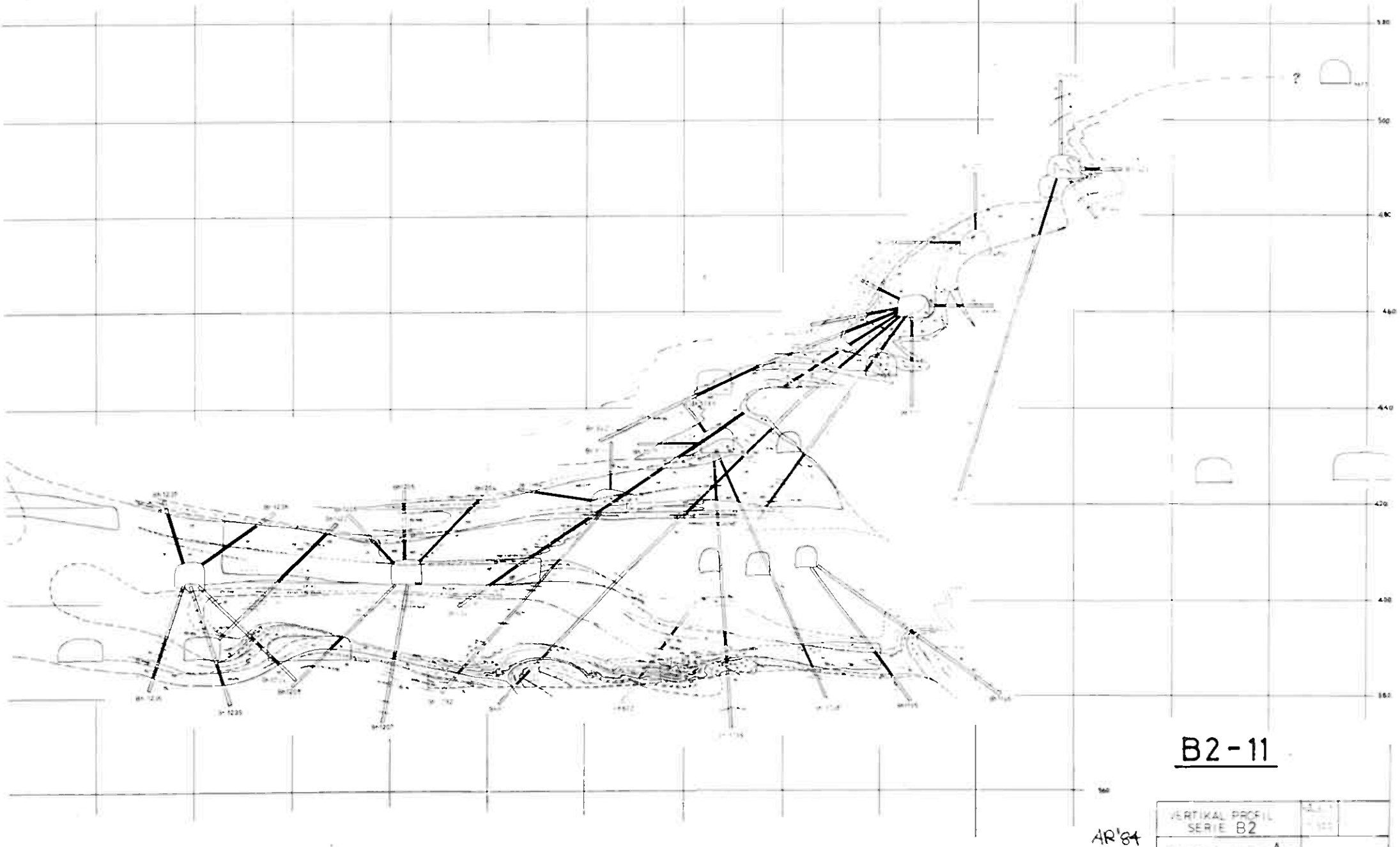
- △ △ △ - breccia structure
- amphibole needles
- S_2 penetrative cleavage
- pyrite layering / veining
- quartz-calcite veins, fracture filling
- F_2
- F_3



SE

B2

NW



B2-11

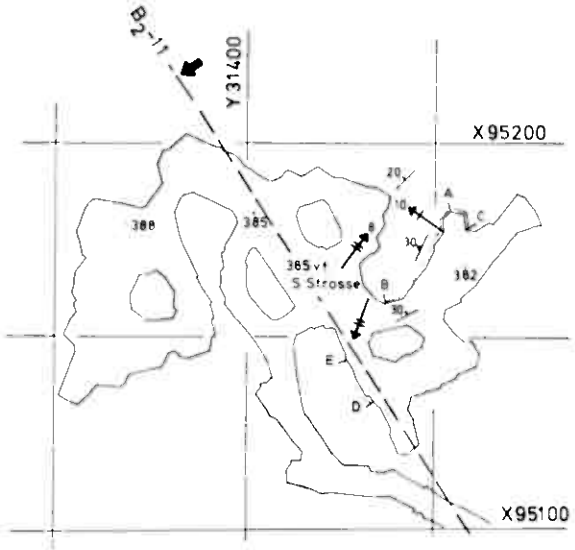
AR'84

VERTIKAL PROFIL
SERIE B2

GRONG GRUBER A/S

Pr. 11

JOMA LEVEL 385 vf S. Strosse

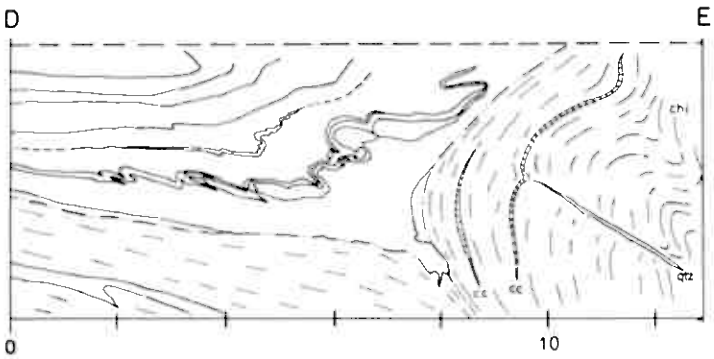


Host Rocks

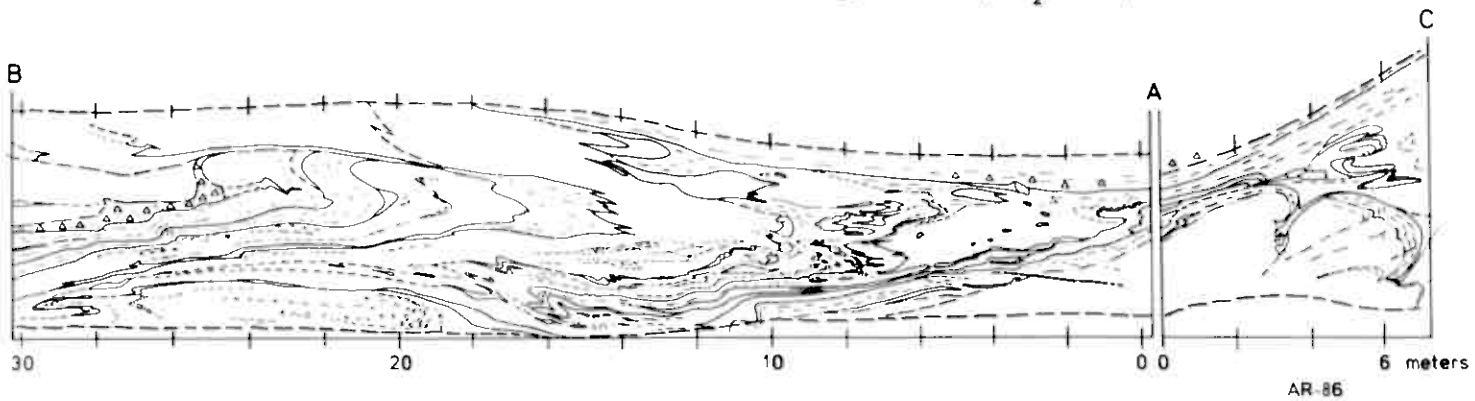
- (C_{1b}) pale footwall greenstone, epidote + calcite rich
- (B_3) moderate green, albite + Fe-chlorite rich greenstone, actinolite, epidote, pyrrhotite - bearing
- (B_{6d}) dark chlorite schists, pyrrhotite + chalcopyrite rich disseminations
- (B_{5b}) pale, layered albitite, pyrite ± sphalerite rich
- white limestone-marble layer
- (Q_{mt}) dark, magnetite-rich quartzite (recrystallized chert) + chlorite + stilpnomelane ± pyrrhotite

Ore Types

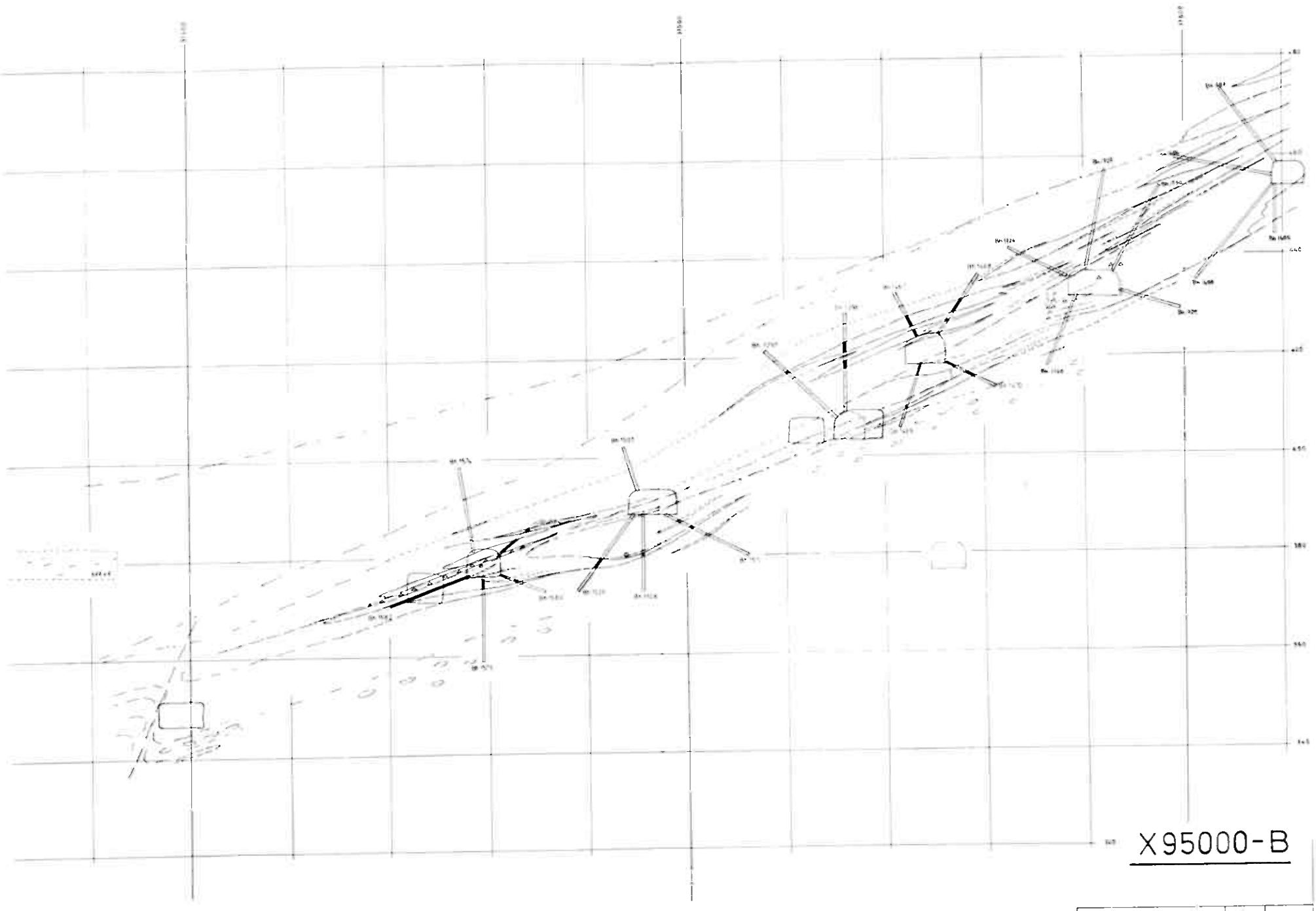
- (IV_{a+b}) Zn-rich, med grained mass. pyrite, calc.-rich, minor amphibole needles
- (II_c) Cu-rich, fine grained, mass. py-po-cp ore facies, layered, remob. cp+po, minor amphibole
- (II_e) Cu-rich, mass. pyrite-pyrrhotite ore facies, with layers of chl, amf, mt and chert lenses
- (III Cu-rich, mass. chalcopyrite-pyrrhotite breccia ore, fragments of chl, mt+py ore



- $\triangle\triangle\triangle$ – breccia structure
- /// – amphibole needles
- – layering and S_2 schistosity
- – S cleavage + fractures filled with qtz + calc + ep
- – F_2
- – F_3
- – major D_2 thrust plane

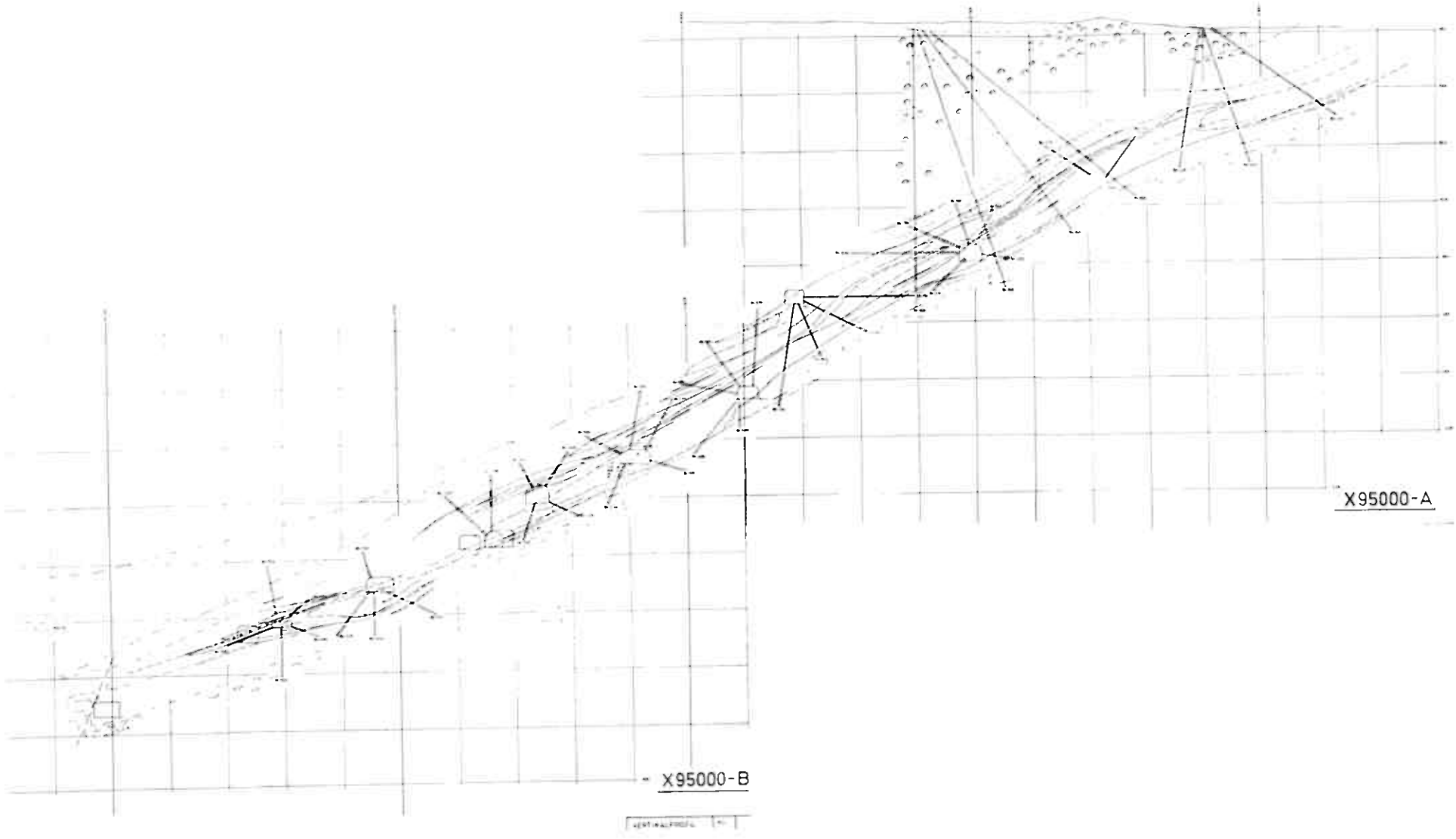


AR-86



X95000-B

VERTIKALPROFIL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