104 I-1 CRY LAKE - KUTCHO CREEK

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CUPRIFEROUS IRON SULPHIDE DEPOSITS KUTCHO CREEK MAP–AREA (104I/1W)

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INTRODUCTION

The area mapped is situated between Tucho River and Kutcho Creek, 12 kilometres north of Pitman River, a major tributary of the Stikine River. Mapping of about 135 square kilometres was completed during a two-week period in July. Orthophotos at a scale of 1:12 500 were used as base maps for fieldwork. The map accompanying this report (Fig. 15) represents a preliminary synthesis of field data.

According to a recent Geological Survey of Canada 1:1 000 000 compilation map (Iskut River, Open File Report 214, 1974), rocks of this area are of Carboniferous and Permian age. They are located at the southeastern extremity of the Atlin terrane and sit in a series of southwesterly directed thrust sheets that juxtapose them with Upper Triassic Stuhini Group and Lower to Middle Jurassic Laberge Group rocks. Plutonic rocks of the Cassiar batholith occur to the north and east of Kutcho Creek map-area.

One of us (A. Panteleyev) made a preliminary study of the Kutcho Creek area in 1974 (Panteleyev, GEM, 1974, pp. 343-348), and recognized that mineralization in this area was stratabound and concordant within a schistose sequence of rocks, and that repetition of the succession by suspected recumbent folds was possible.

This report describes briefly the geological setting of what we believe to be a bedded cupriferous iron sulphide deposit that possesses several characteristics common to other stratabound copper deposits in the world; notably, the 'Kieslager' of European geologists and 'Besshi-type' deposits of Japan (Kanehira and Tatsumi, 1970).

LITHOLOGIES

Because of severe deformation an axial planar foliation, which in most areas has obliterated original textures, has been imposed on all rocks. It is only in hinge areas of major folds that primary textures have been identified. The following is a brief description of major mapped units on Figure 15.

Unit 1: Unit 1 is a sequence of green-coloured, chloritic and actinolitic conglomerates, grits, greywackes, and graded sedimentary rocks together with epidotized, vesicular basalts containing carbonate pods that constitutes the oldest exposed rocks of the area. In

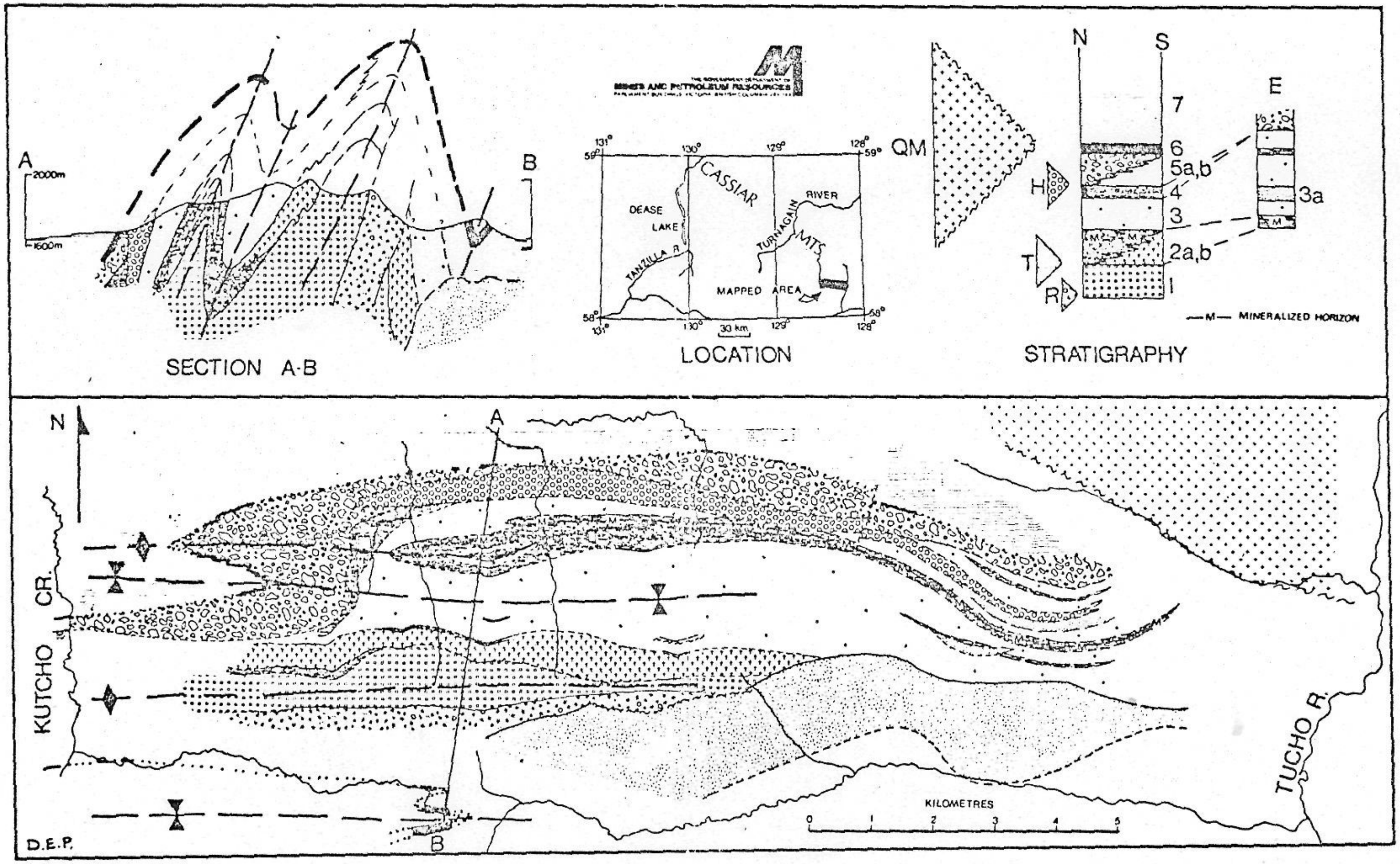

Figure 15. Simplified geological map, Kutcho Creek map-area.

the western part of the area these rocks are intruded by feldspar porphyry dykes and a small metagabbro body, but these features are not illustrated on Figure 15. The rocks form the observed core of the major anticlinal fold in the southern part of the mapped area. The southern margin of the unit we believe to be intruded by a rhyolite dyke (R). The rhyolite is a sodic quartz feldspar porphyry that is foliated in places.

Units 2a and 2b: Unit 2a, which is a white, lustrous quartz-eye sericite schist, includes a sulphide-bearing horizon (M) in a unit of siliceous pelite that contains rare lenses of dolomite on the north limb of the northern anticline (Fig. 15). In the hinge of this fold on the ridge that is taken as a line of section (A–B, Fig. 15), a green quartz-eye feldspathic chlorite schist is intercalated with quartzose sericite schist.

Unit 2b is a mixed sequence of rocks that includes siltstones, cherts, quartz feldspar crystal tuffs, and graded tuffaceous sedimentary rocks, the original textures of which were best studied in folds exposed along the ridge of the line of section (*see* Section A–B, Fig. 15). West of this section, thin bands of sericite schist are found above and below this unit.

The structural interpretation presented in the map and on section line A–B shows unit 2a to be the lateral equivalent of unit 2b. This accepted, a northward provenance and coarsening of sedimentation is implied. The sulphide-bearing bed has not been found in the southern unit, 2b.

Unit 3: Unit 3 is a feldspathic quartz-eye chlorite schist or pelite, and is the most widespread rock type in the central portion of the map-area. The rocks are classified as metamorphosed grits. They are composed predominantly of quartz grains up to 1 centimetre in size and epidotized feldspar grains in a fine-grained chloritic matrix. Proportions and quantities of quartz and feldspar vary so that quartz-eye grits, quartz feldspar grits, and feldspathic grits with little quartz are all present.

Grits in the hangingwall of the main mineralized zone contain rounded cobbles and boulders up to 50 centimetres in size. The rock is an oligomictic conglomerate in which boulders of a coarse-grained quartz-bearing plutonic rock (? trondhjemite) constitute up to 35 per cent of the rock. Such a plutonic rock appears to be the main source of coarse quartz eyes in the grit unit.

The large area of grits in the south is caused by the presence of a synclinal fold trace. At one locality, prefolding intermediate dykes up to 1 metre wide can be seen cutting fold hinges; elsewhere similar rocks are presumed to be dykes rotated into parallelism with the foliation.

Unit 3a: Unit 3a is a pale grey claystone or pelite and occurs at the east end of the mapped area. It forms a marker horizon within a succession of grits along the south side of the foliated hornblendite dyke (H).

Unit 4: Unit 4 is a quartz-eye sericite schist that is exposed in a stream bed on the west side of the mineralized zone. It may not be present at the east end of the mineralized zone (*see* stratigraphic section E, Fig. 15), or it might be represented by the intercalated quartz-eye sericite schist of that section.

Unit 5a and 5b: Unit 5a is a thick sequence of foliated polymictic conglomerate that occurs along the northern margin of the mapped area where it is intruded by the hornblendite dyke (H). In the western part of the area these rocks are considerably thickened in hinge zones of the complimentary northern fold pair.

Unit 5b is a grey-black argillite. It is exposed beneath recrystallized carbonate (marble) in the hinge of the southern syncline. Section A–B (Fig. 15) indicates that this marble is that which overlies polymictic conglomerate in the north. If this is correct, northerly provenance is implied with a southward decrease in grain size of clastic rocks. A similar facies change has been invoked to explain relationships between units 2a and 2b.

Unit 6: Unit 6 is a grey crystalline marble, which outlines the northern fold-pair, and outcrops sporadically across the northern part of the mapped area. A similar (probably the same) marble band can be traced westward across Kutcho Creek and is exposed south of the southern anticline. Traced eastward this marble band defines the southern syncline at locality B in section A–B (Fig. 15).

Unit 7: Unit 7 is slaty siltstone, graphitic shale, sandstone, and thin limestone members that overlie the marble band in the northern part of the map-area, and outcrop in the core of the southern syncline.

Plutonic Rocks

Unit T is a trondhjemite that occupies a broad tract of ground across the southern part of the map-area. It has foliated and locally brecciated margins. Overall it is a medium-grained rock composed primarily of quartz, plagioclase, and chloritized mafic minerals. Locally it is coarse grained and porphyritic with quartz grains up to 1 centimetre in size.

Unit QM is a quartz monzonite stock that occurs across the creek in the northeastern corner of the area. The stock is in fault contact with bedded rocks of the map-area.

STRUCTURE

The dominant planar feature across the entire map-area is a foliation, displayed by all schistose rocks. Many of the more massive intrusive rocks possess a parallel feature at their margins. The steep northerly dip of this foliation can be deduced from the sterogram of measured structural elements (Fig. 16). In the hinge zone of large folds, this foliation is axial plane parallel, and at high angles to bedding. In the limbs of these folds, bedding and axial planar foliation are so close that virtually no sedimentary features, including bedding, can be distinguished, and the folds become tight or isoclinal (Fig. 16).

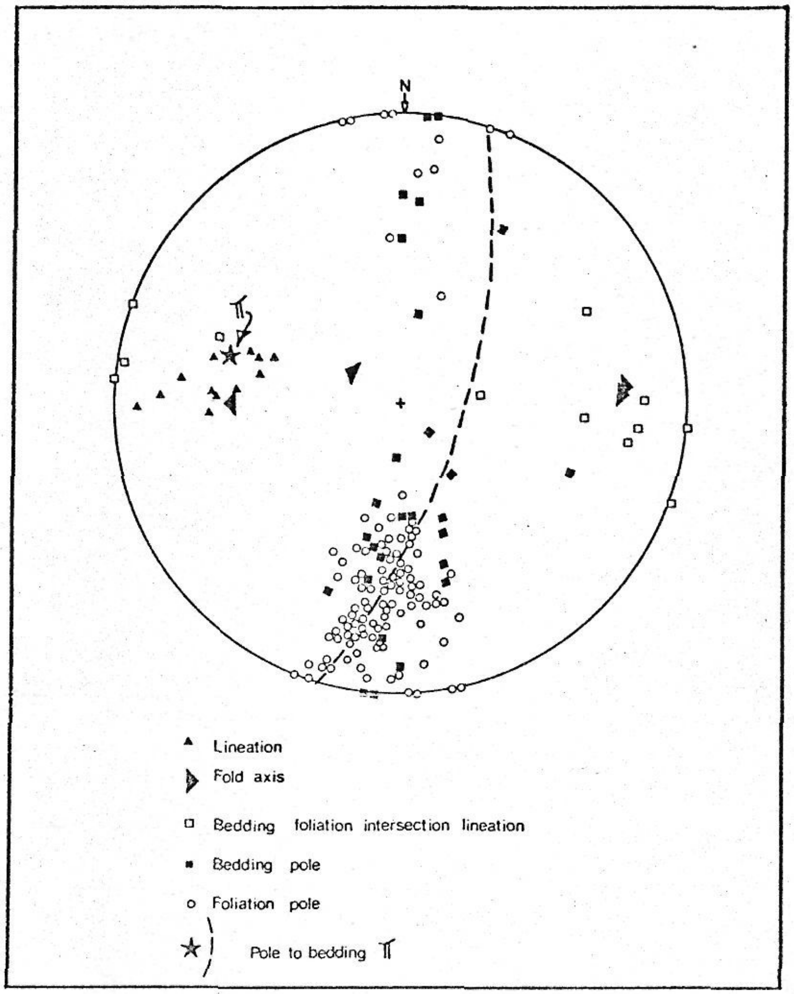

Figure 16. Wulff net structural elements, Kutcho Creek map-area.

Minor folds are not common. They have been recognized only near hinge zones, where their asymmetry indicates the position of the major fold axial plane trace. Fold axes are therefore uncommon, and of the four measured minor fold axes, they show a wide scatter (Fig. 16). Bedding/cleavage intersection lineations lie in an east-west plane and show low stability because of the generally shallow angle between these planes. Lineations measured in conglomerates in the hinges of the northern fold pair are more stable and lie close to the computed Pi point at 285 degrees/25 degrees.

The measured plunge of the northern synclinal hinge is steep at 65 degrees westerly. However, this cannot persist very far because of the observed shape of the folds in map plan. Overall plunge of these structures must approximate horizontal or the trace of major mapped lithological units would not be as observed in map plan.

Late kinking is apparent in many places throughout the area, otherwise there is no evidence of major fold superposition.

Small-scale faults or bedding plane discontinuities have been observed, but their magnitude at this time is not known.

ECONOMIC GEOLOGY

The zone of mineralization, as indicated on the accompanying map by a series of M's, can be traced for approximately 13 kilometres along strike. It is defined on surface by limonite staining of schists. The main zone of interest is about 2 kilometres in length and is located near the western end of the mineralized horizon.

Mineralization is commonly pyrite with lesser chalcopyrite and minor sphalerite disseminated in quartz-sericite schists, with occasional bands rich in chalcopyrite and bornite. Tetrahedrite and pyrrhotite are rare; galena has not been seen. Pyrite content of any specimen from the mineralized bed rarely exceeds 50 per cent. However, the presence of massive sulphide layers or lenses is indicated by float fragments, one large boulder that assayed: copper, 13.7 per cent; zinc, 4.7 per cent; lead, 0.25 per cent; gold, 0.035 ounce per ton; silver, 3.4 ounces per ton (GEM, 1973, pp. 510, 511), and an indigenous gossan derived from a massive sulphide lens measuring 0.5 by 10 metres.

Origin of this deposit is of particular interest in that it might provide a Cordilleran example of what Japanese geologists call bedded cupriferous pyrite deposits. As this type of deposit contrasts with the more familiar Kuroko-type deposit, some of the more salient features of copper-pyrite deposits are summarized below and compared with main features of Kuroko-type deposits.

Comformable copper-pyrite deposits of Japan have the following main characteristics:

(1) They are massive, compact ores of principally pyrite with some chalcopyrite.

(2) Orebodies are lenticular or bed-like and are concordant with planar and linear structures in specific members within sequences of crystalline schists.

(3) The mineralized horizons are persistent along strike; distances of several kilometres are common.

(4) Most, but not all, deposits are associated with products of *basic* volcanism. Less than 10 per cent of these deposits are found in rocks of dominantly pelitic lithology.

The relevant features of the Kutcho Creek deposit are as follows:

(a) Mineralization at Kutcho Creek is of two types: disseminated sulphides with copper sulphide-rich bands and massive sulphide lenses or layers. Both types are intimately associated.

(b) Mineralization can be followed in the same stratigraphic horizon for about 13 kilometres, and is believed to be stratabound. Sulphide minerals are concordant within a sequence of schists of lower greenschist facies. Minor folds outlined by sulphide bands can be seen in at least one outcrop.

(c) In Kutcho Creek map-area, the mineralized horizon is not contained in 'basic schists,' that is, metamorphosed equivalents of basic lavas and pyroclastic rocks. Instead, mineralization is contained within a unit of siliceous sericite schists (pelitic schist in Japanese terminology). Footwall and hangingwall rocks are quartz-eye sericite schists and quartz-eye chlorite schists derived from grits.

In this latter regard the deposit is not identical with most Besshi-type deposits, though we believe it to be a bedded cupriferous pyrite deposit. The main contrasts with Kuroko deposits are: the absence of *acid* volcanic rocks, simple mineralogy (notably absence of galena, barite, gypsum, and anhydrite), and persistence of mineralization in a particular stratigraphic horizon over a great distance.

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