PROGRESS REPORT ON THE GEOLOGY OF THE SPECOGNA (BABE) GOLD DEPOSIT (103F/9E)

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INTRODUCTION

Specogna (Babe) gold property consisting of 41 full claims and seven fractions is 17.6 kilometres south of the town of Port Clements on Graham Island (Fig. 48). The showing is a prospecting discovery, found in late 1970 by Efrem Specogna and Johnny Trico. Five companies optioned the property successively from 1971 to 1975 during which time geochemical sampling, trenching, and diamond drilling were conducted. Consolidated Cinola Mines Ltd., the present owner, bought the claims in 1977 and diamond drilled a total of 708 metres the same year. Another 1 254 metres of diamond drilling in 1978 and 3 041 metres in the first eight months of 1979 have been completed. Sutherland Brown and Schroeter (1975) were the first to describe the showings formally and produced a generalized geological cross-section of the deposit. A more detailed description was given by Richards, *et al.* (1975) who emphasized the fine-grained character of the siliceous ore and the general geochemical expression. Our study is based on detailed geological examination of 5 506 metres of diamond-drill core and limited surface exposure during the summer of 1979. Computerized logging techniques (GEOLOG System) were used as a basis for the work (Blanchet and Godwin, 1972; Godwin, Hindson, and Blanchet, 1977). The GEOLOG System proved to be a useful tool for rigorous description of such a large amount of drill core.

REGIONAL GEOLOGY

The general area about the Specogna gold deposit includes a major fault system and four main rock formations (Sutherland Brown, 1968). These include Sandspit fault system, the Haida and Honna Formations of Cretaceous age, the Masset Formation of Early Tertiary age, and the Skonun Formation of Mio-Pliocene age (Fig. 49).

Sandspit fault system separates the two main physiographic provinces of the area, Queen Charlotte Lowlands on the east and the Skidegate Plateau to the west. The fault zone strikes about 143 degrees and seems to have involved large vertical movement. Southwest of the deposit, the Haida Formation is divided into a lower sandstone member and an upper shale member (Sutherland Brown, 1968). The overlying Honna Formation was mapped originally as an extension of the Haida Formation. Identified lithologies are conglomerate with coarse pebbles to small cobbles, coarse sandstone, and minor siltstone or shale. Sutherland Brown and Schroeter (1975) remapped these sedimentary rocks as part of the Skonun Formation. West of the gold prospect the Masset Formation marks the beginning of the Skidegate Plateau. It is composed exclusively of volcanic rocks ranging from mafic to felsic in composition. East of the Sandspit fault system, the Queen Charlotte Lowlands are underlain by the Skonun Formation consisting of poorly lithified sands, shale, and conglomerate (Sutherland Brown, 1968).

STRATIGRAPHY

The deposit is situated on two small hills (210 metres above sea level) between the Skidegate Plateau and the Queen Charlotte Lowlands. A shale sequence representing the Haida Formation and an overlying interbedded sequence of pebble conglomerate and coarse sandstone of Skonun age are both intruded by a stock of rhyolite porphyry (Fig. 50). A thin cover of glacial till and sand overlies all rocks.

SHALE SEQUENCE – HAIDA FORMATION

This formation extends from the Masset volcanic rocks on the west side of the property to the overlying coarse clastic sequence on the east. The thickness of the shale sequence on the property is unknown although Sutherland Brown (1968) reported that the upper shale member of the Haida Formation is 320 metres thick at the type locality. A maximum thickness of 34 metres was penetrated in drill hole 79-5. The sequence is composed of dark grey to black, poorly consolidated and thinly bedded calcareous shale. Minor sandy layers have been observed. Near the contact with the rhyolite porphyry, the shale sequence becomes an argillite or hornfels due to intense silicification. On the basis of lithology this shale sequence appears to correlate with the upper member of the Haida Formation.

CONGLOMERATE – SANDSTONE SEQUENCE

A coarse sedimentary sequence overlies the Haida Formation to the west and extends to the Sandspit fault system on the east (Fig. 50). The contact between the two sequences has not been observed clearly in drill core because of pervasive silicification and intrusion of the rhyolite porphyry (Figs. 50, 51, and 52). Thickness of the sequence throughout the drilled area varies from 0 to 300 metres. Strike changes from northwesterly to northeasterly with most of the values around 015 degrees. Strata consistently dip 15 degrees to 25 degrees to the east. Thicknesses of mappable units range from 0.1 to 30 metres, with a 2-metre average. The sequence contains about 62 per cent conglomerate, 31 per cent coarse sandstone, and 7 per cent interbedded sandstone and siltstone with minor shale interbeds. Contacts between adjacent units in the sequence are generally sharp but transitional contacts are also observed. Mafic volcanic pebble-rich conglomerate, interbedded sandstone, and shaly siltstones and some sandstone units have been used successfully for stratigraphic correlation between drill holes (Figs. 51 and 52).

The principal rock type is a medium grey to pale brown polymictic conglomerate with well-rounded to subangular large pebbles and small cobbles. Graded bedding and load cast structures are abundant. The coarse fraction totals 70 per cent of the rock with an average fragment diameter of 3 centimetres. Particles are moderately poorly sorted and sphericity is low to intermediate. Most of the conglomerate units are pebble supported. Pebble and cobble lithologies are 60 per cent felsic volcanic rock, 20 per cent mafic volcanic rock, 10 per cent granite, 5 per cent argillite and shale, and 5 per cent conglomerate, sandstone, and siltstone. Acid volcanic clasts include massive and banded rhyolite, rhyolite porphyry, quartz, and rare pyroclastics, chert, and hematitic rhyolite porphyry. Mafic volcanic pebbles are mostly dark green porphyritic andesite with feldspar and hornblende phenocrysts. Granitic fragments consist of a quartz feldspar mosaic with about 10 per cent disseminated mica. Commonly 1 to 3 per cent of wood fragments are intermixed with the coarse and fine fraction. The matrix of these conglomerates occupies 30 per cent of the volume of the rock, and grains are a medium to coarse-grained sand size.

Sandstone units are medium grey to dark brown, medium to coarse grained with bedding and graded bedding commonly apparent. Two to 15 per cent wood fragments are present with rare occurrences of leaves and shells.

Minor but persistent medium to pale grey interbedded sandstone and siltstone-shale units are found locally. They show bedding, graded bedding, crossbedding, ripple marks, and rare convolute bedding and flame structures. Local soft sediment slumping is indicated by conglomerate lenses in sandstone units, disrupted bedding, and matrix replacement.

The coarse nature of the sediments, their polymictic character, and rapid changes from conglomerate to sandstone units suggest a marine near shore environment of deposition for the clastic sequence. The sequence appears to correlate with the Skonun Formation based on lithologic similarity (Sutherland Brown and Schroeter, 1977).

RHYOLITE PORPHYRY

A stock of rhyolite porphyry crops out sparsely east and west of the footwall fault. Dykes of the same composition crop out within the shale sequence west of the footwall fault. In drill hole 77-5 the porphyritic rhyolite crosscuts the shale sequence at four intervals of a few metres each. These dykes or sills contain up to 20 per cent fragments of black silicified shale. In drill hole 79-4, from 144 to 147 metres, a series of shale lenses are intermixed with the porphyritic rock. Sandstone and conglomerate fragments are found in the quartz feldspar porphyry in drill hole 78-3 from 102 to 103 metres. A porphyritic dyke intersects a conglomerate unit from 44.3 to 44.7 metres in drill hole 78-4. These field relations indicate that the rhyolite porphyry is younger than both the shale and conglomerate-sandstone sequence. Locally the contact with the coarse clastic sequence is sharp but in many places a transition zone exists. The contact zone is composed of a mixture of highly deformed conglomerate, sandstone, and rhyolite fragments in an aphanitic bluish grey siliceous matrix.

The thickness of the main rhyolite porphyry mass decreases to the east (Figs. 51 and 52). Drill hole 75-4 intersected 155 metres of intermized rhyolite porphyry and shale after penetrating the footwall fault.

The rock is pale grey and contains 2 to 3 per cent bluish grey subrounded quartz eyes 1 to 4 millimetres in diameter and 5 to 10 per cent white subhedral to euhedral feldspar phenocrysts. The rhyolite is brecciated in many places with the fragments contained in a dark grey to black siliceous matrix. Aphanitic fragments of rhyolite in a white glassy matrix and streaky banding with preferential orientation of the phenocrysts are observed. These two features are possibly characteristic of an extrusive phase of the porphyry.

STRUCTURE

The major structural feature of the Specogna gold deposit is the footwall fault, which strikes 157 degrees and dips 40 to 60 degrees to the east (Figs. 51 and 52). The footwall fault parallels the Sandspit fault system and is probably a part of that system. In the drill core the footwall fault is recognized by an abrupt change from silicified shale to soft, relatively fresh shale. Slickensides have been found in drill hole 79-4 at 153.5 metres in altered rhyolite porphyry. On surface the fault is visible as a scarp near the southwest boundary of the deposit (Fig. 50). Northwest of the present drilling area, an outcrop called the Marino showing exposes the fault contact. At the base of the exposure a gouge zone, 20 centimetres wide, separates the rhyolite porphyry from a black homogeneous shale. Slickensides are abundant in the shale. There the footwall fault strikes 150 degrees and dips 55 degrees to the east.

In drill hole 75-4, located 250 metres northwest of the Marino showing, the rhyolite porphyry is observed both beneath and above the footwall fault. Thus, faulting occurred at least in part after the intrusion of the rhyolite porphyry. Displaced gold geochemical anomalies, drainage patterns, and topography suggest a dextral fault with a downward movement of the east block. This is the same movement picture observed for the Sandspit fault system (Sutherland Brown, 1968).

DISTRIBUTION, FORM, AND SETTING OF THE DEPOSIT

The gold-silver deposit terminates abruptly against the footwall fault to the west and dies out gradually to the north and east (Fig. 50). The rocks are highly anomalous in mercury and arsenic and less anomalous in antimony, copper, and zinc. Gold and silver values are plotted on Figures 53 and 54. Two distinct populations are recognized: a first population of low-grade gold and silver values with a wide range of gold/silver ratios, and a second population of high-grade gold values with gold/silver ratios of about 2:1. Gold values range between 0.01 and 2.50 ounces per ton. High-grade gold values (that is, greater than 5.7 ppm) are found in quartz veins and at the contact zone between the rhyolite porphyry and the coarse sediments (Fig. 55).

Intense silicification characterizes the host rocks. Leached rims of pebbles and cementation of the matrix in pebble conglomerate units by very fine-grained silica is common. The degree of silicification of the host rocks increases toward the rhyolite porphyry body.

Several generations of veins and stringers crosscut the host rock. Larger veins strike 020 ± 20 degrees and dip 60 to 90 degrees in either direction. Their widths range up to several metres. Increased quartz veining toward the rhyolite porphyry has been measured quantitatively in most drill holes (Fig. 55). Individual veins present clear accretionary features such as crustification, chalcedonic quartz, and development of well-formed quartz and calcite crystals reaching 2 centimetres in size. Wallrock silicification is common. Some veins contain numerous angular fragments of host rock. Banding in the veins is common; several coloured bands of quartz show the different episodes of veining. Microveins and stringers commonly pervade wood fragments, producing a chessboard texture on a hand specimen scale. Crosscutting relationships support the following sequence of veining in order of decreasing age: (1) massive sulphide veins; (2) dark grey to black quartz veins, (3) bluish grey quartz veins, (4) white and cherty quartz veins, and (5) calcite veins.

MINERALOGY

Opaque minerals identified in drill cores and hand specimens include in decreasing order of abundance: pyrite, marcasite, limonite, hematite, native gold, and cinnabar. Chalcopyrite and sphalerite have been identified in polished sections of rhyolite porphyry from 157 to 173 metres in drill hole 78-6.

Limonite staining (a pale yellow to reddish brown fine-grained mixture) is present on surface exposures and up to a depth of 20 metres in drill holes. Hematite occurs as finely disseminated grains in quartz veins and massive veinlets in brecciated rhyolite porphyry.

Iron sulphides are encountered throughout the gold-bearing rocks. Sulphide content ranges from 0.5 to 10 per cent, with an average of about 3 per cent. No definite correlation can be obtained between sulphide contents and gold values (Fig. 55). Pyrite and marcasite are the most common sulphides. Pyrite is found as rims, disseminations, blebs, veins, and euhedral crystals. Rims of pyrite consist of dark brown very fine-grained coatings on pebbles in conglomerate units. These rims are thought by some geologists to be melnikovite, but verification is required. Needles, rosettes, veins, and rarely crystals are the forms observed for marcasite. Both pyrite and marcasite are present in petrified wood.

Native gold was recognized in quartz veins, with most occurrences in dark grey and bluish grey quartz veins. The gold apparently exists in a very fine form in varying amounts in most of the rock types that have undergone silicification. At the Marino showing abundant fine free gold is visible in white cherty quartz veins. Cinnabar is rare and was noticed only in a few drill holes.

Two general mineral associations are present in high-grade gold-bearing rhyolite porphyry: (1) pyrite-marcasite and (2) pyrite-marcasite-sphalerite-chalcopyrite-native gold. Sphalerite and chalcopyrite have an average grain size of about 0.2 millimetres in the six polished sections examined. Native gold was observed as monomineralic grains in quartz and in places as inclusions in chalcopyrite. Several soft, white unidentified minerals have been observed associated with sphalerite, chalcopyrite, and native gold. Sphalerite is not readily apparent in hand specimen, and minute grains of chalcopyrite can be confused megascopically with native gold. Paragenesis is summarized on Figure 56.

ALTERATION

Three alteration minerals have been identified in the gold-bearing host rock: a clay mineral (species unidentified), sericite, and chlorite. Clay and sericite alteration are the most extensive. Clay occurs in gouge zones with a white to greyish matrix and containing isolated pebbles. Feldspar phenocrysts in porphyritic pebbles and in the rhyolite poprhyry are also commonly altered to a very fine mixture of clay and sericite. Sericitic alteration is also found as disseminated grains in conglomerate pebbles and matrix and in fine-grained un ts. Chlorite occurrences seem to be limited to within 20 metres of the contact zone with the rhyolite porphyry where it occurs as stringers or finely disseminated grains.

GENESIS

Sutherland Brown and Schroeter (1975) suggested that the Specogna gold mineralization occurred in a vein system in the rhyolite porphyry which is onlapped by sedimentary rocks of the Skonun Formation. Richards, *et al.* (1976) consider the deposit to be of the Carlin type, and indicate that the rhyolite porphyry is mineralized and is younger than or equivalent to unmineralized Skonun conglomerates, suggestions accepted by Sutherland Brown and Schroeter (1977).

After careful examination of new information available from diamond drilling from 1977 to 1979, there is little doubt that the rhyolite porphyry crosscuts the conglomerate-sandstone sequence. The gold mineralization is superimposed in part on the rhyolite porphyry and appears to be spatially related to the intrusion. Intrusion of the porphyry probably created a hydrothermal system in which ascending fluids rich in gold, silver, mercury, arsenic, and antimony percolated through the porous clastic sequence. Deposition of the gold occurred in an early stage of fluid circulation and was followed by later stages of quartz veining.

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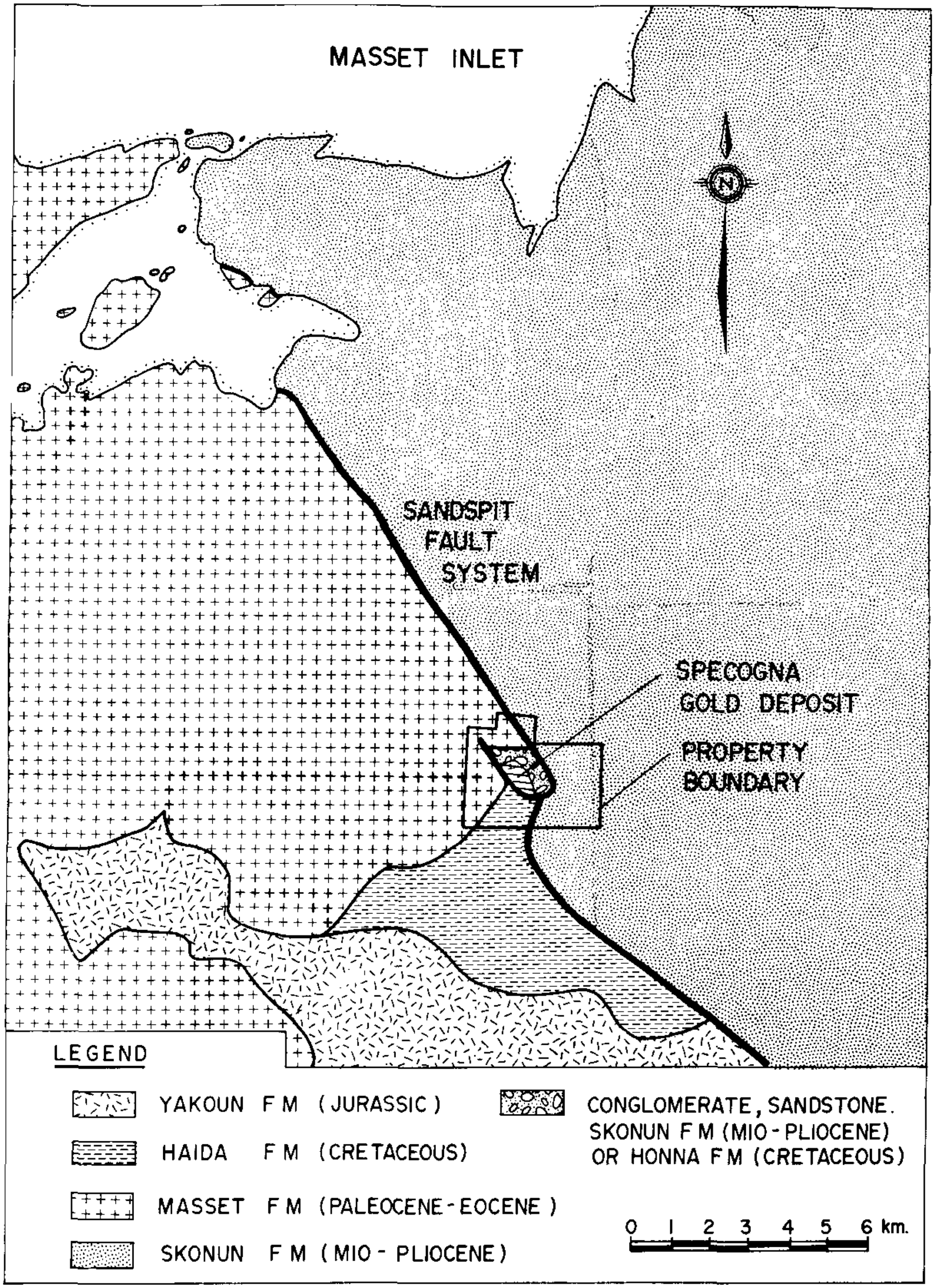

Figure 49. Regional geology, Specogna gold deposit (after Sutherland Brown, 1968).

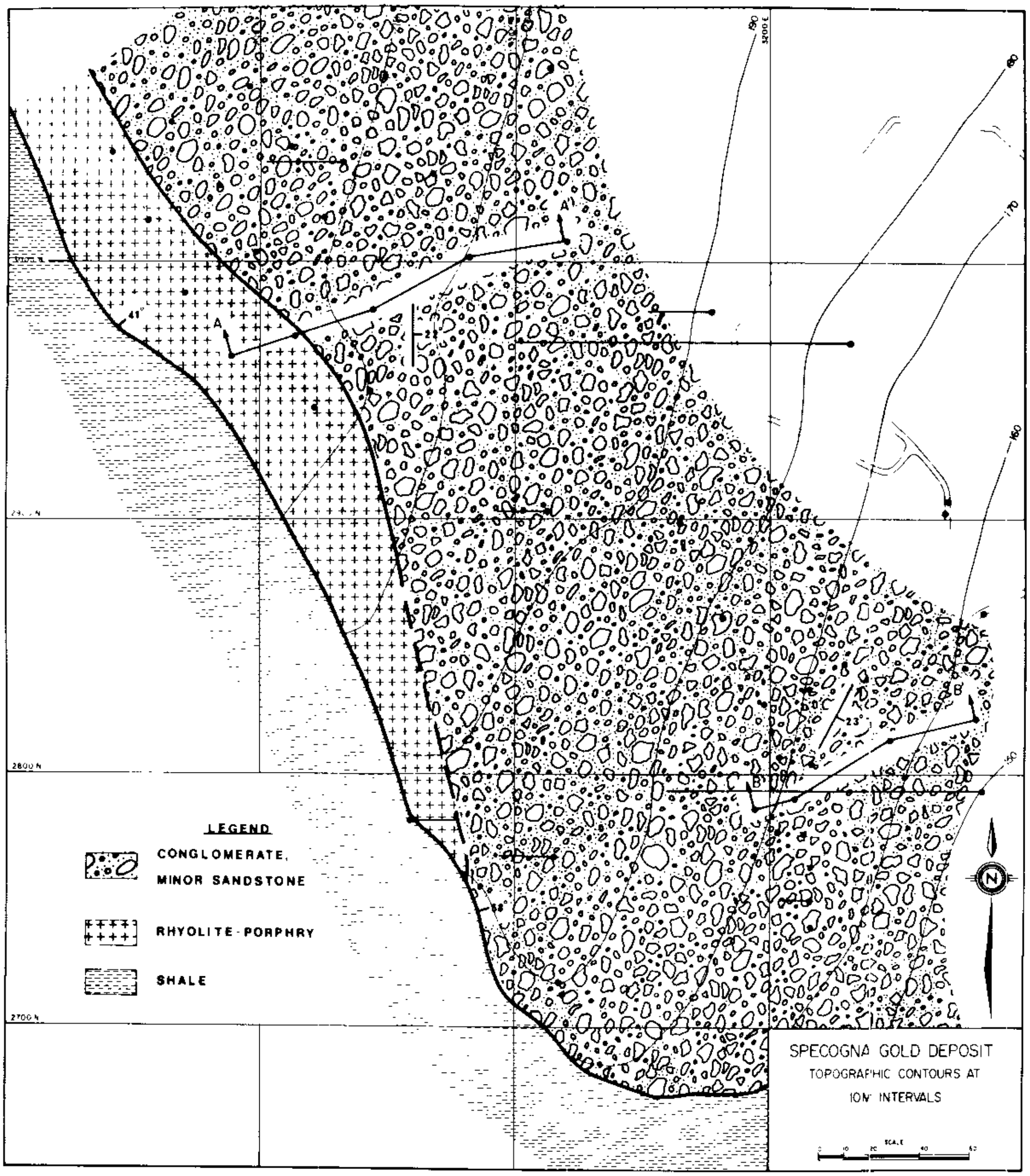

Figure 50. Property geology, Specogna gold deposit.

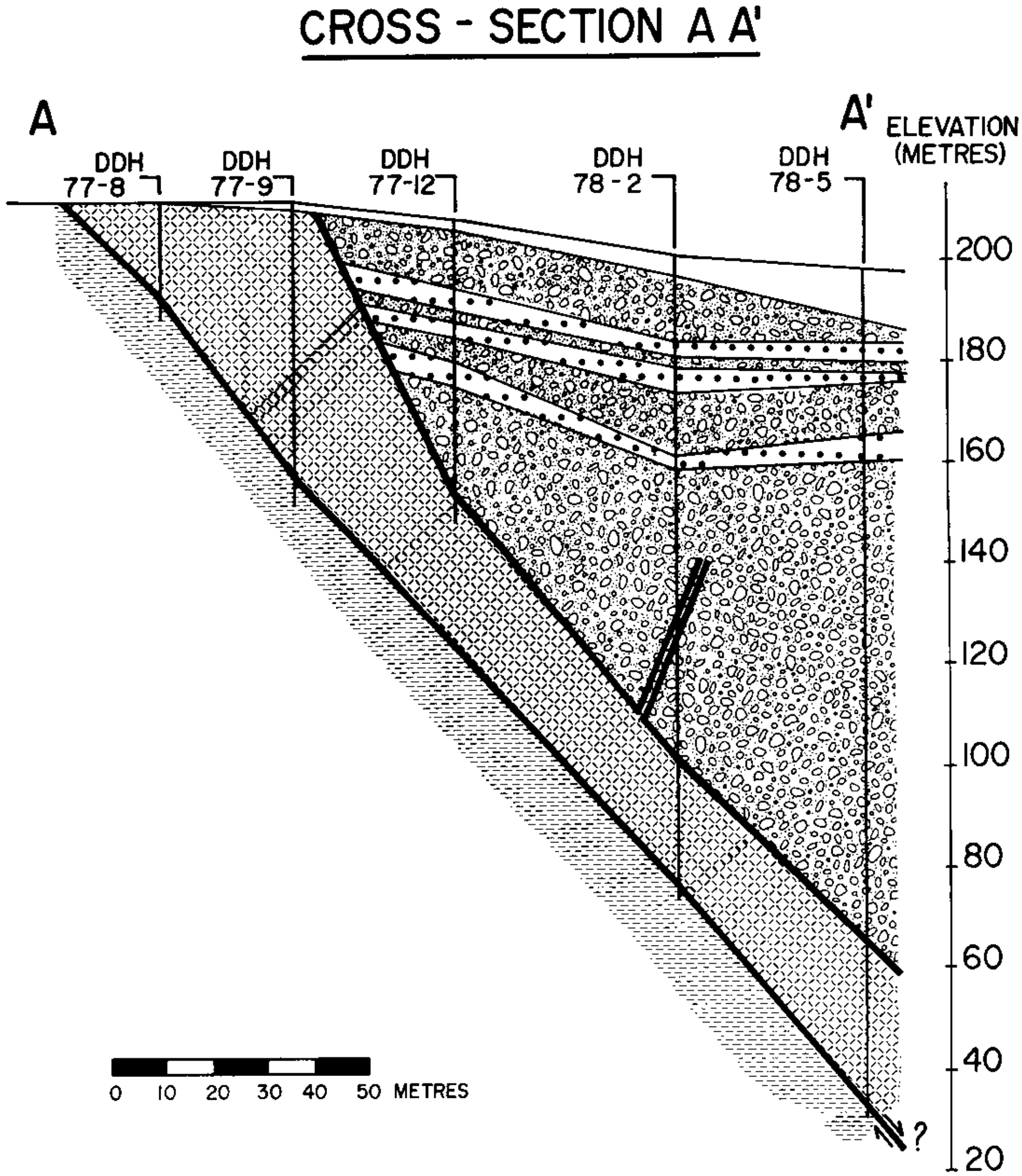

Figure 51. Cross-section A-A' (location shown on Figure 50; *see* Figure 52 for legend).

CROSS - SECTION B B'

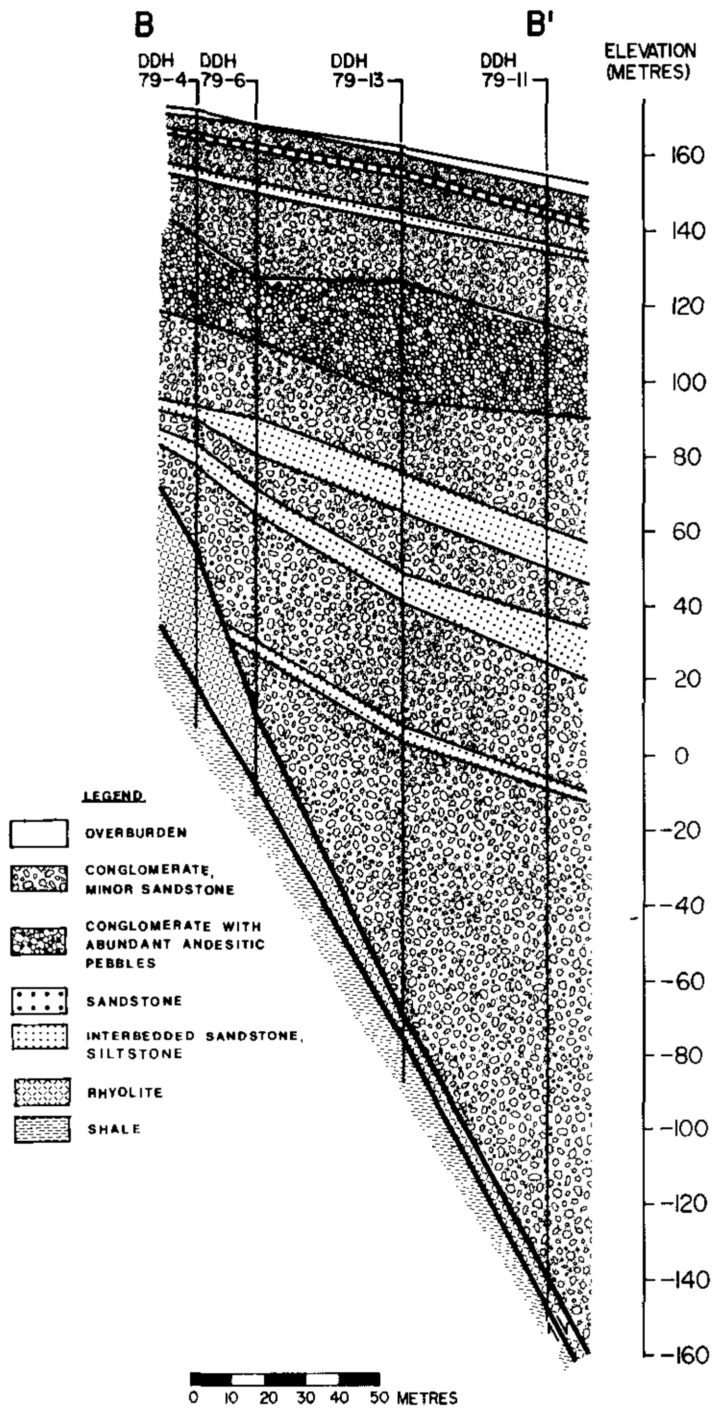

Figure 52. Cross-section B-B' (location shown on Figure 50).

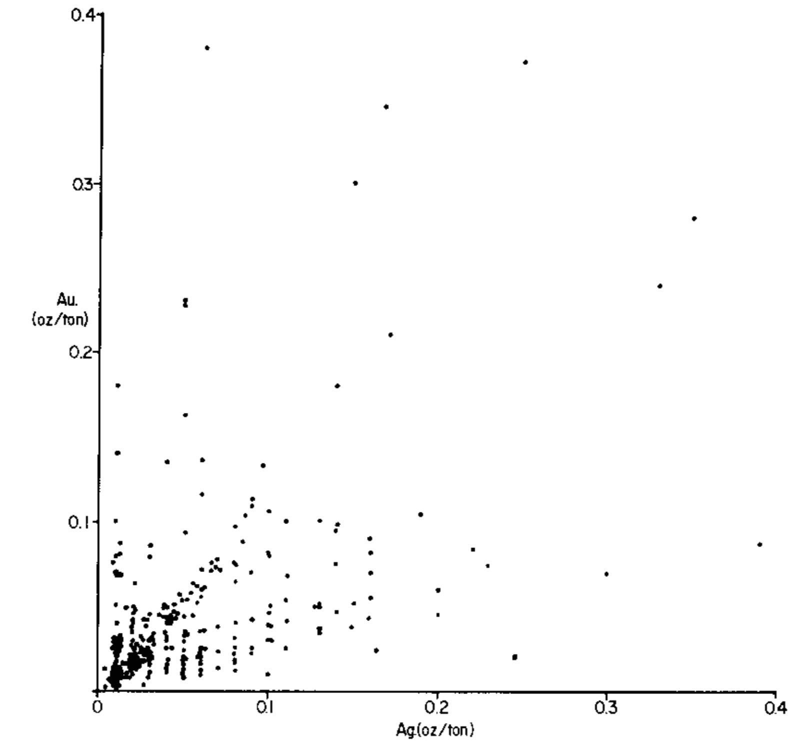

Figure 53. Gold-silver scatter diagram for low-grade assays from drill core, based largely on 2-metre core lengths.

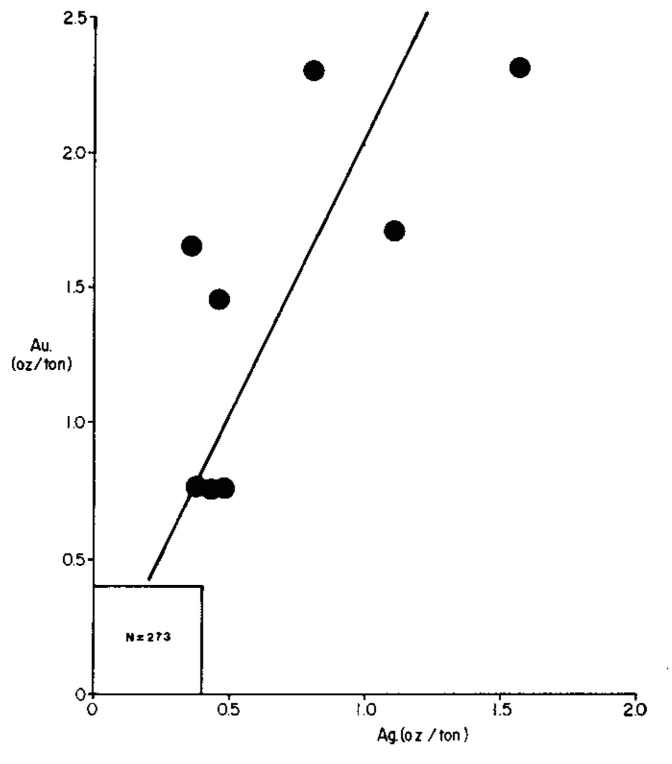

Figure 54. Gold-silver scatter diagram for high-grade assays (>10 grams gold per tonne), based on 2-metre core lengths. The straight line represents a gold/silver ratio of 2:1.

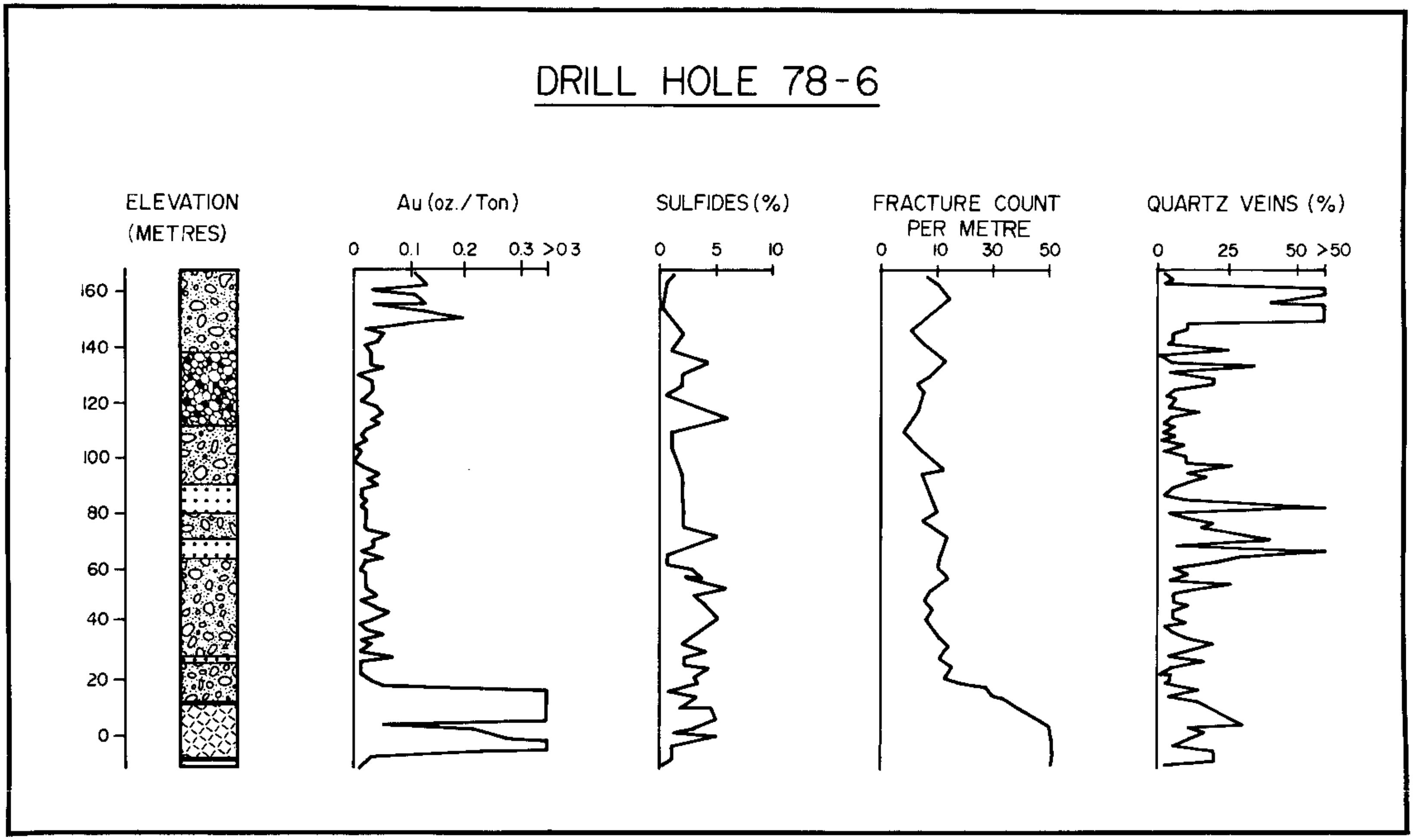

Figure 55. Graphic log of diamond-drill hole 78-6 showing geology, gold assays, percentage sulphides, fracture density, and volume per cent of quartz vein in core. Quantitative data are based on core lengths of 2 metres (*see* Figure 52 for legend).

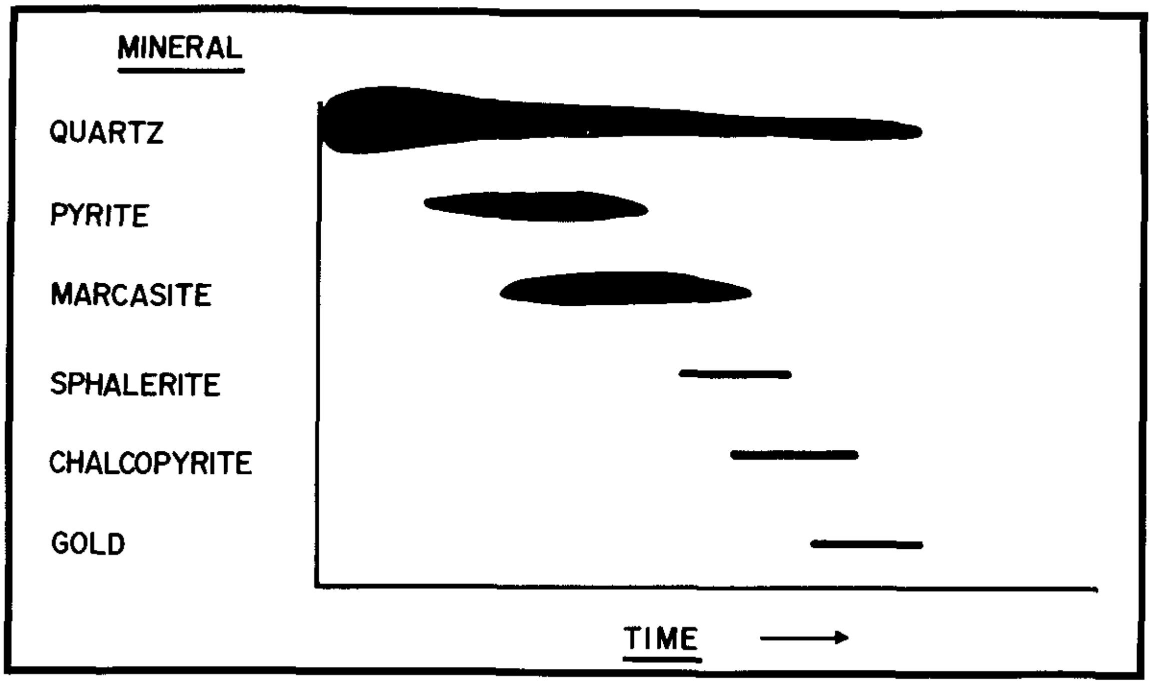

Figure 56. Paragenetic line diagram for high-grade gold occurrences in drill hole 78-6.

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