



**STRUCTURAL GEOLOGY OF THE MILLIE MACK MINE
AND A THEORETICAL ORE CONTROL
(82K/4)**

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GENERAL GEOLOGY

The Millie Mac mine is believed to be at the base of a klippe (Hyndman, 1968) of Late Triassic Slokan Group sedimentary rocks which are in contact with volcanic rocks of the Slokan Group and the Lower Jurassic Rosslund Group. The base of the klippe consists of sheared graphitic argillite which contains some blocks of slickensided quartz vein material mineralized with galena, sphalerite, arsenopyrite, chalcopyrite, and pyrite. Recent operators used a trommel to collect the vein material which was sent to Ainsworth for milling. Recorded production to 1979 was 340 tonnes which yielded 316 grams gold, 21 599 grams silver, 70 kilograms copper, 45 439 kilograms lead, and 2 392 kilograms zinc. Only a very small fraction of the potential extent of the graphitic argillite has been explored by rotary drilling. This paper describes briefly the surface geology of the mine and offers an interpretation of possible controls of mineralization. The area of study covers approximately 1 square kilometre.

SEDIMENTARY ROCKS

Four distinct sedimentary units are present (Fig. 54-1) and include from oldest to youngest: graphitic argillite (unit 2); siltstones, sandstone, and tuff (unit 3); black argillite (unit 4); and limestone and limy siltstone (unit 5). The basal sedimentary unit is graphitic argillite (unit 2) which is of particular interest because it contains vein fragments which host the ore minerals. This unit is 3 to 10 metres thick; mineralized quartz fragments can occur in shear zones throughout the unit.

Black argillite of unit 4 is generally thin bedded and forms a local marker horizon.

IGNEOUS ROCKS

One biotite lamprophyre dyke was observed; it is assumed to be of Tertiary age.

An andesite layer (unit A) was mapped and is believed to be a sill. The basement andesite (unit 1) contains a considerable amount of breccia, but no economic minerals or veins were seen. Although diamond-drill logs in Assessment Report 9 965 (Mooney, 1981) indicate minor quartz veins within the andesite, no economic values were reported.

QUARTZ VEINS

Quartz vein fragments at the Millie Mack and Billie P workings are similar, however, at the Great Bear open pit, approximately 1 kilometre north of the Millie Mack deposit, quartz veins follow the bedding planes and have not been stretched or broken. At the Billie P workings quartz fragments were found to be oriented parallel to the 'b' axes of folds (Figs. 54-2 and 54-3).

Table 54-1 shows assays of concentrates from the Ainsworth mill (Assessment Report 9 965).

STRUCTURAL GEOLOGY

Figure 54-4 is a stereographic plot of 40 poles to bedding from the Millie Mack mine; the average calculated axis plunges 20 degrees toward 225 degrees. Some measured fold axes indicated on Figure 54-1 have this orientation, while some trend nearly east-west. They are doubly plunging producing dome and basin structures. It is of interest that the fold related 'ac' direction with strike 135 degrees is close to the 'possible ore' zone bearing 140 degrees as indicated by rotary drilling.

Figure 54-5 is a plot of 14 poles to bedding from the Billie P east and west pits; The calculated fold axis plunges 5 degrees toward 040 degrees. The calculated 'ac' or tension direction is therefore 139 degrees, practically identical to that found at the Millie Mack mine.

SELF-POTENTIAL TEST (SP)

A self-potential test was made approximately 25 metres west of the Billie P (west) pit using the long-wire method. Results shown on Figure 54-2 indicate that the graphitic argillite has a distinct signature. This type of survey should be carried out to define the exact location of the graphitic argillite throughout the klippe area. Further testing should also be done at the other workings.

ROTARY HOLE DATA

Silver values from rotary drilling at the Millie Mack for two structurally controlled ore zones are indicated in Table 54-2 following.

Table 54-3 shows silver values from rotary drilling of the area that was subsequently mined with tonnages and grades given in Table 54-1.

TABLE 54-1. AINSWORTH MILL ASSAYS

Location	Tons	Gold oz./ton	Silver oz./ton	Copper per cent	Lead per cent	Zinc per cent	Antimony per cent	Arsenic per cent
Billie P (west)	3.732	0.0950	47.7	0.19	4.4	10.3	0.1	1.1
Black Bear	4.0845	0.1950	38.7	0.17	3.3	7.2	0.04	3.3
Billie P (east)	2.2745	0.2180	18.65	0.21	2.4	4.5	0.01	5.1
Millie Mack	1.9495	0.2030	18.55	0.18	2.5	4.5	0.01	4.7
Millie Mack	3.123	0.3740	22.4	0.16	2.5	3.0	0.01	3.9

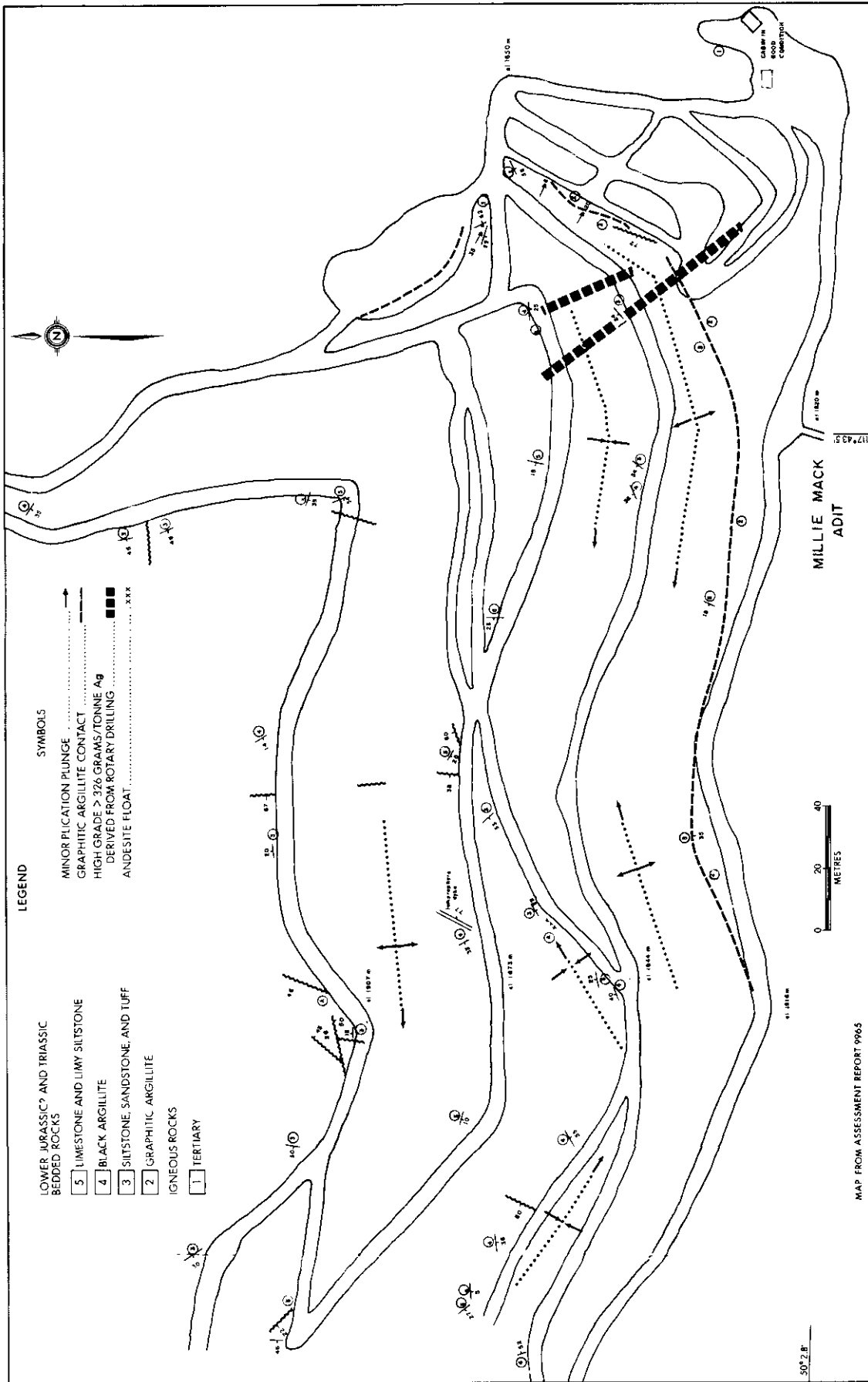


Figure 54-1. Geology of the Millie Mack area.

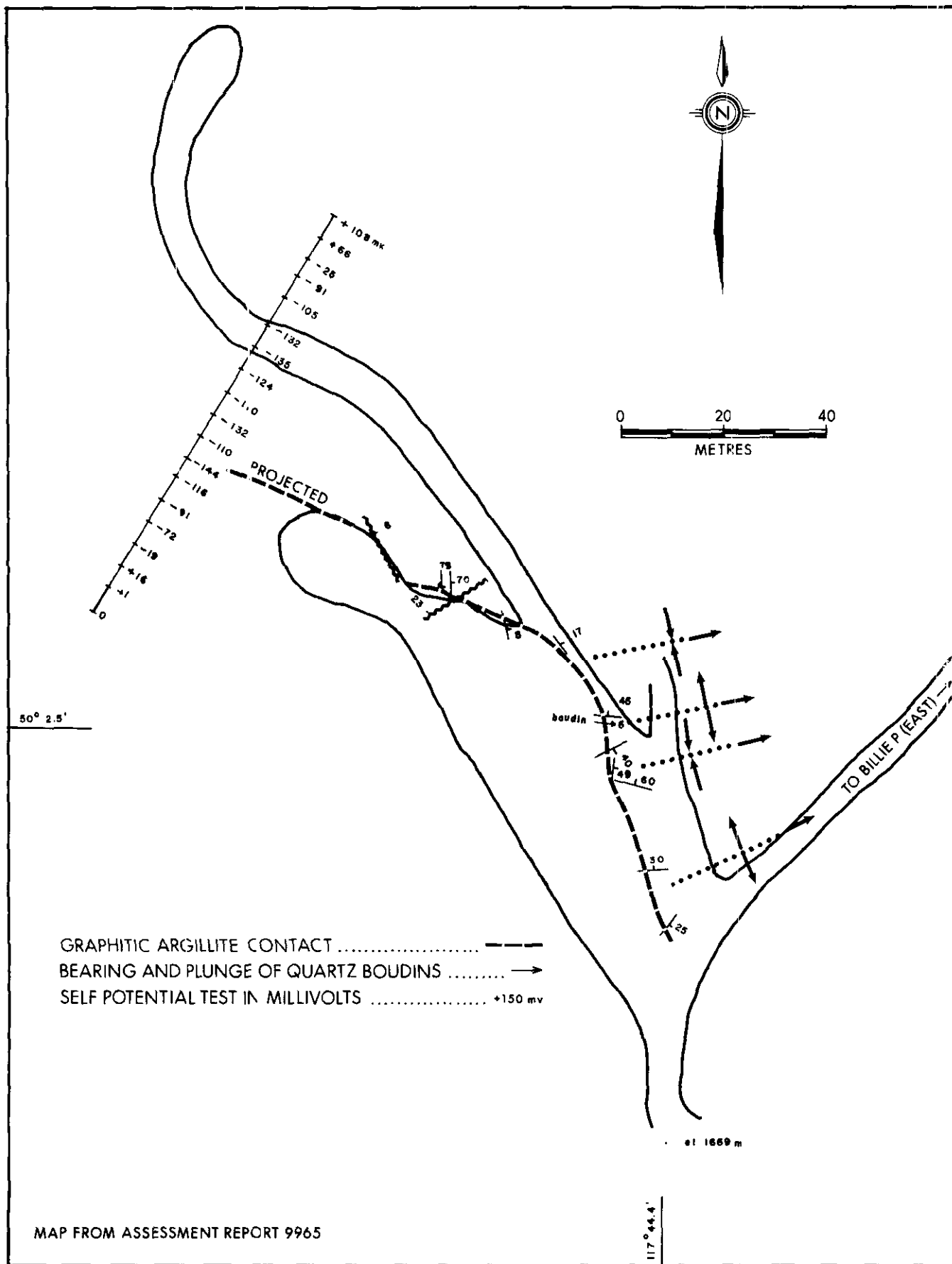


Figure 54-2. Geology of the 'Billie P' (west) zone showing the graphitic argillite contact.

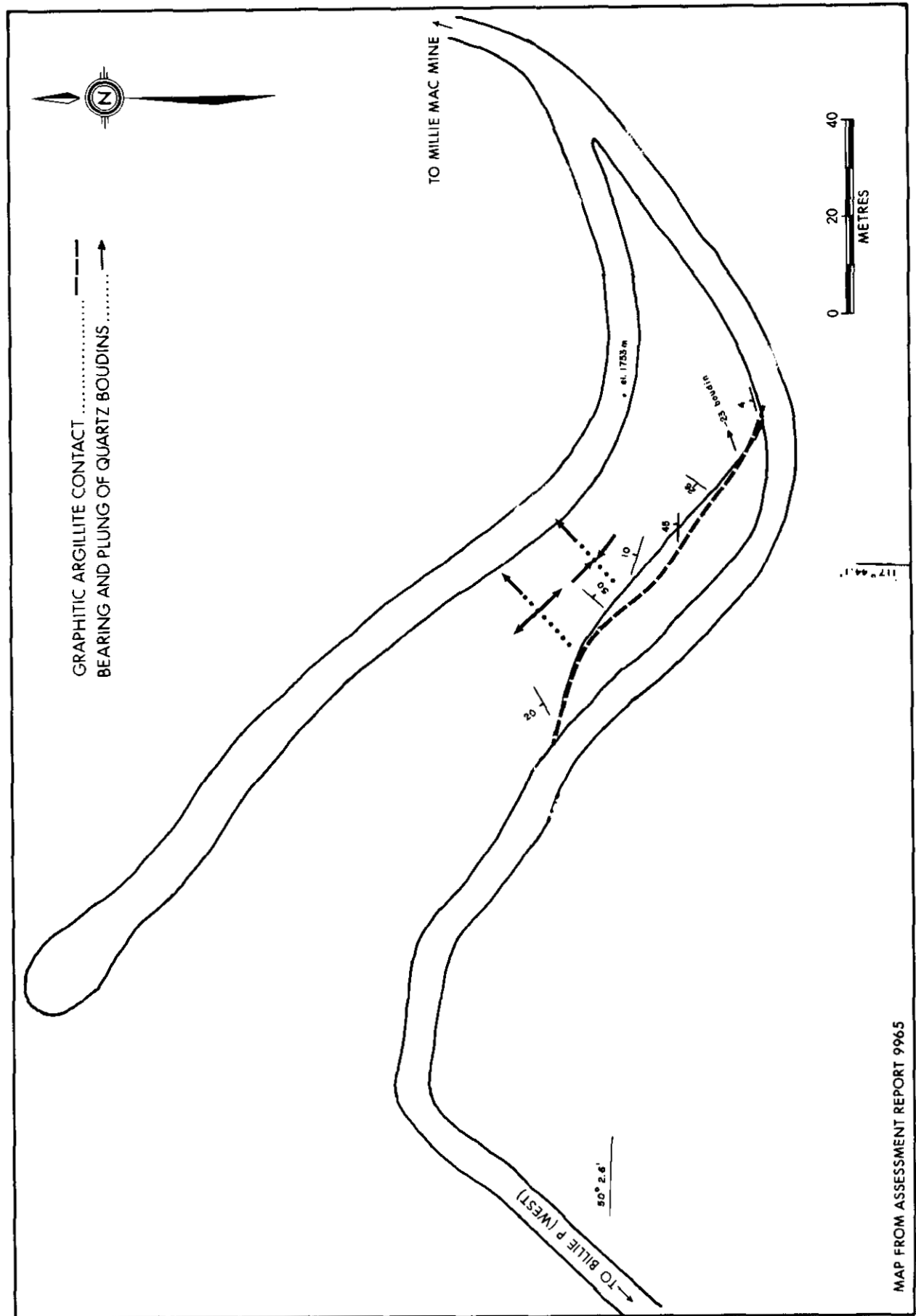


Figure 54-3. Geology of the 'Billie P' (east) zone showing the graphitic argillite contact.

The arithmetic average of the analyses in Table 54-3 is 76.56 grams silver per tonne (2.23 ounces silver per ton). The two net smelter returns from the Millie Mack mine (Table 54-1) averaged 701.9 grams silver per tonne (20.47 ounces silver per ton) after trommel and mill upgrading.

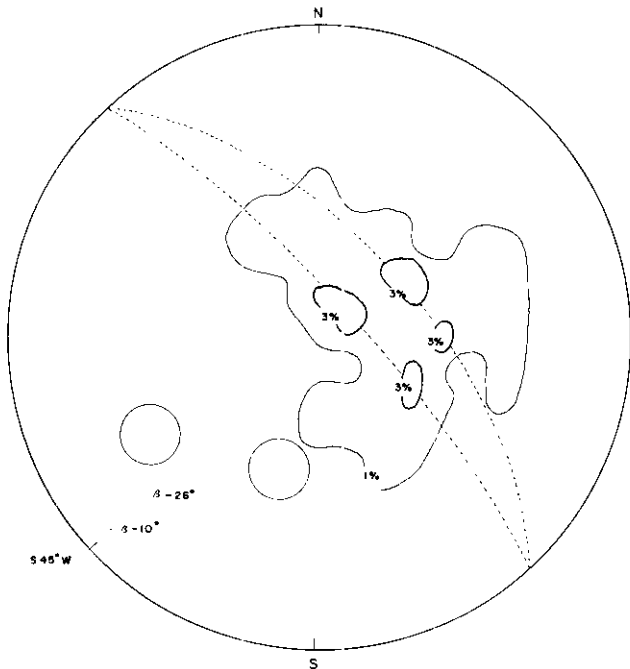


Figure 54-4. Plot of poles to bedding, Millie Mack mine.

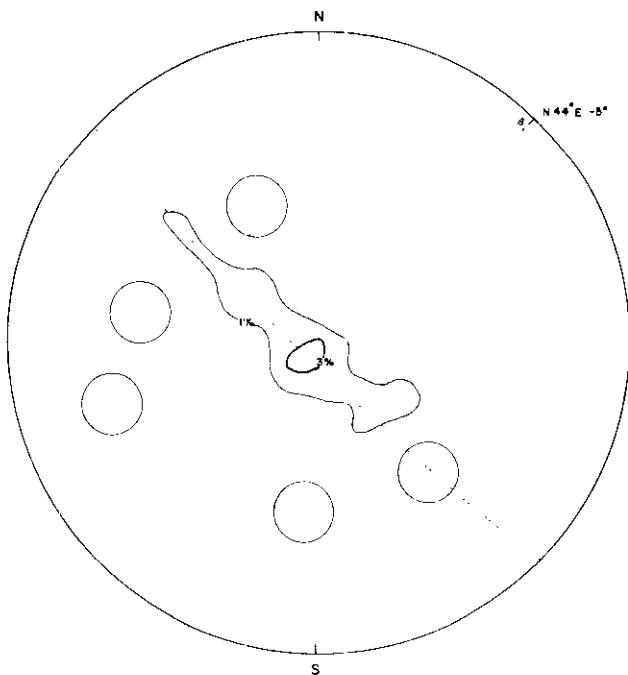


Figure 54-5. Plot of 14 poles to bedding, 'Billie P' east and west pits.

TABLE 54.2
ROTARY DRILL HOLE SAMPLE ASSAYS
MILLIE MACK MINE

Rotary Hole No.	Silver Assay grams/tonne
30-80	320.56
10-80	270.85
9-80	633.59
11-80	80.23
28-80	643.19
17-80	146.05

TABLE 54-3
ROTARY HOLE SILVER ASSAYS
COVERING RECENTLY MINED
AREA,
MILLIE MACK MINE
[Best 1.5 metres (5 feet) used]

Rotary Hole No.	Silver grams/tonne
1-80	63
2-80	74.74
3-80	49.37
4-80	54.17
5-80	139.88
6-80	83.66
12-80	49.37
13-80	67.88
14-80	43.88
15-80	65.82
16-80	80.91
17-80	146.05
Average	76.56

CONCLUSIONS

Mapping at the Millie Mack mine indicates folding about north-east-trending axes. The associated 'ac' or tension direction is north-west-southeast, roughly parallel to the trend of the higher grade mineralization as indicated by rotary drilling.

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