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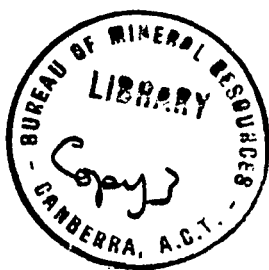
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GEOLOGY AND DIAMOND DRILLING AT THE PINNACLES MINE  
TENNANT CREEK, NORTHERN TERRITORY.

by

J. Barclay

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GEOLOGY AND DIAMOND DRILLING  
AT THE PINNACLES MINE  
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GEOLOGY AND DIAMOND DRILLING AT THE PINNACLES  
MINE, TENNANT CREEK, NORTHERN TERRITORY.

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SUMMARY

A diamond drilling programme was undertaken from late 1961 to mid-1963 by the Mines Branch, Northern Territory Administration, to investigate gold and copper mineralization at the Pinnacles Mine, Tennant Creek.

Gold, malachite, chrysocolla and cuprite occur in talc-chlorite phyllite and hematite which crop out in north-east and east trending crush zones in drag-folded sedimentary rocks.

Of the seven diamond drill holes put down in this programme, Nos. 1, 2, 4 and 6 intersected the downward continuation of a shoot of oxidized copper minerals in chloritic phyllite with negligible gold content.

A tabular deposit, probably of 20,000 tons was outlined with an average copper content of 1.9%. It is 250 feet long, with an average width of 5 feet and persists to a depth of at least 250 feet. It is believed to pitch steeply to the west and to continue with depth.

Drilling was discontinued because of the small size of the deposit and low grade in the oxidized zone.

INTRODUCTION

The Pinnacles Mine lies 2 miles south-east of Tennant Creek township.

A description of geology and statistics of production from 1934 to 1950 are given by Ivanac (1954). 1,355 tons of ore containing 19 dwts of gold per ton and some 200 tons of copper ore of unknown, but low, grade have been won from the Mine. The gold-bearing material was mined at the eastern end of the mineralized zone and the copper ore was mined from the central part.

Malachite, chrysocolla and cuprite are exposed in places at the surface in talc-chlorite phyllite over a strike length of 250 feet, extending to the west of No. 3 shaft (see plan). The maximum surface width of copper mineralization is 10 feet in the central part of the lode where copper ore was mined from an open cut 20 feet long by 20 feet deep.

The drilling and geological investigations were begun in November 1961 and, by July 1962, 4 holes were completed and 2 partly completed. The investigation was interrupted by drilling commitments elsewhere and the programme was eventually terminated in May 1963 on the completion of the seventh hole.

GENERAL GEOLOGY

The Pinnacles workings are at the eastern end of a series of small mesas which trend north-easterly and are aligned parallel to their long axes. Easterly trending, low ranges of hills lie half a mile north and south of the Mine. The intervening broad valleys are covered with alluvium and wind-blown sand or bull-dust, and are practically devoid of outcrops.

On the tops and flanks of the hills, outcrops consist mainly of interbedded greywacke, siltstone and mudstone of the Lower Proterozoic Warrumunga Group. Hematite and quartz blows crop out in shear or crush zones on many of the hills; a large porphyry body with an easterly trend occurs about  $\frac{3}{4}$  mile south of the Pinnacles.

The mineralized zone at the Pinnacles Mine trends in general north-north-easterly and includes occurrences of massive hematite-magnetite and magnetite-amphibolite bodies, talc-kaolin rock with profusely disseminated magnetite, cupriferous talc-chlorite phyllite and a thin lamprophyre sill. These bodies are all elongated parallel to the mineralized zone. Gold was won from chlorite phyllite and ironstone in an open cut at the eastern end of the zone, and copper from talc-chlorite phyllite in the central part.

### STRUCTURAL GEOLOGY

A semi-regional study indicates that the Pinnacles Mine lies on the southern limb of an asymmetrical anticline which pitches westwards at  $20^{\circ}$ . The axis of the anticline probably lies about half a mile to the north, near the Central Government Battery. At the Mine the general dip of the strata is to the south at about  $70^{\circ}$ , and the attitude of the beds on the north limb of the anticlinal axis is nearly vertical.

The structural pattern at the Mine is complicated by drag-folding near the crush zone. Ivanac (1954) suggest that mineralization has replaced a crush zone on the south limb of a west plunging drag-fold and recent investigations support this suggestion.

The Ajax Mine is in a parallel crush zone, about 1,000 feet to the north-west, and it is possible that a broad drag-fold has given rise to the on echelon arrangement of the two crush zones. However, the evidence is complicated by the presence of two directions of cleavage. Near the Mines and parallel to the crush zones the cleavage strike is  $70^{\circ}$ , whereas in the area between the Mines the strike of cleavage is  $200^{\circ}$ .

### GEOCHEMICAL AND MAGNETOMETER SURVEYS

McMillan and Debnam (1961) carried out a geochemical survey at the Pinnacles Mine, and obtained an average value of more than 300 parts per million of copper, compared with a background of 30 parts per million for the field as a whole. This high result can be directly related to the surface outcrops of cupriferous talc-chlorite phyllite.

Daly (1957) describes a ground magnetometer survey which revealed a definite regional type anomaly though no major type anomaly was found.

### DIAMOND DRILLING RESULTS

Five shallow diamond drill holes, Nos. 1-5, were drilled on bearings of about  $340^{\circ}$  and depressed at  $60^{\circ}$ . The strike length of copper mineralization indicated by holes 1, 2 and 4 is of the order of 250 feet. The average true width of intersections including results from No. 6 hole is 5 feet, and the lode appears to persist at least to a vertical depth of 268 feet. The dip is about  $80^{\circ}$  to the south, being slightly steeper than the local dip of the enclosing strata.

Assays indicate an average copper content of 1.9% for these intersections, but gold was generally absent or present in trace amounts only; the highest result was 1.1 dwts/ton from 84'7" to 87' in hole No. 4.

In No. 4 hole, a second intersection of copper minerals, averaging 1.7% copper over 1'7" true width, was made 12 feet down the hole from the main intersection. The lode, therefore, either splits near this intersection or a second parallel and smaller lode is present.

The two deeper holes, Nos. 6 and 7, also depressed at  $60^{\circ}$  on bearings of  $340^{\circ}$ , were sited to pass roughly under the centre of the occurrence, but the results indicate that the pitch of the lode may be steeply to the west.

In No. 6 hole, the lode was still oxidized at a vertical depth of 268 feet, though the flanking sediments were only partially oxidized at this depth.

The sedimentary rocks intersected by drilling consisted dominantly of medium grained greywacke, in places tuffaceous, interbedded with thinner beds of mudstone. Rare instances of porphyroblastic feldspar and hematite were recorded in greywacke in hole No. 3 between 190'7" and 193'1". This recrystallized section immediately underlies 3 feet of chlorite phyllite which in turn is adjacent to a hematite vein 3 feet thick.

Lamprophyre was intersected in two holes. In No. 2 hole two intersections of 8 feet and 1 foot, true widths, (assuming a dip parallel to that of the enclosing strata), were made at vertical depths of 130 feet and 145 feet respectively. In No. 5 hole, two intersections of 27 feet and 5 feet, true widths, were also made at vertical depths of 110 feet and 135 feet.

### CONCLUSIONS

Two main types of gold and copper ore bodies occur in the Tennant Creek area: the Peko type consisting of gold and copper minerals in massive quartz-ironstone; and the Orlando type where gold and copper occur in chloritic phyllite.

The low grade deposit of copper in chlorite phyllite at the Pinnacles Mine is of the Orlando type, though thin, barren ironstone veins were intersected.

A small copper shoot of about 20,000 tons with an average copper content of 1.9% was outlined by diamond drilling. The small size of the shoot, together with the low copper grade and insignificant gold content, indicate that further exploratory work is likely to be disappointing.

However, an additional hole could be drilled to intersect the deposit at a vertical depth of 500 feet where primary mineralization might be encountered. This hole would best be positioned at co-ordinates 140 W, 430 S, and drilled to 650 feet on a bearing of 340° and depression of 60°. It would only be necessary to core in the vicinity of the anticipated lode intersection, probably the bottom 200 feet.

### REFERENCES

- |                                       |        |   |
|---------------------------------------|--------|---|
| Ivanac, J.F.                          | ; 1954 | - The Geology and Mineral Deposits of the Tennant Creek Gold-Field, N.T. Burr. of Min. Res. Aust. Bulletin 22.      |
| Daly, J.                              | 1957   | Magnetic Prospecting at Tennant Creek, N.T., 1935-37; Bur. of Min. Res. Aust. Bulletin 44.                          |
| McMillan, N.J.<br>and<br>Debnam, A.H. | 1961   | Geochemical Prospecting for Copper in the Tennant Creek Goldfield, N.T. Bur. Min. Res. Aust. Record 1961/101 unpub. |

APPENDIX 1

LOGS OF DIAMOND DRILL HOLES

LOG OF DIAMOND DRILL HOLE NO. 1

Location: South side of Pinnacles Mine

Collar Co-ordinates: 35W, 75S, Mine Grid - (see Bulletin 22, Vol. 2, Plate 24)

Course: 340° magnetic

Angle: -60°

Depth: 123'3"

Reason: To test copper/gold lode at depth

Core Assays:

<u>Depth</u>	<u>% Au</u>	<u>% Cu</u>	<u>Core Recovery</u>
93'11" - 95'	Nil	2.7 )	
95' - 96'	Nil	0.7 )	3' or 82%
96' - 97'7"	Nil	0.5 )	
97'7" - 99'6"	Nil	3.1 )	
99'6" - 101'6"	Nil	2.2 )	3' or 77%
101'6" - 102'6"	Nil	0.3 )	
102'6" - 104'	Nil	0.2 )	
104' - 106'	Nil	0.2 )	5.5' or 100%
106' - 107'	Nil	0.1 )	

<u>Drill Run</u>	<u>Recovery</u>	<u>Description of Core</u>
0' - 10'	-	Sandstone and mudstone
10' - 14'	1.5'	Fine tuffaceous sandstone, interbedded mudstone and sandstone, slump features, cleavage/core angle 30°.
14' - 25'7"	3.5'	14-18' - Interbedded mudstone and siltstone, bedding/core angle 50°. 18-22' - Fine red sandstone showing graded bedding. 22-25'7" - Siltstone interbedded with mudstone, slight faulting.

DIAMOND DRILL HOLE NO. 1.

<u>Drill Run</u>	<u>Recovery</u>	<u>Description of Core</u>
63'6" - 70'4"	4'	Fine, red, clayey sandstone, white clayey tuff, both containing thin Mn veins.
70'78" - 78'	4'	Fine red sandstone cleavage angles 30° and 55°, soft white mudstone strongly sheared at 5° to core length.
78' - 93'11"	14'	Fine, red, clayey sandstone, strongly sheared, many thin quartz veins, mudstone from 87' - 87'8" with quartz stringers.
93'11" - 97'7"	3'	LODE MATERIAL. Strongly sheared green chloritic phyllite with malachite, sericite, iron-rich patches, slickensides evident.
97'7" - 101'6"	3'	LODE MATERIAL as above.
101'6" - 108'4"	6'10"	101'6" - 107' - Dense green chloritic phyllite. 107' - 108'4" - Slumped red mudstone with thin, irregular chlorite veins.
108'4" - 118'6"	10'	Mudstone interbedded with siltstone, some fine graywacke, bedding angle 40°, cleavage angle 20°, some manganese staining. At 111' is a 2" vein of quartz in contorted mudstone.
118'6" - 123'3"	3.5'	118'6" - 119' - mudstone. 119' - 123'3" - tuffaceous sandstone with ellipsoidal quartz blobs and thin quartz stringers in the cleavage, cleavage/core angle 25°.
END OF HOLE		(Hole collapsed)

LOG OF DIAMOND DRILL HOLE NO. 2

Location: South side of Pinnacles Mine  
 Collar Co-ordinates: 105W, 130S, (Mine Grid refers)  
 Course: 340° Magnetic  
 Angle: -60°  
 Depth: 180 feet  
 Reason: To test copper/gold lode at depth

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Core Assays:

<u>Depth</u>	<u>%Cu</u>	<u>Au Dwt/ton</u>
77'1" - 81'4"	N/D	Nil
83' - 85'4"	N/D	Nil
86' - 87'8"	N/D	Tr.
87'8" - 90'	0.12	0.2
90' - 93'8"	N/D	1.0
93'8" - 95'	0.12	0.6
95' - 98'4"	N/D	Tr.
98'4" - 101'5"	0.25	Tr.
101'5" - 105'	N/D	Tr.
105' - 108'9"	0.45	Nil
108'9" - 114'	1.75	Nil
114' - 118'	1.12	Nil
118' - 123'	0.75	Nil
123' - 126'	0.2	Nil

N/D = Not determined.

The lode material was very soft and earthy between 98' and 123' and salting may have occurred in the section 114' - 123'.

<u>Drill Run</u>	<u>Recovery</u>	<u>Description of Core</u>
0' - 10'	-	1' of detritus, 9' of sedimentary rocks.
10' - 14'	3½'	Fine-grained, red, tuffaceous sandstone, cleavage/core angle 15°. Thin quartz stringers.
14' - 16'7"	2'7"	Sandstone as above with inter-bedded mudstone, cleavage/core angle 5°. Thin quartz stringers.
16'7" - 24'8"	8'	Cleaved mudstone, cleavage/core angle 10° - 15°, bedding/core angle 25°, subordinate fine sandstone.



DIAMOND DRILL HOLE NO. 2

<u>Drill Run</u>	<u>Recovery</u>	<u>Description of Core</u>
24'8" - 29'	4'	Fine-grained cleaved sandstone, cleavage/core angle 15°. Thin quartz stringers.
29' - 50'	19½'	Strongly cleaved mudstone with subordinate fine sandstone, cleavage/core angles 0-5°, 25° - 40°, 70°, bedding/core angle 40°.
50' - 60'	9'	Red mudstone, in part strongly cleaved, subordinate fine sandstone, cleavage/core angles 15°, 25°, 30°, bedding/core angle 40° - 60°, 20° from 53' - 56'.
60' - 67'8"	7'	Interbedded mudstone and fine sandstone, slight faulting, slumping, cleavage/core angle 15°, bedding/core angle 45° - 55°, thin quartz, iron rich stringers.
67'8" - 71'6"	3½'	Mudstone grading to fine sandstone, cleavage/core angle 40°, at 69' fine sericite in siltstone.
71'6" - 77'1"	4'	Mainly strongly cleaved mudstone, subordinate fine sandstone.
77'1" - 81'4"	3'	Very broken core, probably fault zone, clayey material.
81'4" - 87'8"	4'	Very broken core, as above.
AT 86'		LODE INTERCEPTED.
87'8" - 93'8"	3'	Very broken core, of black, iron-rich material with quartz ramifications. Very porous, vuggy with boxwork structures.
93'8" - 95'	4"	Ironstone pebbles.
95' - 101'5"	2½'	Very broken core, black iron-rich with quartz; becoming soft, sericitic at 98'. Iron-rich material magnetic in part.
101'5" - 125'	20'	Very soft core. Brown, sericitic, iron rich interbedded with kaolin, pulverulent, 122-125' pink quartz-mica phyllite with kaolin, vugs. <u>NB</u> END OF LODE AT 122'.
125' - 128'3"	3'3"	Very broken core, phyllite as above to 125½', followed by soft kaolin phyllite, foliation parallel to core.
128'3" - 138'8"	7'	Soft, talc-kaolin phyllite, rare thin inter-layered iron rich bands.
138'8" - 150'	6½'	Weathered lamprophyre, with rare iron rich bands and pebbles, soft greasy, brown phyllite 145½' - 146', 146'8" - 147'2".
150' - 157'3"	5'	Soft brown phyllite with hard green, chloritic phyllite from 152' - 155'.

DIAMOND DRILL HOLE NO. 2

<u>Drill Run</u>	<u>Recovery</u>	<u>Description of Core</u>
157'3" - 160'	3'	Very broken core, soft brown micaceous phyllite, becoming harder and more chloritic from 159'. Weathered lamprophyre from 158' - 159'.
160' - 163'	2'	Hard, light green, chloritic phyllite with cleavage at 35° to core.
163' - 165'6"	2½'	Green mudstone, cleavage/core angle 40°, bedding/core angle 60°.
165'6" - 171'7"	6'	Intercalated mudstone and siltstone with red, iron rich spots. From 168' resembles hematite shale but the iron content is less. Bedding/core angle 55°, cleavage/core angle 55° in opposite sense.
171'7" - 172'2"	7"	Siliceous mudstone with free quartz areas.
172'2" - 172'10"	8"	Soft, clayey mudstone with kaolin and iron enrichments in part.
172'10" - 176'10"	3½'	Buff coloured mudstone, subordinate siltstone, bedding/core angle 40°-45°, cleavage/core angle 35°-40°, minor quartz stringers.
176'10" - 180'	3'	Darker buff coloured mudstone, bedding/core angle 45°, with cleavage/core angle 45° in same sense.
END OF HOLE		(Hole collapsing over soft sections)

LOG OF DIAMOND DRILL HOLE NO. 3

Location: South side of Pinnacles Mine  
 Collar Co-ordinates: 300W, 230S, (Mine Grid refers)  
 Course: 350° Magnetic  
 Angle: -60°  
 Depth: 280 feet  
 Reason: To test copper/gold lode at depth.

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Core Assays:

<u>Depth</u>	<u>Au dwts/ton</u>	<u>Cu%</u>
158' - 159'	Nil	No visible copper minerals, not assayed.
159' - 162'1"		
162'1" - 163'2"		
163'2" - 164'8"		
164'8" - 168'7"		
168'7" - 171'1"		
177'1" - 178'1"		
178'1" - 180'6"		
180'6" - 184'		
184' - 185'3"		
185'3" - 187'		
187' - 190'		

<u>Drill Run</u>	<u>Recovery</u>	<u>Description of Core</u>
0' - 10'	1'	0' -1' - Talus 1' -10' - Mudstone, bedding/ core angle 50°, cleavage/core angles 0° and 15°.
10' - 22'	12'	Mainly cleaved mudstone, some fine sandstone and siltstone, bedding/core angle 50°, cleavage/core angles 0°, 30°, 50°.
22' - 38½'	16'	Mudstone and fine sandstone, graded bedding, bedding/core angle 45°, cleavage/core angles 25°, 40°.
38½' - 44'	5½'	Fine sandstone, slightly sheared - shearing/core angle 0°.
44' - 51'10"	7'10"	Fine sandstone, some mudstone, graded bedding, bedding/core angle 45°, cleavage/core angles 0°, 20°.
51'10" - 66'10"	15'5"	Mudstone and fine sandstone, fine manganiferous stringers.
66'10" - 74'	7'	Mudstone, irregular quartz- manganiferous stringers, bedding/core angle 45°.
74' - 108'6"	34'5"	Mudstone, some fine sandstone, bedding/core angle 45°, quartz and manganiferous stringers, cleavage/core angles 5°, 20°, 40°.
108'6" - 131'7"	18'	Mudstone, sheared and slightly faulted, shear/core angle 15°, manganiferous stringers, less oxidised from 129'. Grades to fine tuffaceous sandstone at 131'.
131'7" - 159'	27'	Fine tuffaceous sandstone and mudstone, very sheared from 135' -159', shearing/core angle 5°, quartz stringers.

<u>Drill Run</u>	<u>Recovery</u>	<u>Description of Core</u>
159' - 168'7"	8'	Quartz-magnetite, with amphibole, chlorite from 159' -161'; section becomes almost entirely quartz rich with depth.
168'7" - 173'10"	5'	Dark green chloritic phyllite, sheared on 15° to core length, slickensides.
173'10" - 178'1"	4½'	173'10" -175' - green chloritic mudstone. 175' - 178' - chloritic-talc phyllite, cleavage/core angle 30°.
178'1" - 179'4"	1'	178'1" -178'4" - soft brown mudstone. 178'4" -179'4" - massive hematite, slightly magnetic, hematite/mudstone contact at 35° to core length.
179'4" - 185'3"	4'6"	Massive hematite, slightly magnetic to 184'. 184' -185'3" - green chloritic phyllite with hematite specks.
185'3" - 189'9"	3'	Green chloritic phyllite, as above.
189'9" - 193'1"	2'	189'9" -190'7" - green chloritic phyllite as above. 190'7" -193'1" - medium grained graywacke with small grains of porphyroblastic quartz and hematite.
193'1" - 230'2"	32'	Fine-medium graywacke, bedding/core angle 70°, a faint segregation banding at 35° to core length, somewhat re-crystallized.
230'2" - 280'	47'6"	Mainly graywacke, rare thin bands of mudstone, bedding/core angle 50°, cleavage/core angles 15°, 40°.

END OF HOLE

LOG OF DIAMOND DRILL HOLE NO. 4

Location:	South side of Pinnacles Mine
Collar Co-ordinates:	61E, 51S, (Mine Grid refers)
Course:	328°
Angle:	-60°
Depth:	125'
Reason:	To test copper/gold lode at depth.

Core Assays

<u>Depth</u>	<u>Au dwts/ton</u>	<u>Cu%</u>
71' - 73'5"	0.1	1.00
73'5" - 75'9"	0.1	0.3
75'9" - 79'7"	Tr	1.4
79'7" - 82'5"	Tr	1.45
82'5" - 84'7"	Tr	1.65
84'7" - 87'	1.1	1.60
87' - 89'7"	Nil	0.3
89'7" - 91'8"	Nil	0.4
92' - 94'	Nil	0.2
95'11" - 99'7"	Nil	0.65
99'7" - 101'	Nil	2.05
101' - 102'	Nil	1.35
104' - 105'	Nil	0.3

<u>Drill Run</u>	<u>Recovery</u>	<u>Description of Core</u>
0' - 12'4"	1½'	Fine graywacke and mudstone with slight faulting on 20° to core length.
12'4" - 50'	30½'	Mainly fine graywacke, some mudstone, bedding/core length angle 40°, cleavage/core length angle 25°, highly cleaved 25' -26', 29' -43', 46' -50', cleavage/core angle 0° -10°.
50' - 54'7"	3½'	Fine graywacke, graded bedding, bedding/core angle 45°.
54'7" - 66'8"	1½'	Hard red mudstone, in part strongly cleaved, bedding/core angle 40°.
66'8" - 71'2"	2½'	66'8" -67'6" - mudstone as above. 67'6" -71'2" - soft fine graywacke, strongly cleaved with cleavage/core angle 0° -10°.
71'2" - 73'5"	2'	71'2" -72' - green chloritic phyllite. 72' -73'5" - brown micaceous mudstone, with manganese staining.
73'5" - 75'9"	2'	Green phyllite, with spots of malachite from 74'9" -75'9".
75'9" - 87'8"	10'	Green chloritic phyllite with malachite and some chrysocolla. Highly sheared in places. From 84'7" -86' is a more talcose zone, and 86' -87' no visible copper minerals.

<u>Drill Run</u>	<u>Recovery</u>	<u>Description of Core</u>
87'8" - 95'11"	5 $\frac{1}{2}$ '	Graywacke somewhat recrystallized, rare irregular stringers, and blebs of quartz. From 93' -95'11" quartz with graywacke.
95'11" - 101'	4 $\frac{1}{2}$ '	Green chloritic phyllite mainly, with reddened chloritic phyllite from 95'11" -96'5". Malachite throughout.
101' - 104'4"	2'	101' -104' - pale, dirty white mudstone. very rare malachite on cleavages. 104' -104'4" - green chloritic phyllite with malachite.
104'4" - 107'6"	3'	104'4" -105' - green, chloritic phyllite with malachite. 105' -107' - graywacke, some malachite on cleavage.
107'6" - 111'3"	3'3"	Mainly "green" graywacke somewhat recrystallized and with irregular quartz stringers. Some greenish mudstone slightly sheared within graywacke.
111'3" - 115'6"	3 $\frac{1}{2}$ '	111'3" -112' - green mudstone. 112' -114' - fawn mudstone. 114' -115'6" - graywacke, irregular quartz stringers.
115'6" - 121'1"	4'	Graywacke to 116', then mudstone, bedding/core angle 15°. Slight faulting present, cleavage/core angle 15°.
121'1" - 125'2"	4'	Mainly grey-green mudstone, rare fine graywacke. Bedding/core angle 40°.
END OF HOLE		(Hole caving)

LOG OF DIAMOND DRILL HOLE NO. 5 AND 5B

Location: South side of Pinnacles Mine

Collar coordinates: 5 - 261E, 30S; 5B - 276E, 28S, (Mine Grid refers)

Course: 350° Magnetic

Angle: - 60°

Depth: 198'

Reason: To test eastern extension of copper and possibly gold mineralization.

<u>Drill Run</u>	<u>Recovery</u>	<u>Description of Core</u>
0' - 38'5"	17 $\frac{1}{2}$ '	Medium grained graywacke, subordinate mudstone; from 17' -25' bedding/core angle 45°.
38'5" - 47'	1'	Interbedded mudstone and graywacke.
47' - 55'5"	4 $\frac{1}{2}$ '	Medium grained graywacke, subordinate mudstone, bedding/core angle 55°.

<u>Drill Run</u>	<u>Recovery</u>	<u>Description of Core</u>
55'5" - 77'7"	9½'	Interbedded mudstone and graywacke, graded bedding evident, graywacke occasionally highly cleaved.
77'7" - 82'8"	1½'	Mudstone, highly cleaved.
82'8" - 101'10"	10'	Interbedded mudstone and graywacke, bedding/core angle 55° - 60°, dendritic manganese on cleavage at 95', mud pellets in graywacke.

At 101'10" Hole 5 collapsed. Hole 5A was drilled to 26' but collapsed. Hole 5B was drilled with non-coring bit to 101' and cored from there to the end.

101' - 119'	3'	Mainly fine-medium grained graywacke, some mudstone.
119' - 151'	5'9"	Lamprophyre, micaceous, <u>oxidized</u> and of reddish colour to 126', partially oxidized and grey in colour to 151'.
151' - 156'	1'	Mudstone, somewhat chloritic and greenish-grey in colour.
156' - 165'	2'	156' - 157' - mudstone as above. 157' - 165' - lamprophyre.
165' - 175'	1'6"	Medium grained graywacke, with irregular quartz stringers.
175' - 188'	1'3"	Mudstone, with irregular quartz stringers.
188' - 198'	3'6"	Graywacke, medium to coarse grained, irregular quartz stringers.
END OF HOLE		No lode intercepted. Zone of strong oxidation to 126'.

#### LOG OF DIAMOND DRILL HOLE NO. 6

Location: South side of Pinnacles Mine  
 Collar Co-ordinates: 86W, 253S, (Mine Grid refers)  
 Course: 340° Magnetic  
 Angle: -60°  
 Depth: 301'  
 Reason: To test vertical extension of copper lode.

#### Core Assays:

<u>Depth</u>	<u>% Cu</u>	<u>Au dwts/ton</u>
276' - 279'	1.1	Tr
279' - 282'	3.5	Tr

<u>Drill Run</u>			<u>Recovery</u>	<u>Description of Core</u>
0'	-	29'10"	9'	Mainly fine graywacke, some mudstone.
29'10"	-	38'	6'	Interbedded mudstone and graywacke, bedding/core angle $50^{\circ}$ , cleavage/core angle $10^{\circ}$ .
38'	-	41'6"	$1\frac{1}{2}'$	Graywacke.
41'6"	-	49'	$6\frac{1}{2}'$	Mainly graywacke, some mudstone.
49'	-	54'	3'	Mudstone and siltstone, bedding/core angle $60^{\circ}$ , cleavage/core angle $15^{\circ}$ .
54'	-	137'	$75\frac{1}{2}'$	Interbedded graywacke and mudstone, individual beds up to 4' thick, graded bedding, mud pellets, manganese staining on cleavages at 60', 90' and 110', bedding/core angles $50^{\circ}$ - $65^{\circ}$ , cleavage/core angles $15^{\circ}$ - $20^{\circ}$ , $60^{\circ}$ . Base of strong oxidation at 137'.
137'	-	147'	10'	Mainly graywacke, interbedded with mudstone.
147'	-	169'	22'	Mudstone, often shattered and highly cleaved, with irregular quartz stringers, grading to graywacke at 169'.
169'	-	178'	8'	Interbedded graywacke and mudstone, occasional slump features.
178'	-	183'6"	5'	Mudstone, bedding/core angle $40^{\circ}$ , cleavage/core angle $25^{\circ}$ , ? cuprite staining on cleavage at 183'.
183'6"	-	189'	$5\frac{1}{2}'$	Interbedded mudstone and graywacke, bedding/core angle $60^{\circ}$ .
189'	-	192'	3'	Fine grained graywacke, with rare quartz blebs.
192'	-	201'	9'	Mainly graywacke, some mudstone, slump structure, graywacke with hematite spots and irregular quartz stringers.
201'	-	207'6"	$6\frac{1}{2}'$	201' - 203' - Graywacke as above. 203' - 207' - sheared chloritic phyllite with blebs of hematite, irregular quartz stringers.
207'6"	-	211'	$3\frac{1}{2}'$	Sheared quartz-hematite - chlorite phyllite.
211'	-	216'	5'	Hematite rich-chlorite - amphibole altered mudstone with talc and irregular quartz stringers. At 215' is 6" zone of quartz and hematite impregnations.



<u>Drill Run</u>	<u>Recovery</u>	<u>Description of Core</u>
216' - 219'	3'	Hard chlorite - hematite impregnated altered mudstone.
219' - 223'6"	4 $\frac{1}{2}$ '	Contorted, faulted and banded mudstone, with irregular stringers and blebs of quartz.
223'6" - 239'	13'	Mainly graywacke, rare interbedded with mudstone, irregular faulting and quartz stringers, bedding/core angle 40°.
239' - 258'6"	17'	Graywacke, grading from medium-coarse grain size, highly cleaved in part, 1' mudstone slump at 250', bedding/core angle 35°.
258'6" - 270'6"	11'	Interbedded graywacke and highly cleaved mudstone. Rare mudstone inclusions in the graywacke. Highly cleaved mudstone oxidized on partings, bedding/core angle 90°, some faulting.
270'6" - 276'	5'	270 $\frac{1}{2}$ ' - 273' - graywacke, faulted and with quartz stringers. 273' - 274' - cleaved chloritic phyllite with hematite impregnations. 274' - 276' - oxidized sheared mudstone.
276' - 278'	2'	<u>LODE</u> material. Altered, contorted mudstone with malachite, talc, hematite. Some apparently unaltered mudstone inclusions.
278' - 284'	5'	278' - 282' - <u>LODE</u> as above. 282' - 283' - chloritic phyllite with numerous quartz blebs. 283' - 284' - banded mudstone.
284' - 289'	5'	Banded mudstone, banding on 50°, siliceous, oxidized, somewhat chloritic, malachite on cleavage to 285'.
289' - 295'	6'	Mudstone, partly oxidized, siliceous, somewhat chloritic, bedding/core angle 50°.
295' - 301'	6'	Mainly graywacke, some mudstone, Graywacke occasionally with quartz, feldspar, ? porphyroblasts.

END OF HOLE

LOG OF DIAMOND DRILL HOLE NO. 7

Location: South side of Pinnacles Mine  
 Collar co-ordinates: 383S, 110E, (Mine Grid refers)  
 Course: 340°  
 Angle: 60°  
 Depth: 621'2"  
 Reason: To determine the extension at depth of the mineralized shear exposed at the Pinnacles mine and in D.D. holes Numbers 1, 2, 4, and 6.

Surveys:

<u>Depth</u>	<u>Acid Tube</u>	<u>Corrected</u>
200'	63°	57°
300'	63°	57°
390'	63°	57°
500'	63°	57°
600'	67°	62°

<u>Drill Run</u>	<u>Recovery</u>	<u>Description of Core</u>
0' - 135'	not cored - hole caved and was cemented - coring began at 116' and did not follow course of original hole.	
116'0" - 135'0"	18'0"	red alternating bands of mudstone and fine graywacke - some rare bands of hematite - manganese staining on joint planes - bedding/core angle 30°.
135'0" - 158'0"	17'3"	reddish graywacke - somewhat better sorted than above - some quartz stringers, slight evidence of shearing.
158'0" - 181'0"	21'9"	reddish mudstone alternating with dark grey graywacke and poorly sorted sandstone - reddish along joint planes.
181'0" - 204'0"	21'4"	similar sediments as above - slicken-sides and manganese staining on cleavage plane - rare quartz stringers.
204'0" - 223'0"	18'5"	dark red mudstone as above - thin quartz stringers with vugs lined with specularite crystals - thin bands of quartz - hematite not conformable.
223'0" - 230'0"	6'1"	mudstone and graywacke - some load casting - strongly cleaved - thin beds of quartz sandstone.

<u>Drill Run</u>	<u>Recovery</u>	<u>Description of Core</u>
230'0" - 256'0"	25'2"	black mudstone - rare fine graywacke - some fractured quartz stringers.
256'0" - 270'6"	13'4"	interbedded mudstone and graywacke - water table at 270 feet.
270'6" - 300'2"	25'2"	mudstone - thin (1') band of hematite shale with common quartz veins.
300'2" - 328'8"	24'7"	interbedded graywacke and mudstone.
328'8" - 353'10"	23'7"	as above with rare quartz veins.
353'10" - 373'10"	19'7"	sediments as above with chloritic phyllite.
373'10" - 379'8"	4'8"	<div> 1'0" - graywacke  1'2" - chloritic phyllite - abundant hematite.  1'0" - vuggy quartz with chlorite and hematite.  6" - hematite with quartz and chlorite.  1'0" - chlorite phyllite with hematite. </div>
NO VISIBLE SULPHIDES		
379'8" - 391'10"	8'10"	fine-grained graywacke with quartz veinlets and hematitic mudstone.
391'10" - 422'0"	28'10"	fine-grained graywacke with some mudstone and quartz veinlets, thin bands of coarse graywacke.
422'0" - 445'7"	22'8"	interbedded graywacke and mudstone - common quartz veins.
445'7" - 474'6"	17'11"	as above - some silicification.
474'6" - 514'0"	7'10"	black chloritic mudstone and phyllite - some silicified graywacke.
514'0" - 537'6"	5'7"	silicified graywacke - some mudstone.
537'6" - 566'0"	5'9"	as above.
566'0" - 600'0"	5'0"	as above - quartz veins common near 600'.
600'0" - 610'0"	1'1"	chloritic material with angular quartz fragments.
610'0" - 614'0"	2'7"	1'3" - material as above. 1'4" - hematitic fault gouge.
614'0" - 617'0"	3'0"	1'0" - hematitic fault gouge. 2'0" - chlorite - quartz fault breccia.
617'0" - 621'2"	4'0"	black chloritic phyllite.

END OF HOLE

# PINNACLES MINE, TENNANT CREEK N.T.

DIAMOND DRILLING INVESTIGATIONS 1962-1963

FEET 40 20 0 40 80 120 160 200

Bulldust Flat

PINNACLES MINE

AJAX MINE

Bulldust Flat

Bulldust Flat

## Reference

Mudstone

Greywacke

Ironstone

Magnetite amphibolite

Talc magnetite

30° Strike and dip of bedding

70° Strike and dip of cleavage

Shear zone

Fault

Open-cut

Costean

Diamond drill hole inclination and plan length

Shaft, inaccessible

Contours

Plane table stations

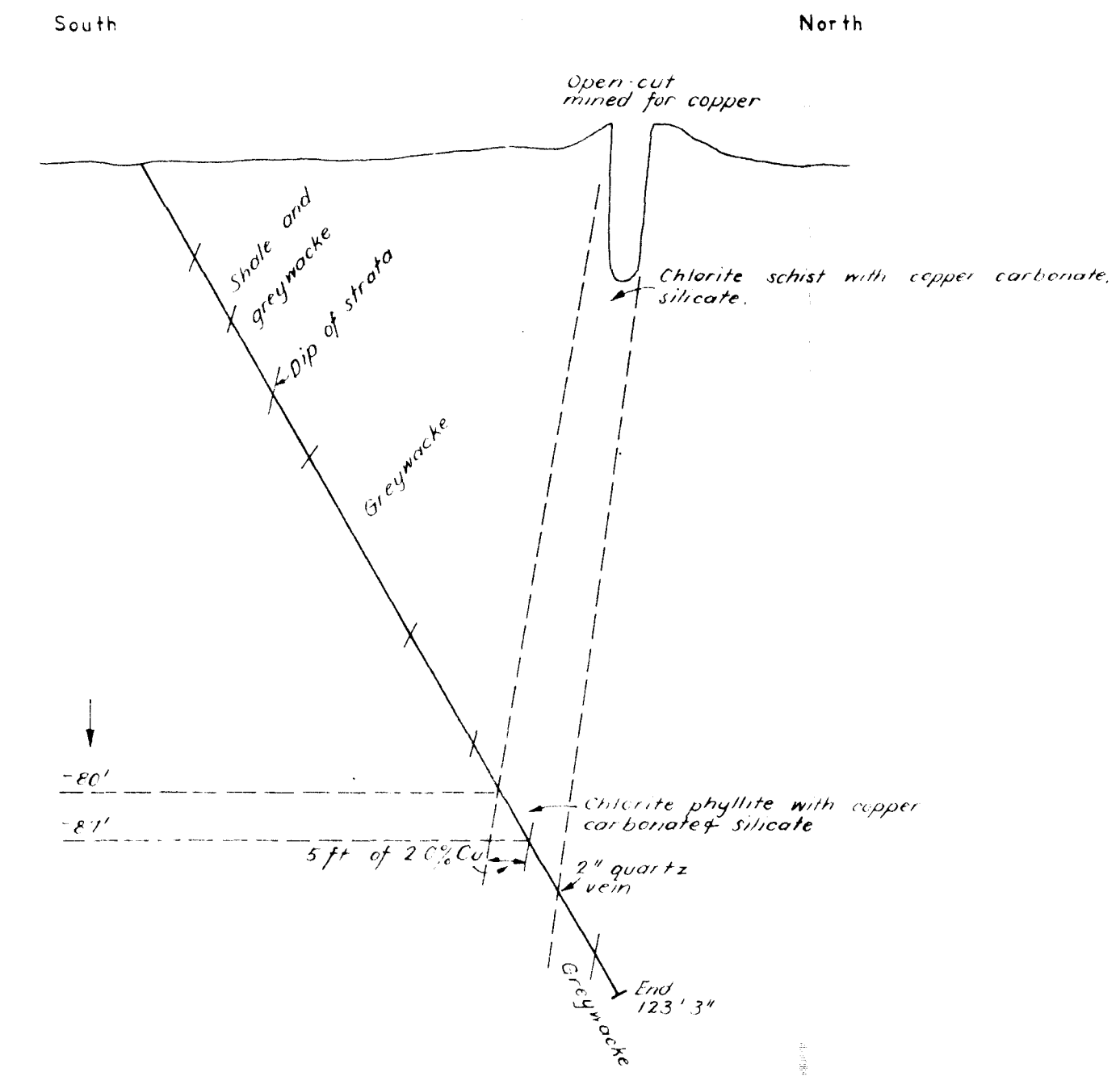
Plan incorporates information from Ivanac (1954)

Longitudinal Section

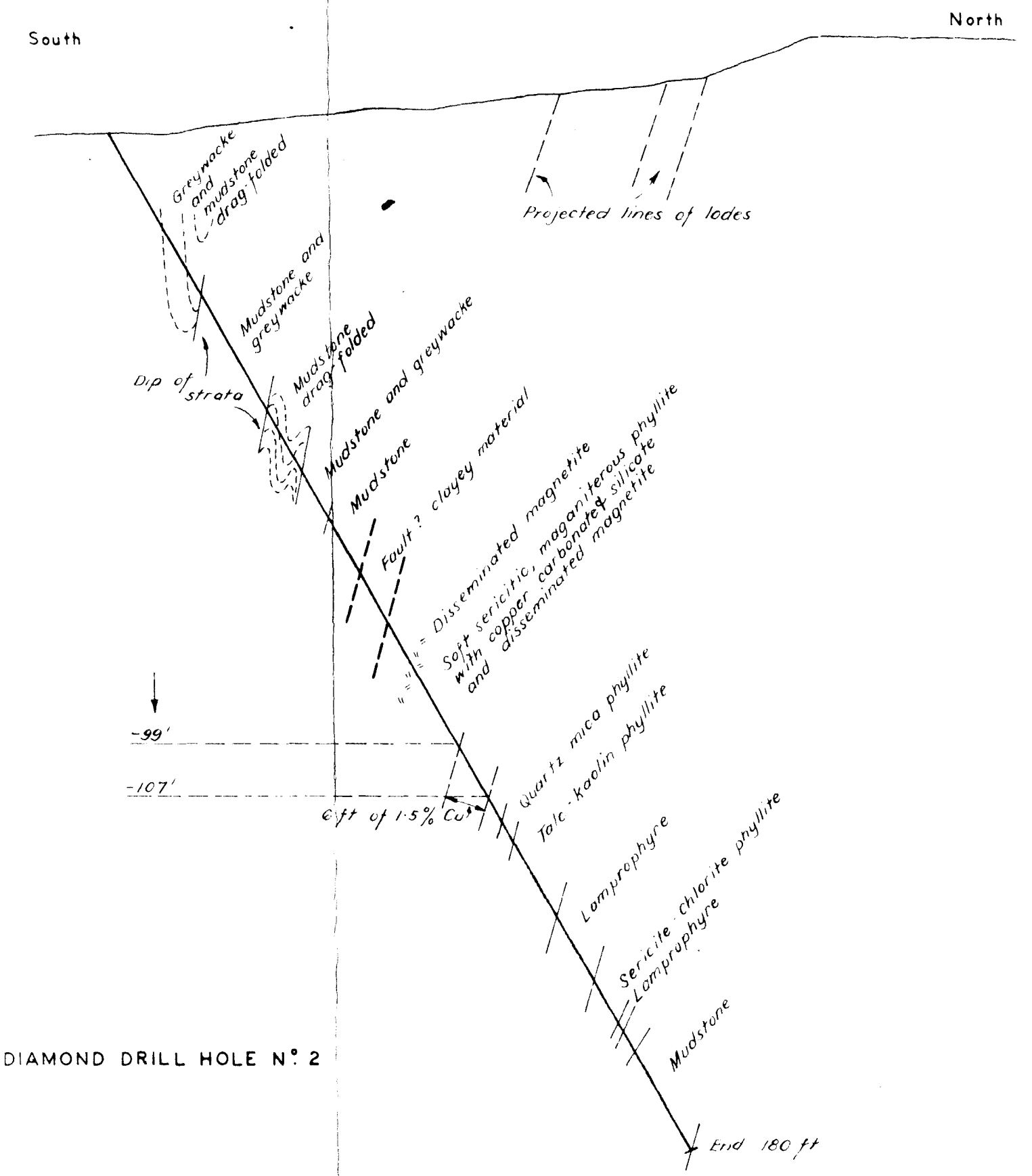
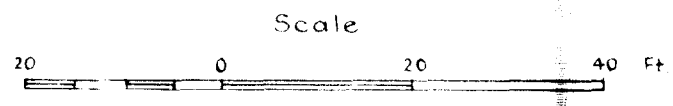
DD 5A -60° collapsed  
DD 5B -60° collapsed

Old DD -60° no record

DD 7 -60°

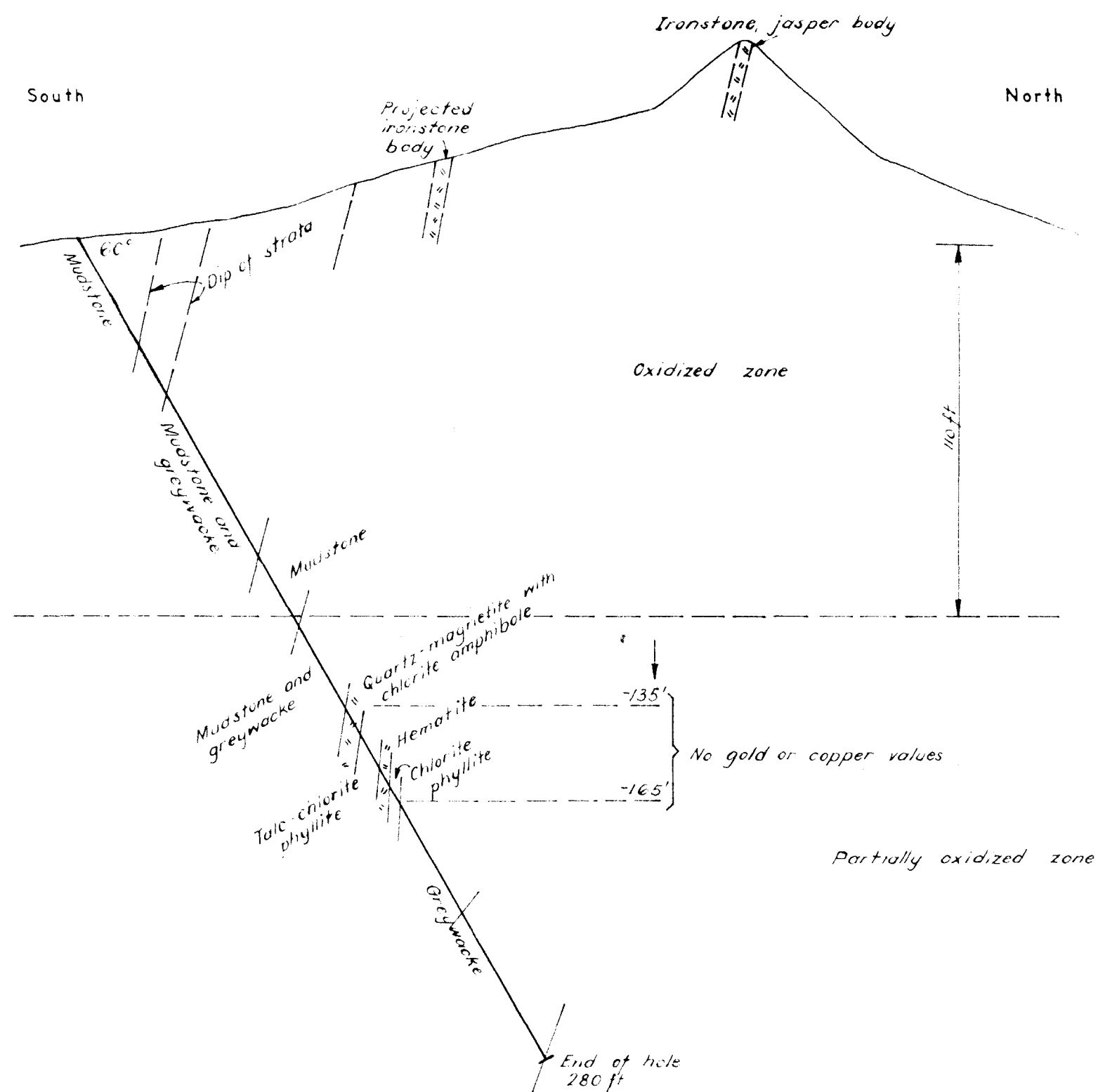


DIAMOND DRILL HOLE N°1

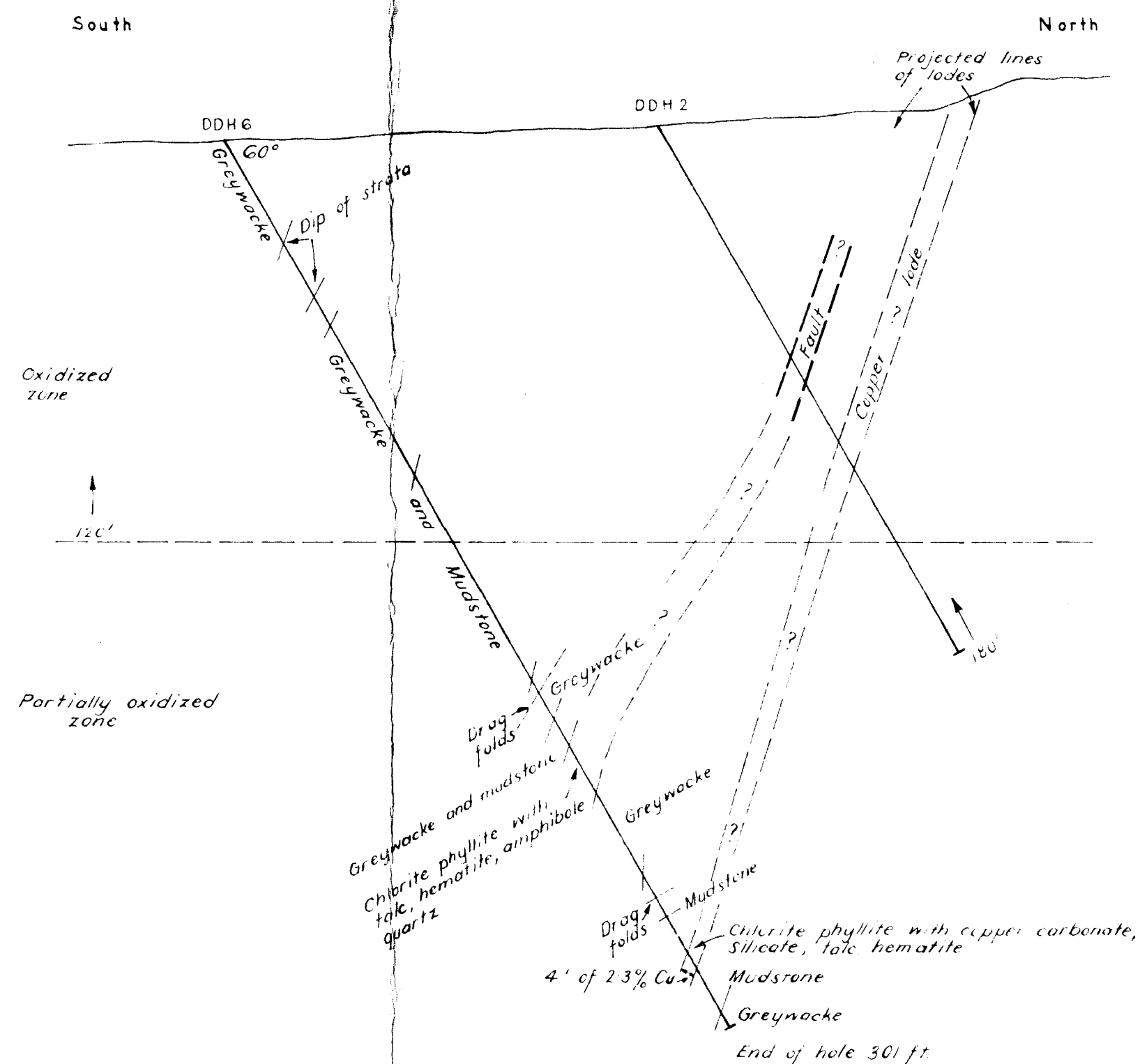
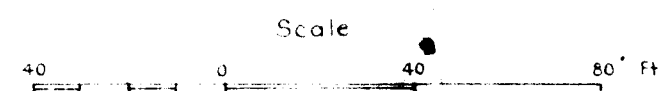


DIAMOND DRILL HOLE N°2

PINNACLES MINE,  
TENNANT CREEK N.T.

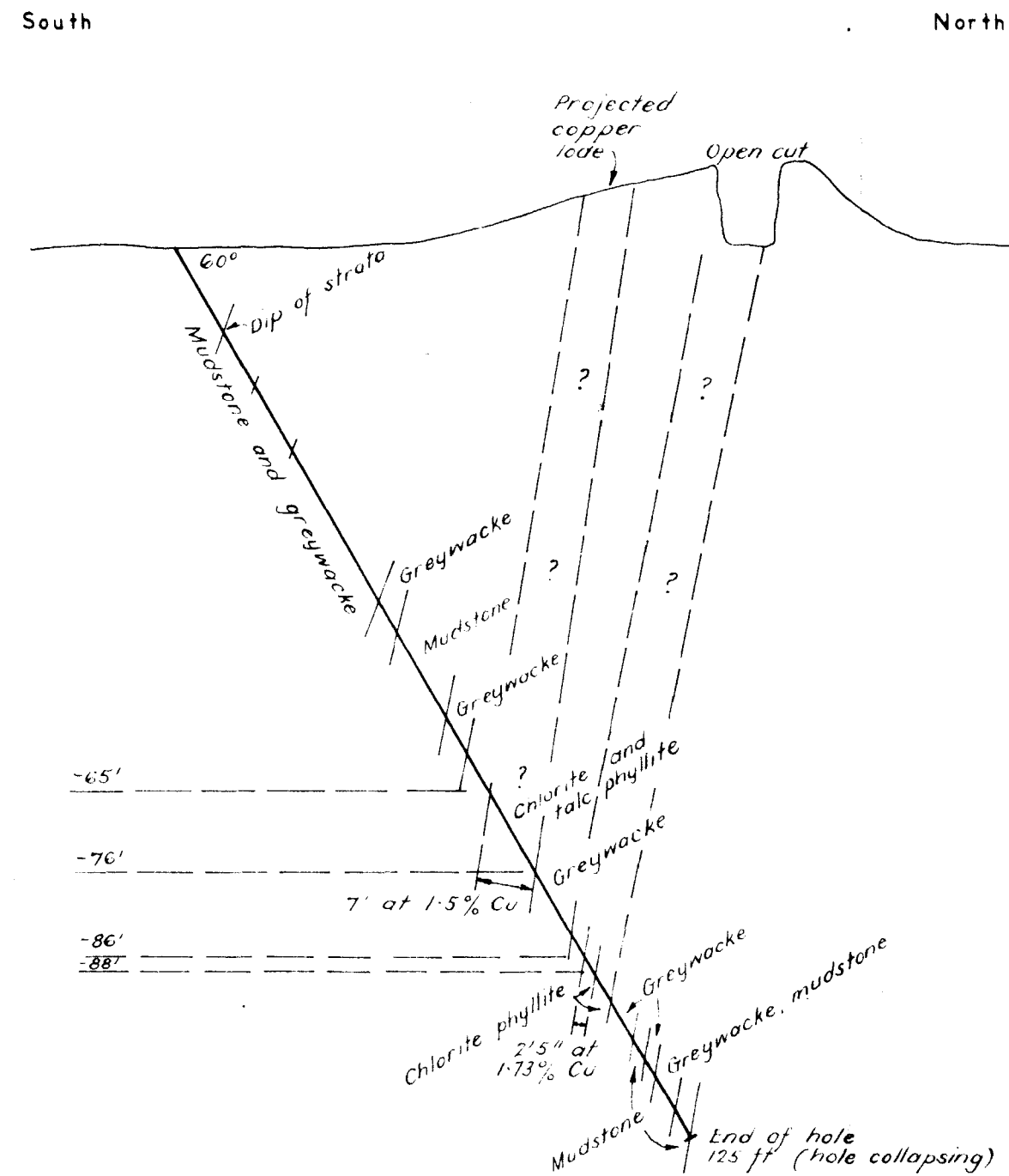


DIAMOND DRILL HOLE N°3

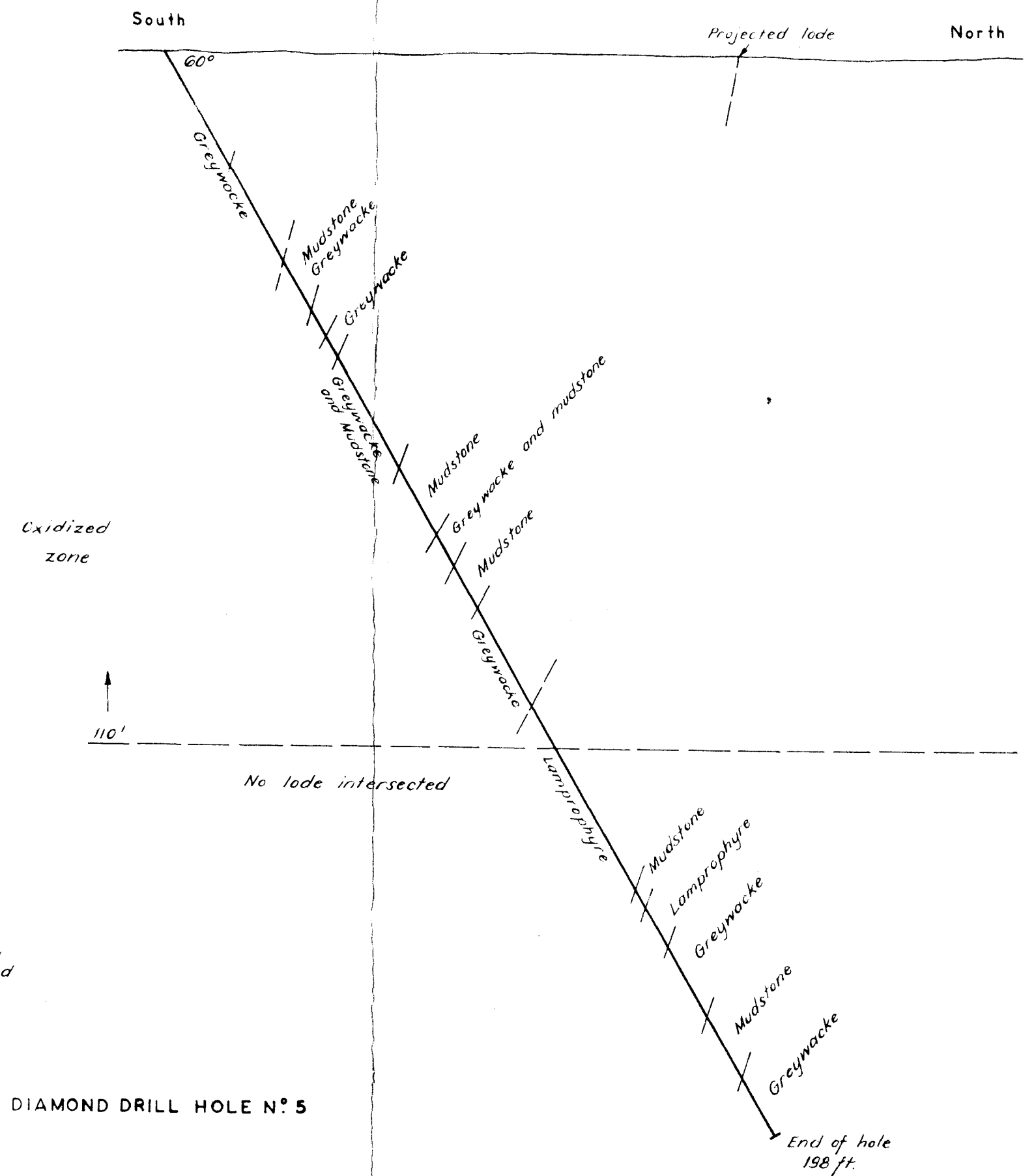
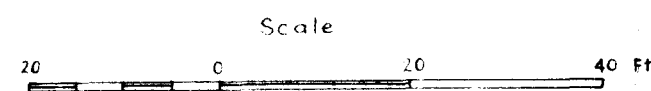


DIAMOND DRILL HOLE N°6

PINNACLES MINE  
TENNANT CREEK N.T.



DIAMOND DRILL HOLE N° 4

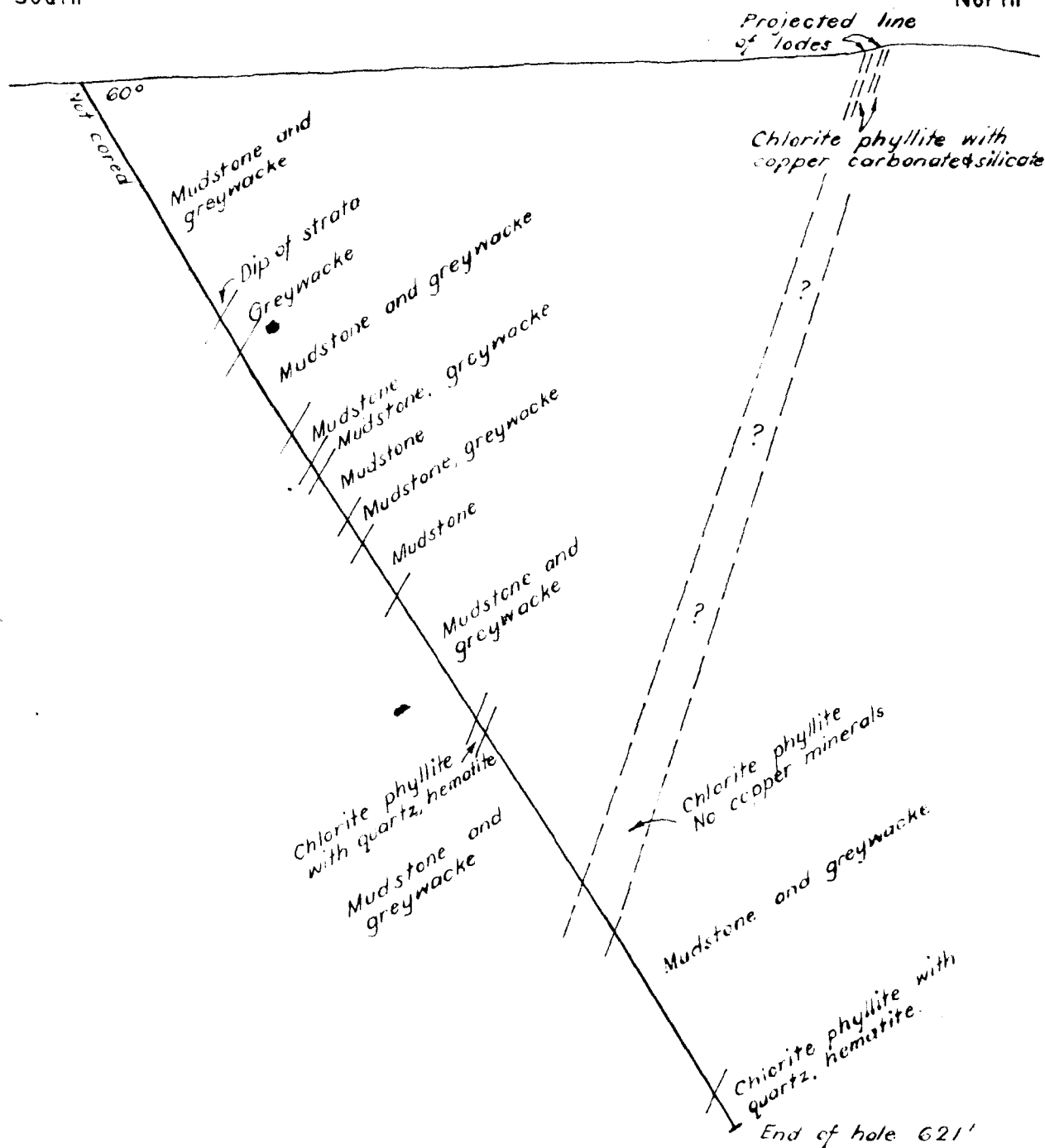


DIAMOND DRILL HOLE N° 5

# PINNACLES MINE, TENNANT CREEK N.T.

South

North



DIAMOND DRILL HOLE N° 7

# PINNACLES MINE TENNANT CREEK N.T.

