

GS 72/007 o/f.

THE DOCKER RIVER COPPER PROSPECTS  
REINHOLD REERVE  
BLOODS RANGE 1:250,000 SHEET AREA SG 52-3  
NORTHERN TERRITORY

1971

by

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## SUMMARY

Minor copper mineralization occurs in the undifferentiated Precambrian Blooms Range Beds in the Docker River area on the south-western margin of the Amadeus Basin.

Secondary copper minerals are present in veins intruding schists as well as altered and partly amygdaloidal epidote-rich basalt.

Shallow diamond drilling to test a surface copper grade as rich as 26% took place in 1971. The only mineralization visible in the core is minor malachite, chrysocolla and chalcochite occurring within quartz and quartz-orthoclase veins and, specifically, within calcite which heals fractures therein. Assay values are low.

A small surface mining operation carried out under supervision by aborigines from the local settlement may yield an adequate tonnage of high-grade oxidized copper ore extracted from the zone of supergene enrichment by means of trenching and pitting.

## INTRODUCTION

The Docker River Copper Prospects are situated 300 air miles west-south-west of Alice Springs and lie in the south-western quadrant of the Blooms Range 4-mile Sheet. The distance by road between Alice Springs and the Docker River Settlement is approximately 423 miles of which 270 miles of good road up to Ayers Rock tourist resort and the rest on the track which leads to Giles Meteorological Station, Western Australia (see Fig. 1).

The copper prospects where the drilling was carried out are located 15 and 18 miles east-north-east of the Settlement in the Hull River area between the Blooms Range and the Petermann Ranges (see Fig. 2).

Traces of copper, silver lead and gold have been found within the Precambrian Blooms Range Beds and Mount Harris Basalt at various localities scattered over this general area, but no deposits of sufficient size to encourage prospecting

have been discovered.

#### PREVIOUS INVESTIGATIONS

The most recent and comprehensive geological investigation was undertaken in 1962 when a field party from the Geological Branch of the Bureau of Mineral Resources, Canberra mapped the entire Bloods Range Sheet area (Forman, 1965 and 1966).

A limited programme of trenching and pitting was carried out by aboriginal prospectors from Docker River Settlement at a number of copper occurrences within a few miles east of Hull River between August and October 1970.

At the request of the Superintendent, Docker River Settlement Authority to Prospect 2359 of 1451 sq. miles, held by the Docker River Social Club was examined and a small drilling programme was decided to assess if a quite rich copper grade on the surface at two of the recently developed copper prospects would extend to any depth.

#### GENERAL GEOLOGY

The area between the Bloods Range and the Petermann Ranges contains igneous, metamorphic and sedimentary rocks of Precambrian age, of which the Upper Proterozoic sediments (Dean Quartzite and Pinyinna Beds) represent the base of the Amadeus Basin sequence.

All these units are surrounded, at the foot of the ranges, by Tertiary conglomerates; superficial Quaternary deposits almost entirely composed of aeolian sand overlie most of the area between the hills.

#### Undifferentiated Igneous, Metamorphic and Sedimentary Rocks

The area east of the Hull River, between the Bloods and the Ilyaralona Ranges (the last being already part of the composite Petermann Ranges), is mainly occupied by the Mount Harris Basalt and the Bloods Range Beds, two Precambrian rock

units, plus porphyry, granite and gneiss (Olia Gneiss) also Precambrian in age.

The Mount Harris Basalt comprises epidotized amygdaloidal basalt, tuff, agglomerate and quartzite.

The Bloods Range Beds, which represent the most broadly copper mineralized unit in the investigated area, include epidote-rich basalt, in part amygdaloidal, quartz-epidote rock, tuff, agglomerate, gneiss, whist, phyllite, slate and then quartzite, arkose, sandstone, siltstone and shale.

#### Structure

Apparently the sediments belonging to the Mount Harris Basalt and Bloods Range Beds were deposited during a period of intense volcanism and subsequently were folded, eroded and then metamorphosed as well as granitized during the "Petermann Ranges Orogeny", which took place in the late Upper Proterozoic.

The general strike of the foliation in the metamorphosed rocks is east-west with a steep dip to the north.

Faults are common and have a northwest-southeast trend.

#### ECONOMIC GEOLOGY

The Docker River Copper Prospects in the Hull River area are two of a number of copper occurrences within the Precambrian Bloods Range Beds and Mount Harris Basalt in the south-western margin of the Amadeus Basin.

The surface expression of the copper mineralization is given by the secondary minerals malachite, chrysocolla and chalcoelite. Minor azurite has been recorded and specular hematite as well as ilmenite are sometimes associated with malachite. The secondary copper sulphide chalcoelite generally occurs within calcite which is filling fractures in quartz- and quartz-orthoclase veins intruding the country rock possibly along shear zones.

No primary mineralization was intersected below the water table, the only visible traces of copper in the cores consisting of very minor chalcocite normally surrounded by malachite and chrysocolla as at the surface.

Diamond Drilling

Five diamond drill holes, totalling 1116 feet, were drilled by Mines Branch, Northern Territory Administration at the Docker River prospects (see Appendix I and figs. 3 to 6 inclusive).

Drillhole 1, located 140 feet north of the southern edge of the main pit at the prospect 15 miles east-north-east of the Settlement, was drilled with a  $45^{\circ}$  depression and a bearing of  $180^{\circ}$  magnetic to obtain information about primary sulphide mineralization beneath a zone rich in oxidized copper minerals associated with lamellar ilmenite. Only minor chrysocolla was detected in the core and the prospect was abandoned.

DDH 2 was sited 115 feet north of the point where the main coarsean cuts an east-west trending trench at the prospect 18 miles east-north-east of the Settlement (Also DDH's 3, 4 and 5 were put down at this prospect). This hole was drilled at a depression of  $45^{\circ}$  on a bearing of  $180^{\circ}$  magnetic to investigate the section below the trench, which is almost running parallel to the rock foliation and where the richest surface copper grade was assayed; no significant mineralization was intersected.

Drillhole 3, planned to test another copper-rich zone in the vicinity of a pit east of the main aforesaid trench, was drilled vertically. Chalcocite with subordinate malachite and chrysocolla was found to occur mainly in calcite infillings within quartz veins; the host rock was commonly chlorite schist.

With the same aim as drillhole 2, DDH 4 and DDH 5 were put down respectively 75 feet south and 120 feet north of No. 2 drillsite, both with  $180^{\circ}$  magnetic bearing and depressions of  $72^{\circ}$  for No. 4. and  $45^{\circ}$  for No. 5. Results were not encouraging and therefore it was decided to stop the drilling programme.

### Assay Results

Forty-six samples, including three representative surface chip samples taken from both prospects and forty-three split core samples were assayed (see Appendix II).

The chip samples were assayed for copper, lead, zinc and titanium (the last one because of the presence of ilmenite at the first prospect) and only copper gave encouraging results up to 26%; 23.05% Cu was the average grade at the second prospect.

The split samples, mainly in two-foot lengths, were then spectrographically analysed for copper, silver and tungsten (partly). The only result really worth mentioning is from DDH 1 at between 73 and 82 feet, downhole depth, where copper averaged 0.21%, the highest assay value being 2310 p.p.m. on a 7 foot-interval. Silver ranged up to 8 p.p.m. (= 5 dwt/ton) in DDH 2 at between a downhole depth of 212 and 213 feet, where some chalcoelite apparently bearing silver occurs. The tungsten analyses were requested for some epidote-rich rock cut by quartz-calcite veinlets, within which a few rounded specks of what was thought to be scheelite were identified using the UV lamp. Tungsten results up to 950 p.p.m. in DDH 1 and 340 p.p.m. in DDH 2 were not considered significative.

### Ore Reserves

No attempt was made to compute available oxidized ore reserves since it was not considered worth carrying out especially by using a diamond drill.

A series of very shallow wagon drill holes on a 50-foot grid may indicate, specifically at the eastern prospect, sufficient tonnage of high-grade copper ore within a few feet of the surface and thus warrant a limited exploitation under supervision by local aborigines.

### CONCLUSIONS AND RECOMMENDATIONS

Copper mineralization at the Docker River prospects does not extend to any depth; it consists of malachite, chrysocolla

and chalcocite concentrated near the surface and mainly in association with quartz-orthoclase and calcite veins intruding schists and metamorphosed volcanics.

Considering the superficial high copper grade at the eastern prospect a series of shallow wagon drill holes may be warranted to assess the feasibility of a small mining operation.

No further diamond drilling is recommended at this stage.

ACKNOWLEDGEMENTS

The assistance and hospitality given by the Superintendent and the staff of the Docker River Settlement as well as by members of the Docker River Social Club are gratefully acknowledged.

REFERENCES

- |              |      |  |
|--------------|------|--|
| Forman, D.J. | 1965 | Regional geology of the south-western margin, Amadeus Basin.<br>Bur. Min. Resour. Austr. Rep. 87 |
| Forman, D.J. | 1966 | Bloods Range, N.T. Explanatory Notes, Geological Sheet SG 52-3,<br>Bur. Min. Resour. Australia.  |

## APPENDIX I

DOCKER RIVER D.D.H. 1

Location : 140° N of S end of pit.  
 Bearing : 180° magnetic.  
 Depression : 45°.  
 Logged by : J. S. Morlock.  
 Note : All angles measured relative to core axis (0°).

<u>Depth</u>	<u>Core Size</u>
0' - 13'	NX Casing
13' - 35'	NX
35' - 206'	BX

<u>Depth</u>	<u>Core Recovered</u>	<u>Remarks</u>
0' - 9'	3½"	WEATHERED SCHIST: Highly altered, sheared. Rock is mainly chlorite, serpentine, sericite; iron-stained. Quartz veins parallel to schistosity (90°).
9' - 87'	70 "	CHLORITE SCHIST: As above but much less sheared and weathered. Highly intruded by quartz. Very rare specks of chrysocolla in quartz. Fractures in quartz are calcite-filled. Very rare red garnets.
		Also: 17'-18' : quartz-calcite vein. 19'-19½' : random epidote stringers. 44'-45' : quartz-orthoclase-calcite vein. 45½'-46½' : quartz vein. 52½'-54' : quartz-calcite vein.
87' - 206'	119 "	CHLORITE SCHIST: May be highly altered basalt. Chloritized, serpentized. Schistosity approx. 55°. Quartz-orthoclase-calcite veining generally parallel to schistosity. Rare specks of chrysocolla, within the quartz veins and possibly within the calcite which fills fractures in the quartz.
206'	---	End of hole.

LOCKER RIVER D.D.H. 2

Location : 115° N of middle of first cross-trench.  
Bearing : 180° magnetic.  
Depression : 45°.  
Logged by : J. S. Morlock.  
Note : All angles measured relative to core axis (0°).

	<u>Depth</u>	<u>Core Size</u>
	0' - 42'	NX
	42' - 251'	BX

<u>Depth</u>	<u>Core Recovered</u>	<u>Remarks</u>
0' - 59½'	31'	CHLORITE-TALC-SERICITE SCHIST: Highly sheared. Somewhat weathered to approx. 30'. Quartz-calcite veins parallel schistosity (approx. 65°)  Also : 10'-12' 23½'-34' (6' recovered) } quartz veins.
59½' - 78'	19'	QUARTZ-EPIDOTE ROCK: Green, fine-grained. Quartz, epidote, rare mica specks. Probably a vein-filling rock.
78' - 117'	39'	ALTERED BASALT: Epidote as lineations from amygdales and random stringers. Quartz-calcite-(rarely) orthoclase veins bearing rare chalcocite specks.
117' - 155'	38'	CHLORITE-SERICITE SCHIST: Somewhat talcose. Contact with above approx. 70'.
155' - 164'	9'	QUARTZ-EPIDOTE ROCK: As for 59½'-78'.
164' - 196'	30'	ALTERED BASALT (?): Schistose. Chloritized, epidotized. Quartz veins bearing very rare chalcocite specks.
196' - 208'	11½'	EPIDOTE-QUARTZ ROCK: Contains angular fragments of dark very-fine grained rock. Possible fault zone.
208' - 221'	13'	CHLORITE SCHIST: Highly fractured; quartz-filled. Fractures in quartz are calcite-filled.  212' : Very rare specks of what appeared to be chalcocite were analyzed spectroscopically and silver was found to be present. Mineral is probably silver-bearing chalcocite.
221' - 232'	11'	QUARTZ EPIDOTE ROCK: As for 196'-208'.
232' - 251'	17'	ALTERED BASALT: Relatively unaltered, 232-approx. 240' then gradational to chlorite schist. Rare epidote. Chloritized.
251' - --	--	End of hole.

DOOKER RIVER D.D.H. 3

Location : 9' from W edge of pit.

Bearing : (vertical).

Depression : 90°.

Logged by : J. S. Morlock.

Note : All angles measured relative to core axis (0°).

<u>Depth</u>	<u>Core Size</u>
0' - 17'	BX
17' - 42'	NX
42' - 159'	BX

Depth	Core Recovered	Remarks
0' - 12'	3½'	QUARTZ VEIN: Highly fractured. Very rare copper mineralization; e.g. in one case a chalcocite speck was surrounded by concentric rings of malachite and chrysocolla. (In general, copper mineralization appears within calcite which fills fractures in quartz; it also appears within the quartz itself).
12' - 44'	23'	CHLORITE SCHIST: May be highly altered basalt. Chloritic with some unaltered olivine also present. Minor hornblende. Epidote-quartz-calcite veining parallel schistosity (approx. 50°).
44' - 52'	7'	QUARTZ-EPIDOTE ROCK: Epidote and quartz containing breccia of dark fine-grained rock.
52' - 78'	24'	CHLORITE SCHIST: Schistosity approx. 45°. Does not appear to necessarily be altered basalt.
78' - 80'	2'	QUARTZ-EPIDOTE ROCK: Contains breccia; as for 44'-52'.
80' - 130'	48'	CHLORITE SCHIST: Schistosity approx. 50°. Also: 92'-93' : quartz-calcite vein with rare malachite in calcite. 109'-110' : quartz-calcite vein with rare malachite, chalcocite, in calcite (in fractures in quartz).
130' - 159'	29'	AMYGDALOIDAL BASALT: Little (if any) gneissosity. Spidote amygdales. Random calcite (rarely, quartz) veining. Feldspar is generally white, unstriated. Possibly rare chalcocite in calcite.
159' ---	--	End of hole.

LOCKER RIVER D.D.H. 4

Location : 75' S of No. 2 drill site.

Bearing : 180° magnetic.

Depression : 72°.

Logged by : J. B. Morlock.

Note : All angles measured relative to core axis (0°).

	<u>Depth</u>	<u>Core Size</u>
	0' - 20'	NX
	20' - 200'	BX

<u>Depth</u>	<u>Core Recovered</u>	<u>Remarks</u>
0' - 27'	13'	QUARTZ-EPIDOTE ROCK: Core highly broken.
27' - 109'	80'	ALTERED BASALT: Gneissic. Epidote as lineations from amygdales as relatively unaltered amygdales. Also in stringers parallel gneissosity (50°). Chloritized. Also : 49'-57' : Highly epidotized.
109' - 115'	6½'	QUARTZ-EPIDOTE ROCK:
115½' - 155'	38'	CHLORITE-EPIDOTE SCHIST: Schistosity approx. 53°. Highly quartz-calcite veined.
155' - 175'	20'	QUARTZ-EPIDOTE ROCK: Also : 171½'-172½' quartz vein containing rare chalcocite (?) blebs (apparently) in quartz.
175' - 200'	25'	ALTERED AMYGDALOIDAL BASALT: As for 27'-109' but more highly epidotized. Also : 177'-179' : } Quartz-calcite veins containing 193½'-194' : } very rare chalcocite specks.
200' ----	---	End of hole.

DOCKER RIVER D.D.H. 5

Location : 120' N of No. 2 drill site.

Bearing : 180° magnetic.

Depression : 45°.

Logged by : J. S. Morlock.

Note : All angles measured relative to core axis (0°).

	<u>Depth</u>	<u>Core Size</u>
	0' - 13'	NX Casing
	13' - 62'	NX
	62' - 193'	BX
	193' - 300'	AX

<u>Depth</u>	<u>Core Recovered</u>	<u>Remarks</u>
0' - 8'	3'	QUARTZ VENIN: Highly broken core.
8' - 19'	2'	CHLORITE SCHIST: Schistosity approx. 90°.
19' - 96'	65'	CHLORITE SCHIST: As above but also quartzose. Also : 74'-75' : quartz vein. 90'-96' : quartz-calcite vein.
96' - 136'	40'	CHLORITE GNEISS: Grades from above.
136' - 152'	16'	QUARTZ-FELDSPAR ROCK: Minor calcite filling fractures.
152' - 161'	9'	CHLORITE SCHIST: Schistosity approx. 50°.
161' - 166½'	5'	QUARTZ-EPIDOTE ROCK.
166½' - 300'	32'	ALTERED AMYGDALOIDAL BASALT: Gneissosity approx. 50° to approx. 193' whereupon gneissosity becomes difficult to detect. Epidote as stringers and lineated amygdales. Minor quartz-calcite veining; rare malachite specks, blebs. Also : 248'-252' : Fracture zone, quartz-calcite Healed. Very rare malachite specks.
300' ---	---	End of hole

## APPENDIX II

ASSAY RESULTS \*DOCKER RIVER

## Chip Samples

	<u>Cu%</u>	<u>Ti%</u>	
70/AS/6631	11.9	1.6	{ Prospect 15 miles ENE of Settlement }
70/AS/6632	20.1	< 0.01	< 0.01 { Prospect 16 miles ENE }
70/AS/6633	26.0	< 0.01	< 0.01 { of Settlement. }

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DOCKER RIVERD.D.H. 1  
(Split Core)

Parts per Million

<u>INTERVAL</u>	<u>Cu</u>	<u>Ag</u>	<u>W</u>
44' - 46'	700	2	- *
52' - 54'	225	2	- *
62' - 64'	100	<2	<100
73' - 75'	2310	<2	<100
78' - 80'	2310	2	- *
80' - 82'	1600	4	- *
118' - 120'	25	2	- *
132' - 133'	30	2	- *
135' - 136'	15	<2	- *
141' - 142'	30	2	<100
156' - 158'	25	2	950
163' - 164'	90	<2	- *
168' - 169'	25	<2	<100
193' - 194'	270	<2	- *

Note : D.D.H. 1 is located at the prospect 15 miles ENE of Settlement.  
 D.D.H.'s 2,3,4 and 5 are located at the prospect 16 miles ENE of Settlement.

D.D.H. 2  
(Split Core)

Parts per Million

<u>INTERVAL</u>	<u>On</u>	<u>ΔE</u>	<u>W</u>
68° - 69°	15	<2	<100
95° - 96°	30	<2	<100
114° - 117°	90	<2	340
164° - 165°	25	<2	- *
202° - 205°	10	<2	<100
212° - 213°	15	8	<100
217° - 218°	25	<2	- *
225° - 227°	10	<2	- *
227° - 229°	10	2	- *
229° - 230°	10	<2	<100
232° - 234°	≤5	<2	- *
234° - 236°	10	<2	- *

D.D.H. 3  
(Split Core)

Parts per Million

<u>INTERVAL</u>	<u>On</u>	<u>ΔE</u>	<u>W</u>
0° - 12°	10	2	- *
51° - 52°	10	<2	<100
79° - 80°	<5	2	<100
92° - 93°	10	2	- *
109° - 110°	10	<2	- *
123° - 125°	10	<2	<100
131° - 132°	10	<2	<100

D.D.H. 4  
(Split Core)

Parts per Million

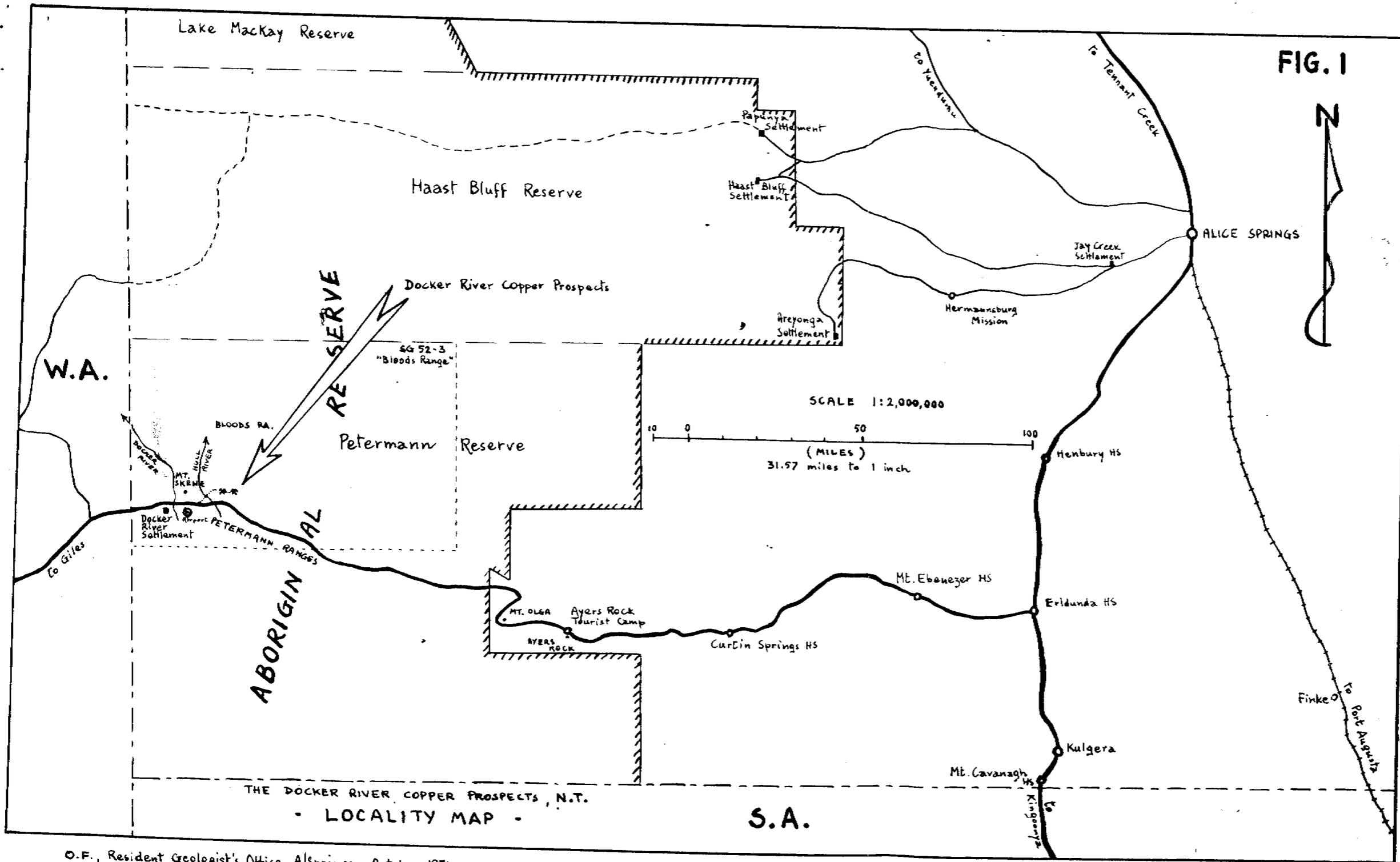
<u>INTERVAL</u>	<u>On</u>	<u>ΔE</u>	<u>W</u>
18° - 19°	30	<2	<100
50° - 51°	15	2	<100
172° - 173°	10	<2	<100
176° - 177°	10	<2	<100
181° - 183°	10	<2	<100

D.D.H. 5  
(Split Core)

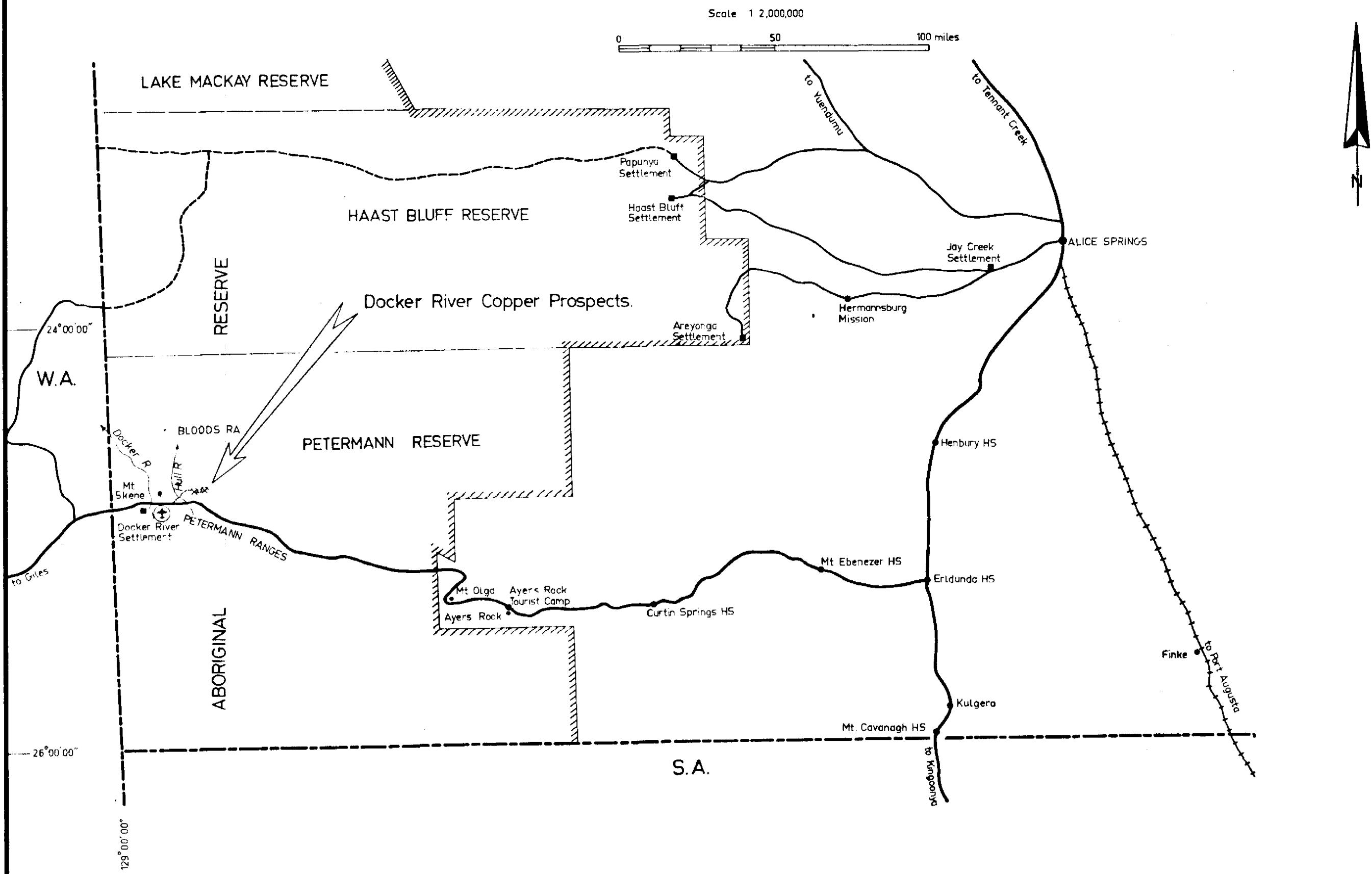
Parts per Million

<u>INTERVAL</u>	<u>Cu</u>	<u>Ag</u>	<u>W</u>
74' - 75'	10	<2	- *
90' - 92'	10	<2	- *
153' - 155'	10	2	<100
163' - 165'	15	<2	<100
248' - 252'	10	<2	<100

+ Assays by Mines and Water Resources Branch Laboratory, Darwin.  
Detection Limits : Cu 5 ppm, Ag 2 ppm, W 100 ppm .  
\* "-" means analysis not requested.



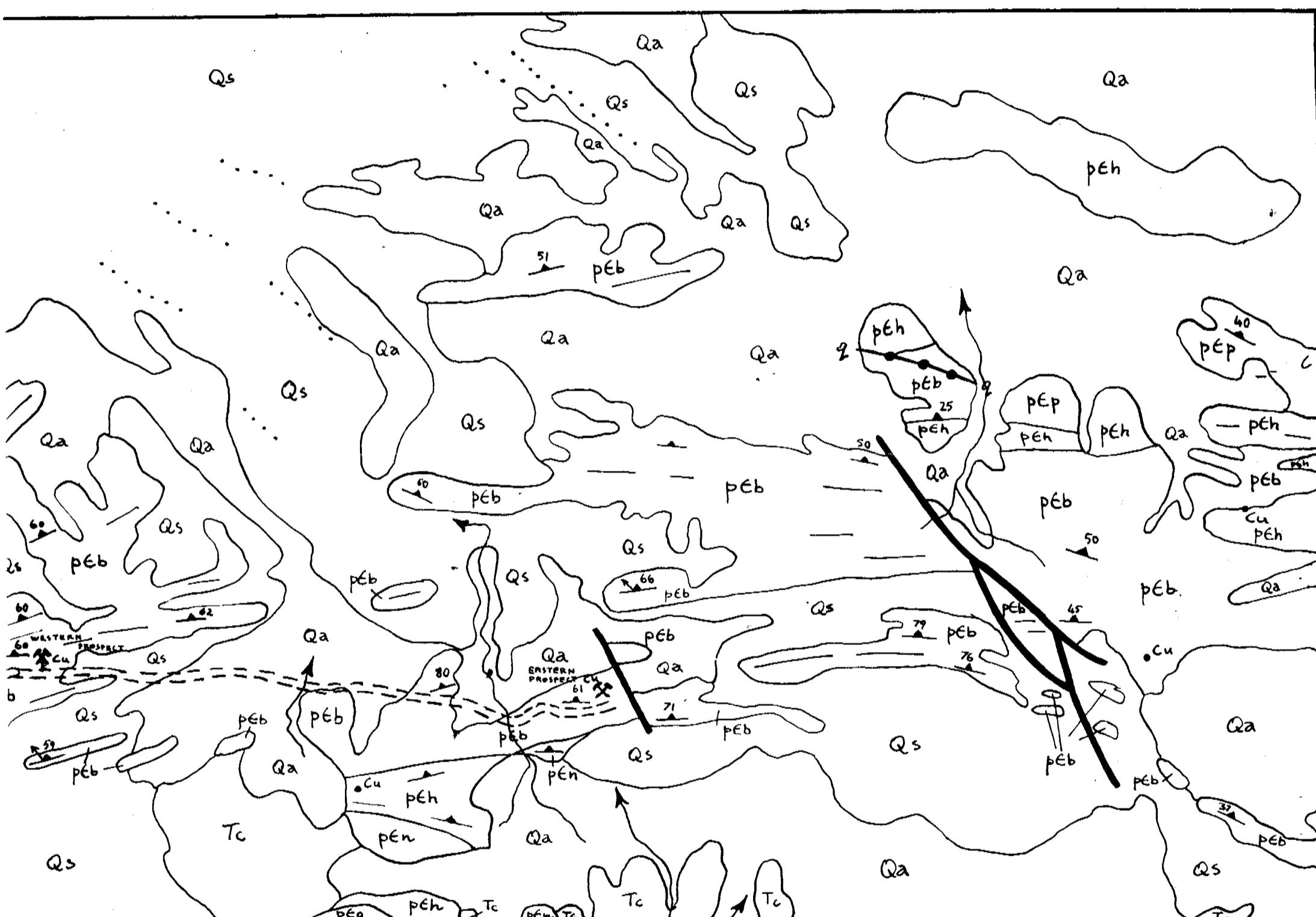
LOCALITY MAP  
DOCKER RIVER COPPER PROSPECTS, N.T.



THE DOCKER RIVER COPPER PROSPECTS, N.T.

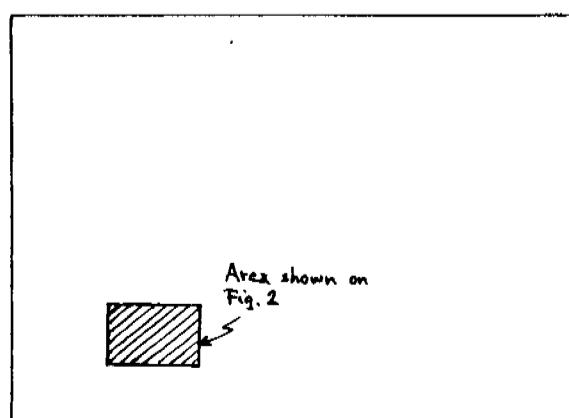
SKETCH-MAP OF THE PROSPECTS AREA, EAST OF THE HULL RIVER

FIG. 2



In part after FORMAN & STEWART, B.M.R.

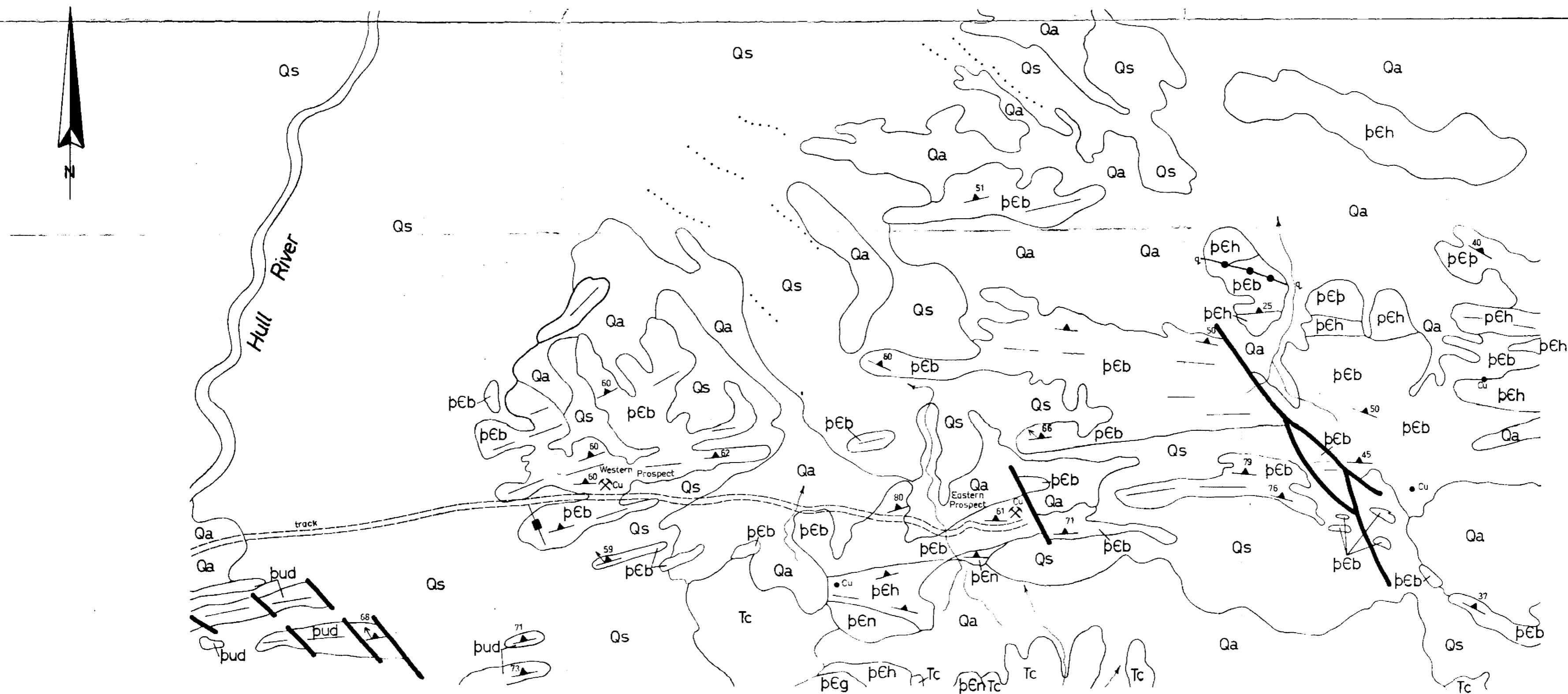
- Quartz vein
- P.A. = Position approximate
- Fault
- Water-course
- Vertical joint
- Trend line
- NOTE:  
Geology based on reconnaissance mapping  
and a number of traverses, using airphotos.
- Strike and dip  
of foliation
- Strike and dip  
of foliation and  
plunge of lineation
- Mineral occurrence
- Mineral prospect
- Sand dune



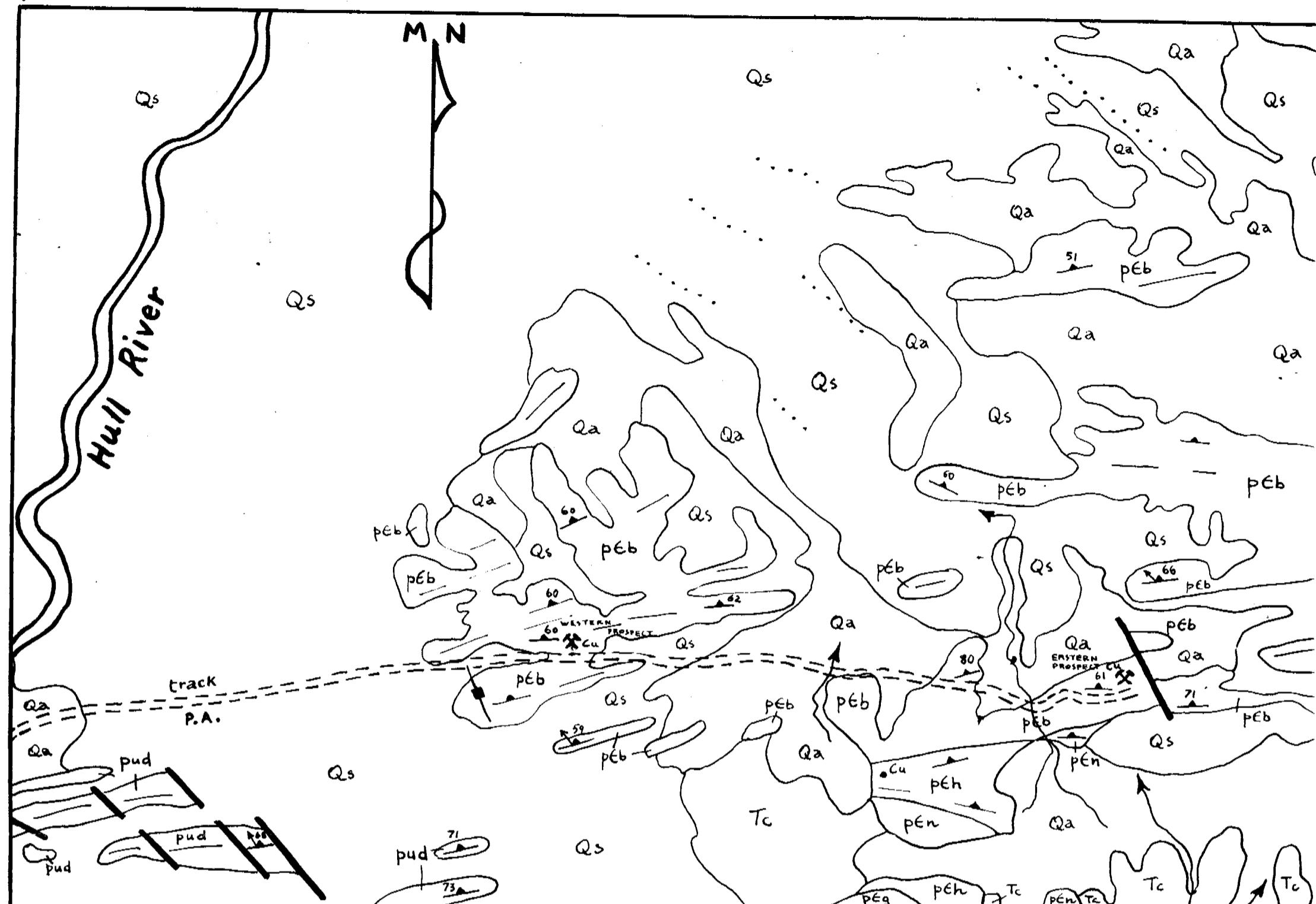
SG 52-3  
"Bloods Range"  
1:250,000 Sheet

SCALE 1:46,500  
(Photoscale)

0 0.5 1 2 3  
MILES



THE DOCKER RIVER COPPER PROSPECTS, N.T.  
GEOLOGICAL SKETCH-MAP OF THE PROSPECTS AREA, EAST OF THE



REFERENCE :

Quaternary {  
 Qs - Aeolian sand  
 Qa - Alluvium  
 Tertiary {  
 Tc - Conglomerate  
 U. Proterozoic {  
 pud - Dean Quartzite

Precambrian (undifferentiated)  
 peg - Granite  
 ptn - Ola Gneiss  
 pfp - Quartz-feldspar porphyry  
 pfb - Bloods Range Beds (mainly schists & basalt)  
 pth - Mount Harris Basalt  
 Geological boundary

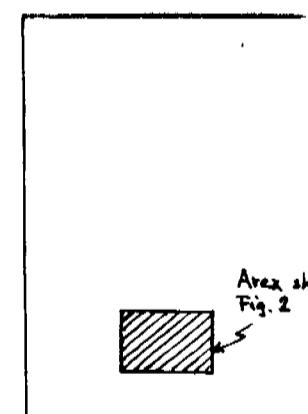
- Q Quartz vein
- Fault
- Vertical joint
- Strike and dip of foliation
- Strike and dip of foliation and plunge of lineation
- Cu Mineral occurrence
- Cu Mineral prospect
- .... Sand dune

P.A. = Position approximate

Water-course

Trend line

NOTE :  
Geology based on reconnaissance mapping  
and a number of traverses, using airphotos.



O.F., Resident Geologist's Office, Alice Springs, October 1971

## THE DOCKER RIVER COPPER PROSPECTS, N.T.

## Western Prospect

M N

FIG. 3

Surface plan based on tape and compass survey.  
Elevations: barometric

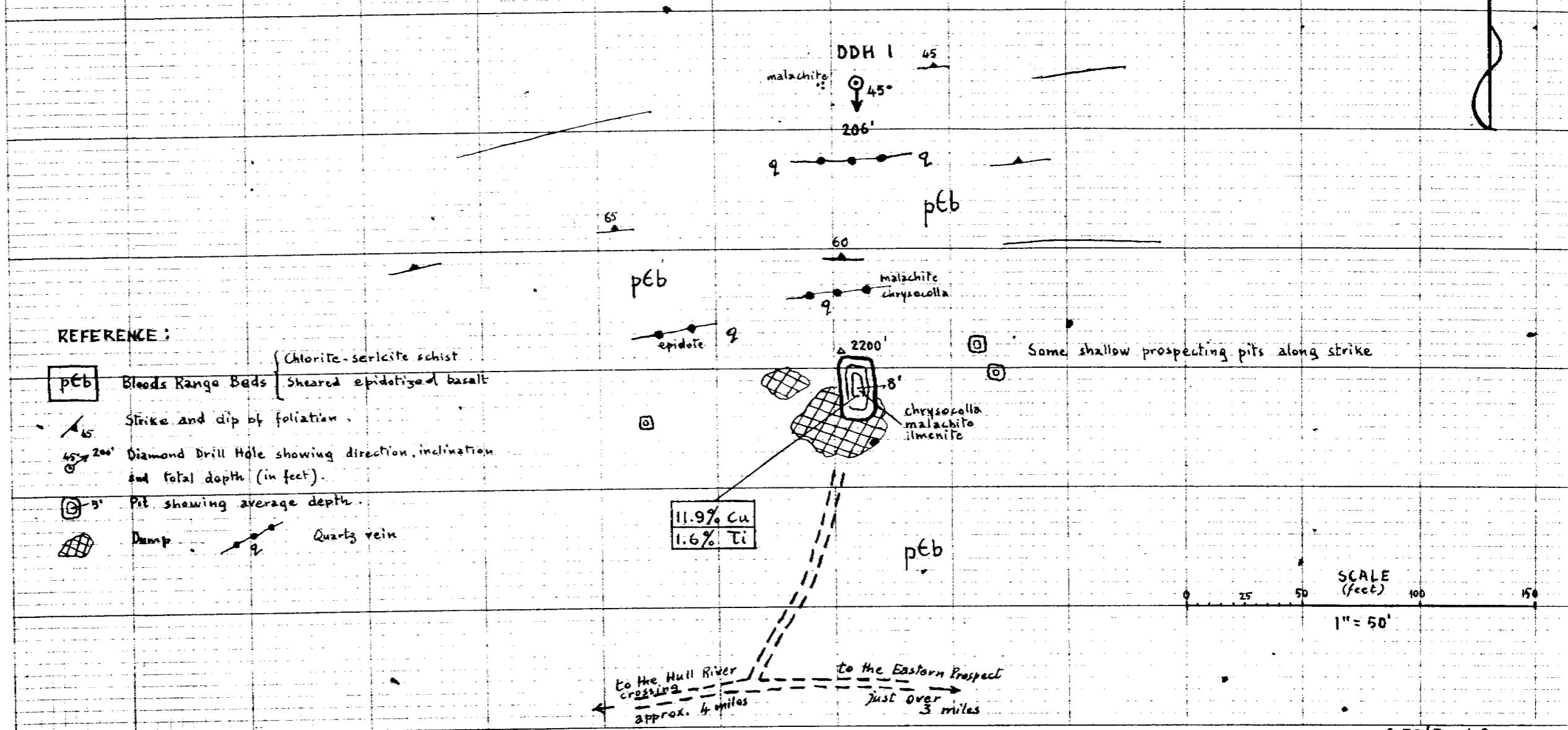
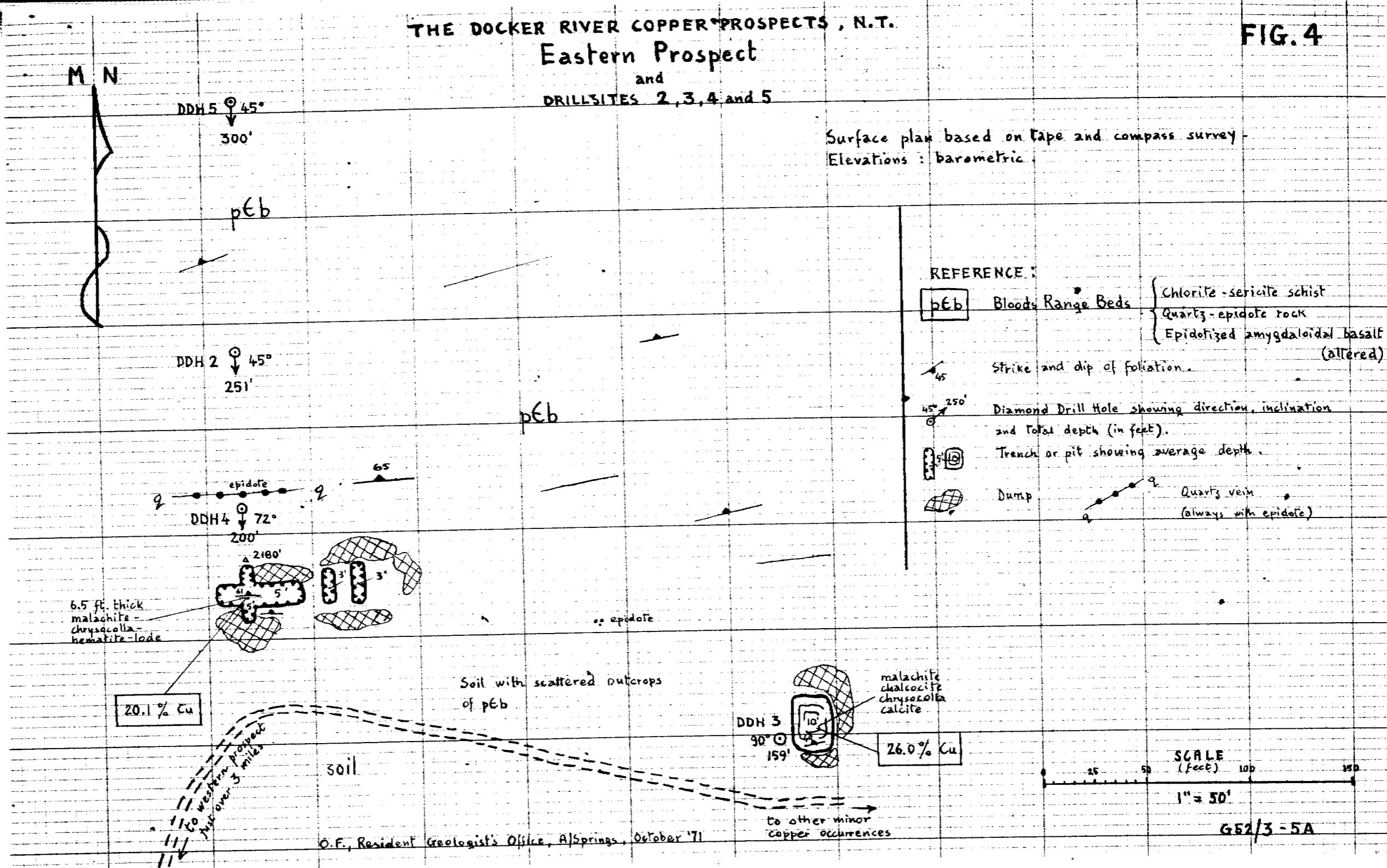


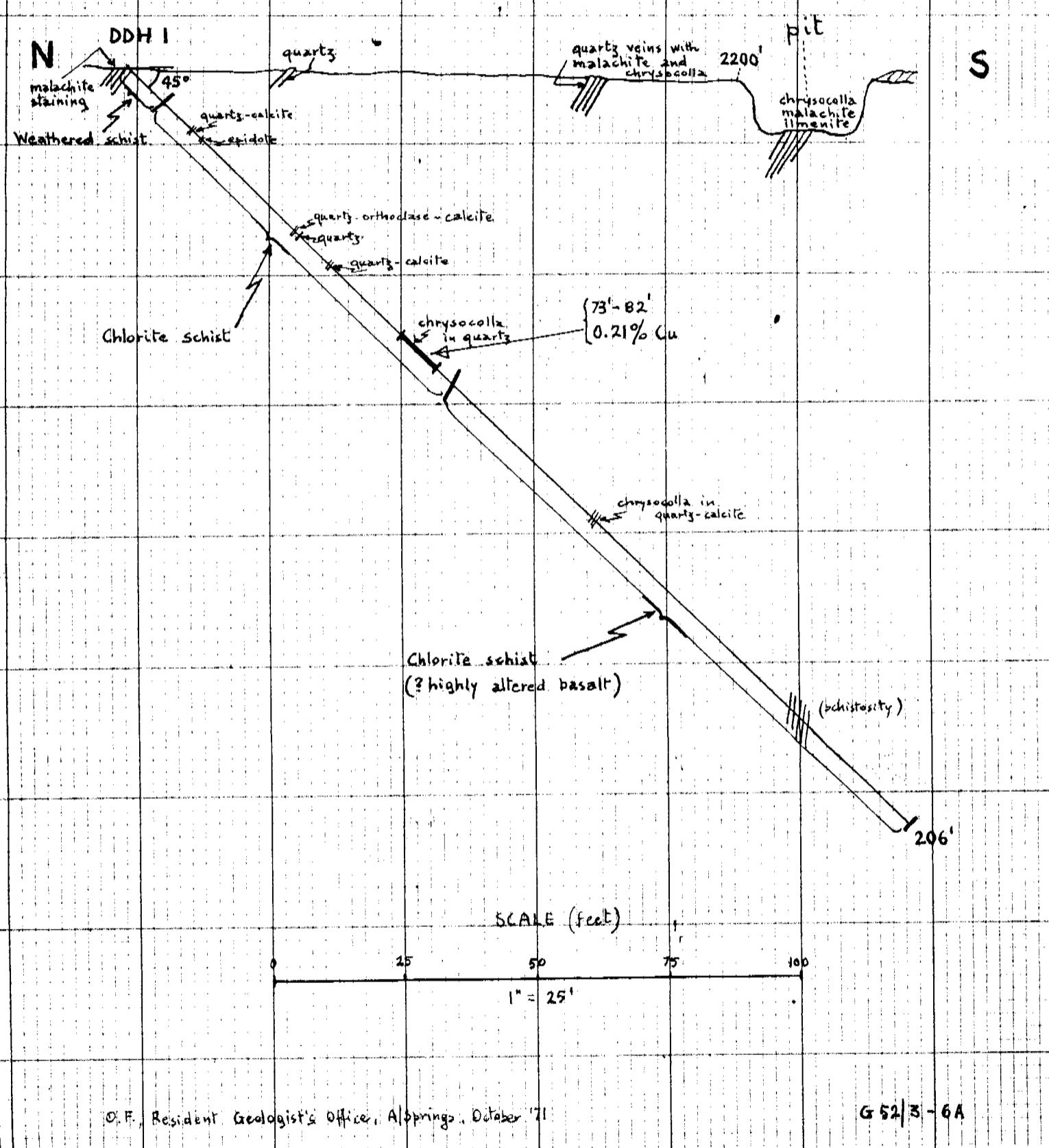
FIG. 4



THE DOCKER RIVER COPPER PROSPECTS  
N.T.

Section of Drillhole I  
(Western Prospect)

FIG. 5



O.F., Resident Geologist's Office, Al�prings, October '71

G 52/3 - 6A

THE DOCKER RIVER COPPER PROSPECTS  
N.T.  
Sections of Drillholes 2, 3, 4 & 5  
(Eastern Prospect)

F.G.6

