DEPARTMENT OF MINES
SOUTH AUSTRALIA

GEOLOGICAL SURVEY
REGIONAL GEOLOGY DIVISION

PRELIMINARY REPORT ON STRATIGRAPHIC DRILLING IN E.L.207 AND ADJACENT AREAS, NORTHERN YORKE PENINSULA

by

J. PARKER

and

B. THOMSON

Rept.Bk.No.77/142
G.S. No. 5961
DM. No. 1125/73

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ABSTRACT

Stratigraphic drilling in the Bute and Pt. Broughton region of northern Yorke Peninsula has outlined the nature and subsurface distribution of Adelaidean and pre-Adelaidean rocks. The Adelaidean sediments are relatively flat lying, moderately thin and are comparable with Stuart Shelf strata. The pre-Adelaidean rocks consist of a thick, steeply dipping succession of interlayered, low grade meta-siltstone and dolomite intruded by granite. Copper mineralization has been located at several different horizons within the Adelaidean strata.

INTRODUCTION

The Department of Mines Torrens Hinge Zone project was initiated by Bute No. 1 stratigraphic diamond drill hole in 1969. In 1973 the Director of Mines took out E.L. 75 covering the Bute-Pt. Broughton area where drilling in the Bute region of the E.L. showed some signs of mineralization (for a progress report on the early drilling and geological mapping see Thomson, 1973, and Thomson et al., 1976). This portion of the E.L. area was surrendered in 1975 to North Broken Hill Ltd. (now E.L. 248) while the northern portion encompassing Alford and Pt. Broughton was retained by the Director as E.L. 207.

There were two main reasons for maintaining an interest in this area. One was to show that suitable metalliferous rock strata existed beneath alluvial sands and clays and thus establish

company interest; and the other was to correlate those strata with known sequences both on the Stuart Shelf, west of Lake Torrens, and in the Adelaide Geosyncline to establish stratigraphic guidelines to assist in current company exploration on the Stuart Shelf and Torrens Hinge Zone.

The purpose of this preliminary report is to make available summary geological logs of recent and previously unreported drilling within E.L. 207 and adjacent areas (Plan 1). Anomalously mineralised zones are also reported. A future report now in preparation will contain detailed accounts of all the work carried out in the region including detailed surface mapping, geological, geophysical and geochemical logs of the drillholes, and conclusions.

REGIONAL GEOLOGY

Revisionary surface geological mapping in the licence area was completed by Wayne McCallum of the Geological Survey during 1973. He reported that most of the map area is covered by Quaternary units comparable to sequences described by Firman (1969) from the Spencer Basin and St. Vincent Basin. The pre-Quaternary units are exposed only along the coast - Tickera Granite (Carpentarian) and Melton Limestone (Tertiary, Lindsay, 1970); in the ranges to the east - mainly upper Adelaidean quartzites (lateral equivalents of the ABC Range Quartzite); and in occasional wells and quarries - Adelaidean sediments and pre-Adelaidean low grade metasiltstones.

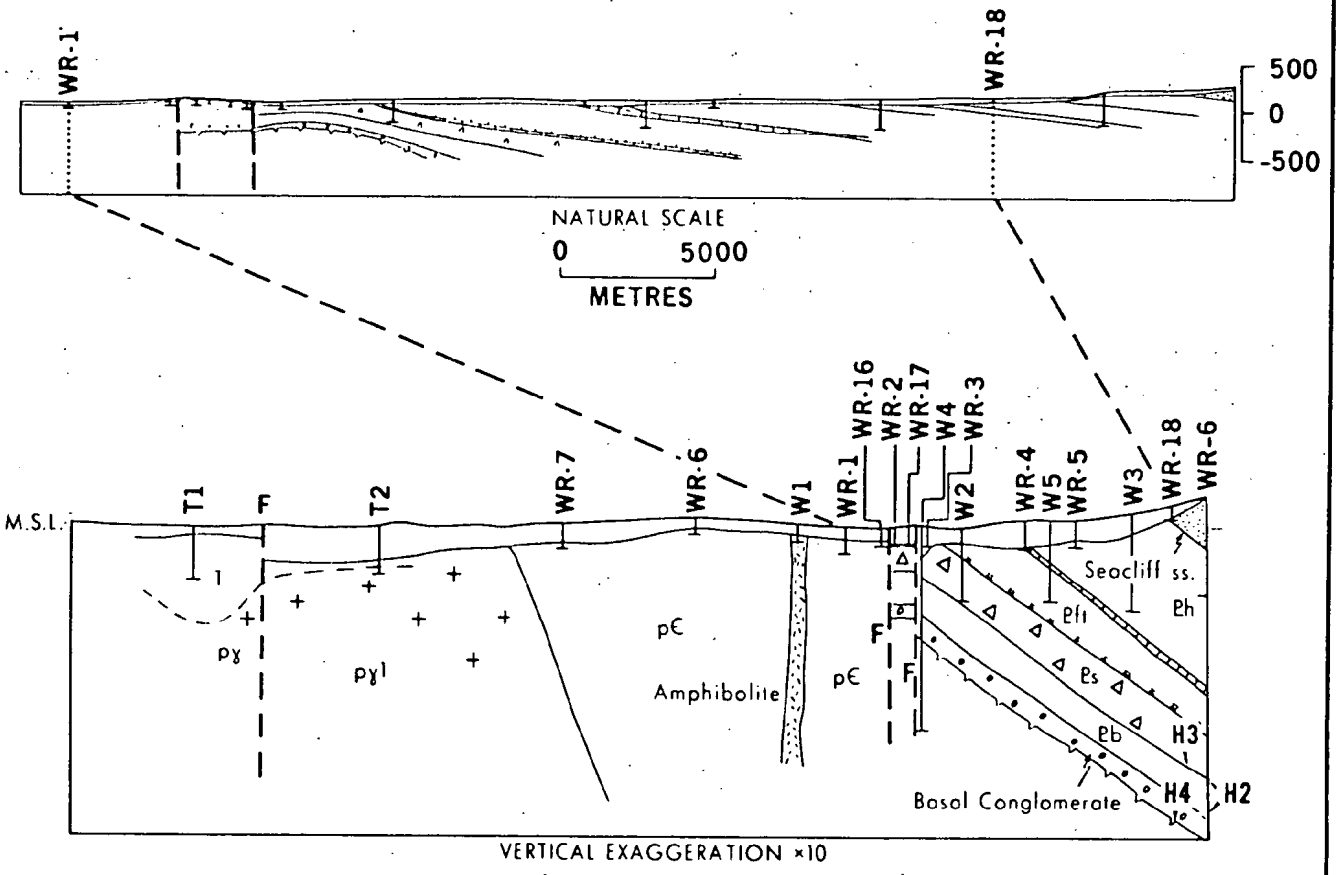
From intensive mapping of float material and rare outcrops, McCallum did, however, locate significant areas of pre-Quaternary strata. He was able to establish that mainly older Precambrian basement sub-outcrops below the Quaternary west of the Bute-Pt. Broughton main road, whereas mainly Adelaidean sediments sub-outcrop beneath the Quaternary east of there. Tertiary sub-outcrop becomes prominent west of Alford. A generalized summary of the subsurface geology is given by Thomson et al., (1976).

SUMMARY OF DRILLING

Since 1968 a total of 21 diamond drill holes and 16 rotary drill holes have been drilled in the region around Bute and Pt. Broughton. All the drilling has been done by the Drilling and Mechanical Branch of the Department of Mines and the best results have been obtained from cored wireline diamond drilling. Rotary drilling combined with bottom hole coring has, however, provided a quick and cheap method of reconnaissance type sampling of the pre-Quaternary basement.

The lithological logs summarised below (Appendix A) have been prepared mainly by B. Thomson (Bute No. 1-7; see Thomson, 1973), W. McCallum (Bute No. 8-13) and J. Parker (Tickera No. 1-2, Wokurna No. 1-6, and WR-1 to WR18). The valuable assistance of R.P. Coats, B.G. Forbes and W.V. Preiss of the Geological Survey, and of J. Lynch and P. Forwood of North Broken Hill Ltd., is acknowledged. The main rock units recognised are the Precambrian basement (granite, metasiltstone, amphibolite and volcanics) and the cover sediments of late Precambrian (Adelaidean), Tertiary and Quaternary age.

SECTION 3
TICKERA 1-2,
WOKURNA 1-6, WR1-7, 16-18,



J.Parker 1977

FIG. 1

	DEPARTMENT OF MINES—SOUTH AUSTRALIA	SCALE:
COMPILED: J. Parker	E-W CROSS-SECTION EXTENDING FROM SPENCER GULF TO BARUNGA RANGE	DATE: 13-12-77
DRN: CKD.		PLAN NUMBER: S13163

Their relationships are outlined in the summary E-W cross section shown in Figure 1.

PRELIMINARY GEOCHEMICAL LOGS

Geochemical sampling of drill core from the Bute and Pt. Broughton areas was carried out in September, 1977 using a new machine designed by J.F. Drexel (geologist of the Geological Survey) and constructed by the Department of Mines Drilling and Mechanical Branch. The machine is similar in principal to a common bench saw except that the normal saw blade has been replaced by a silicon carbide grinding wheel and the bench top has a carriage attachment on it which can be moved backwards and forwards over the wheel. Drill core is placed in this carriage and moved over the wheel so that a very shallow groove is cut in it. The dust sample is collected in a catcher and then submitted for geochemical analysis. In this way a representative sample can be collected over any predetermined interval without destruction of the core. Minor contamination from the grinding wheel depends on rock hardness and the type of wheel. The particular wheel used in this case, produced significant Zn contamination, but Cu and Pb contamination was at an acceptable level of 5 to 10 ppm.

Only Cu analyses are so far available for all samples and the areas of anomalous Cu are outlined in Figures 2 to 6 to give an indication of the extent and stratigraphic localization of Cu mineralisation.

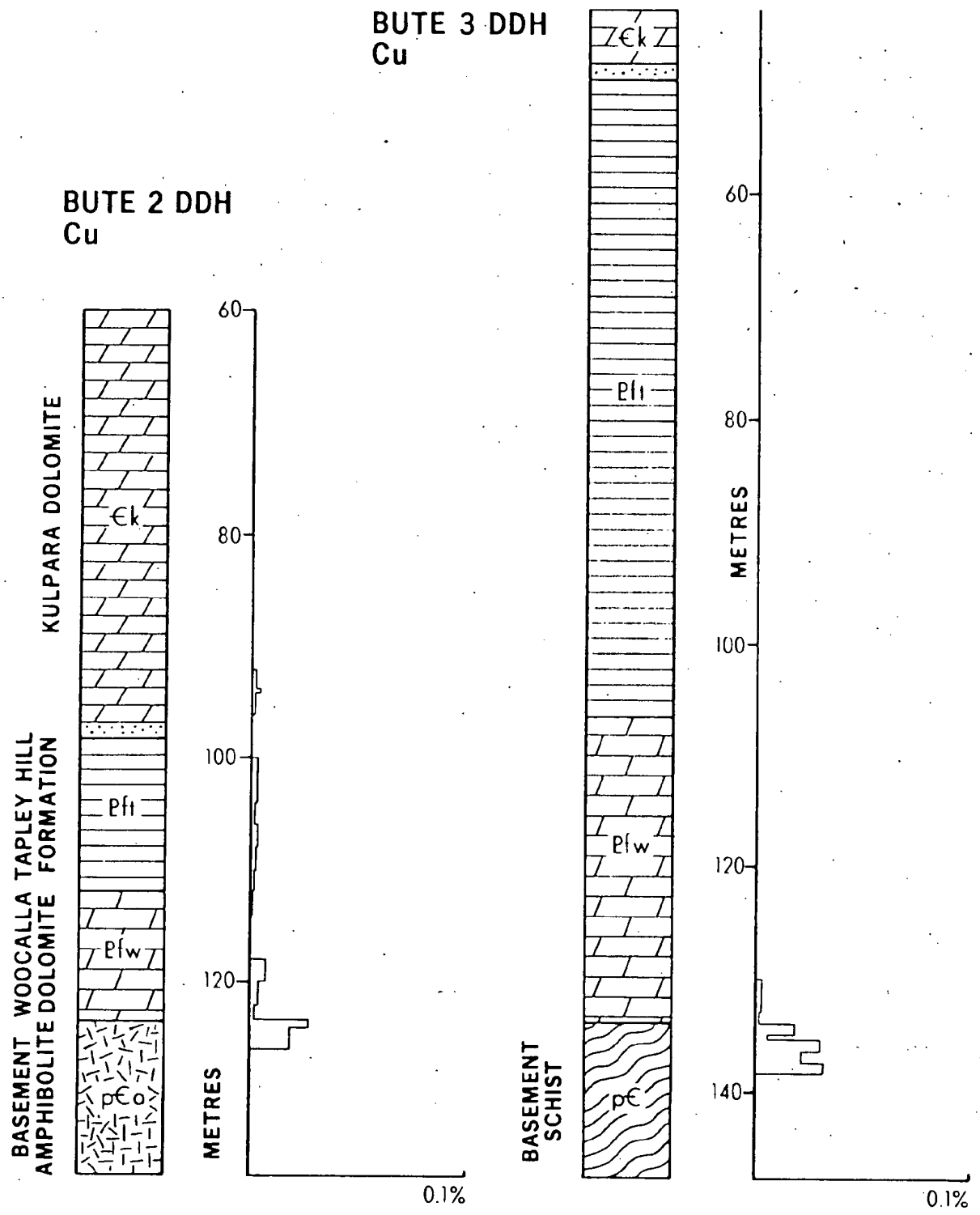


FIG. 2

	DEPARTMENT OF MINES—SOUTH AUSTRALIA	SCALE.
COMPILED: B.P. Thomson	Cu MINERALISATION IN BUTE 2 DDH AND BUTE 3 DDH	DATE: 13-12-77
DRN: CKD.		PLAN NUMBER: S13164

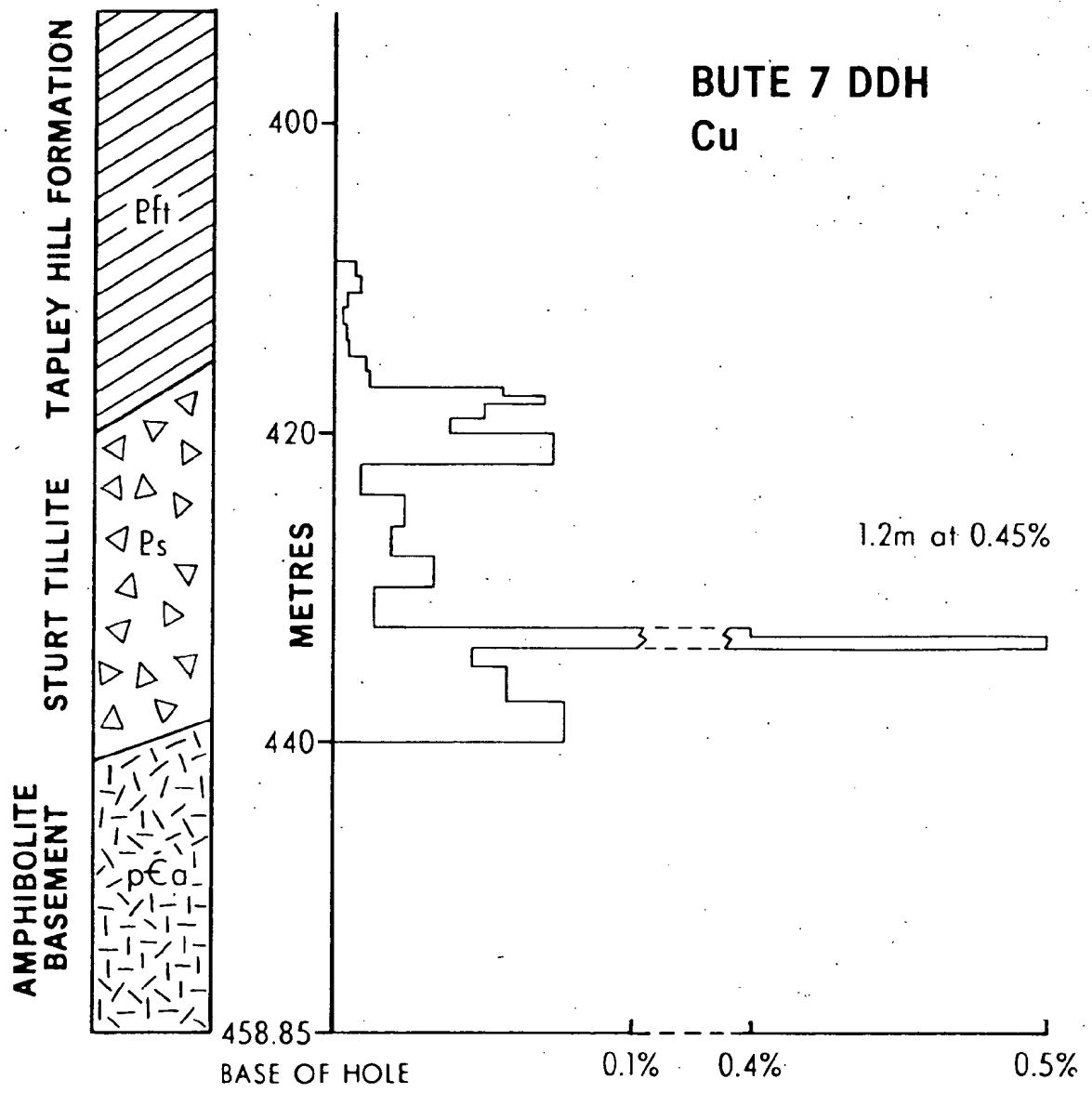


FIG. 3

	DEPARTMENT OF MINES—SOUTH AUSTRALIA	SCALE.
COMPILED: B.P. Thomson	Cu MINERALISATION IN BUTE 7 DDH	DATE: 13-12-77
DRN: CKD.		PLAN NUMBER: S13165

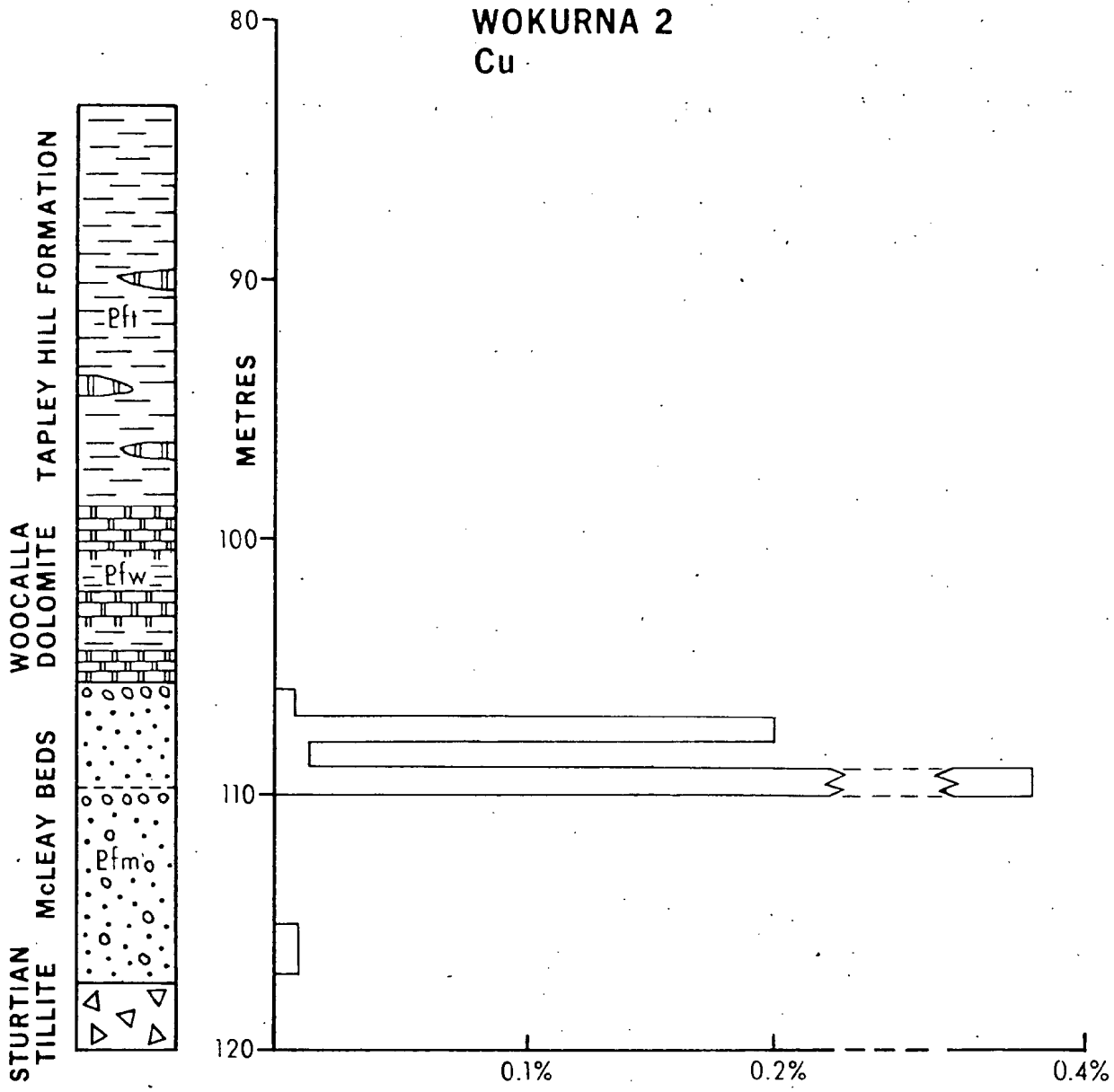


FIG. 4

	DEPARTMENT OF MINES—SOUTH AUSTRALIA	SCALE.
COMPILED: J. Parker	Cu MINERALISATION IN WOKURNA 2 DDH	DATE: 13-12-77
DRN: CKD.		PLAN NUMBER: S13166

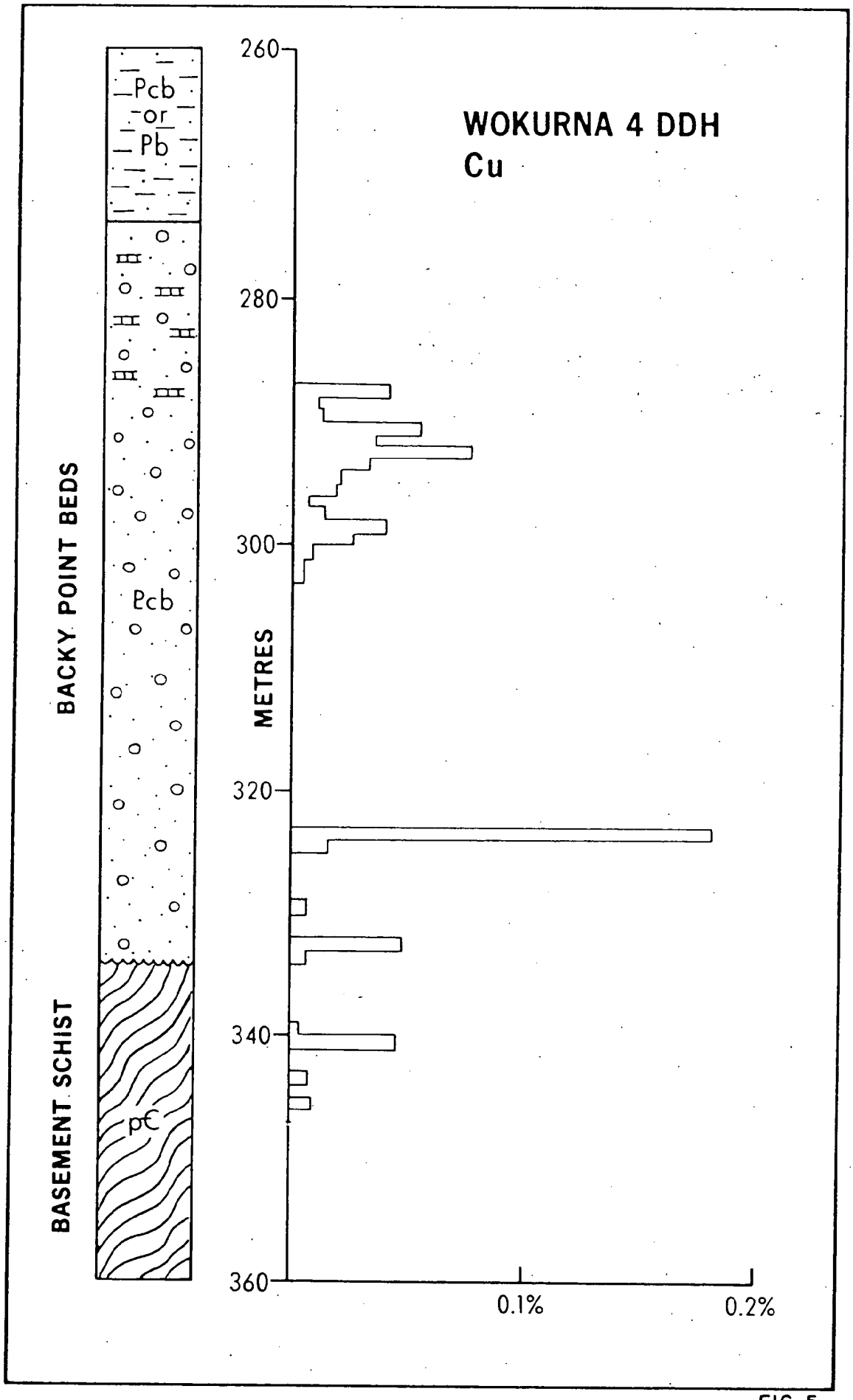


FIG. 5

	DEPARTMENT OF MINES—SOUTH AUSTRALIA	SCALE:
COMPILED: J. Parker	Cu MINERALISATION IN WOKURNA 4 DDH	DATE: 13-12-77
DRN: CKD.		PLAN NUMBER: S 13167

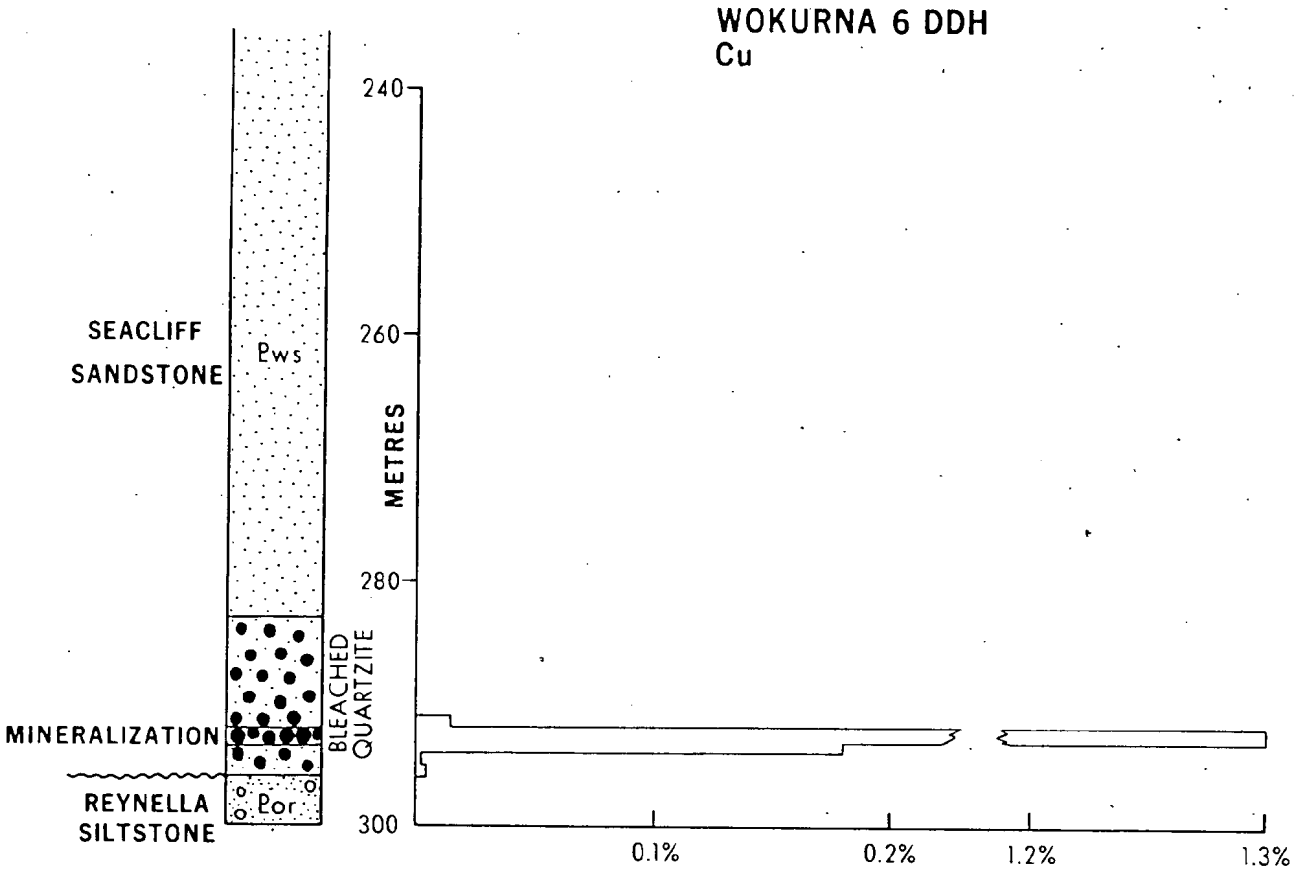


FIG. 6

	DEPARTMENT OF MINES—SOUTH AUSTRALIA	SCALE:
COMPILED: J. Parker	Cu MINERALISATION IN WOKURNA 6 DDH	DATE: 13-12-77
DRN: CKD.		PLAN NUMBER: S 13168

CONCLUSIONS

In brief, the results are:

1) the thickness of the Quaternary sediments ranges between 25 and 75 m, becoming thinner around Bute and adjacent to the Barunga Range;
2) the underlying basement can be subdivided into two sequences; one consists of low metamorphic grade metasiltstones, and the other of Adelaidean sedimentary strata similar to that in both the Stuart Shelf and Adelaide Geosyncline;
3) a Tertiary basin exists on the western margin of the E.L. area between Tickera and Pt. Broughton in which the sediments are lignitic;
4) the Adelaidean strata are relatively flat lying and their total thickness is moderately thin. As such they are more comparable to the Stuart Shelf strata than to those in the geosyncline proper but provide a definite link between the two.
5) the Adelaidean strata are metalliferous with abundant pyrite and traces of other metals (e.g. copper), which has bearing on theories of ore genesis on the Stuart Shelf.

REFERENCES

Firman, J.B., 1969. Quaternary Period. In: L.W. Parkin (Ed.), Handbook of South Australian Geology. Geological Survey of South Australia, Adelaide, pp. 204-233.

Lindsay, J.M., 1970. Melton Limestone: multiple mid-Tertiary transgressions, south-eastern Gawler Platform. Q. geol. Notes, geol. Surv. S. Aust., 33: 2-10.

Thomson, B.P., 1973. Torrens Hinge Zone Project: Bute Region: Report No. 1. S. Aust. Dept. Mines Report RB73/8 (unpublished).

Thomson, B.P., Daily, B., Coats, R.P. and Forbes, B.G., 1976. Precambrian Geology and Tectonics of the Stuart Shelf and Torrens Hinge Zone. Excursion Guide No. 33A, 25th Int. Geol. Congr., pp. 1-11.

APPENDIX A

SUMMARY GEOLOGICAL LOGS

SUMMARY OF DIAMOND DRILLING IN THE BUTE REGION, FORMERLY E.L. 75

Bute No. 1 DDH

Date completed: 4/7/68
0-22.9 m Sturtian tillite
22.9 - 163.4 m Pandurra Formation - feldspathic quartzite.

Bute No. 2 DDH

Date completed: 11/3/70
0 - 12.2 m Quaternary
12.2 - 93.8 m Kulpara Limestone (Cambrian) - grey dolomite
93.8 - 98.1 m Mt. Terrible Formation (Cambrian)
98.1 - 112 m Tapley Hill Formation
112 - 123.4 m Woocalla Dolomite Member
123.4-215.5 m Amphibolite - dark green amphibolite basement

Bute No. 3 DDH

Date completed 7/12/70
0 - 46.2 Kulpara Limestone
46.2 - 49.5 m Mt. Terrible Formation
49.5 - 106.7 m Tapley Hill Formation - dark grey laminated slate
106.7 - 134.1 m Woocalla Dolomite Member
134.1 - 135 m Conglomerate
135 - 163 m Metasiltstone - basement low grade metamorphosed siltstone with dolomite veining.

Bute No. 4 DDH

Date completed 19/1/71
0 - 19 m Quaternary sand
19 - 76 m (?) Tertiary riverine sand - white and grey quartz sand

Bute No. 5 DDH

Date completed 30/6/71
0 - 21 m Quaternary
21 - 36 m Kulpara Limestone and Mt. Terrible Formation
36 - 213.5 m Willamulka volcanics, metasiltstone and amphibolite.

Bute No. 6 DDH

Date completed
0 - 2.7 m Quaternary clay
2.7 - 478.7 m Emeroo Quartzite (Pandurra Formation) - pink feldspathic sandstone.
478.7 - 483.6 m Metasiltstone - with dolomitic veining.

Bute No. 7 DDH

Date completed
Incline 70° to west
0 - 15 m Quaternary
15 - 35.6 m Weathered siltstone
35.6 - 418 m Tapley Hill Formation - laminated slaby siltstone with numerous carbonate lenses (calcite at top but more dolomitic in depth.
418 - 440 m Sturtian tillite - minor chalcopyrite mineralisation at 432.5 - 433.7 m (1.2 m @ 45% Cu).
440 - 458.5 m Amphibolite

Bute No. 8 DDH

Date completed 6/2/74
0 - 7.4 m Quaternary
7.7 - 10.5 m (?) Sturtian tillite - weathered grey slate.

Bute No. 9 DDH

Date completed 8/2/74
0 - 5.8 m Quaternary
5.8 - 17.1 m (?)Sturtian tillite-very strongly weathered to sandy clay.

Bute No. 10 DDH

Date completed 12/2/74
0 - 6.8 m Quaternary
6.8 - 20.9 m (?)Sturtian tillite - very strongly weathered.

Bute No. 11 DDH

Date completed 13/2/74
0 - 4.5 m Quaternary
4.5 - 11.4 m Sturtian tillite

Bute No. 12 DDH

Date completed 15/2/74
9 - 8.2 m Quaternary
8.2 - 13.1 m Jaspilite breccia - brecciated Carpentarian(?) finely laminated quartzite and jaspillite.

Bute No. 13 DDH

Date completed 19/2/74
0 - 9.9 m Quaternary
9.9 - 20.9 m Metasediment - highly altered (to clay) siltstone.

SUMMARY OF ROTARY AND DIAMOND DRILLING IN THE PT. BROUGHTON REGION, E.L. 207

WR-1

Elevation: 79.3 m
Date completed 28/4/77
0 - 35 m Quaternary sand and mottled clay.
35 - 77 m Pre-Adelaidean basement - dark grey and red, banded metasiltstone with contorted steeply dipping bedding.

WR-2

Elevation: 82 m
Date completed: 30/4/77
30 - 45 m Weathered (to dark red brown colour) Sturtian tillite.

WR-3

Elevation: 83.5 m
Date completed: 2/5/77
0 - 52 m Quaternary
52 - 58.2 m Sturtian intraglacial - dolomitic sandstone and silty dolomite; subhorizontal bedding.

WR-4

Elevation: 105 m
Date completed: 4/5/77
0 - 66 m Quaternary
66 - 78.5 m Brighton Limestone - silty and partly dolomitic.

WR-5

Elevation: 120 m
Date completed: 5/5/77
0 - 50 m Quaternary
50 - 73.1 m Angepena Formation (Willochra Sub-group) - maroon siltstone with minor dolomite; subhorizontal bedding.

WR-6

Elevation: 88 m
Date completed: 7/5/77
0 - 24 m Quaternary
24 - 46.6 m Pre-Adelaidean siliceous, metamorphosed dolomite - steeply dipping bedding.

WR-7

Elevation: 64 m
Date completed: 11/5/77
0 - 57 m Quaternary (and weathered siltstone (?)).
57 - 74.5 m Pre-Adelaidean greenish grey chloritic schist and siltstone.

WR-9

Elevation: 42.3 m
Date completed: 14/5/77
0 - 9 m Quaternary
9 - 86 m Weathered feldspathic sandstone
86 - 97.2 m Partially weathered feldspathic sandstone - (?) Backy Point Beds.

WR-10

Elevation: 46.2 m
Date completed: 19/ 5/77
0 - 9 m Quaternary
9 - 18 m Weathered sandstone
18 - 27 m (?) Backy Point Beds - feldspathic quartzite with conglomeratic bands.

WR-11

Elevation: 52 m
Date completed: 23/5/77
0 - 18 m Quaternary
18 - 30.9 m (?) Backy Point Beds - feldspathic quartzite

WR-13

Elevation: 46 m
Date completed: 24/5/77
0 - 35 m Quaternary
35 - 42.1 m weathered Sturtian tillite.

WR-14

Elevation 53.6 m
Date completed: 26/5/77
0 - 36 m Quaternary
36 - 47.75 m Brighton Limestone - silty with some oolites and siltstone bands; subhorizontal bedding.

WR-15

Date completed: 28/5/77
0 - 18 m Quaternary
18 - 36.7 m (?) Backy Point Beds - feldspathic quartzite and conglomerate; sub horizontal bedding.

WR-16

Elevation: 79.7 m
Date completed: 31/5/77
0 - 39 m Quaternary
39 - 49.73 m Pre-Adelaidean basement - contorted, steeply dipping dolomitic siltstone dark grey and red banded.

WR-17

Elevation: 86.3 m
Date completed: 1/6/77
0 - 35 m Quaternary
35 - 39.95 m Weathered Sturtian tillite.

WR-18

Elevation: 178 m
Date completed: 2/6/77
0 - 27 m Quaternary
27 - 39.60 m Seacliff Sandstone - fine grained feldspathic quartzite.

Tickera No. 1 DDH

Elevation: 10.5 m
Inclined 60° from east
Date completed: 12/5/76
0 - 37.26 m Quaternary sand and clay
37.26 - 69.32 m Melton Limestone (Tertiary)
69.32 - 151.81 Upper Eocene carbonaceous siltstones with minor, silty lignite beds; horizontal bedding.

Tickera No. 2 DDH

Elevation: 46 m
Date completed: 2/6/76
0-109.72 m Quaternary and (?) Tertiary sand
109.72 - 118.70 (?)silicified grit and angular conglomerate
118.70 - 151.23 Tickera granite - pink, massive, medium to coarse grained granite.

Wokurna No. 1 DDH

Elevation: 91 m
Date completed: 9/6/76
0 - 24.6 m Quaternary sand and clay.
24.6 - 61.5 m Pre-Adelaidean basement - massive, dark grey gabbro with numerous alteration zones.

Wokurna No. 2 DDH

Elevation: 84 m
Date completed: 5/7/76
0 - 45.5 m Quaternary sand and clay
45.5 - 90.1 m Tapley Hill Formation - dark grey slate with scattered sandy dolomite lenses; bedding dip is 5°.
90.1 - 98.7 m Tapley Hill Formation - sandy dolomite and slate (lesser slate laminations).
98.7 - 105.6 m Woocalla Dolomite Member - pale grey dolomite.
105.6 - 117.5 m McLeay Beds - pale grey quartzite with conglomerate bands. Minor chalcopyrite mineralisation.
117.5 - 165.5 m Sturtian tillite.
165.5 - 218.56 m Unnamed Sturtian intraglacial - dolomitic and feldspathic quartzite.

Wokurna No. 3 DDH

Elevation: 153 m
Date completed: 3/8/76
0 - 57.2 m Quaternary sand and clay.
57.2 - 74.2 m Unnamed member of Willochra Sub-group - maroon shale with minor sandy dolomite lenses.
74.2 - 120.9 m Unnamed member of Willochra Subgroup - pale grey feldspathic and calcareous sandstone with narrow conglomerate and oolitic limestone bands.

120.9 - 306.37 m Angepena Formation (Willochra Subgroup) - maroon shale interlayered with grey feldspathic sandstone. Minor carbonate and oolitic limestone; bedding dip is 5-10°.

Wokurna No. 4 DDH

Elevation: 88.2 m
Date completed: 15/7/77
Inclined 80° from west
0 - 74 m Quaternary sand and clay
74 - 155.5 m Sturtian tillite - with more magnetic horizon from 84 - 90 m; bedding inclined 70-60° from core axis,
155.5 - 157.5 m fractured, silicified, feldspathic quartzite.
157.5 - 274.1 m (?)Backy Point Beds or undifferentiated Burra Group - feldspathic quartzite and siltstone. Laminated, medium to dark grey, and pyritic with traces of dolomite.
274.1 - 334.1 m (?)Backy Point Beds - pink feldspathic quartzite and conglomerate. Minor dolomite bands from 278-287 m.
334.1 - 395.77 m Pre-Adelaidean basement metasiltstone - dark grey and red banded with irregular bleached zones. Steeply dipping.

Wokurna No. 5 DDH

Elevation: 112.8 m
Date completed: 9/8/77
0 - 41.7 m Quaternary sand and clay
41.7 - 116.5 m Angepena Formation (Willochra Subgroup) - maroon shale interlayered with grey sandy lenses and pink dolomite.
116.5 - 171.3 m Brighton Limestone - including upper sandy, dolomitic limestone, central pale grey limestone with stromatolitic bioherms, central/lower grey fragmental limestone with white oolitic fragments, and lower fragmental limestone with pink fragments.
171.3 - 179.1 m Interbanded Brighton Limestone and grey Tapley Hill Formation slate.
179.1 - 294.65 m Tapley Hill Formation - medium to dark grey slate with numerous calcareous sandy bands decreasing in width and frequency down hole; bedding dip is 7-8°.

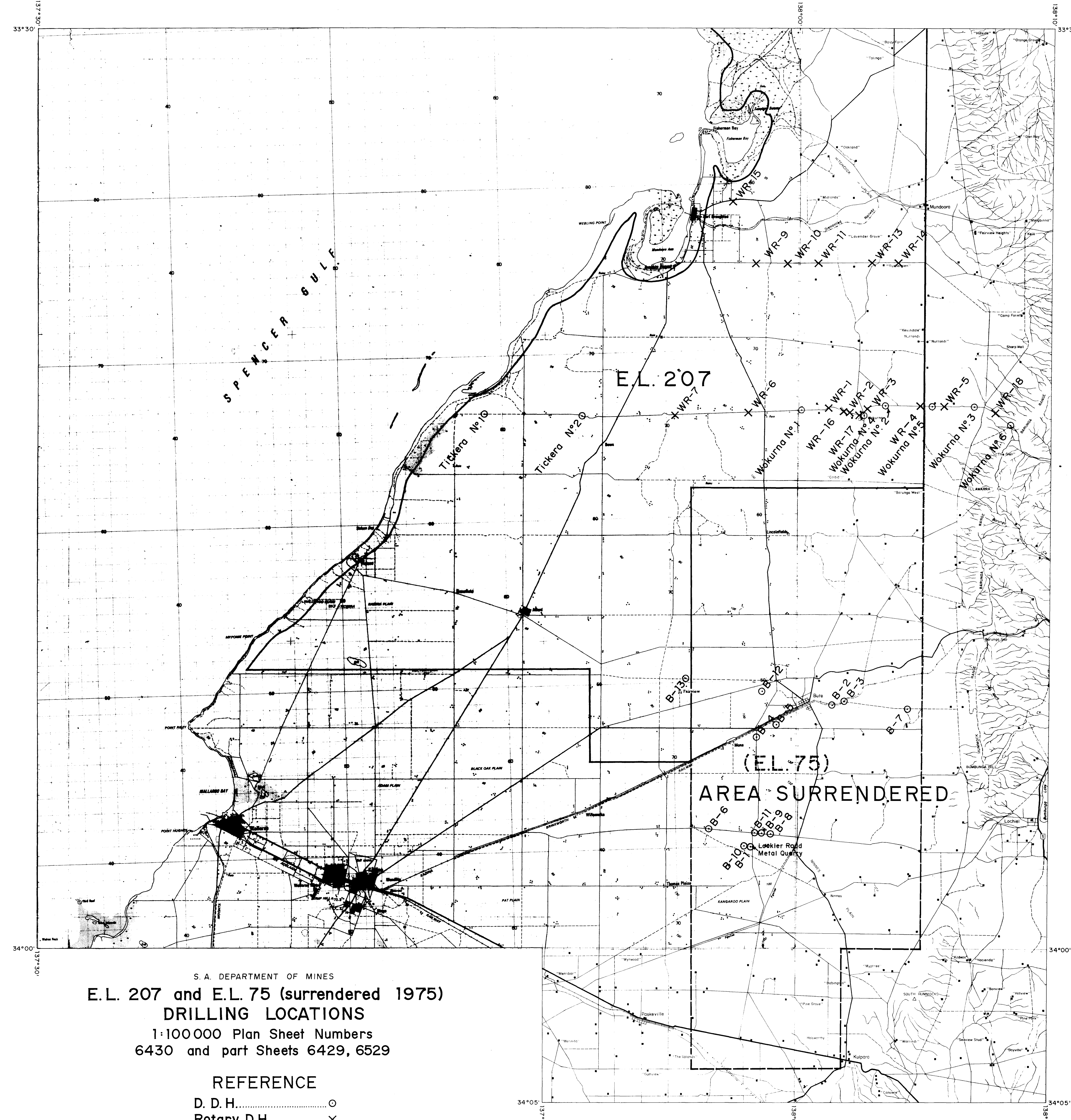
Wokurna No. 6 DDH

Elevation: 227.4 m
Date completed: 23/9/77
0 - 15.4 m Quaternary sand, clay and boulder conglomerate.
15.4 - 118.7 m Brachina Formation - laminated maroon shale with scattered green bleached bands, and scattered heavy mineral, cross-laminated, sand lenses; bedding dip 5-10°.
118.7 - 160.5 m Interbanded Brachina Formation and Seacliff Sandstone - broad bands <1 m wide)

160.5 - 283.9 m Seacliff Sandstone - pale to medium grey, fine grained quartzite with narrow shale bands (<1 m wide) and numerous scattered laminae of pink dolomite predominant in upper part (above 220 m) (Nucalleena Formation).

283.9 - 295.9 m Seacliff Sandstone - speckled due to bleaching. Minor mineralisation at 292-293.2 m (1.2m@ 1.0% Cu).

295.9 - 329.0 m Reynella Siltstone - massive maroon shale with scattered granules and minor cross-laminated sandstone bands.


137°30'
138°00'
138°10'
33°30'
34°00'
34°05'
137°50'
SPENCER GULF
E.L. 207
(E.L. 75)
AREA SURRENDERED
Fisherman Bay
Mundoora
"Oakland"
"Midlands"
"Lavender Grove"
"Kevindale"
"Nurrondi"
"Camp Farm"
Sharp Well
"Fairview Heights"
"Glen Roy"
"Hillside"
"Orange Grove"
"Baldy Farm"
"Talinga"
"Mingbinna"
Kelli
HITCHCOCK PLAIN
Dismantled Railway
WEBLING POINT
WR-1
WR-2
WR-3
WR-4
WR-5
WR-6
WR-7
WR-9
WR-10
WR-11
WR-13
WR-14
WR-15
WR-16
WR-17
WR-18
Tickera No.1
Tickera No.2
Wokurna No.1
Wokurna No.2
Wokurna No.3
Wokurna No.4
Wokurna No.5
Wokurna No.6
"Barunga West"
Lincolnfields
ILLAWARRA
BARUNGA RANGE
Barunga Gap
HUMMOCK RANGE
BUMBUNGA HILL
Lochiel
Bute
Fairview
Mona
B-1
B-2
B-3
B-4
B-5
B-6
B-7
B-8
B-9
B-10
B-11
B-12
B-13
Lockier Road Metal Quarry
NINNES PLAIN
Ninnes
KANGAROO PLAIN
Thomas Plains
BLACK OAK PLAIN
ADAM PLAIN
PAT PLAIN
POINT RILEY
WALLAROO BAY
POINT HUGHES
MYPONIE POINT
Walrus Rock
"Wynwood"
"Merribar"
"Merinda"
"The Uplands"
"Gumview"
Paskeville
Kulpara
"Myphree"
"Babington"
"Pine Grove"
Holsworthy
SOUTH HUMMOCKS
"Kildeas"
"Hacienda"
"Bonview"
"Hillview"
"Pine Park"
"Seaview Stud"
"Warrindi"
"Bayville"
"Canowie"
S. A. DEPARTMENT OF MINES
E.L. 207 and E.L. 75 (surrendered 1975)
DRILLING LOCATIONS
1:100 000 Plan Sheet Numbers
6430 and part Sheets 6429, 6529
REFERENCE
D. D. H. ⊙
Rotary D.H. ×
E.L. Boundary
SCALE IN KILOMETRES
2 1 0 2 4 6 8 10 12
To accompany report by J. Parker and B. Thomson
77-914