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EL 99

SOUTH WARREN RESERVOIR

PROGRESS REPORT TO LICENCE EXPIRY FOR THE PERIOD 10/10/1973 TO 9/10/1974

Submitted by
Cominco Exploration Pty Ltd
1974

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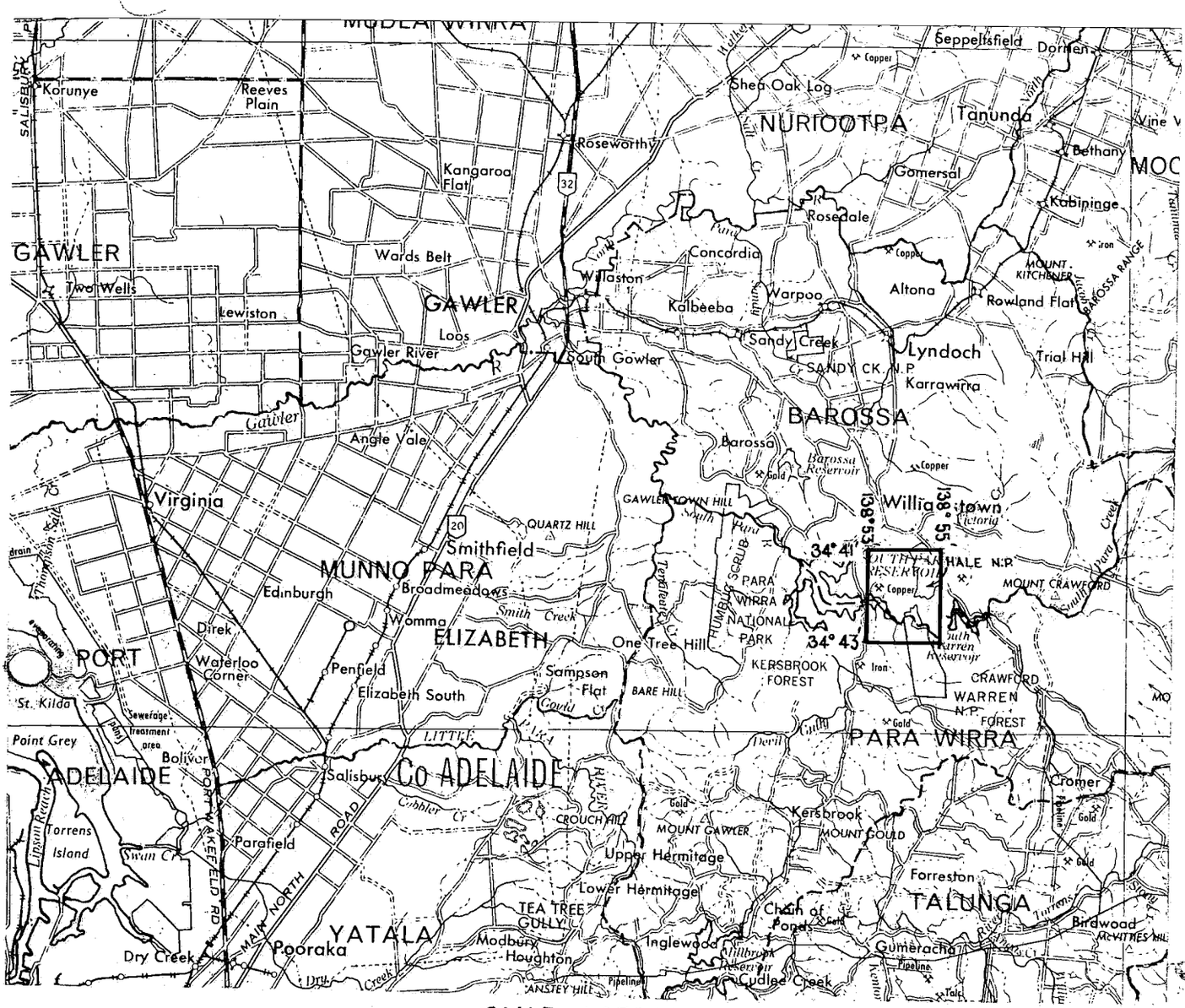
SCHEDULE A



SCALE 1:250,000

0 5 10 km

4 miles

COMINCO EXPLORATION PTY. LTD

DOCKET DM 821/73 AREA 11 km.²

1:250000 PLANS ADELAIDE

LOCALITY SOUTH WARREN RES., APPROX. 20 km S.E. OF ~~WILLUNGA~~ GAWLER

EL. No. 99 EXPIRY DATE 9.10.7

CONTENTS ENVELOPE 2428 E.L. No. 99

TENEMENT: Exploration Licence No. 99

TENEMENT HOLDER: Cominco Exploration Pty. Ltd.

COMINCO EXPLORATION PTY. LTD.

REVIEW REPORT

UKAPARINGA AND SOUTHERN HILLS PROSPECTS

EXPLORATION LICENCE 99

South Australia

by: F.L. Hunt
Manager
Cominco Exploration Pty. Ltd.

August 20 1974

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1. SUMMARY

The Ukaparinga and Southern Hills Prospects lie within EL99, South Australia, granted over 11 square Kilometres 20 Kilometres south-east of Gawler for one year from 9th October, 1973. The Ukaparinga area is privately held, and the Southern Hills area forms part of the ground now held by Cominco Exploration Pty. Ltd.

This report reviews tonnages and grade figures given by Crane Enfield Metals for the Ukaparinga prospect, and of drilling completed at Southern Hills.

The percussion and diamond drill data for Ukaparinga were re-examined and re-plotted at 1" to 100'. This data was projected to plans for Relative Levels 1100, 1000 and 900 feet. On the basis of an arbitary cut-off of 0.55% Cu, the likely zones of better grade mineralisation were outlined.

Minoil Services Pty. Ltd. for Crane Enfield, calculate the volume between surface and RL 700 to contain 1.3 mT of 1.3% Cu, with cut-off grade 0.5% Cu. This study indicates that the volume is more likely to be 700,000 T and confirms that a large portion of that volume is not at present economically extractable.

The Ukaparinga prospect has a strike length of 400 ft. plus. It is tested in two places to depth RL 600 - about 600 feet below surface. One of these holes, DD-6, gave no mineralised zone within the expected strike length. The other, DD-4, intersected only a narrow zone and hence Crane Enfield suggest a wedging out at depth. A suggested re-interpretation is that DD-6 stopped short, in a shear zone, before reaching the mineralisation, and at that point a dip reversal has occurred. Hence, the prospect is given continued depth potential.

Examination of the Southern Hills Prospect in February 1971 showed that three percussion holes had been drilled relatively close together on the western margin and at the south end of the main copper geochemical anomaly. Their attitudes limited coverage to the margin. In an assessment by CEPL in April 1971, prior to attempting Farm-in negotiations with Crane Enfield, it was recommended that one or two holes be sited centrally on the Southern Hills geochemical anomaly and be directed to give wide coverage on one cross section.

Negotiations by CEPL with Crane Enfield were unsuccessful.

Application for Exploration Licence No 99 was made on July 6th, 1973, when it was known that Crane Enfield had relinquished the Southern Hills property.

Subsequent investigations since EL 99 was granted have shown that Crane Enfield drilled a further 30 percussion holes and 5 diamond drill holes on the Southern Hills geochemical anomaly and that the prospect has been thoroughly tested. This drilling, which has not been documented, revealed limited width s of 1% Cu in the Ukaparinga Schist, and showed that the possible tonnage of 1% Cu was not economically significant. CEM's exploration also included geological mapping and geochemical sampling along the favourable stratigraphy south from Southern Hills to the Scott group of paddocks. This work located no further zones of copper concentration.

In view of the poor encouragement in the intensive exploration programme carried out by CEM, no further work can be recommended.

2. INTRODUCTION

A detailed study of stratabound copper occurrences in Proterozoic rocks of the Adelaide Geosyncline began in January 1971. Available literature on copper deposits in S.A. was studied but invariably the interesting properties were held by other mining companies.

The Crane Enfield Metals holdings were brought to Cominco's attention by Mr. David Jones, geologist for the company. Mr. Jones had written to Cominco for technical assistance regarding a copper leaching problem with ore from the company's Ukaparinga Mine. The property of Crane Enfield Metals Pty. Ltd. is situated just 30 miles north east of Adelaide.

Much of the data in this report was either provided by Crane Enfield, or produced through a number of field examinations and an office assessment of Crane Enfield data by CEPL staff. Some field checks of a geological/geochemical nature were carried out by CEPL.

3. LOCATION

The prospects are located 2 miles south-south-east of Williamstown, a township 33 road miles north east of Adelaide (Figs. 1 and 2). A bitumen road connects Williamstown and Adelaide. The property can be reached by several dirt tracks leading from Williamstown and the bitumen road 1½ miles to the west. Most of the property is accessible by standard two wheel drive vehicles.

4. FACILITIES

The property is situated ½ mile from an 11 kv line and only 1/4 mile from a 240 volt line.

The 11,000 million gallon capacity South Para Reservoic lies within one mile of the Ukaparinga Mine, while the 36" diameter trunk main of the South Warren Reservoir passes through the leases. A 1½" circumference pipe connection can be made to this main for agricultural or other purposes, i.e. diamond drilling.

5. HISTORY

The Ukaparinga Mine was worked in the 1840's and was closed down in 1852 when the miners got "gold fever" and fled to Victoria. The Inspector of Mines visited the property in 1889 and found the mine abandoned. The workings consisted of a 305' long adit cutting the north lode 100' below the top of the hill (No. 1 Adit) with a winze proving the lode a further 95'. At the southern end there was a tunnel driven 200' into the hill (No. 2 Adit).

About 1900, further mining was done and another adit (No. 3 Adit) was driven into the southern end of the hill, connecting with a shaft. Serious flooding prevented further development at the time. The mine lay idle until November 1965 when Mr. Moisseef staked claims over the area which were later converted to ML's 3449 and 3450. In 1965-66, Mr. Moisseef and a partner set up a small plant for acid leaching and recovered 4½ tons of cement copper from 150 tons of high grade ore.

In 1966, three IP lines were run over the prospect by Mines Exploration Pty. Ltd. (Broken Hill South subsidiary). A few weak anomalies were obtained but were not followed up.

In March, 1966, the prospect was optioned to Aminco who did some geochemical sampling, trenching and underground sampling before relinquishing their option.

In 1967, Mr. Warwick of Andamooka Enterprises took an option over the leases. Seven vertical holes were drilled in the top of the hill to a depth of 45'. His requirement of 20,000 tons of 2% copper was apparently not reached for he also relinquished his option.

Crane Enfield Metals Pty. Ltd. optioned the property in July 1969 and commenced a comprehensive exploration programme in August 1969. To February 1971 they had drilled 47 percussion drill holes and 6 diamond drill holes. Geochemical soil sampling and geological mapping on a 100' grid has been carried out on both the Ukaparinga and the Southern Hills prospects. The total expenditures to February 1971 on the two prospects were reported to be $200,000. The balance of the holdings were unexplored at that time.

Subsequent to discussions with CEPL, Crane Enfield continued work on the property in the belief that:

- the Ukaparinga prospect is adequately tested,
- the prospect has firm (or near firm) reserves
- the reserves are minable
- the problem remaining is one of establishing a satisfactory leaching method for Copper extraction.

So far as we are aware, no satisfactory leaching method was developed.

In a final stage of drilling, Crane Enfield completed 5 holes at the Southern Hills prospect.

6. TENURE AND OWNERSHIP

a) Ukaparinga Prospect

The land was purchased outright by Crane Enfield Metals (CEM). However, the mineral rights were held by Mr. Moisseef who was granted these mineral leases to cover the mine workings. These three leases are now held under option by CEM. Under terms of the option between Mr. Moisseef and CEM, for a consideration of $5,000 cash and a royalty of $10.00 per ton of copper extracted for the first 2,900 tons and $2.00 per ton of copper extracted in excess of 2,900 tons up to a further amount of 7,100 tons, the leases were transferred to CEM until June 1, 1971. If extraction has not commenced by then the company will transfer the leases back to Moisseef but has the right of extension if necessary. At this point we understand CEM continue to have first rights to the Ukaparinga prospect.

In addition, a royalty of 2½% of gross profit after treatment and transport is payable to the Government of South Australia.

Note: A rental fee of $2.00 per acre per year is payable to the S.A. Government on all mineral leases.

b) Southern Hills Prospect

The mineral rights are reserved by the Crown and a royalty of 2½% is payable to the S.A. Government. The land was held by CEM who staked mineral claims 6076 and 6154 in September 1970 but these rights have expired and the mineral rights are now covered by CEPL's EL99.

c) Other Holdings

An Authority to Enter was granted to CEM on all other land outlined in green on plate 590/71. The implications of the future rights of an Authority to Enter under the previous Act are still not clear to us. Apparently, agreement must be obtained from the landowner and the district warden before one can search for minerals on private land. Once the landowner has given his permission, the prospector is granted an Authority to Enter by the government. Mineral leases cannot be obtained without the approval of the landowner.

Therefore, if anomalies are found on this land, outright purchase of the land would have to be considered. Land in this area can be purchased for around $200.00 per acre. Staking would then be necessary to secure the right to mine.

However, it is our understanding that CEM have now relinquished their rights under Authority to Enter. That land now forms part of EL99.

d) Exploration Licence 99

This EL was granted for a term of one year, commencing 9 October 1973, for an annual fee of $5.50.

The licence requires all plans to be submitted in form of transparencies.

The land is contained within latitudes 34° 41' to 34° 43'S and longitudes 138° 53' to 138° 55'E.

The licence demands an amount of $20,000 to be expended on drilling operations, or the licence may be suspended.

The area is 11 sq.km., less those areas which are unavailable because sections of the Hale and Warren Conservation Parks are part of that area.

By correspondence, the Engineering and Water Supply Department confirmed its opposition to exploration within 16 various private land allotments bordering South Para and Warren Reservoirs.

Thus, favourable ground within EL99 is distinctly limited, and the geologically interesting ground is probably restricted to a ½ mile strip, with strike extent confined to 3 miles. This area is covered by portions numbered 3166, 988, 2503 and Pt. 26, Pts. 137 and 133, 134, and 321.

Note: 1. The Ukaparinga prospect is on portion 2503, with Moisseef holding rights over portions 2503 and Pt.26.
2. The Southern Hills prospect is on portion 134.
3. Rollick's Prospect is outside EL99, to the north.

7. EXPLORATION AND DEVELOPMENT

Discussion with Crane Enfield established their belief that
- the Ukaparinga Prospect is adequately tested
- the prospect has firm (or near firm) reserves
- the reserves are minable
- the problem remaining is one of establishing a satisfactory leaching method for copper extraction.

Crane Enfield provided a series of 1" to 20' cross sections together with access (for copying purposes) to geological and assay logs of drill holes. This data showed the irregular nature of the mineralization and therefore quoted reserve tonnages were questionable. It became apparent that CEPL should establish a better approximation for minable grade.

Programme Followed:

As an office study in 1971 Crane Enfield's 1"=20' cross sections were redrawn at scale 1"=100', as shown on the following drawings:

Sections	Plate No.
700S to 200S	405/71
100S to 200N	404/71
300N to 500N	406/71

These are attached to this report.

Assay data is plotted on the cross sections, split arbitarily as

>0.55% Cu - coloured RED
<0.55% Cu - coloured BLUE

Intersected margins of the Aldgate sandstone and the Pipeline schist are also plotted. These geological boundaries and the assay split was used to prepare 1" to 100' plans, as follows:

Horizontal Plan	Plate No.
1100 RL, feet above Sea Level	403/71
1000 RL feet above Sea Level	402/71
900 RL feet above Sea Level	401/71

These are also attached to this report.

Both plans and sections illustrate the irregular nature of the mineralisation boundaries and assay profiles for part Hole PD-2, section 100S, Hole DD-2, section 200N, show this irregularity at 5 ft. intervals.

Note: The 2.4% assay in DD-2, 340-345', reflects a 6" chalcopyrite vein intersected at 341 feet.

Tonnages were calculated from volumes determined within the +0.55% Cu boundaries, using the RL plans. A tonnage factor of 13.5 cu.ft./ton was used for the mica schist. It is possible that this may be low, but the range is likely to be 13.5 to 14.0 cu.ft./ton.

Note: Minoil Services used a factor of 11.9 cu.ft./ton for their calculations, which is unlikely, and automatically produces 13% higher tonnages for Crane Enfield.

The Ukaparinga prospect (from surface about RL 1150 to at least RL 900) dips easterly beneath the Aldgate sandstone. Familiarity with the data led to a suggestion other than wedging out as proposed by Jones, which is discussed later in this report.

The Ukaparinga case was idealised, with 60' width ore zone, strike 600' at RL 1100 to 400' at RL 900, which was used to establish waste:ore ratios for an open cut operation.

Jones (CEM) suggests waste:ore ratios of

1:1 if lower grades are treated
2:1 for the +1% Cu

It may be demonstrated that a 3:1 waste:ore ratio is realistic, but this only allows carbonate ore extraction. It is also apparent that open pitting of any quantity of sulphides will lead to high waste:ore ratios, probably uneconomic. The waste:ore ratio is 5:1 at Kanmantoo.

A comparable situation could be expected at Southern Hills. Pit economics (discussed later) consider both open pitting of carbonate and underground extraction of sulphides.

Comment: During the period, the opportunity was taken to visit the Kanmantoo mines, which are situated in a similar environment east of Adelaide. Kanmantoo are currently stockpiling carbonate mineralisation, and this stockpile will eventually exceed 300,000 tons, grading about 1% Cu. Kanmantoo are uncertain how Cu extraction may be economically effected, and have no immediate plans for work on this aspect of their mine.

The Kanmantoo stockpile is similar to the carbonate mineralisation in the upper levels, Ukaparinga.

8. PRODUCTION

Currently Nil.

9. GEOLOGY

A. General Geology

To indicate scale, the four prospects are

. Ukaparinga Prospect, extensively drilled over a strike length of 1600 feet with the best mineralisation over a 400 ft. length.

. Southern Hills prospect, of unknown potential, negligible outcrop, but producing a soil geochemical anomaly +800' x +100'.

The Southern Hills prospect is ½ mile south of Ukaparinga.

. Rollicks Prospect of unknown potential, is about 1 mile north of the Ukaparinga workings. (This lies outside E199)

. Enterprise Workings, 3 miles to the north of Ukaparinga, and also of unknown potential.

1) Regional Setting

The group of prospects lie to the east of and adjacent to a major N-S structure, the Kitchener Fault. The fault is within 500 feet of the Ukaparinga prospect.

The host rocks are considered to be metamorphosed members of the Torrensian Burra Group.

Comparative sequences are:

Campana and Whittle (1953)	Jones (1970)
Aldgate sandstone	ALDGATE Sandstone
Quartz mica schist)	UKAPARINGA schist
Biotite muscovite schist)	
Mixed schist and gneiss	PIPELINE schist

Campana et al, 1955, concluded the schists to be overturned beds of the Burra Group, lying above the Aldgate Formation.

2) Rock Types

Outcrop overall is poor. From available outcrop and drill sections it seems clear enough that the mineralisation occurs in schistose rocks overlying the Aldgate sandstone.

i) Aldgate Sandstone; basal unit; feldspathic fine to coarse grained sandstone and arkose; local cross bedding and heavy mineral banding (titaniferous hematite); minor conglomerate members.

ii) Schists: Jones (Crane Enfield Metals) subdivises the schists mainly on colour, competence and mineralogical content. Measured thicknesses are not true stratigraphic thicknesses. Ample evidence exists in present openings that rocks are tightly crumpled.

a) mineralised schist (UKAPARINGA SCHIST: Jones 1970) the lowermost unit, biotite-chlorite-sericite-quartz assemblage, distinguished by several large pegmatite lenses: the main mineralised unit has a biotite-chlorite-sericite-quartz-magnetite assemblage with lenses of vein quartz; it is up to 140' thick at the Ukaparinga prospect, and possibly 200' at the Southern Hills prospect: the uppermost (ie most westerly) unit has a chlorite-biotite-quartz assemblage; 25-30' in thickness. Hand specimen characteristics, particularly coarse grain size and friability, distinguish these rocks from the overlying rocks. In colour, they vary from creamy white to black.

b) barren schists (PIPELINE SCHIST : JOnes 1970)
quartz (~ 50%) -biotite-chlorite-schist; minor graphite, pyrite (~ 1%); the lower section, i.e. near the contact, is marked by carbonate in the assemblage which may increase sufficiently to form a dolomitic marble. Compared to the mineralised schist, the rock is more compact and very much harder.

iii) "Phyllitic shale series": this term refers to rocks immediately west of the Kitchener Fault, i.e. part of the Saddleworth Formation. They consist predominantly of sandy to silty phyllitic shales with frequent interbedded thin siltstone and sandstone beds. An interpretation by previous workers suggests that the mineralised schists are a faulted and metamorphosed section of this formation.

For comparison, Blissett gives the following descriptions:

Mixed schist and gneiss
...from No. 1 Adit .... a quartz-muscovite-biotite almandine schist.

Biotite-muscovite schist (ore bearing horizon) discussed above.

Quartz mica schist
is composed of similar minerals to the mineralised horizon (i.e. variable amounts of quartz, biotite, muscovite, and sericite) but is more massive, particularly where quartz predominates and foliation is less well marked.

Aldgate sandstone
haematised and shattered feldspathic quartzite.

The description of the Aldgate sandstone as a "quartzite" has relevance to DD-6.

3) Metamorphism
Regional metamorphism - the upper part of greenschist facies (Mines specimen TS 14894).

4) Structural Geology (Ukaparinga Workings)
The N-S trending Kitchener Fault is the major structure (extending over 35 miles) to the immediate west. Within the half-mile strip of the Ukaparinga workings the dips of the Aldgate/Ukaparinga contact change from W dips at the south end, to near vertical at section 400S, and remain near vertical at least to 200S. By 200N there is clear evidence of overturning with dips to E. The E dips appear to be maintained in the upper levels to 800N and beyond.

Dips are based on drill hole information.

It is suggested that the overturning may be corrected below RL 900, where dips are proposed as westerly - see later, in this report.

B. Mineralisation
Copper mineralisation is erratically distributed through thicknesses ranging from 35 to 80 (or more) feet between section 00 and section 400N. Narrow intersections also occur quite commonly.

In the upper levels, malachite, azurite, and red iron-copper oxide occur as blebs, irregular patches and disseminations along planes of schistosity.

The erratic distribution of copper persists with chalcopyrite mineralisation below the water table.

Cross sections show assay variations.

Ore Controls

The discussion principally refers to sections and RL plans with this report, and draws on observations set down by Jones, Crane Enfield, in the logs of percussion and diamond drill holes.

a) Lithology

Mineralisation occurs within a soft friable (Ukaparinga) schist, consisting of variable amounts of quartz, biotite, muscovite and sericite.

A quartz muscovite schist with true width ± 7 feet, persistently separates the ore bearing schist from the Aldgate sandstone. This quartz-muscovite schist can be weakly mineralised (DD-2, DD-3, particularly between 260 and 285 feet, DD-4, and DD-5).

The Pipeline schist, immediately west of the ore bearing schist, appears barren.

Within the Ukaparinga ore schist, drill hole assays are erratic. For convenience, an arbitrary cut-off of 0.55% Cu was used to split higher values from lower values. These assay boundaries at even sections were projected as lines on RL planes, and the boundary points joined in plan. A reasonable suggestion is for the higher mineralisation to represent a centre of more intense folding.

Holes DD-3, DD-4 and DD-6 indicated to Jones wedging of the property at depth.

A dip reversal at depth is suggested, following

1) doubts about the correct interpretation of the bottom of DD-6, on section 300N;

2) study of the footwall, Aldgate sandstone particularly, to account for inconsistency in the dips of that footwall between 200N and 400N.

Consider the apparent dip of the Aldgate sandstone on the cross sections.

500N and 400N show dip E with flattening to the north (This trend persists to 800N.)

200N shows dip E.

100N is inconclusive.

00N shows dip E which could be near vertical, but the 500 ft. elevationddifference between contacts allows room for dip reversal.

200S, 350S, 400S indicate near vertical dips

From 500S to south dips are to the west

From closer examination, we see

DD-1:400N core/bedding (c/b) angle 30° at margin, Aldgate sandstone. Nagy has observed c/b angles changing from 45° to 60° between 395 ft. and 442 ft. probably reflecting hole flattening in this abandoned hole.

C/b of 30° at Aldgate would indicate a dip near vertical or just slightly to west.

DD-5:500N In Ukaparinga, near Aldgate, the c/b angle is 23°. The Aldgate position in P-11 would require a substantial overturned roll in the Aldgate sandstone. This roll is supported by the flat (15°) dip of the Pipeline schist at 600N. (Fig.1)

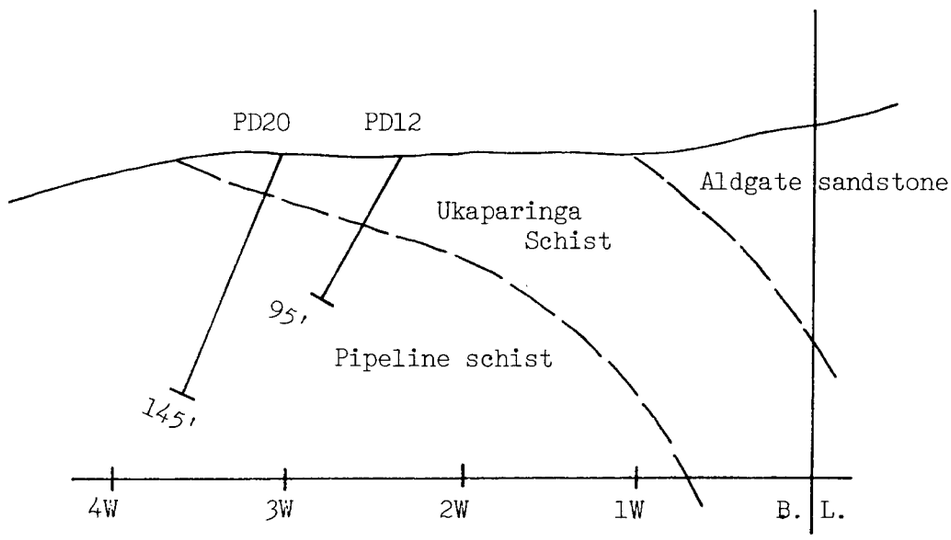


Fig. 1: Section 600N, at scale 1" = 100'

DD-2:200N Three points are available on the Aldgate sandstone to confirm an E dip of 75° (apparent). The c/b angle in the Ukaparinga is 30°, which indicates a near vertical dip where DD-2 leaves the Aldgate. This suggests a transition point in dip reversal.

Consider section 00
Surface and PD-3 data indicate an E dip. DD-4 supports an E-dip, but this must either be much steeper than 75°E (at 86°E) or else a dip reversal must occur.

Now consider section 300N
DD-6 gives a c/b angle of 25° for the Aldgate sandstone. This indicates a dip west of about 80°. If the E dip of 75° is applied from PD-9, a dip reversal occurs about RL 900. Potential dip changes are consistently around Rl 700. Jones considered DD-6 entered Pipeline schist definitely at 649' and the hole terminated at 650'. The log shows a shear zone from 620' to 649' which includes broken feldspathic sandstone at 633'. The 649'-650' is categorised as Pipeline schist, but is described as very pale grey feldspathic quartzite. Micaceous material occurs in the shear zone. Recoveries are only fair.

It is considered that hole DD-6 stopped inconclusively in a shear zone and the micaceous schist intersected may not be from the ore bearing horizon, but may represent the quartz-mica schist zone. This is testable by deepening DD-6.

b) Faults and Shear Zones
Faults observable at surface are

. at 700N, trending N70°E

. at 00 trending N35°W

and suspected
. in costean, at 575N, 175W (Elev. 1192 ft.)

These observed faults are supported by break up of stratigraphy, when cross section data is plotted on RL plans. There is, however, limited information on faults.

c) Folds

It is suggested that locally the beds are overturned at a horizontal axis, positioned about Rl 900. The NS strike trend is apparently arcuate or warped concave to the west, possibly reflecting either developments of the Kitchener Fault, or the effects of tight folding.

The Ukaparinga schist is tightly folded. Its width increase at the Ukaparinga workings is interpreted as a concentration of sediment folding within the concavity mentioned above.

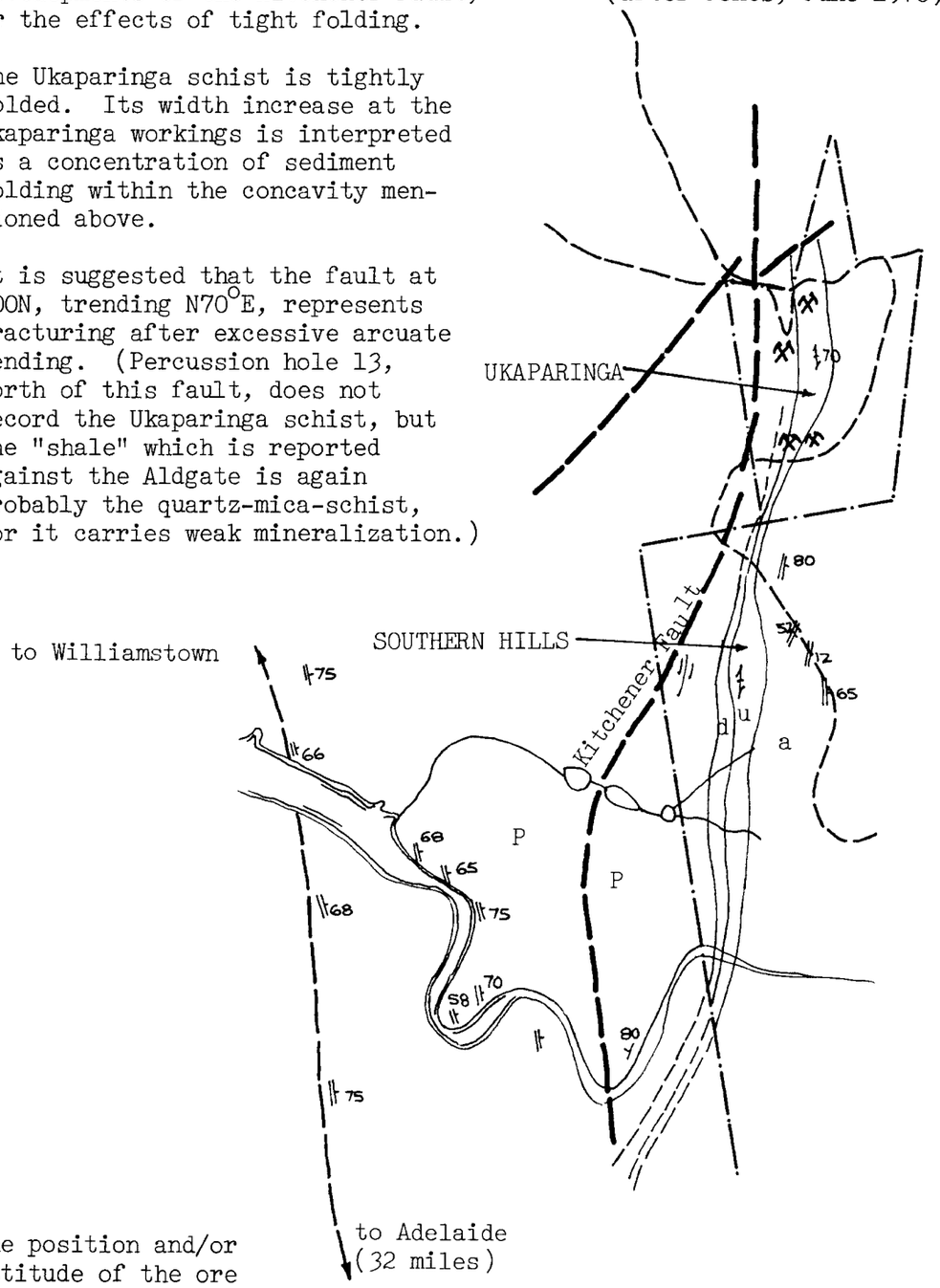
It is suggested that the fault at 700N, trending N70°E, represents fracturing after excessive arcuate bending. (Percussion hole 13, north of this fault, does not record the Ukaparinga schist, but the "shale" which is reported against the Aldgate is again probably the quartz-mica-schist, for it carries weak mineralization.)

Figure 3:

Local Geology

Scale: 1" = 20 chains

(after Jones, June 1970)



The position and/or attitude of the ore bearing horizon immediately along strike to the north is not known. To the south the Ukaparinga schist narrows, apparently remaining narrow until reaching the Southern Hills zone.

This is illustrated by Fig.3.

u	Ukaparinga schist
d	Dolomitic marble
P	Pipeline schist
a	Aldgate sandstone
	Phyllitic shale series
-60	Strike and dip of bedding
60	Strike and dip of schistosity
	Geological boundary
	Fault

Inferred Ore

Only one category exists at Ukaparinga:

i.e. Inferred Ore: quantitative estimates based on limited sampling of a Cu-mineralised zone estimated to carry about 85% of Cu values in carbonate form.

Potential Ore: remains as possibilities only. (the potential of Southern Hills)

Inferred Ore Calculations (+1%)	CEPL	Minoil Services
Surface to RL900	-	0.76MT
Surface to RL800	0.55 MT	-
Surface to RL700	0.70 MT	1.00 MT
N.B. Tonnage factor varies (c.ft./ton)	13.5	11.9

Potential For Development

a) OPEN PIT

It is apparent that the potential here is for carbonate ore only.

In 1971 Operating costs were likely to be overall $5.00 per ton ore at 3:1 waste ore ratio. This gives break even grades of 0.55% recoverable copper, or say, 0.65% Cu in the ground.

Grade must be higher again to cover both return of capital and profit requirements - or else metal price increases must exceed increases in costs.

Where CEM can solve the vat leaching problems it is conceivable that small pit operations could be economic, but the scale is considered to be too small for Cominco. However, vat leaching of ore from small open pits may be attractive to Cominco as an adjunct to underground operations.

b) UNDERGROUND

Rate of return calculations were developed for a selected cost/grade relationship. These calculations (in 1971) indicate the need for either:

. lower operational costs than $11/ton ore, or
. better grades than 1.3% Cu recoverable

for a firm Cu price of 45 cents/lb. (long term price), i.e. a marginal situation, price dependent.

Cominco's interest in the Ukaparinga group of prospects is centred on the tonnage and grade potential of primary ore zones as yet untested to any extent. In 1971 Southern Hills presented an area of potential for chalcopyrite mineralisation, but later drilling by Crane Enfield has not sustained encouragement.

10. THE SOUTHERN HILLS PROSPECT

This "prospect" is outlined by a geochemical anomaly of 1000 ppm Cu in soils, which lies on strike ½ mile south of the Ukaparinga prospect. CEM initially drilled 33 percussion holes to an average depth of 150' to test the 1200' long soil geochemical anomaly covering Ukaparinga Schist. Three best holes intersected oxide mineralisation of +1% Cu (PDH 1,2,3, see plan UK2).

The Ukaparinga Schist is approximately 200' thick at that location and because of the high water table only about a 100' thickness could be tested by percussion drilling. The attractive feature of this prospect was the dip of the Ukaparinga schist. It is dipping at about 65° to the west and is unlikely to be faulted off at depth as at the Ukaparinga prospect. The chances of finding higher grade (+1%) primary ore at depth were considered good.

CEM further tested this prospect with 5 diamond drill holes, 4 in section on OON beneath PDH 2 and PDH 3, and DDH 1,200 feet north of this section, all were inclined at -60° and sited for a deeper test of the best mineralisation located by the percussion drilling. Core from these holes was examined by Cominco. Of these five holes,, the last core tray of DDH 2 and several core trays of DDH 1 were missing.

No report has been compiled by CEM on the results of the last 30 percussion drill holes and the 5 diamond drill holes.

All holes were drilled in an easterly direction and were collared in "Pipeline Schist". DDH Nos. 1,4 and 5 stopped in Ukaparinga Schist short of the boundary with the Aldgate Sandstone. All five holes intersected a dolomite horizon between the Pipeline Schist and the Ukaparinga Schist.

The Pipeline Schist is easily distinguishable from the Ukaparinga Schist by its hardness and particle size. The Pipeline Schist is fine grained, massive and hard, whereas the Ukaparinga Schist is generally coarsely crystalline and friable. Some specks of pyrite were noted in the Pipeline schist, but it was generally seen to be barren with regard to sulphides and oxidised equivalents.

Occasional pyrire specks were noticed in the dolomite horizon, but this too was generally barren of sulphides.

Pyrite and chalcopyrite occur sporadically throughout the Ukaparinga schist, being present as euhedral crystals and anhedral flakes along the plane of schistosity. Quartz and quartz feldspar grains are fairly common within the Ukaparinga schist. There appears to be no direct correlation between quartz veining and sulphide mineralisation to support hydrothermal introduction of sulphides.

The Aldgate sandstone is easily distinguishable from the above formation.

Diamond drill holes Nos. 1 and 2 were drilled in an easterly direction 200 feet apart to test the peak values of the geochemical anomaly and the best percussion drill results.

Holes Nos. 3,4, and 5 were drilled on the DDH 2 section, each hole being stepped back to the west at 100 feet intervals from DDH 2. Thus only 200 feet of strike length was tested by diamond drilling at the prospect.

Best assay results are tabulated below. Results in general were very poor and do not encourage more testing at that section.

DDH	1	0.77% Cu over 9.25 feet (including 0.96% Cu over 3 feet)
	2	1.05% Cu over 12 feet.
	3	0.82% Cu over 14 feet.
	4	1.02% Cu over 8 feet 6 inches.
	5	some assays not printed on log.

No evidence of localisation of these copper rich zones by structure is evident in the core; however, the zones may have been localised by folding of an original bed, in which syngenetic chalcopyrite has been redistributed into subsequent schistosity.

UKAPARINGA PROSPECT : SUMMARY OF DRILLING RESULTS

PDH	SECTION	DIP	DEPTH	%Cu	INTERVAL
1	0200S	Vertical	230'	0.93%/180'	50' - 230'
2	0100S	-60°W	235'	0.34%/90'	90' - 180'
3					
4 A	0000	Vertical	215'	0.54%/125'	85' - 210'
5					
6	0100N	-65°W	265'	0.69%/130'	125'- 255'
7	0200N	-63°W	270'	1.12%/130'	120'- 250'
8	0200N	Vertical	250'	1.37%/150'	100'- 250'
9	0300N	-70°W	285'	1.28%/120'	90' - 210'
10	0400N	-65°W	210'	0.32%/140'	30' - 170'
11	0500N	-60°W	215'	0.23%/75'	20' - 95'
12	0600N	-60°W	95'	-	-
13	0800N	-55°W	55'	-	-
14	0800N	-60°W	100'	-	-
15	0800N	-65°W	90'	-	-
16					
17					
18					
19					
20	0600N	-65°W	145'	-	-
21	0400N	Vertical	110'	0.33%/35'	15' - 50'
22					
23	0200N	-65°W	100'	0.3%/10'	10' - 20'
24					
25	0200S	-65°W	125'	0.32%/105'	10' - 115'
26	0100N	-70°W	100'	0.53%/75'	5' - 80'
27	0300S	-75°W	115'	0.29%/60'	40' - 100'
28					
29					
30					
31					
32					
33					
34					
35					
36	0750S	-55°E	80'	-	-
37	0750S	-60°W	65'	0.13%/10'	15' - 25'
38	0500S	-70°W	55'	-	-
39	0500S	-68°E	175'	0.36%/145'	5' - 150'

PDH	SECTION	DIP	DEPTH	% Cu	INTERVAL
40					
41	0600S	-55°E	185'	0.28%/120'	50' - 170'
42	0350S	-55° E	195'	0.21%/75'	70' - 145'
43	0300S	-45°W	155'	0.63%/100'	55' - 155'
44	0400S	-55°W	105'	0.20%/60'	45' - 105'
45	0350S	-58°W	205'	0.56%/20	185' - 205'
46	0200S	-60°W	275'	0.94%/25'	250' - 275'
47	0700S	-60°E	130'	0.27%/65'	65' - 130'

DDH	SECTION	DIP	DEPTH	% Cu	INTERVAL
1	0400N	-60°W	481'	0.90%/111'	370' - 481'
2	0200N	-65°W	491'	0.86%/105'	315' - 420'
3	0200S	-60°W	387'	0.36%/45'	270' - 315'
4	0000	-50°W	597'	0.87%/30'	560' - 590'
5	0500N	-60°W	428'	0.33%/89'	298' - 387'
6	0300N	-55°W	650'	0.10%/4'	624' - 628'

SOUTHERN HILLS PROSPECT

PDH	SECTION	DIP	DEPTH	% Cu	INTERVAL
1	100N	-50°E	200'	0.87%/100'	70' - 170'
2	00N	-50°E	210	1.01%/35'	90' - 125'
3	00N	-50°E	200'	0.30%/50'	150' - 200'
30 further percussion drill holes; results not available.					

DDH	SECTION	DIP	DEPTH	% Cu	INTERVAL
1	200N	-60°E	435'	0.76%/9.25' 0.77%/9.25'	169.75' - 179' 225' - 234.25'
2	00N	-60°E	503'	1.05%/12'	213' - 225'
3	00N	-60°E	600'	0.82%/14'	325' - 339'
4	00N	-60°E	578.25'	1.02%/8.5'	421.5' - 430'
5	00N	-60°E	788.25'	All assays <0.5% Cu.	

CONCLUSIONS

The exhaustive drill testing of the Southern Hills geochemical anomaly by Crane Enfield Metals has revealed very limited widths of 1% Cu and less in the Ukaparinga Schist. CEM's work also included geological mapping and geochemical sampling south from Southern Hills to the Scott Group of paddocks without significant results.

In view of poor encouragement in the results of the intensive programme carried out by CEM, no further work can be recommended.

11. ATTACHMENTS

1. Summary of available drilling results, Ukaparinga and Southern Hills Prospect.

2. Drawings:

Location, tenure (1974) and cultural map	Plate UK 12
Ukaparinga prospect 1" = 100'0"	
. Geology and drill sites, plan	Plate UK 1
. Cross sections 700S to 200S	Plate UK 9
100S to 200N	UK 8
300N to 500N	UK 10
. Horizontal plans 1100 RL Ukaparinga	UK 7
1000 RL "	UK 6
900 RL "	UK 5
Southern Hills area	
. Geological plan showing geochemical and some drill sites.	UK 2
. Cross section on 00N	UK 4

12. REFERENCES

Jones, D.G.	(1969)	Report- Ukaparinga Prospect Stage I(CEM)
Jones, D.G.	(1970)	Report- Ukaparinga Prospect Stage II(CEM)
Jones, D.G.	(1970)	Report- Southern Hills Prospect Stage I (CEM)
Campana,B., Glaessner, M.F. Whittle, A.W.G.	(1955)	The Geology of the Gawler Military Sheet: Geol. Surv. S. Aust. Report of Investigations, 4 Geological Map-Adelaide 1"=4 miles
Hillswood, E.R.	(1970)	Tonnage Estimates (Minoil Services P/L) for CEM
Blissett, A.H.	(1965)	Report on Ukaparinga Copper Mine (S.A. Mines Department)

Submitted: _____

F.L. Hunt
Manager

Cominco Exploration Pty. Ltd., 1 Greenhill Road, Wayville, S. Aust. 5034, Australia. Telephone 272 1103, 272 1403
(Incorporated in New South Wales)
Telex No. AA 82843
Telegrams Cominco Adelaide

The Director,
Department of Mines,
Box 38,
Rundle Street P.O.,
ADELAIDE. S.A. 5000

January 20, 1975

Dear Sir,

Re: Exploration Licence 99

I apologise for the delay in replying to your letter of November 27, 1974.

The following is the statement of our expenditure on the above licence for the twelve months ended September 30, 1974, this date being the end of our accounting period nearest to October 9, 1974, the expiry date of the above EL.

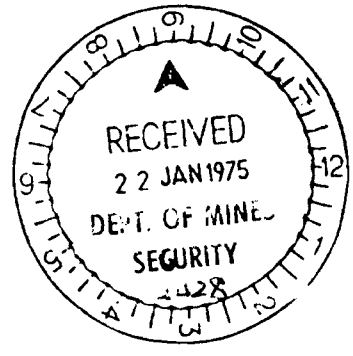
Expenditure:

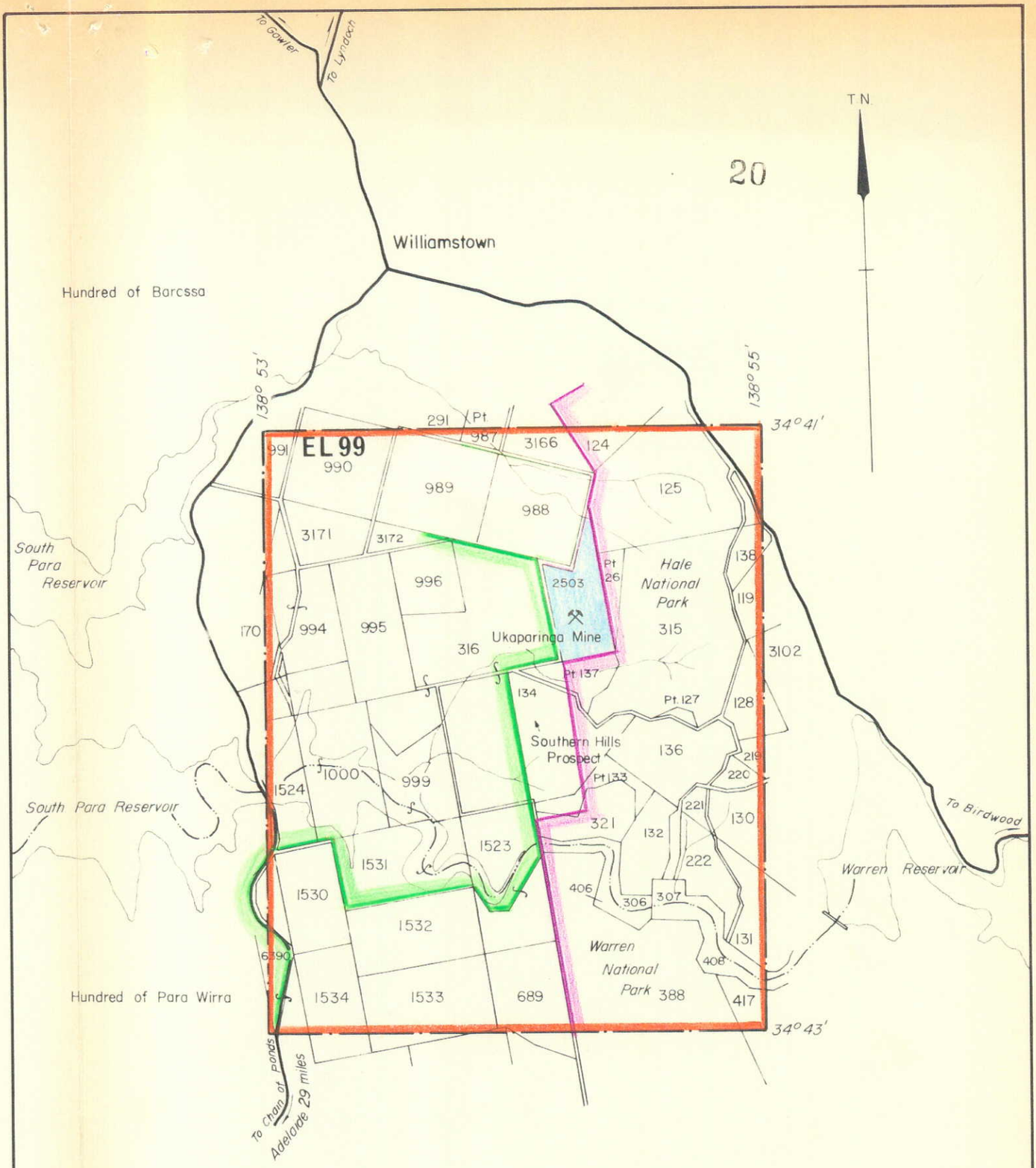
Geology, core logging, interpretation	$412
Tenure, legal	40
Total	$452

Trusting this meets your requirements.

Yours faithfully,
COMINCO EXPLORATION PTY. LTD.

D.C. Simpson





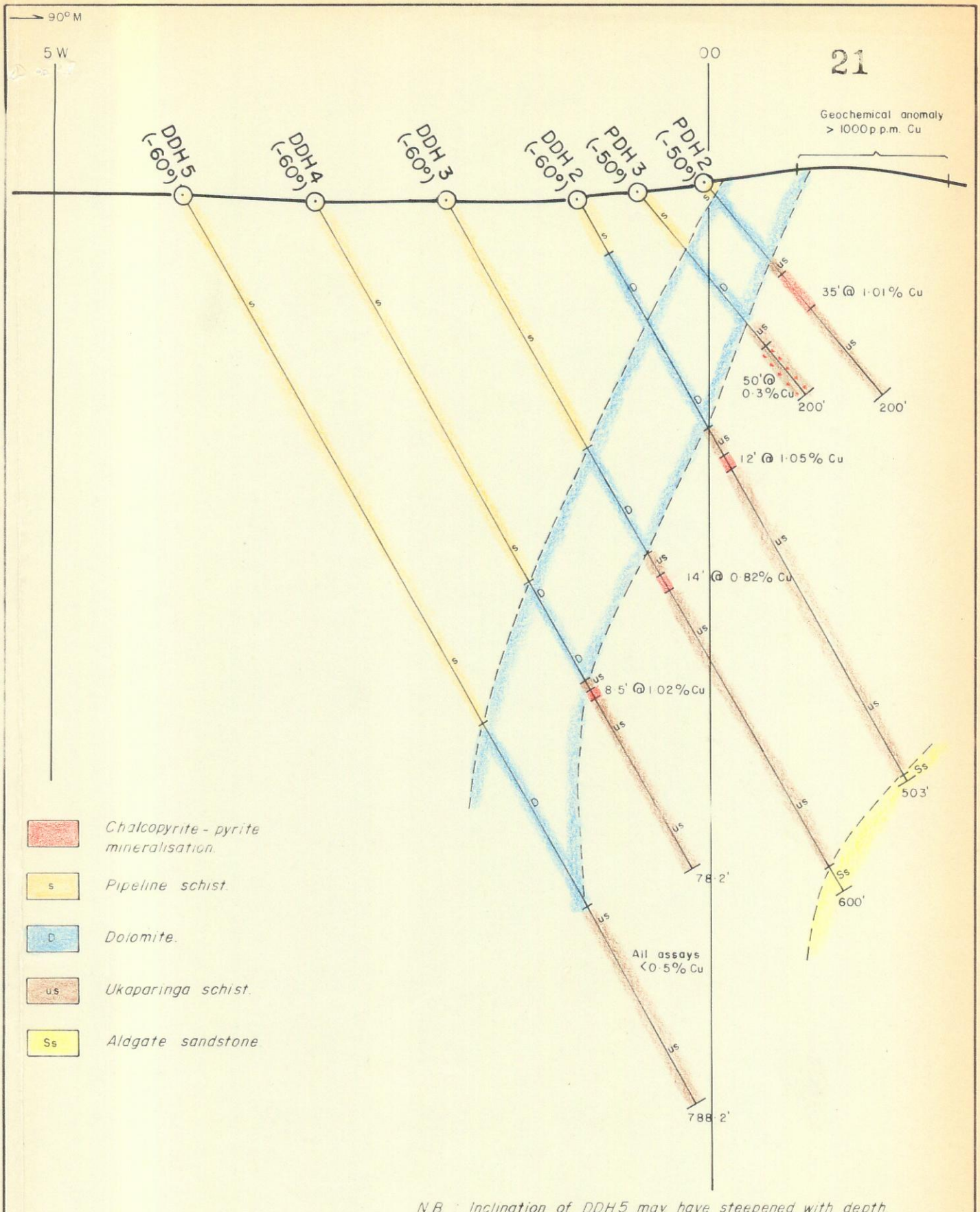
Road
Creek
Reservoir
Section boundary
Hundred boundary
E.L. boundary N°99 Cominco Exploration Pty Ltd
100% owned by Crane Enfield Metals Pty Ltd
Pine plantation
National park land

SCALE
80 70 60 50 40 30 20 10 0 40 80 chains

RECEIVED
19 SEP 1974
DEPT. OF MINES
SECURITY
2428

COMINCO EXPLORATION PTY. LTD.

Drawn by: R.K.Y.	Traced by:	UKAPARINGA AREA S.A.		
Checked by:		TENURE MAP		
Location code: 154/9	Scale: 1" = 40 chains	Date: Aug. 1973	Plate: UK 12	



NB : Inclination of DDH5 may have steepened with depth

COMINCO EXPLORATION PTY. LTD.

DRAWN BY :	TRACED BY : P.F.	SOUTHERN HILLS PROSPECT	
CHECKED BY :	REVISED BY / DATE	WILLIAMSTOWN	
REVISED BY / DATE		SOUTH AUSTRALIA	
		CROSS SECTION ON 00N	
Location code : I 54 / 9	Scale : 1"=100'	Date : September 1974	Plate : UK 14

RECEIVED
19 SEP 1974
DEPT. OF MINES
SECURITY
2428

ENV 2428-1

GEOLOGY BY D. JONES - CRANE ENFIELD METALS PTY. LTD.

COMINCO EXPLORATION PTY. LTD.

DRAWN BY D.J. | TRACED BY G.E.R.

CHECKED BY

REVISED BY	DATE	REVISED BY	DATE

UKAPARINGA PROSPECT

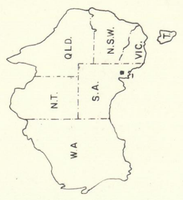
GEOLOGY AND DRILL SITES

SOUTH AUSTRALIA

Location code I54/9/800 | Scale 1" = 100' | Date JANUARY 1971 | Plan UK 1

RECEIVED 19 SEP 1974 DEPT. OF MINES SECURITY 2428

M.N.



5N 0.0 5S 10W

10N 10E

5E 5E

0.0 0.0

5W 5W

10N 5N 0.0 5S 10S

PDH19 PDH16 PDH1 (-50°) 200 PDH2 (-50°) 210 PDH3 (-50°) 200 PDH4

DDH1 (-60°) 435 DDH2 (-60°) 505 DDH3 (-60°) 600 DDH4 (-60°) 578.25 DDH5 (-60°) 788.25

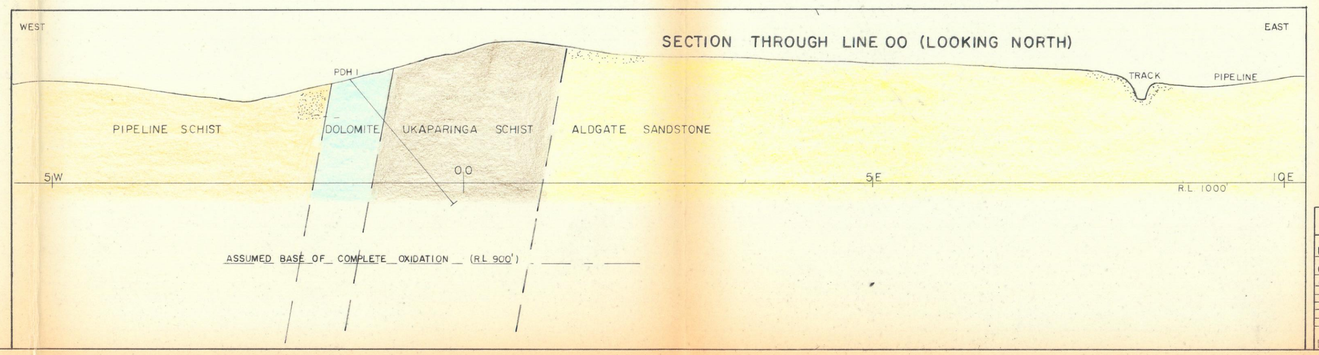
1000m SA CONTOUR

60° 50°

300' 200' 100' 0 50' 100'

PIPELINE SCHIST
DOLOMITE
UKAPARINGA SCHIST
ALDGATE SANDSTONE
STRIKE AND DIP OF BEDDING
STRIKE AND DIP OF SCHISTOSITY
TRACK
FENCE
GATE
LEASE PEG
Diamond Drill Hole
Percussion Drill Hole

SECTION THROUGH LINE 00 (LOOKING NORTH)



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19 SEP 1974
DEPT. OF MINES
SECURITY
2428

GEOLOGY BY D.JONES

ENV 2428-2

COMINCO EXPLORATION PTY. LTD.

DRAWN BY D.G.J	TRACED BY G.E.R
CHECKED BY	REVISED BY / DATE
REVISED BY / DATE	

SOUTHERN HILLS PROSPECT

GEOLOGY, P.D.H sites GEOCHEM ANOMALY

SOUTH AUSTRALIA

Location code: 154/9/800 | Scale: 1" = 100'- | Date: JANUARY 1971 | Plate: UK 2

N

line 5 NORTH

F

F

F

F

F

F

DD6

DD2
chalcopyrite

From DD1

No Data

Calculated

BASE
LINE

400N

200N

GRID 0.0

200S

0 100
METRES

100 50 0 100 200
FEET
(Grid In Feet)

① ALDGATE SANDSTONE

③ PIPELINE SCHIST

>0·55% Cu
<0·55% Cu
} Over 10ft

AFTER CRANE ENFIELD METALS

ENV 2428-3

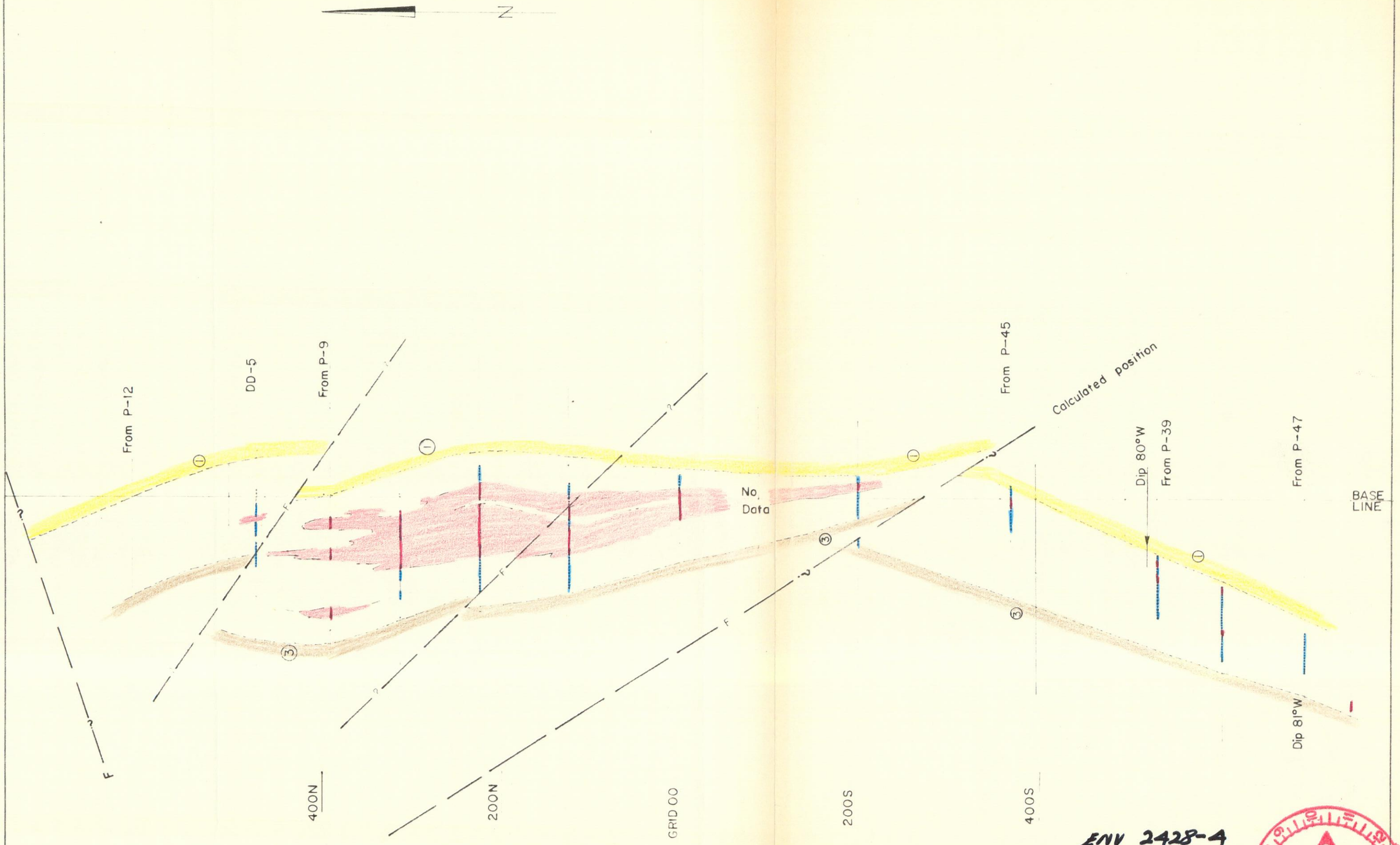
RECEIVED
19 SEP 1974
DEPT. OF MINES
SECTION
2428

COMINCO EXPLORATION PTY. LTD.

DRAWN BY FLH	TRACED BY GER	
CHECKED BY	REVISED BY	DATE
REVISED BY / DATE		

UKAPARINGA PROSPECT
PLAN: RL 900 SHOWING ASSUMED
MARGINS 0·55% Cu ZONE
HUNDRED OF BAROSSA S.A.

Location code: J53/9/800 | Scale: 1:1200 | Date: MARCH 1971 | Plate: UK5



ENV 2428-4

AFTER CRANE ENFIELD METALS

COMINCO EXPLORATION PTY. LTD.

DRAWN BY FLH	TRACED BY GER		
CHECKED BY	REVISED BY	DATE	
REVISED BY	DATE		

UKAPARINGA PROSPECT

PLAN: RL1000, SHOWING ASSUMED MARGINS 0·55% Cu ZONE

HUNDRED OF BAROSSA S.A.

Location code: J53/9/800 | Scale: 1:1200 | Date: MARCH 1971 | Plate UKG

RECEIVED
19 SEP 1974
DEPT. OF MINES
SECURITY
2428

N

From P-12, position of ③

From P-11

From P-8, P-7

From P-2

From P-43

From P-42

From P-44

P-38
P-39

1100RL Surface Contour

BASE LINE

DD-1

F

800N

Fault at 1192 Elevation in Eastern 575N 75W

From P-21

400N

200N

Interpreted position

GRID 00

200S

400S

P-27

Crane Enfield assume U/C Schist absent 1800 evidence weak inconclusive

0 100
METRES
100 50 0 100 200
FEET
(Grid In Feet)

① ALDGATE SANDSTONE

③ PIPELINE SCHIST

>0·55% Cu
<0·55% Cu
} Over 10ft

For RL1100 — 100S to 400N: +·55 Area 22000sqr ft

ENV 2428-5

AFTER CRANE ENFIELD METALS

COMINCO EXPLORATION PTY. LTD.

DRAWN BY FLH	TRACED BY GER		
CHECKED BY	REVISED BY	DATE	
REVISED BY	DATE		

UKAPARINGA PROSPECT
PLAN: RL1100, SHOWING ASSUMED MARGINS 0·55% Cu ZONE
HUNDRED OF BAROSSA S.A.

Location code: J53/9/800 | Scale: 1:1200 | Date: MARCH 1971 | Plan UK7

RECEIVED
19 SEP 1974
DEPT. OF MINES
SECURITY
2428

BASE LINE

P-2

5' interval Assay profile For P-2

67 / 25

55 line

0·10 %

1·00 %

180'

90

av 0·67 / 25'

(Geo Profile)

Best 220 / 5'

av 0·34 / 90'

180

RL1100

SECn 100S

P-24

P-44

P-3

#1 Shaft

Adit

0·27 / 35'

0·75 / 25'

1·05 / 35'

X87

90

0·26 / 30'

1·06 / 10'

0·35 / 30'

0·54 / 25'

0·64 / 15'

0·39 / 5'

1·43 / 20'

Water Level

100

RL1000

DD-4

300'

Crane Enfield Wedge

F.L.H: Intersection narrow at south end of warp

Trenched

500'

av 0·87 / 30'

best 1·40 / 5

worst 0·15 / 5

597

RL600

3W

2W

1W

1E

SECn 00

P-6

P-26

113

0·44 / 30'

0·84 / 10'

93

100

265

0·17 / 15'

0·75 / 40

0·28 / 30'

0·67 / 130'

1·08 / 40'

0·32 / 30'

RL1000

3W

2W

1W

1E

SECn 100N

P-8

P-7

P-23

P-40

DD-2

Qtz Diorite Contact

0·03 / 10'

75°

0·16 / 20'

120'

125'

1·14 / 115'

100'

1·52 / 1·25

0·30 / 35'

235

270'

250'

RL1000

Reflection at 6" cp at 341'

X265

302 312' Qtz veins in mica schist

0·51 / 10'

320

0·34 / 0

Water Level

1·45 / 80'

C/b 30°

400'

0·39 / 20

0·84 / 110'

Chalcopyrite

450'

0·61 / 15'

C/b 30°

Assay Profile DD-2

> 55

< 55

1·06 %Cu

80'

450

400

365

300

3W

W

1E

SECn 200N

ENV 2428-6

AFTER CRANE ENFIELD METALS

0 100

METRES

100 50 0 100 200

FEET

(Grid In Feet)

① ALDGATE SANDSTONE

③ PIPELINE SCHIST

>0·55 %Cu

<0·55 %Cu

} Over 10ft

COMINCO EXPLORATION PTY. LTD.

DRAWN BY F.L.H	TRACED BY J.B
CHECKED BY F.L.H	REVISED BY / DATE
REVISED BY / DATE	

UKAPARINGA PROSPECT

CROSS SECTIONS

100S to 200N

HUNDRED OF BAROSSA S.A.

Location code: J53/9/800

Scale 1:1200

Date MARCH 1971

Plate UK8

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BASE LINE

P-47

av 0·27/65'

best 0·44/5'

RL 1000

65'

130'

2 W 1 W

SECn 700S

P-41

av 0·29/120'

best 0·50/5'

worst 0·12/5'

3·3 Shaft

50'

170'

185'

RL 1000

2 W

SECn 600S

P-39 P-38

av 0·36/145'

0·55/10'

0·89/10'

worst 0·11/5'

Fe oxide/sandstone

155'

175'

RL 1000

3 W 2 W 1 W

SECn 500S

P-44

P-45 on 3755

av 0·20/60'

best 0·38/5'

worst NIL/10'

45'

105'

WATER

205'

0·38/10'

0·72/10'

RL 1000

2 W 1 W

SECn 400S

① ALDGATE SANDSTONE

③ PIPELINE SCHIST

>0·55% Cu

<0·55% Cu

} Over 10ft

0 100

METRES

100 50 0 100 200

FEET (Grid In Feet)

P-42

BASE LINE

P-45 on 3755

av 0·12/40'

av 0·21/75' best 0·33/5'

av 0·16/30'

70'

145'

195'

RL 1000

185'

205'

0·38/10'

0·72/10'

2 W 1 W

SECn 350S

P-27 P-43

av 0·29/60'

best 0·56/5'

40

100

115

125'

95'

116'

av 0·17/40'

av 1·68/30'

av 0·32/30'

%all 0·67/100

RL 1000

2 W 1 W 1 E

SECn 300S

P-1,40-65' Qtz. mica schist

P-25 P-1

P-46 D-3

av 0·32/105

best 0·69/5

best 0·94/10

115

125'

1·87/40

0·66/30

1·08/30

av 0·93/180'

FLH Interpreted

230'

av 0·84/45' best 1·30/5'

C/b30°

235

270

2 W 1 W 1 E

SECn 200S

C/b30°

315

av 0·36/45' best 0·92/5' (low recy zone)

387

ENV 2428-7

AFTER CRANE ENFIELD METALS

COMINCO EXPLORATION PTY. LTD.

DRAWN BY FLH	TRACED BY JB		
CHECKED BY	REVISED BY	DATE	
REVISED BY	DATE		

UKAPARINGA PROSPECT

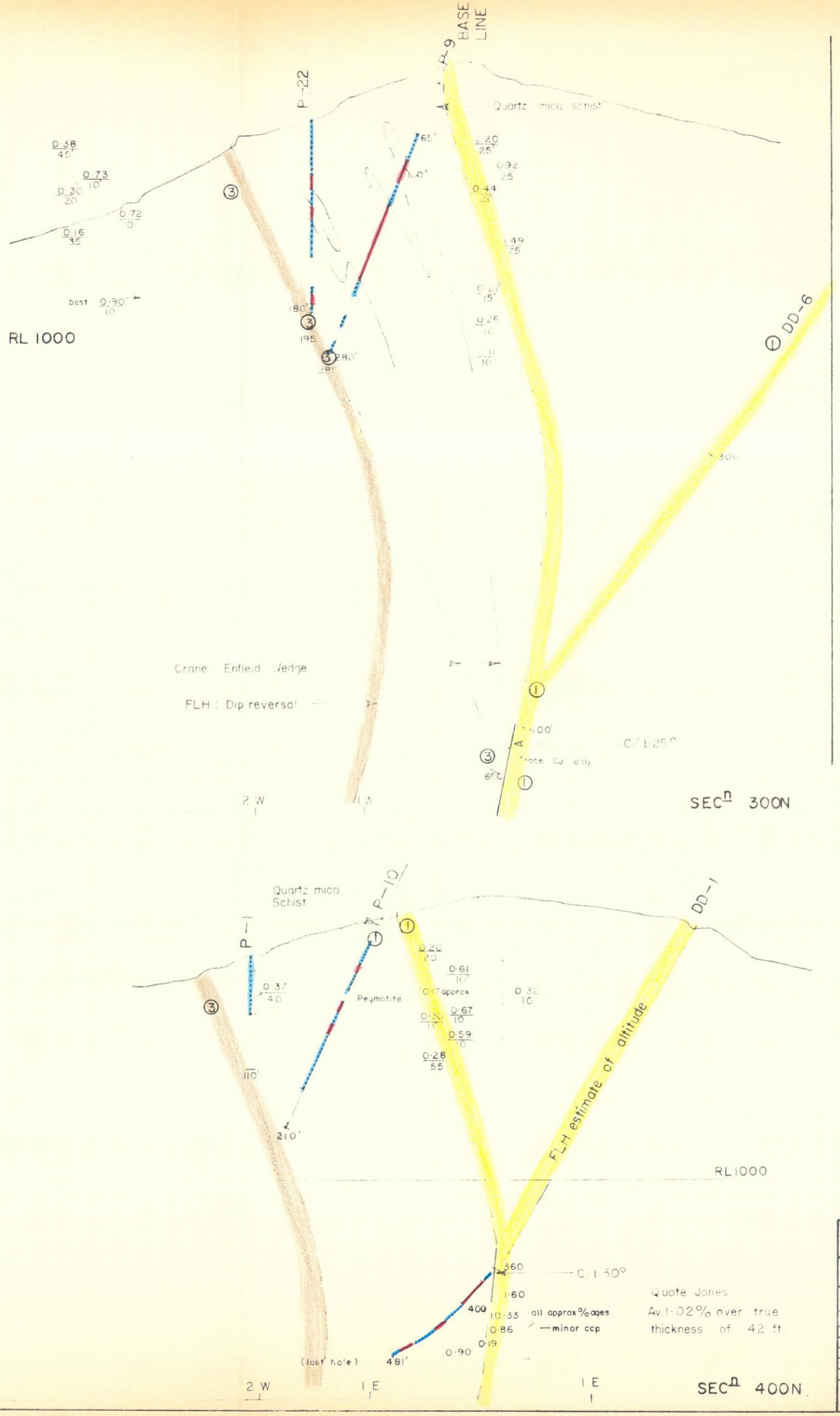
CROSS SECTIONS

700S to 200S

HUNDRED OF BAROSSA S.A.

Location code: J53/9/800 | Scale 1:1200 | Date MARCH 1971 | Plate UK9

RECEIVED 19 SEP 1974 DEPT. OF MINES SECURITY 2428



ENV 2428-8

AFTER CRANE ENFIELD METALS

COMINCO EXPLORATION PTY. LTD.

DRAWN BY FLH	TRACED BY JB		
CHECKED BY	REVISED BY	DATE	
REVISED BY	DATE		

UKAPARINGA PROSPECT

CROSS SECTIONS

300N, 400N, 500N

HUNDRED OF BAROSSA S.A.

Location code: J53/9/800 | Scale: 1:1200 | Date: MARCH 1971 | Plate: UK 10

RECF (Adel)
19 SEP 1974
DEPT. C
SEC
2428