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THE SHELL COMPANY OF AUSTRALIA LIMITED

METALS DIVISION

THE NATONE PYRRHOTITE - MAGNETITE SKARN

N.W. TASMANIA

OPEN FILE

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CONTENTS

SUMMARY

1.0 INTRODUCTION

1.1 General/Summary

1.2 Exploration History

2.0 STRATIGRAPHY OF THE NATONE AREA

2.1 Burnie Formation

2.2 Oonah Formation

2.3 Ordovician Conglomerates/sandstones

2.4 Housetop Granite

2.5 Tertiary

3.0 CONTACT METAMORPHISM/METASOMATISM

3.1 General

3.1.1 Burnie Formation

3.1.2 Oonah Formation

3.2 Natone Skarn - Petrology

3.3 Natone Skarn - Geochemistry

4.0 GEOPHYSICAL & GEOCHEMICAL SIGNATURE

5.0 CONCLUSIONS & RECOMMENDATIONS

REFERENCES

LIST OF FIGURES

FIGURE 1	: Geology of the Northern Margin of the Housetop Granite.	1:50,000
FIGURE 2	: Geology of the Natone - Upper Stowport Area.	1:20,000
FIGURE 3	: Natone Aeromagnetic Anomaly (4044/1).	1:20,000
FIGURE 4	: Natone INPUT Anomaly (IR 3).	1:20,000
FIGURE 5	: Stratigraphy of the Natone Area.	Diagrammatic

LIST OF PLANS

<u>Plan No.</u>	<u>Title</u>	<u>Scale</u>
D/MQ 04/166 .	Natone Skarn - Geology	1:2,500
D/MQ 04/167 .	Natone Skarn - Ground Magnetics (Shell)	1:2,500
D/MQ 04/168 .	Natone Skarn - Magnetic Profile and Longitudinal Section - Geology	1:2,500
D/MQ 04/169 .	Natone Skarn - Longitudinal Section Summary Diagram (interpretive)	1:2,500
D/MQ 04/170 .	Natone Skarn - Longitudinal Section - Geology	1:1,000
D/MQ 04/171 .	Natone Skarn - Longitudinal Section - Mineralogy & Petrology	1:1,000
D/MQ 04/172 .	Natone Skarn - Longitudinal Section - Geochemistry Sn, WO ₃ , Cu, Pb, Zn	1:1,000
D/MQ 04/173 .	Natone Skarn - Longitudinal Section - Geochemistry Mo, Bi, As, Sb, Au	1:1,000
D/MQ 04/065 .	Natone Anomaly 4044/1 - Line 8500 NE - Geophysical Anomalies	1:2,500

SUMMARY

The Natone pyrrhotite-magnetite skarn is located southwest of Natone, 12 km south of Burnie, Northwestern Tasmania.

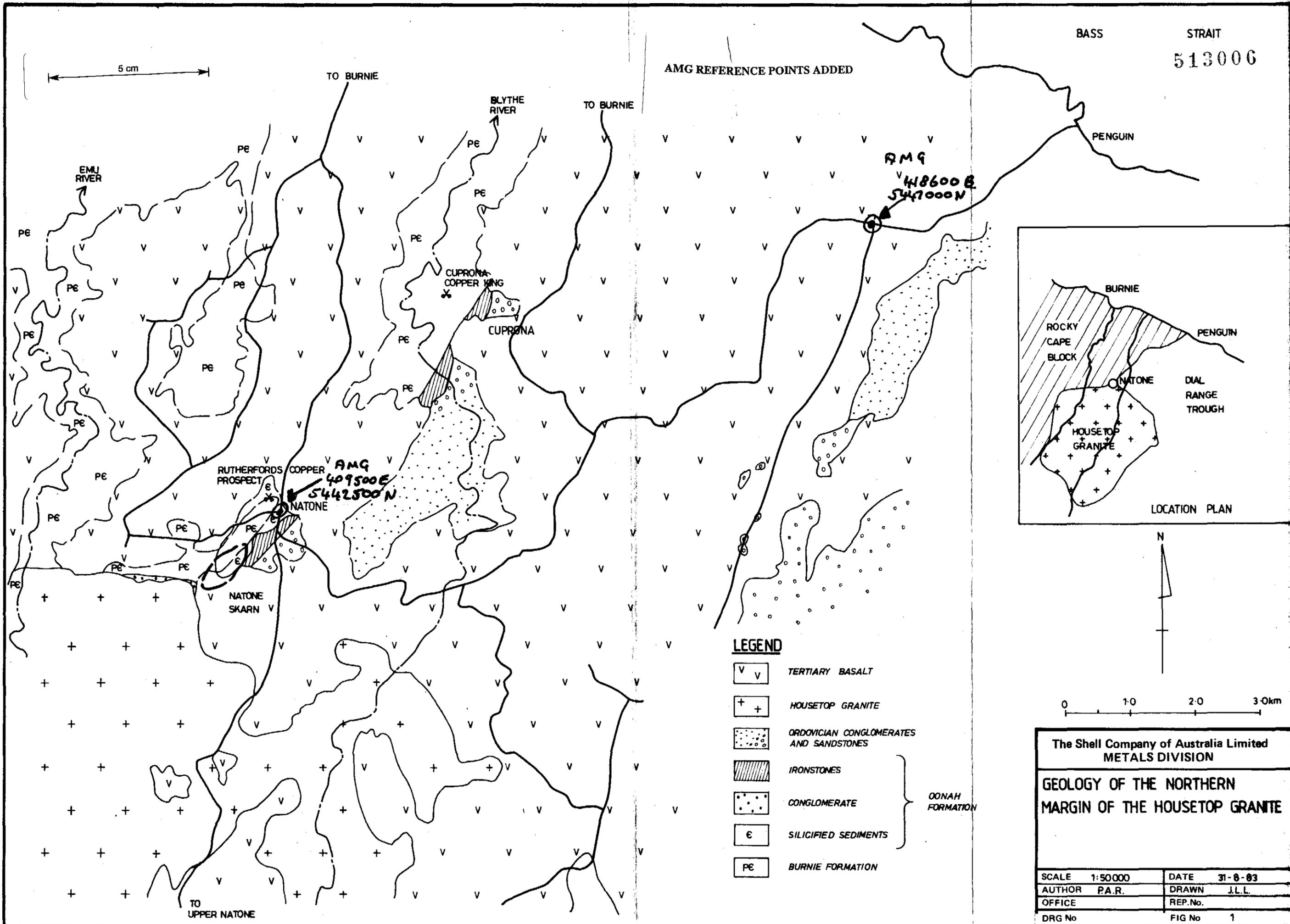
The skarn is situated on the northern contact of the Devonian Housetop Granite and is hosted by dolomitic limestones of the Oonah Formation of Precambrian/Cambrian age.

Bands of massive pyrrhotite and magnetite (upto 3m thick) and disseminated pyrrhotite/magnetite with associated calcium-magnesium and calc-silicates typify the skarn. A mineralogical zonation from pyrrhotite/magnetite-rich skarn close to the granite to calc-silicate skarn with minor sulphides away from the granite contact is observed.

The dimensions of the skarn body are unknown however ground magnetic data defines an anomalous area of 1200m by 500m (elongate NE - SW) with drilling indicating a thickness in excess of 210m of skarnified limestones (NT 3).

Sn, WO_3 and Au assay results from drilling to date are low order throughout.

? Pyrrhotite-magnetite skarns associated with limestones and dolomites of the Oonah Formation are known to contain significant tin on the West Coast of Tasmania - principal deposits are Mt. Bischoff, Cleveland, Mt. Ramsay, Mt. Lindsay, St. Dizier, Severn, Trial Harbour and the largest Renison with reserves of 16.95 mt at 1% Sn.



BASS STRAIT
513000

AMG REFERENCE POINTS ADDED

5 cm

TO BURNIE

BLYTHE RIVER

TO BURNIE

EMU RIVER

RMG
48600 E
547000 N

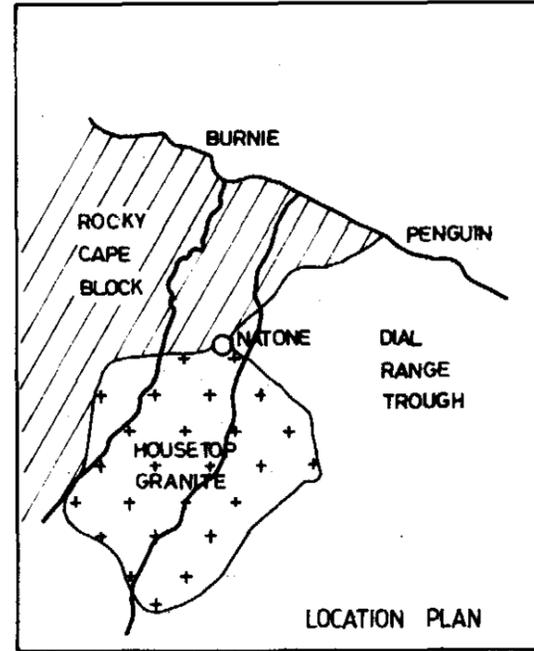
CUPRONA
COPPER KING

CUPRONA

RUTHERFORDS
PROSPECT
AMG
409500 E
5442500 N
NATONE

NATONE
SKARN

TO
UPPER NATONE



0 10 20 30 km

LEGEND

- V V TERTIARY BASALT
 - + + HOUSETOP GRANITE
 - ● ● ● ORDOVICIAN CONGLOMERATES AND SANDSTONES
 - ▨ ▨ ▨ ▨ IRONSTONES
 - ● ● ● CONGLOMERATE
 - ε SILICIFIED SEDIMENTS
 - PE BURNIE FORMATION
- } OONAH FORMATION

The Shell Company of Australia Limited METALS DIVISION	
GEOLOGY OF THE NORTHERN MARGIN OF THE HOUSETOP GRANITE	
SCALE 1:50000	DATE 31-8-83
AUTHOR P.A.R.	DRAWN J.L.L.
OFFICE	REP.No.
DRG No	FIG No 1

1.0 INTRODUCTION

1.1 General/Summary

The Natone Skarn is located in prime dairy farming country 1 km southwest of Natone, Northwest Tasmania. Access is by sealed road from Burnie 12 km to the north (Fig. 1). The area is essentially basalt covered with poor rock exposure. Minor outcrop exposed in basalt windows indicates that Natone lies at the boundary of the eastern margin of the Precambrian Rocky Cape Block and the north-south trending Dial Range Trough of Cambrian/Ordovician age (Gee, 1977).

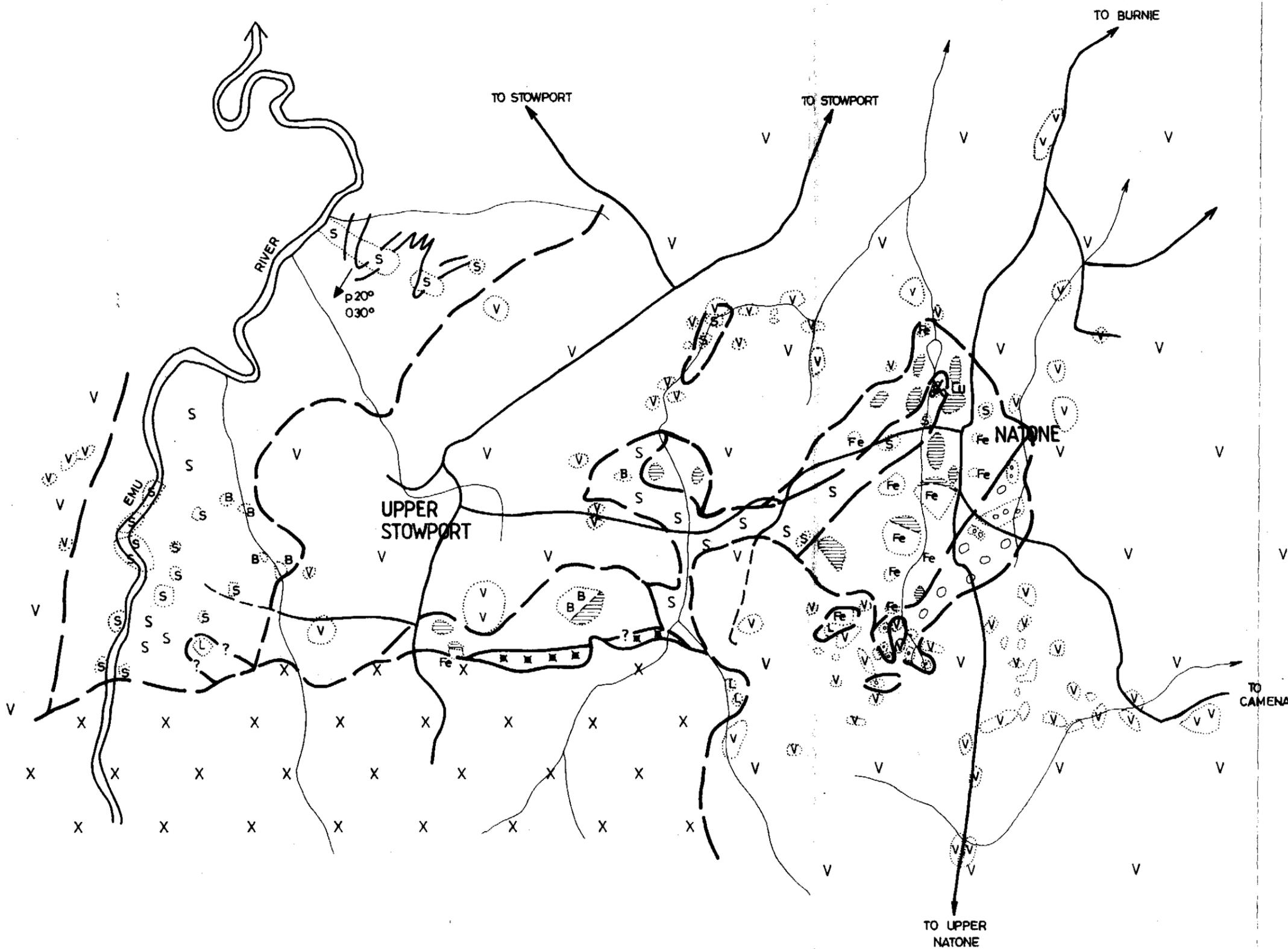
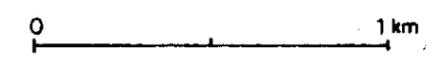
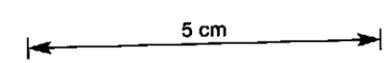
The oldest rocks in the area are flysch deposits with minor basic intrusives of the Precambrian Burnie Formation (Fig. 2). These rocks underwent polyphase folding during the Penguin Orogeny (c. 700 Ma) resulting in a dominant NE - SW fold axial trends. Burnie Formation deposits are overlain unconformably by sediments of the Oonah Formation of Precambrian/Cambrian age which consist of conglomerates, sandstones, shales, dolomitic limestones and ironstone deposits. Ordovician aged conglomerates and sandstones overly the Oonah Formation to the east. Intrusion of the Husetop Granite occurred in the Upper Devonian with the formation of the Natone Skarn. All rocks in the area are covered with a thin veneer of Tertiary basalts and sediments.

The Natone Skarn rests adjacent to a steep contact with porphyritic and fine grained variants of the Husetop Granite. Irregular bands (upto 4m thick) and disseminated pyrrhotite and magnetite pervade calc-silicate bearing dolomitic limestones of the Oonah Formation. A broad mineralogical variation from pyrrhotite/magnetite-rich

- V TERTIARY BASALT
- X X DEVONIAN GRANITE
- ° ° ORDOVICIAN CONGLOMERATE
- Fe IRONSTONE
- L LIMESTONE / DOLOMITE
- ▨ SILICIFIED SEDIMENT
- * * SILICIFIED CONGLOMERATE
- B VOLCANICS / INTRUSIVES
- S SHALES
- Cu RUTHERFORDS COPPER PROSPECT

DOONAH FORMATION
(CAMBRIAN)

BURNIE FORMATION
(PRECAMBRIAN)



The Shell Company of Australia Limited METALS DIVISION	
E.L. 8/77 RIANA NATONE / UPPER STOWPORT AREA GEOLOGY	
SCALE 1:20000	DATE 28-8-83
AUTHOR P.A.R.	DRAWN J.L.L.
OFFICE DEVONPORT	REP.No.
DRG.No. D/MQ04/175	FIG.No. 2

skarn in the proximity of the granite to calc-silicate-rich skarn with magnetite and minor pyrrhotite in distal areas is apparent.

The precise dimensions of the skarn body are unknown however ground magnetic data indicates a magnetic body (probably representing pyrrhotite and magnetite at depth) with an area of 1200m by 500m (elongate NE - SW). Drilling of NT 3 less than 100m from the granite/skarn contact indicates a vertical thickness in excess of 210m of skarn. The sequence of altered limestones has not been closed off at depth.

Low order Sn (max. 80 ppm), WO_3 (max. 65 ppm) and Au (0.05 ppm) values were recorded from the pyrrhotite/magnetite skarn from drill core and percussion chips. The highest values of Sn (390 ppm) and WO_3 (210 ppm) occurred in ironstones of NDDH 2.

The geology of the Natone Skarn is shown in Plan D/MQ 04/166 and ground magnetic trace in D/MQ 04/167. Plans D/MQ 04/168 - 173 define a longitudinal section running NE - SW through the skarn with drillholes projected on to this plane. Plans D/MQ 04/168 and 170 define the geology, 169 summarizes the zonation of the body, 171 the petrology and 172 plus 173 the geochemistry.

1.2 Exploration History

The initial work at Natone was done by the Bureau of Mineral Resources who flew an aeromagnetic survey in the late 1950's and followed up with ground magnetics in the early 1960's (see Banwell, 1981). Minops conducted a ground McPhar IP survey and drilled three vertical diamond holes which intersected magnetite-bearing

calc-silicate skarn in the early 1970's. Tasminex investigated the Rutherford copper prospect to the northwest of Natone in the early 1970's.

In 1980 The Shell Company of Australia flew an aeromagnetic and radiometric survey of the Riana Licence (E.L. 8/77). Natone was selected as a priority one follow-up target (Fig. 3). In 1982 an airborne INPUT survey highlighted Natone as a good conductor and a priority one follow-up target (Fig. 4). Ground exploration has included magnetic, max-min EM coverage of the entire grid with SP completed over the north of the grid and gravity over the southern half, plus selected lines of IP, gravity, SP, VLF and Sirotem TEM. Soil sampling in the central portion of the grid yielded disappointing results. The three diamond holes drilled by Minops were re-logged and assayed for Sn. Two further drillholes have been completed on the southern half of the skarn body (NT 1 and NT 3) by SCOA. Results of this work are recorded in Banwell (1981) and Ruxton (1982; 1983). Complete ground coverage of the skarn body was hampered by problems with Mr. Shepherd a local farmer. As a result the eastern margin of the skarn body is geophysically undefined.

Using all five drillholes a longitudinal section has been constructed along the NE - SW extent of the Natone Skarn. In this report the petrology and geochemistry of the skarn are outlined in the context of the local geology. The geophysical and geochemical signature of the skarn is briefly examined.

It is clear that the petrology of the skarn is not fully understood and that detailed re-examination of

geophysical data will lead to a better understanding of the distribution of magnetite and pyrrhotite in the skarn itself.

2.0 STRATIGRAPHY OF THE NATONE AREA

The stratigraphy of the Natone area is summarized in Figure 5 and the local geology in Figure 2.

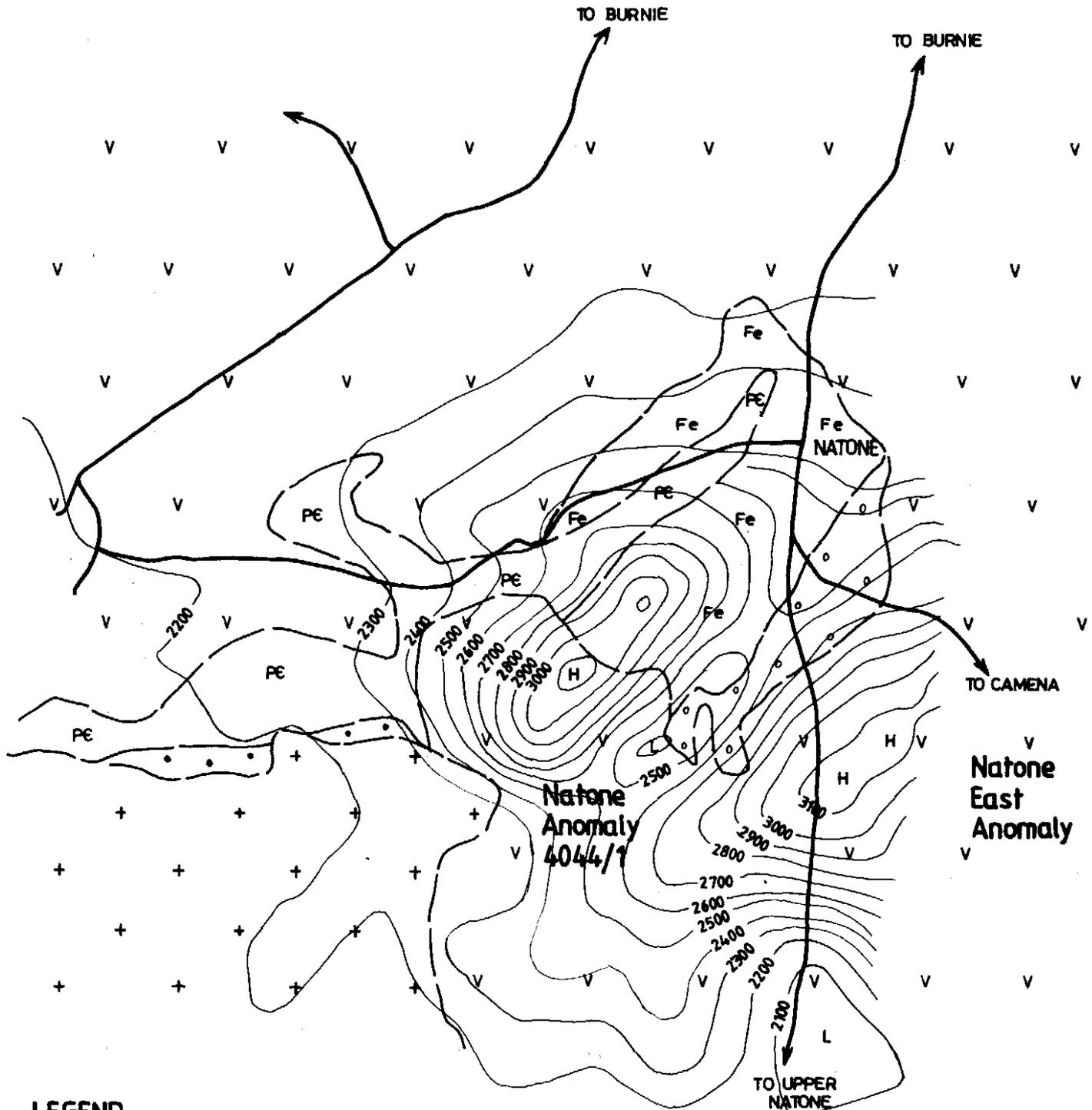
2.1 Burnie Formation

The oldest rocks in the area belong to the Burnie Formation and consist of flysch or turbidite sediments consisting mainly of bedded siltstones and shales with minor sandstones. The shales are often graphitic and may contain syngenetic/diagenetic pyrite (NT 2). The sediments are described more fully by Gee (1977). Associated with these sediments are intrusive fine and coarse grained dolerites and gabbros which appear conformable to bedding. These igneous rocks are clearly pre-Tertiary since they are metamorphosed by the intrusion of the Husetop Granite. They are correlated with the Cooee Dolerites which outcrop on the coast (Spry, 1957; Gee, 1977).

The Burnie Formation underwent at least five phases of deformation during the Penguin Orogeny (700 Ma) resulting in dominant fold axes trending NE - SW (Gee, 1977).

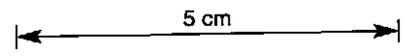
2.2 Oonah Formation

The Oonah Formation is considered to dip shallowly to the SE - both from its outcrop pattern in the Natone area and NE trending strike (Natone - Cuprona) (Fig. 1 and 2). Ironstones, silicified sandstones, shales and



LEGEND

- V V TERTIARY COVER
- + + HOUSE TOP GRANITE
- ORDOVICIAN CONGLOMERATE
- Fe • OONAH FORMATION (IRONSTONES)
- PE BURNIE FORMATION
- 3500 — MAGNETIC CONTOURS (GAMMAS)
(L = LOW ; H = HIGH)



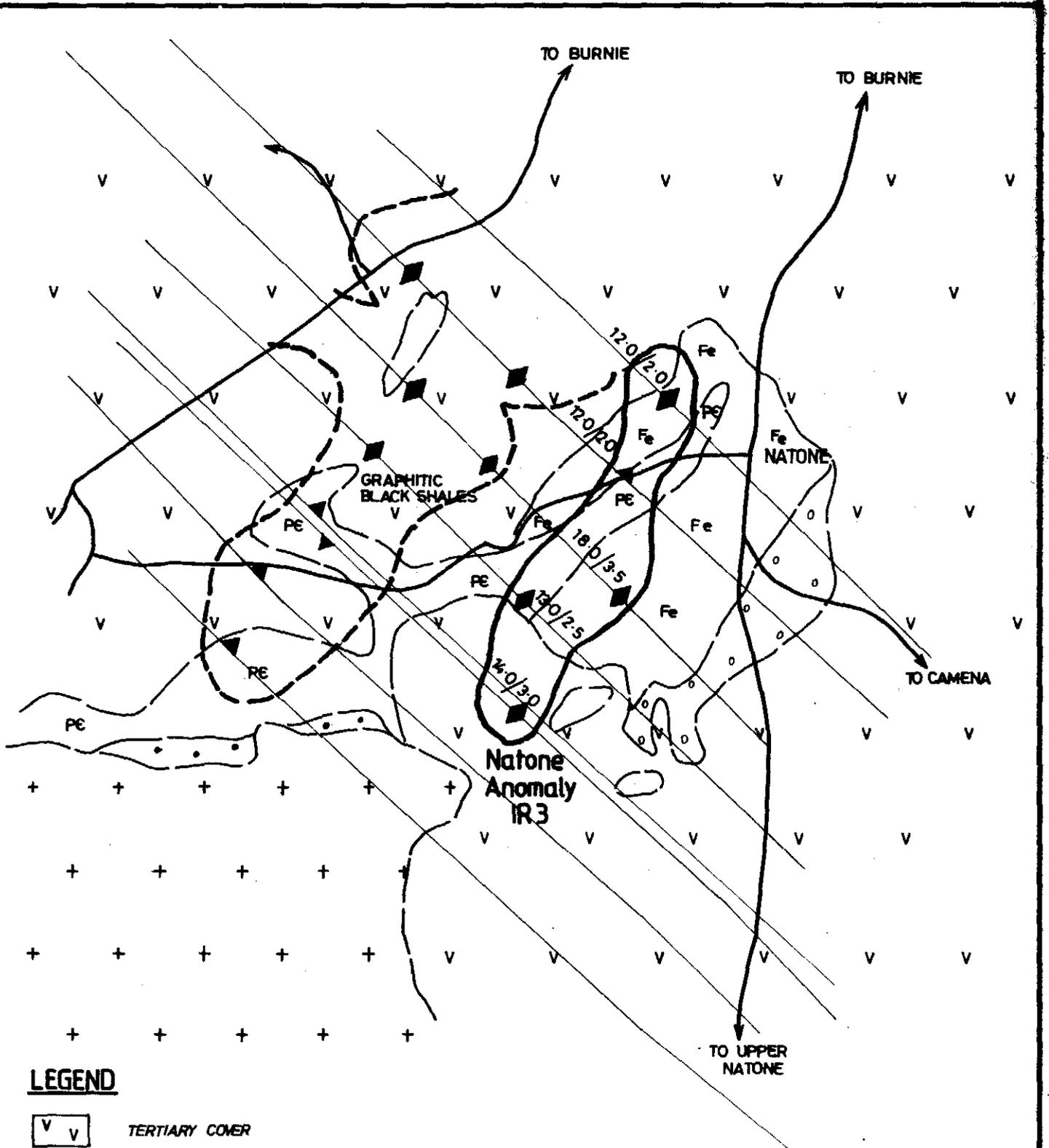
The Shell Company of Australia Limited METALS DIVISION	
E.L. 8/77 RIANA NATONE AEROMAGNETIC ANOMALY 4044/1	
SCALE 1:20000	DATE 5-9-83
AUTHOR P.A.R.	DRAWN J.L.L.
OFFICE D'PORT	REP.No.
DRG No 01/WF 04/178	FIG No 1

dolomitic limestones have been intersected in drill holes and outcrop of silicified conglomerate recognized at the granite contact. The Oonah Formation is considered to overly the Burnie Formation unconformably - due to different degrees of folding, although the contact may be faulted on the western margin of the Natone Skarn.

Silicified conglomerates are considered to form the base of the sequence. Clasts are rounded upto 20 cm across but generally 10 cm and are supported in a siliceous matrix. Clast-types consist of quartzite or chert. This rock unit is extremely siliceous and very hard. It's thickness is unknown.

Dolomitic limestones are considered to overly these conglomerates although no contact is seen. Calc - silicate minerals are common with associated disseminated and banded pyrrhotite/magnetite of the Natone Skarn. Petrological descriptions of the skarn mineral assemblage suggest an original rock composition of magnesite/ankerite - dolomite. The host dolomites are green to yellow in colour with no discernable bedding. These carbonate rocks are interbedded with andalusite - cordierite bearing shales/schists (upto 34m thick in NT 3) and silicified sandstones (upto 10m thick in NDDH 1). Fine intercalations of shale and dolomite in NT 3 indicate a bedding dip of approximately 10° to 20° . This dolomite/shale/sandstone units is in excess of 210m thick in NT 3.

Ironstones and associated silicified sandstones overly the dolomitic unit. Ironstones vary from massive hematite to iron - rich silicified sediments. Immediately west of Natone itself (Fig. 2), outcrop of intensely silicified breccia is exposed on a low ridge. Fine banding is apparent in clasts which themselves appear brecciated. This rock is similar to volcanogenic cinter



LEGEND

- V V TERTIARY COVER
- + + HOUSETOP GRANITE
- o o o o ORDOVICIAN CONGLOMERATE
- Fe / • OONAH FORMATION (IRONSTONES)
- Pe BURNIE FORMATION
- INPUT ANOMALY

18.0/2.0 2nd AND 5th CHANNEL AMPLITUDES

The Shell Company of Australia Limited METALS DIVISION	
E.L. 8/77 RIANA NATONE INPUT ANOMALY IR 3	
SCALE	DATE 5-9-83
AUTHOR P.A.R.	DRAWN J.L.L.
OFFICE D'PORT	REP.No.
DRG No D/MD04/177	FIG No 4

deposits seen by the author at Mt. Paris on Anglesey, Wales. Supportive evidence for a volcanogenic origin is provided by petrological data from the Natone and Cuprona ironstones which are suggested by Whittle (Banwell, 1981) to represent Banded Iron Formation deposits on the grounds of fine scale bedding, slump structures, pelletal jasperite and jasperoidal cherts etc. The association of low levels of Sb, Hg, WO_3 and Au in ironstones and silica from Natone further suggests a submarine felsic source. The trend of ironstone from Natone to the Blythe River and Cuprona deposits clearly refutes a contact metamorphic/metasomatic origin for the Natone ironstones. Petrological studies indicate a recrystallization of quartz and iron probably related to contact metamorphism during the Devonian.

The Natone and Cuprona ironstones are spatially related to quartz vein-hosted copper mineralization in the underlying Burnie Formation - the Rutherford copper prospect and Cuprona Copper King Mines respectively. Gee (1977) records the production of 100 tonnes at 10% Cu (1900 - 1909) from Rutherfords prospect and 1314 tonnes at 16.7% Cu (1904 - 1909) from the Cuprona Copper King Mine. Neither deposit had economic potential. However, they are considered to represent rocks related to the source vents of the overlying ironstone/cinter quartz deposits.

These conglomerate, sandstones, shales, dolomites and ironstones are tentatively correlated with the Onah Formation of the West Coast. Basal silicified conglomerates (and sandstones?) are related perhaps to the Dalcoath Member, they contain dolomitic limestones, andalusite - bearing hornfelses are recorded at St. Dizier and Severn and the ironstones are possibly equivalent to the Red

rock of Renison Bell. No volcanics are however observed in the Natone sequence although the ironstones are considered to represent volcanogenic deposits.

2.3 Ordovician Conglomerates/Sandstones

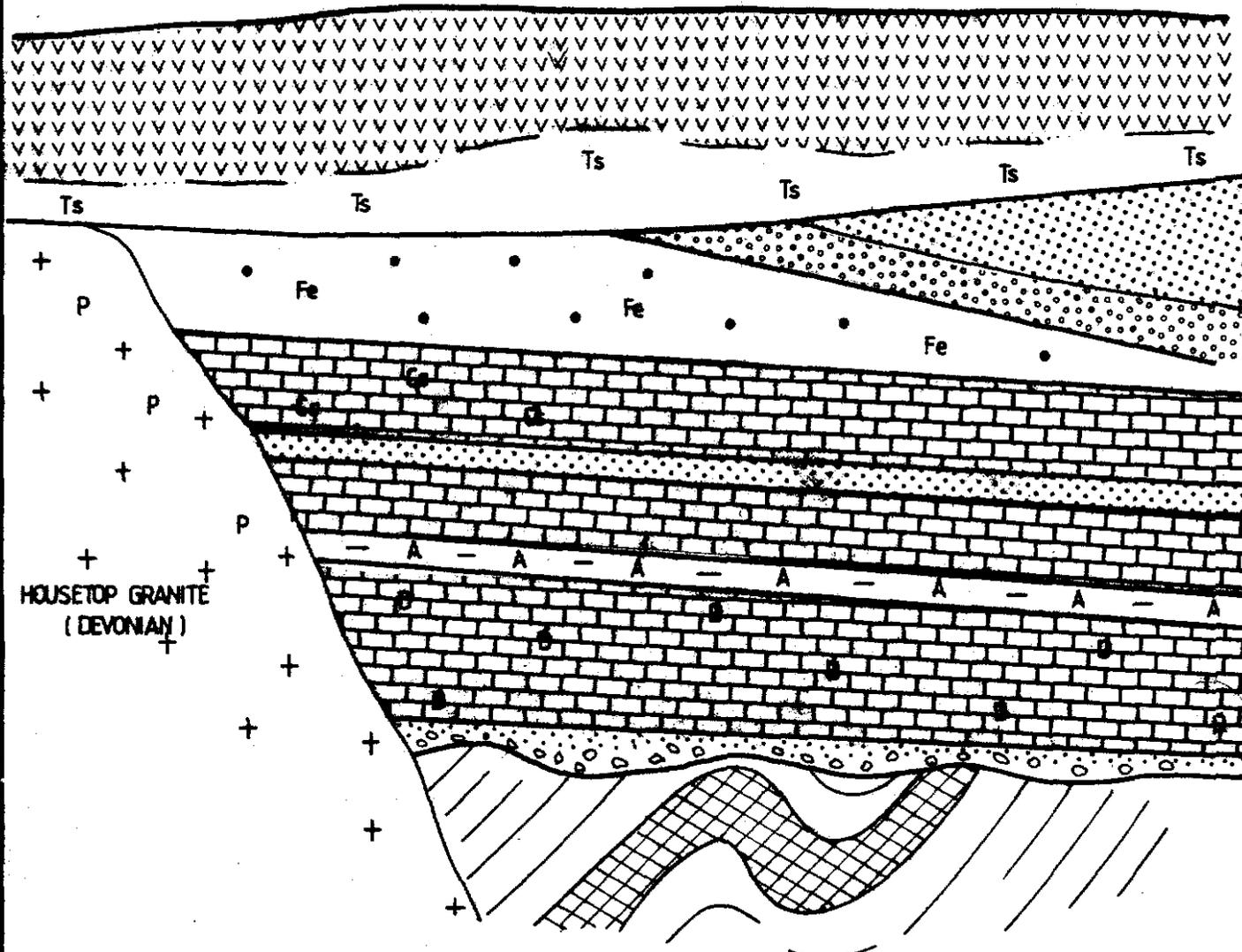
Ordovician conglomerates and sandstones overly the Oonah Formation unconformably (Fig. 5) with a NE - SW strike and SE dip. Conglomerates in the Cuprona (and Natone?) areas contain clasts of Oonah Formation Ironstones. Clasts are generally a few centimetres across, rounded and supported in a medium to coarse grained sandstone matrix. These deposits are correlated with the Roland conglomerate and Moina sandstone.

2.4 Housetop Granite

The Housetop Granite was intruded during the Devonian. It is generally a pink, coarse to medium grained, equigranular biotite granite. 200m from the granite margin at Natone fine grained and sparsely porphyritic variants occur. Phenocrysts of biotite and quartz rest in a fine grained groundmass of quartz, feldspar and biotite. Pegmatitic clots upto 10 to 20 cm across occur with biotite, quartz and feldspar fills. No tourmaline or muscovite is recorded. Assay results from fine grained, porphyritic and coarse grained granite variants plus pegmatitic clots yield low order Sn (max. 6 ppm), WO_3 (max. 15 ppm) and Mo (max. 6 ppm).

The northern contact of the granite is considered steep due to a strong gravity gradient. Aerial photographic studies in the Natone area indicate a linear contact - probably a steep north to north easterly dipping fault at the Natone skarn margin.

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TERTIARY BASALT
AND
SEDIMENTS

ORDOVICIAN AND
CONGLOMERATE SANDSTONES

IRONSTONES

DOLOMITE

SILICIFIED SEDIMENTS

DOLOMITE

ANDALUSITE SHALES

DOLOMITE LIMESTONES

SILICIFIED CONGLOMERATES

PRECAMBRIAN
BURNIE FORMATION
SEDIMENTS AND INTRUSIVES

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E.L. 8/77 RIANA
STRATIGRAPHY OF THE
NATONE AREA

SCALE	DATE	31-8-77
AUTHOR P.A.R.	DRAWN	J.L.L.
OFFICE D'PORT	REP.NO.	
DRG.No. D/MC04/77	FIG No	1/1



CAMBRIAN
PRECAMBRIAN
OONAH FORMATION

2.5 Tertiary

Tertiary sediments and basalts overly all rocks in the area. Evidence of local granite and skarn erosion are reflected by quartz sand containing pyrrhotite in the Tertiary sediments of NT 3. Minor graphitic component indicates the erosion of Burnie Formation shales.

Basalt cover reaches a thickness of 50m on Mr. Klein's farm in NT 1.

3.0 CONTACT METAMORPHISM/METASOMATISM

3.1 General

Rocks of the Burnie and Oonah Formations have undergone metamorphism and metasomatism as a result of the intrusion of the Housetop Granite.

3.1.1 Burnie Formation

Dolerites and Gabbros of the Burnie Formation have been altered with the uralitisation of pyroxenes, replacement of pyroxenes by amphibole and the introduction of amphibole, calcite, chlorite, minor magnetite, pyrrhotite, arsenopyrite, pyrite and chalcopyrite, usually vein-related. Shales and sandstones have been recrystallized/silicified with the introduction of actinolite/chlorite veins and associated pyrrhotite, pyrite, chalcopyrite and minor arsenopyrite.

3.1.2 Oonah Formation

Contact metamorphic effects resulted in the formation of andalusite and cordierite in shales

and the recrystallization of quartz and iron in ironstone B.I.F. and silicified sandstone units. Calcium/magnesium and calc-silicate minerals formed in dolomites and dolomitic limestones. Metasomatic effects led to the formation of an unusual red-brown dravite (tourmaline) at the borders of shale units and dolomitic limestones (NT 3). Veinlets and dissemination of pyrrhotite are common in the shales with additional minerals K feldspar, biotite, muscovite, phlogopite, magnetite, pyrite plus minor sphene, apatite, siderite, pumpellyite and anthophyllite recorded. Alteration of the dolomitic limestones of the Oonah Formation led to the development of the Natone Skarn.

3.2 Natone Skarn - Petrology

The Natone Skarn is magnetic and conductive consisting of disseminated and massive bands of pyrrhotite/magnetite and associated calcium, magnesium and iron-bearing silicates commonly found in contact metamorphosed dolomitic limestones. No minerals of economic significance have to date be found in this skarn body.

In a gross sense the Natone Skarn is zoned (Plan D/MQ 04/169). Zonation from pyrrhotite/magnetite-rich skarn with associated chondrodite-humite-clinohumite minerals and serpentinitic alteration to a calc-silicate skarn with disseminated magnetite and minor pyrrhotite is evident passing away from the granite margin.

A tentative paragenetic mineral sequence is suggested with the early formation of calcium-magnesium and calc-silicate minerals followed by serpentinization and sulphide (magnetite?) production. In proximal skarn positions

contact metamorphic and minor metasomatic effects led to the formation of forsterite, titaniferous diopside, talc, chlorite, calcite, green spinel and chondrodite - humite - clinohumite (unusual Mg silicates containing F and OH restricted in occurrence to limestone/dolomite hosted skarn bodies - common in West Coast of Tasmania skarns) and tremolite. In distal skarn areas diopside, tremolite, calcite, wollastonite, talc, chlorite, K - feldspar, scapolite, prehnite and spinel are observed (summarized in Plan D/MQ 04/171). Serpentinitic alteration of Ca/Mg and calc-silicates occurred in proximal skarn areas (NT 3 and NT 1) but not in distal zones, with the formation of serpentinitic pseudomorphs after diopside, forsterite etc. This retrograde serpentinitic alteration of stanniferous skarns is generally considered to release tin which is contained within early calc-silicate skarn minerals, leading to the formation of free cassiterite. Sulphides formed at a late stage with chalcopyrite, galena, sphalerite, loellingite and arsenopyrite associated with pyrrhotite.

The association of white and clear calcite with magnetite and pyrrhotite was recognized in NT 3. The host rock a green/yellow dolomite is frequently cross-cut by white calcite with associated magnetite and pyrrhotite. This relationship was also suggested from petrological work.

3.3 Natone Skarn - Geochemistry

Low grade Sn (80 ppm max.), WO_3 (65 ppm max.) and Au (0.05 ppm) are recorded from drill core and percussion chips. Slightly elevated values of Cu (1600 ppm max) and Zn (140 ppm max.) are related to the pyrrhotite/magnetite units of NT 3 presumably reflecting minor base metal sulphides associated with pyrrhotite formation.

A marginal increase in the values of Mo (4 to 24 ppm), Bi (65 to 210 ppm) and As (115 to 7300 ppm) is observed from distal to proximal skarn zones. Maximum values of Pb (90 ppm) and Sb (65 ppm) are recorded. Selected geochemical data is presented on Plans D/MQ 04/172, 173.

4.0 GEOPHYSICAL & GEOCHEMICAL SIGNATURE

The Natone Skarn is very magnetic (anomaly of 3800 gammas) and highly conductive. The strong magnetic response is due to the presence of magnetite and to a lesser extent pyrrhotite and the conductive response due to pyrrhotite. The skarn body was selected as a priority one follow-up target from both airborne INPUT and aeromagnetic surveys. Ground magnetic, max-min EM, VLF and Sirotem TEM responses are strong. SP detected sulphide at depth and IP disseminated and massive sulphide zones. A small gravity response was discernable over the skarn body but generally obscured by the strong regional gradient. Ground magnetics has proved the best geophysical tool in defining the Natone Skarn.

Plan D/MQ 04/065 is a profile indicating geophysical response to the skarn body beneath 40m of basalt over NT 1.

Detection of the skarn body was however complicated by several conductive, magnetic and density contrasting sources:

	<u>Sources</u>
Magnetics	(1) Magnetic Basalt (2) Magnetite - bearing Precambrian Dolerites (3) Skarn
Conductors	(1) Graphitic schists - Burnie Formation (2) Clay bands beneath basalt cover (3) Skarn
Density Contrasts	(1) Lithological variations (2) Thickness variation of basalt (valleys) (3) Skarn

However a combination of magnetics and max-min EM for shallow conductors (100m) and IP for deeper conductors (150m) is recommended. A combined magnetic and max-min EM anomaly would still require IP follow-up to eliminate the possibility of a magnetic basalt and underlying clay layer.

It is important that the search for basalt covered magnetic/ conductive skarn bodies be constrained where possible by geological information. Every effort should be made to narrow down the area of prospective stratigraphy and to study magnetic lineaments with a view to possible magnetic basalt sources.

There is no obvious geochemical signature of the Natone Skarn. An elevated stream sediment Cu zone is recognized but related to the Rutherford Copper Prospect. Soil geochemistry over non-basalt covered Oonah Formation reflected slightly elevated Sn (85 ppm), WO_3 (60 ppm), Cu (350 ppm) and Zn (130 ppm).

Outcropping stanniferous skarns on the West Coast for example Mt. Bischoff and Renison were originally located by panning cassiterite in surrounding streams.

5.0 CONCLUSIONS & RECOMMENDATIONS

A pyrrhotite/magnetite replacement skarn body has been discovered in the Oonah Formation (Precambrian/Cambrian) on the northern margin of the Husetop Granite (Devonian) at Natone, NW Tasmania.

Geochemical data from five drill holes indicate that the skarn is barren with respect to Sn, WO_3 and Au.

The dimensions of the skarn are estimated at 1200m by 500m (NE to SW elongation) and in excess of 210m thick.

Several signs indicate that there is little likelihood of tin mineralization in untested portions of the skarn:

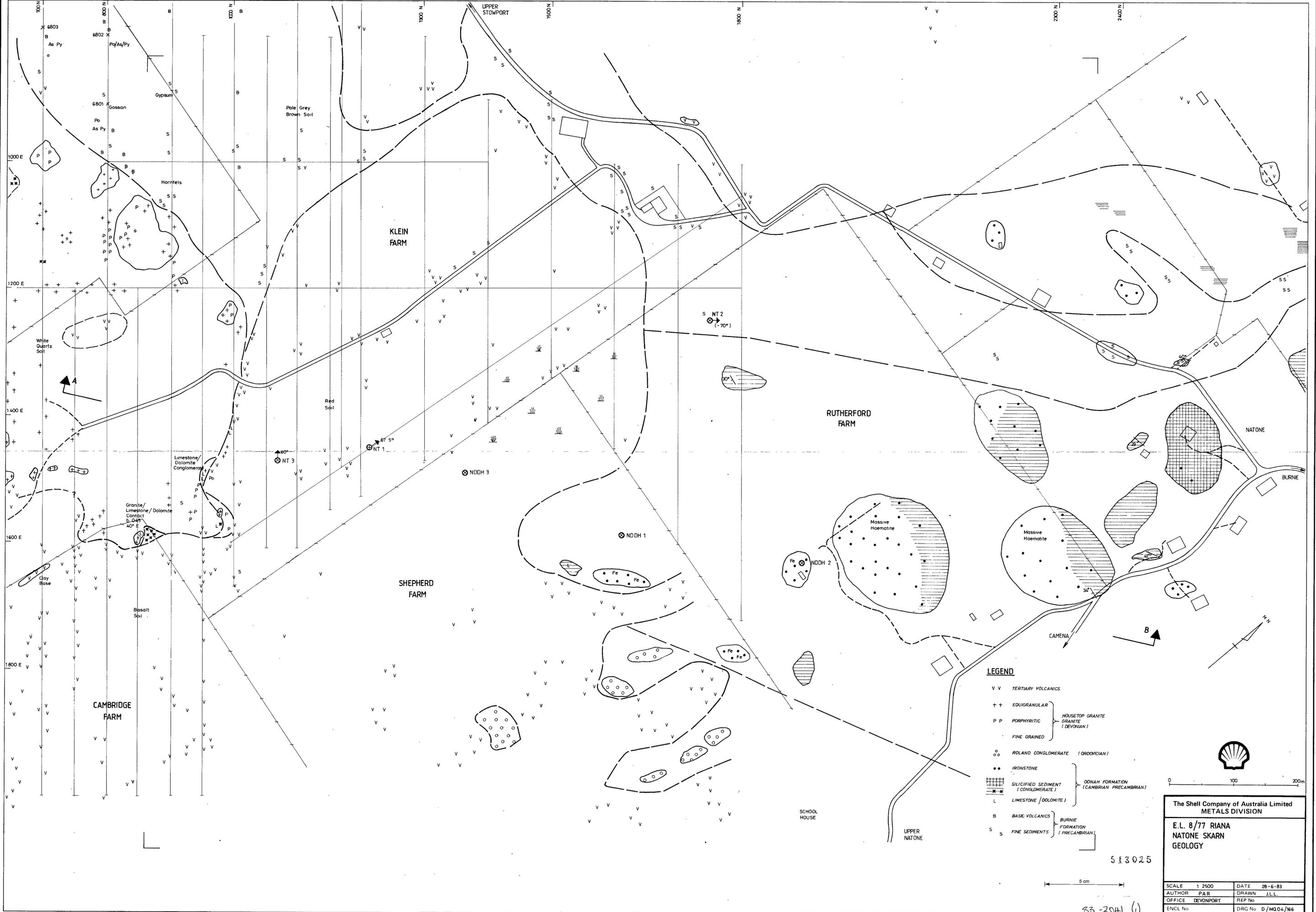
- (1) The total lack of Sn, WO_3 and Au values with a maximum of 80 ppm Sn in drill assays.
- (2) The lack of alteration and low Sn values of the margin of the Housetop Granite (the Pine Hill Granite at Renison Bell is extremely altered and Sn-bearing).
- (3) Several skarn bodies at the margins of the Housetop Granite have yielded low Sn, WO_3 and Au values - Redwater magnetite, Highclere, Buckby pyrrhotite skarns - with the exception of the Kara WO_3 /magnetite skarns.

A thorough petrological examination is recommended to define the various stages of skarn development. Such a study will aid in the determination of whether tin was originally present in the skarn and has been removed to lower temperature areas surrounding the skarn by late stage serpentinite fluids or if the skarn is indeed barren. Electron-microscope scans and analysis are currently being made on spinels and sphenes from within the skarn body to determine their Sn content. It is suggested that low order Sn results will indicate that the skarn-forming fluids were non-stanniferous.

More information regarding the distribution of pyrrhotite and magnetite within the skarn body could be gleaned from a close look at the ground geophysical data prior to further drilling or investigation.

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Pap. Proc. R. Sco. Tas. 91 p. 81-73.



The Shell Company of Australia Limited
METALS DIVISION

E.L. 8/77 RIANA
NATONE SKARN
GEOLOGY

513025

SCALE	1:2500	DATE	28-6-83
AUTHOR	P.A.R.	DRAWN	J.L.L.
OFFICE	DEVONPORT	REP No	
ENCL No		DRG No	D/MQ04/166

33-2041 (1)



513026

5 cm

53-2041 (1)

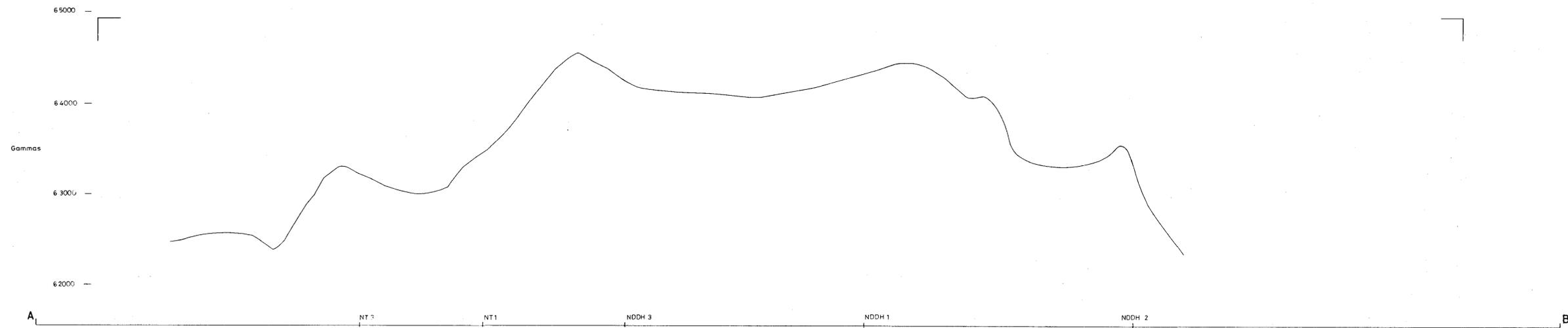


0 100 200m

The Shell Company of Australia Limited
METALS DIVISION

E.L. 8/77 RIANA
NATONE SKARN
GROUND MAGNETICS (SHELL)

SCALE 1:2500	DATE 28-6-83
AUTHOR P.A.R.	DRAWN J.L.L.
OFFICE DEVONPORT	REP. No.
ENCL No.	DRG No. D/M004/167



MAGNETIC PROFILE

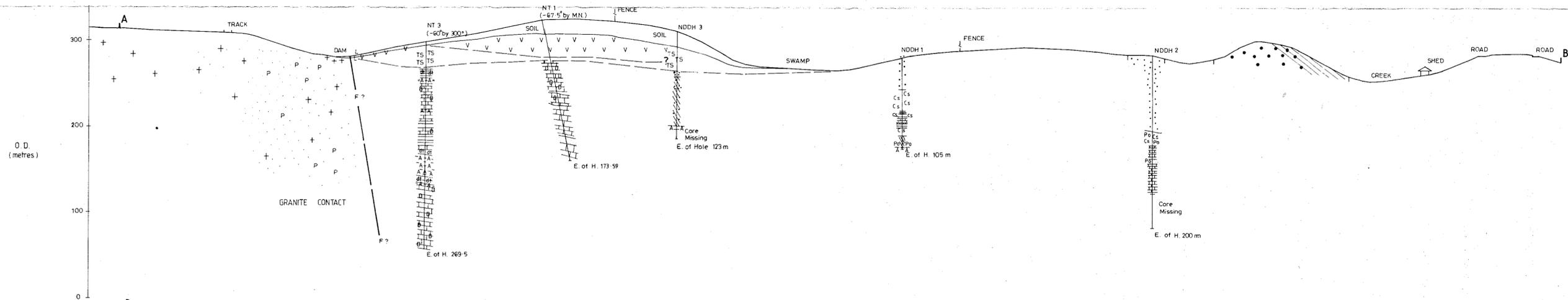
S.W.

N.E.

KLEIN

SHEPHERD

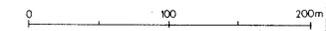
RUTHERFORD



LONGITUDINAL SECTION THROUGH THE NATONE SKARN

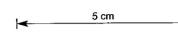
LEGEND

- | | | | |
|-------|----------------------|-------|-------------------------------------|
| V V | TERTIARY BASALT | ••• | IRONSTONE (HAEMATITE) |
| TS TS | TERTIARY SEDIMENTS | ••• | SILICIFIED SILTSTONE |
| P P | PORPHYRITIC GRANITE | ••• | SILICIFIED SANDSTONE |
| + + | EQUIGRANULAR GRANITE | Cs | CALC - SILICATE ROCK |
| ••• | FINE GRAINED GRANITE | — — — | LIMESTONE |
| — — — | PYRRHOTITE RICH | — — — | DOLOMITIC LIMESTONE |
| — — — | MAGNETITE RICH | — — — | DRAVITE - BEARING LIMESTONE / SHALE |
| Po | PYRRHOTITE | — — — | SHALES |
| | | -A-A- | ANDALUSITE / CORDIERITE SHALES |

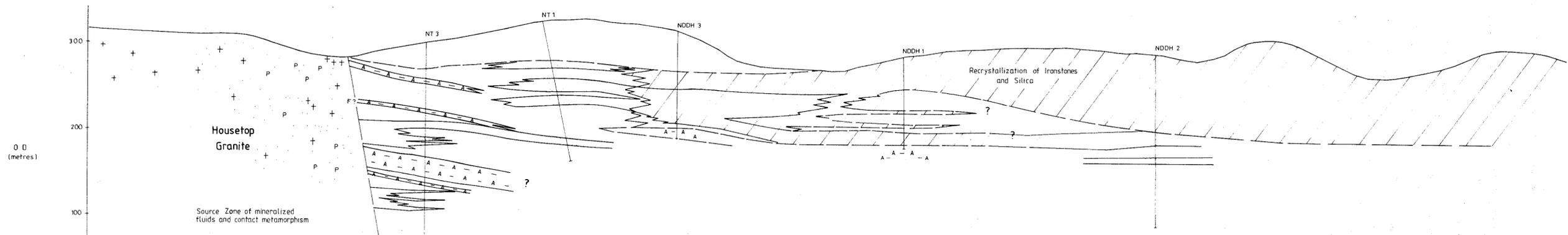


The Shell Company of Australia Limited METALS DIVISION			
E.L. 8/77 RIANA NATONE SKARN MAGNETIC PROFILE AND LONGITUDINAL SECTION - GEOLOGY			
SCALE	1:2500	DATE	18-7-83
AUTHOR	P.A.R.	DRAWN	J.L.L.
OFFICE	DEVONPORT	REP. No.	
ENCL. No.		DRG No.	D/MQ04/168

513027



83-254(1)



0 0
(metres)

House Top
Granite

Source Zone of mineralized
fluids and contact metamorphism

Pyrrhotite / Magnetite / Calc - Silicate
Serpentinite Alteration

Massive Pyrrhotite & Magnetite ()

CONTACT METAMORPHIC

Di, Fo, Trem
Chondrodite Series
K. feldspar

METASOMATIC

Serpentinite overprint
Dravite

HIGH TEMPERATURE SKARN ?

Calc - Silicate alteration

Disseminated Pyrrhotite / Magnetite

CONTACT METAMORPHIC

Di, (Fo), Trem, Woll

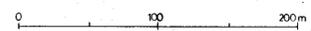
(No serpentinite overprint
or Chondrodite formation)

LOWER TEMPERATURE SKARN ?

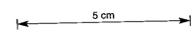
Recrystallization of Ironstones
and Silica

LEGEND

- HOUSE TOP GRANITE
- ANDALUSITE - BEARING SHALES
- PYRRHOTITE - BEARING ROCK
- DIOPSIDE
- FORSTERITE
- TREMOLITE
- WOLLASTONITE

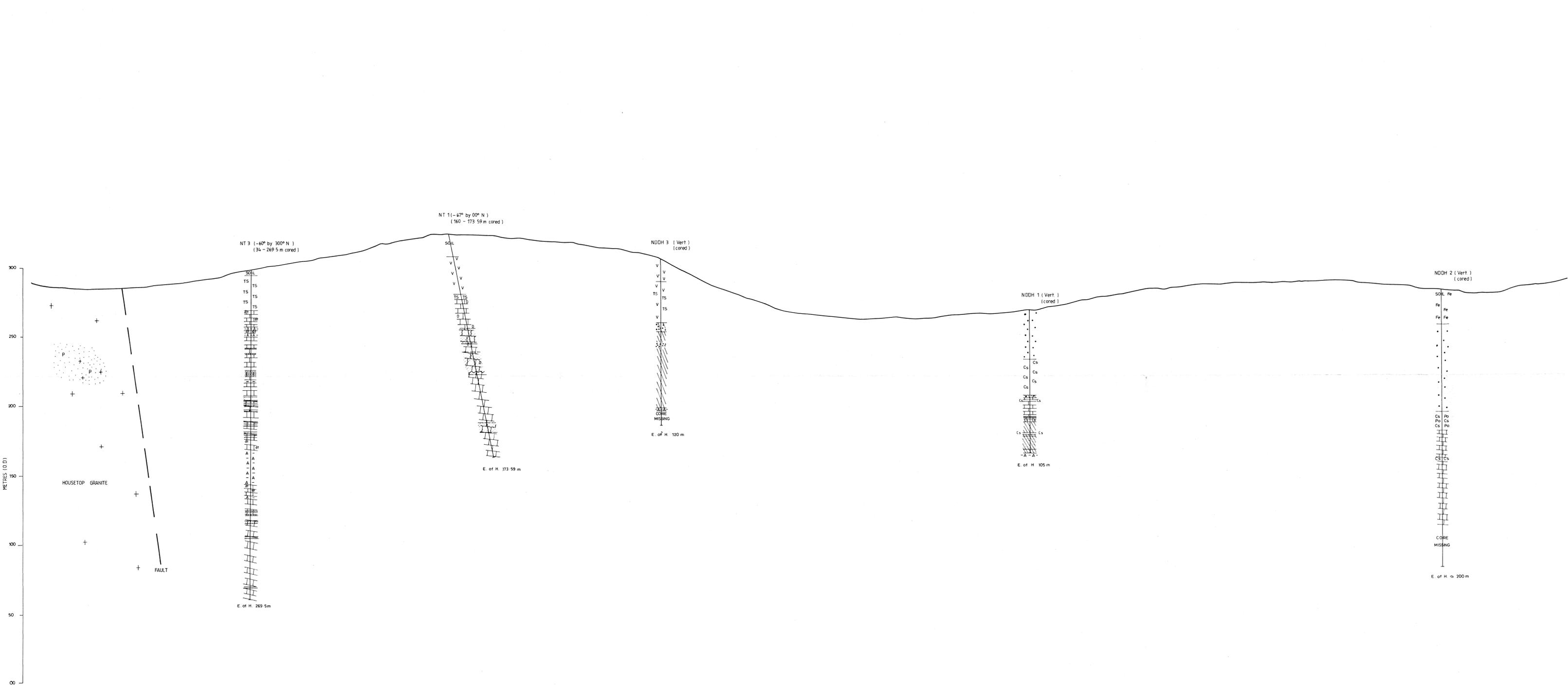


513028



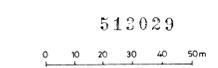
83-2041 (1)

The Shell Company of Australia Limited METALS DIVISION			
E.L. 8/77 RIANA NATONE SKARN LONGITUDINAL SECTION - SUMMARY DIAGRAM (INTERPRETIVE)			
SCALE	1:2500	DATE	18-7-83
AUTHOR	P.A.R.	DRAWN	J.L.L.
OFFICE	DEVONPORT	REP No.	
ENCL No.		DRG No.	D/MQ 04/169



LEGEND

SOIL	SOIL COVER
V, V	TERTIARY BASALT
TS, TS	TERTIARY SEDIMENT
P, P	DEVONIAN GRANITE
(Dotted pattern)	IRONSTONE (HAEMATITE)
(Diagonal lines)	SILICIFIED SILTSTONE
(Diagonal lines)	SILICIFIED SANDSTONE
Cs	CALC. SILICATE ROCK
(Horizontal lines)	LIMESTONE
(Horizontal lines)	DOLOMITIC LIMESTONE
(Horizontal lines)	GRANITE BEARING LIMESTONE / SHALE
(Horizontal lines)	SHALE
(Horizontal lines)	ANDALUSITE CORDIERITE BEARING SHALE
(Horizontal lines)	PYRRHOTITE RICH
(Horizontal lines)	MAGNETITE RICH
Po	PYRRHOTITE

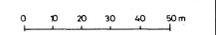
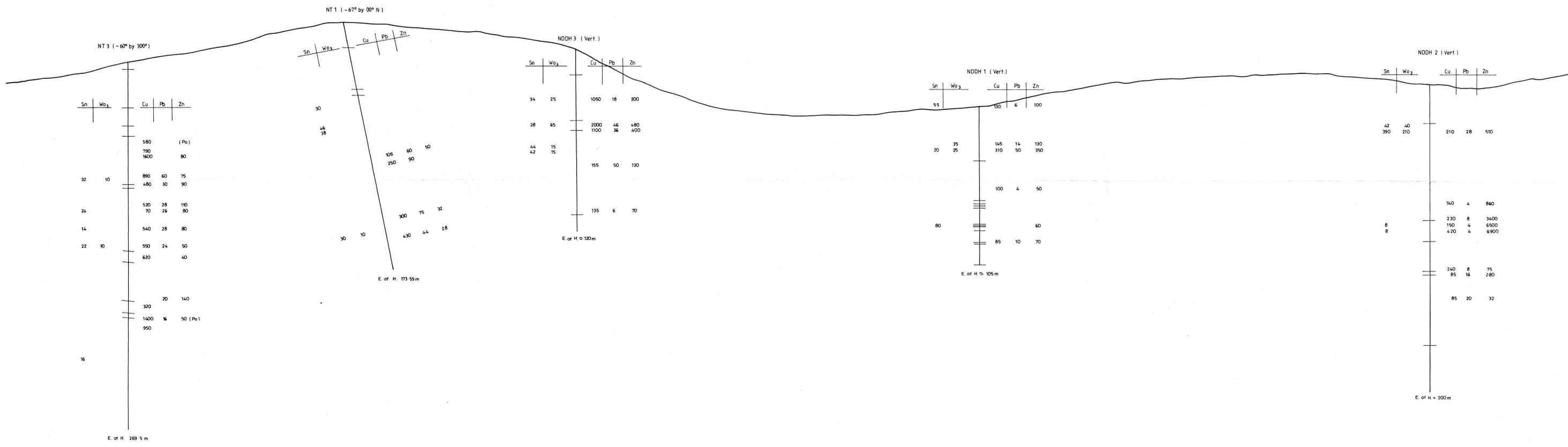


The Shell Company of Australia Limited METALS DIVISION	
E.L. 8/77 RIANA NATONE SKARN LONGITUDINAL SECTION GEOLOGY	
SCALE 1:1000	DATE 20-7-82
AUTHOR P.A.R.	DRAWN J.L.L.
OFFICE DEVONPORT	REP. No.
DRG. No. D/MQ04/170	FIG. No.

5 cm

83-2041(F)

METRES (O.D.)



513031



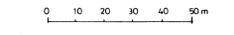
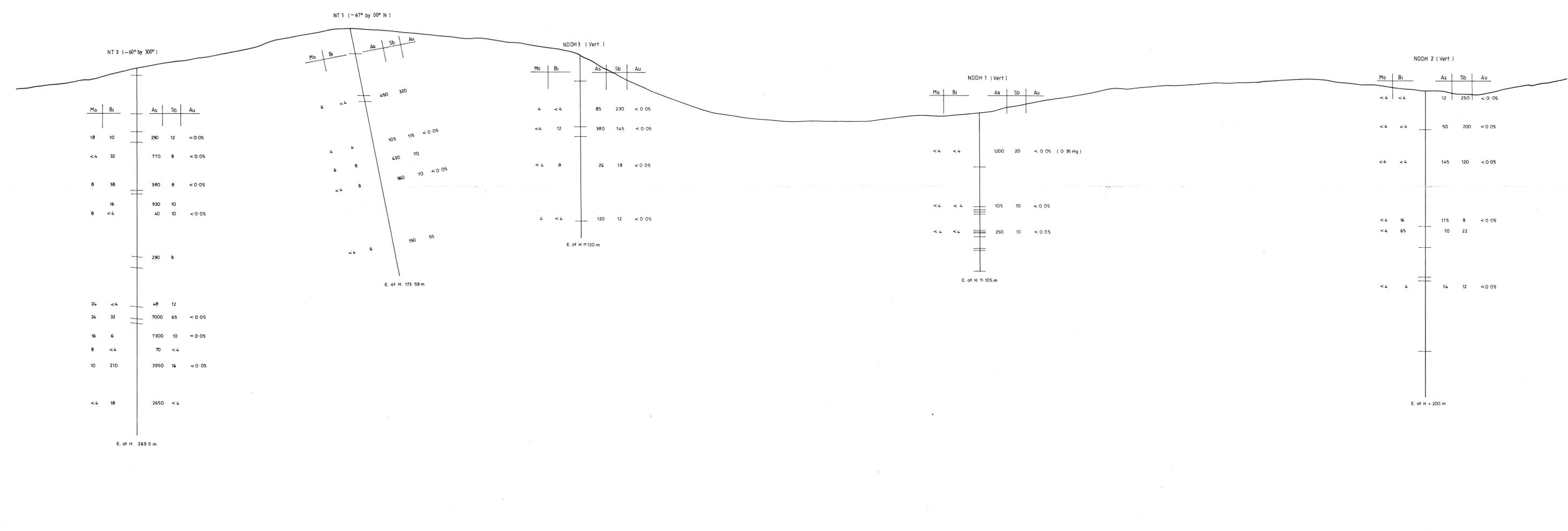
83-204(1)

The Shell Company of Australia Limited
METALS DIVISION

E.L. 8/77 RIANA
NATONE SKARN
LONGITUDINAL SECTION
GEOCHEMISTRY - Sn, Wb₃, Cu, Pb, Zn.

SCALE	1:1000	DATE	19-7-83
AUTHOR	P.A.R.	DRAWN	J.C.L.
OFFICE	DEVONPORT	REP. No.	
DRG. No.	D/MG04/172	FIG. No.	

METRES (O.D.)

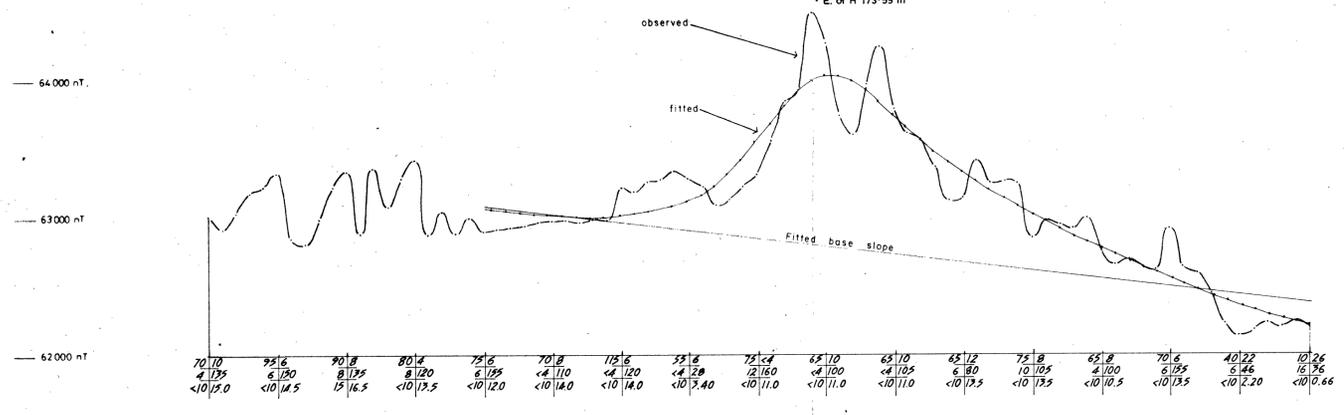
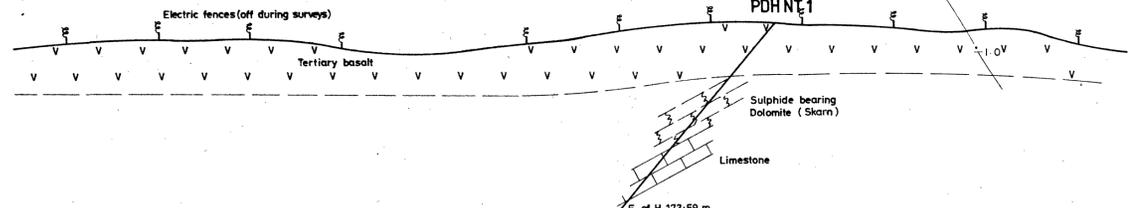
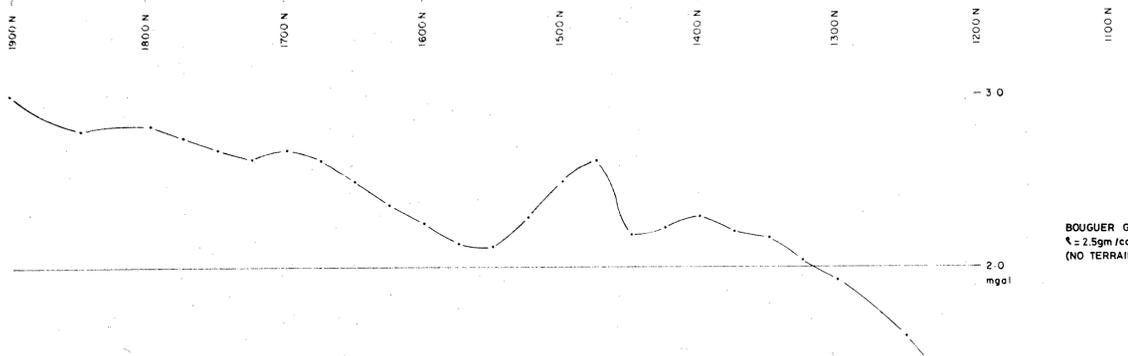


513032



S3-2041(1)

The Shell Company of Australia Limited METALS DIVISION			
E.L. 8/77 RIANA NATONE SKARN LONGITUDINAL SECTION GEOCHEMISTRY - Mo, Bi, As, Sb, Au,			
SCALE	1:1000	DATE	19-7-83
AUTHOR	P.A.R.	DRAWN	J.L.L.
OFFICE	DEVONPORT	REP. NO.	
DRG. NO.	0/MO04/773	FIG. NO.	



ELEVATION & INFERRED GEOLOGY

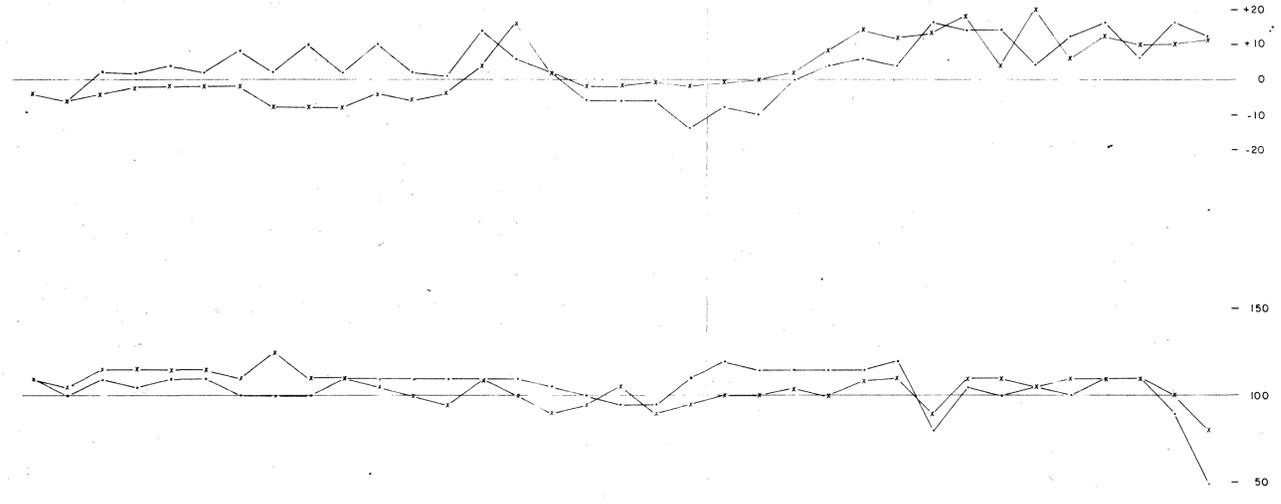
Fitted model (by MAGMOD, TABULAR 2)
 Top depth : 61m
 Top width : 38m
 Centre position: 1465 N
 Dip : 22° S

LINE 8500 N.E.
 (BEARING $\approx 0^\circ \text{MN}$)

NOTE
 SOIL GEOCHEMISTRY =

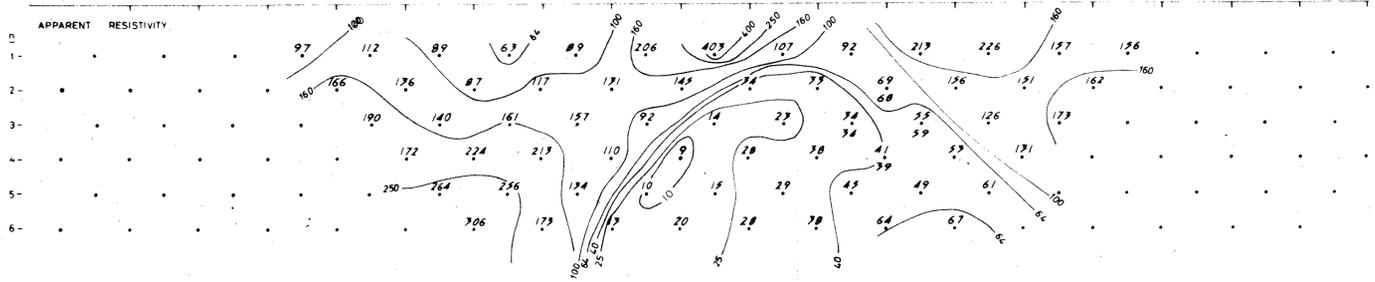
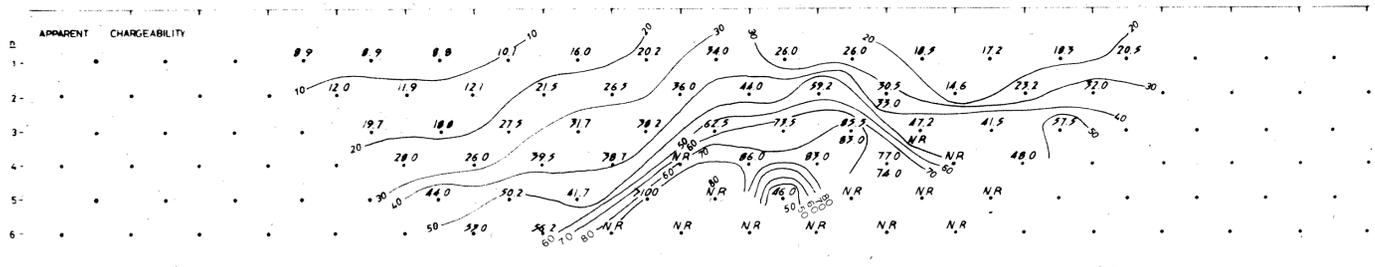
Cu	Pb
Sr	Zn
W	Fe%

 Analyses in ppm.

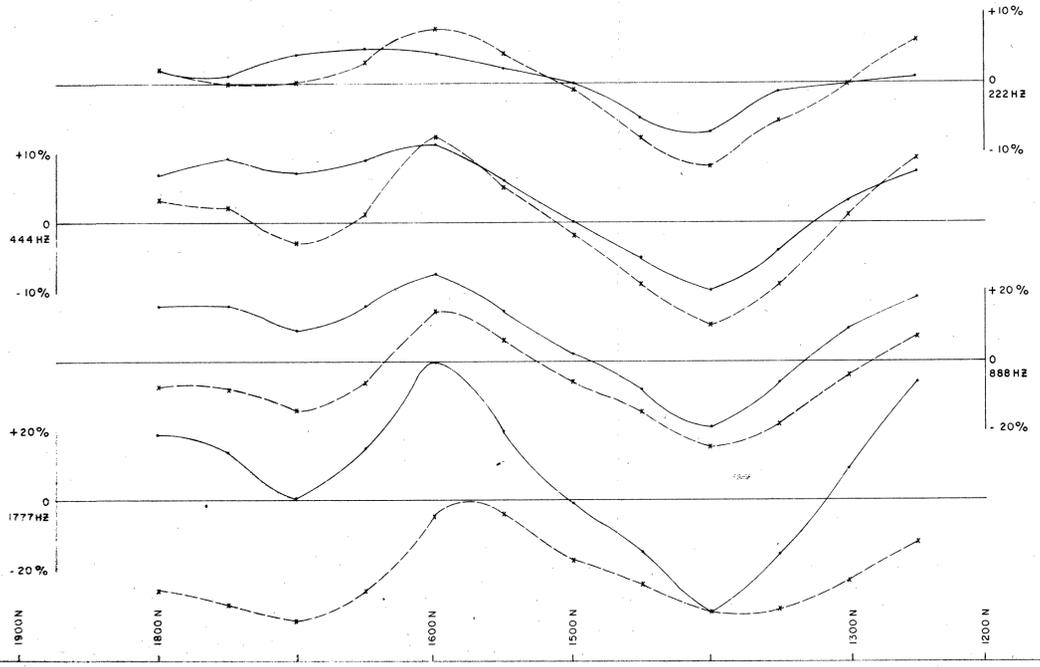


VLF E.M. SURVEY

x - Japan
 Dip convention: +ve for easterly dip, -ve for westerly dip
 F - North West Cape
 Dip convention: +ve for northerly dip, -ve for southerly dip



Contractor : SCINTREX
 Date : 3-8-81
 Timing : 2-SEC
 Transmitter : IRC-7/2.5kw
 Receiver : IPR 8
 Array : DIPOLE - DIPOLE
 Dipole length : 50M



513033

5cm

83-204H(1)