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SML 274

RADIUM HILL - MUTOOROO AREA

PROGRESS AND TECHNICAL REPORTS FOR THE PERIOD 1/3/69 TO 28/2/71

Submitted by

Longreach Metals NL
1971

Enquiries: Customer Services
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101 Grenfell Street, Adelaide 5000

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PRIMARY INDUSTRIES AND RESOURCES SA

CONTENTS ENVELOPE 1178 DM 389/69

TENEMENT:- SML 274

TENEMENT HOLDER:- LONGREACH METALS N.L. - RADIUM HILL

REPORTS:-

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PLANS:-

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GEOCHEMICAL AND MINERALOGICAL LABORATORIES PTY. LTD.

TELEPHONE: 31 9011 (9 LINES)
AFTER HOURS: 36 4904
TELEGRAMS & CABLES:
GEOCHEM-SYDNEY

76 McLACHLAN AVENUE,
RUSHCUTTERS BAY,
N.S.W., 2011

005

7915/FMJ

13 February, 1970.

Longreach Group Management Pty. Ltd.,
Box 4737, G.P.O.
Sydney, N.S.W. 2001.

PETROGRAPHIC REPORT

SAMPLE M1 2557

This is a laminated white mica-quartz-felspar schist, some layers of which are rich in vein like opaque material that appears to be largely limonite. However, other layers contain abundant opaque grains in a more granular form; these appear slightly silvery in a reflected light examination of the thin section, but would need examination of a polished section for identification. These opaque-rich layers are also rich in fine-grained white mica, and contain relatively large numbers of grains of zircon, tourmaline, and a yellow mineral with high relief that is probably monazite, but which would need x-ray diffraction for absolutely certain identification. This appears to be partly metamict and may well be the main radioactive mineral in the rock. It occurs in irregular to sub-prismatic grains, similar in size to those of the zircon and some of the opaque grains. The remaining (opaque poor) parts of the rock consist of irregular to lenticular grains and partly recrystallized grains of quartz, microcline and plagioclase interspersed with fine to medium-grained schistose to decussate white mica, scattered irregular opaque grains, accessory zircon and (?) monazite, and small to large grains of accessory tourmaline.

SAMPLE M2 2558

This is a laminated quartz-felspar-muscovite-schist, in which the coarser-grained layers tend to be more granular than schistose. Most of the layers consist of abundant irregular to lenticular grains and granoblastic aggregates of quartz, plagioclase and microcline, interspersed with irregular opaque grains (generally concentrated into thin layers in the rock), generally subordinate, fine-grained, random to foliated white mica.

.../2

Some layers are nearly devoid of opaque grains, but others consist largely of opaque grains, interspersed predominantly with fine white mica, minor quartz and felspar, and accessory grains (though quite numerous) of zircon and what appears to be monazite (as in 2557). The identification of the opaque mineral can only be sagely made by examination of a polished section. The zircon and (?) monazite are strongly concentrated into the opaque-rich layers, being virtually absent from the opaque-poor layers.

192 MAGILL ROAD
NORWOOD, S.A. 5067
TELEPHONE 32 1708 OR 31 3019

007

FILE

CENTRAL MINERALOGICAL SERVICES

20th February, 1970.

The Director,
Geochemical & Mineralogical Laboratories Pty. Ltd.,
P.O. Box 9,
RUSHCUTTERS BAY. N.S.W. 2011.

REPORT CMS 70/2/25.

YOUR REFERENCE:	Services Order No. 7915 dated 17/2/70
DATE RECEIVED:	18/2/70
SAMPLE NOS:	M1 2557, M2 2558
SUBMITTED BY:	Mr. P.Shinton
WORK REQUESTED:	Mineralogy.

H.W.Fander.

H.W.Fander, M.Sc.

cd.

CENTRAL MINERALOGICAL SERVICES

Date: 20th February, 1970.

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

IDENTIFICATION 008

Job No. CMS 70/2/25 Date Received: 18/2/70

Reference Day Book No. 7015

Sample No. M1 2557

Nature of Sample: Polished Section.

Radioactive Sample.

DESCRIPTION **SECTION No.**

a. Hand Specimen:

b. Microscopic:

The main opaques are martitised magnetite and complex intergrowths of rutile and ilmenite, with patches or detrital grains of rutile and detrital zircon.

There are very small patches of an intensely-yellow translucent mineral; in one case this contains a semi-opaque core, which has optical properties similar to that of pitchblende. This core is only 25μ in size, and a Vickers microhardness reading was rather low for pitchblende. Another possibility is betafite, a complex uranium-bearing oxide.

It is possible that most of the radioactivity is due to secondary minerals, and some U may occur in goethite veinlets.

Remarks/Special Features

An autoradiograph should be prepared to pinpoint radioactive centres. This can be carried out if authorized.

N.B.: Typewritten report will follow.

g35623

H.W. Fander, M.Sc.

CENTRAL MINERALOGICAL SERVICES

Date: 20th February, 1970.

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

IDENTIFICATION
009
Oxide layers in rock.

Job No. CMS 70/2/25 Date Received: 18/2/70

Reference Day Book No. 7915

Sample No. M2 2558

Nature of Sample: Polished Section.

DESCRIPTION **SECTION No.**

a. Hand Specimen:

b. Microscopic:

The layers of opaques consist of grains of titaniferous hematite, showing complex irregular, often vernicular intergrowths with rutile, and with exsolution lamellae of ilmenite. There is a possibility that some of the titanhematite is intergrown with pseudobrookite -- the distinction between rutile and pseudobrookite in polished section is rather difficult.

In either case, the titanhematite-rutile (or pseudobrookite) intergrowths represent an exsolution of a titaniferous phase from a hematite saturated with Ti (about 10% Ti O_2).

Detrital grains of rutile also occur in the opaque layers.

Remarks/Special Features

N.B.: Typewritten report will follow.

E35623

H.W. Fander, M.Sc.

192 MAGILL ROAD
NORWOOD, S.A. 5067

TELEPHONE 32 1708 OR 31 3019

010

CENTRAL MINERALOGICAL SERVICES

18th March, 1970.

Mr. L. Denholm,
Longreach Oil Ltd.,
275 George Street,
SYDNEY. N.S.W. 2000.

REPORT CMS 70/3/6.

YOUR REFERENCE:	Verbal request
DATE RECEIVED:	5/3/70
SAMPLE NOS:	2562 to 2564
SUBMITTED BY:	Mr. L.Denholm
WORK REQUESTED:	Petrography, ore-microscopy.

H.W.Fander, M.Sc.

cd.

CENTRAL MINERALOGICAL SERVICES

Date: 18th March, 1970.

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

IDENTIFICATION	011
2562.	
Meta-tillite.	

Job No. CMS 70/3/6 Date Received: 5/3/70

Reference Verbal request -- Mr. L.Denholm

Sample No. 2562

Nature of Sample: Hand-specimen

DESCRIPTION **SECTION No.** 1694

a. Hand Specimen:

Grey, low-grade metasediment -- possible tillite.

b. Microscopic:

An autoradiograph was prepared of a slab of this rock, but even after 90 hours there was no effect on the film, indicating no radioactivity, at least in the area of the slab.

The rock consists of large and small rock and mineral-fragments in a lineated muscovite matrix. It is believed to be a meta-tillite of granitic provenance. The coarser fragments are virtually unsorted, angular or brecciated and strained, and consist of quartz, microcline, oligoclase and granitic fragments in a matrix of well-crystallized fresh muscovite, with conspicuous opaques, secondary rutile grains, some tourmaline (not detrital), detrital zircon and others.

Remarks/Special Features

Metamorphic grade is low-- greenschist facies. Radioactivity measured in the area must be a mass effect due to trace amounts of radioactive minerals.

N.B.: Typewritten report will follow.

g35623

H.W.Pander, M.Sc.

CENTRAL MINERALOGICAL SERVICES

Date: 18th March, 1970.

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

IDENTIFICATION 012
2563.
Metasediment-mica schist.

Job No. CMS 70/3/6 Date Received: 5/3/70

Reference Verbal request -- Mr. L.Denholm

Sample No. 2563

Nature of Sample: Hand-specimen

DESCRIPTION **SECTION No.** 1695

a. Hand Specimen:

Pale clastic rock -- low-grade metamorphic with conspicuous heavy-mineral layering.

b. Microscopic:

An autoradiograph with an exposure of over 90 hours failed to reveal any centres of radioactivity.

This rock is similar to 2562, though appreciably finer-grained, so that evidence of tillitic origin is not as clear-cut. In fact, in view of the false-bedded heavy mineral layers, the rock is most probably fluvio-glacial in origin. It is composed of poorly-sorted angular grains of quartz and feldspars, in a wide size-range, in a well-lineated muscovite matrix. It belongs to the greenschist facies. The heavy-mineral layers are composed of opaques (mainly magnetite), tourmaline, zircon, rutile (partly recrystallized) and minor xenotime.

Remarks/Special Features

The xenotime is possibly significant, as this mineral often contains some (variable) amounts of uranium.

N.B.: Typewritten report will follow.

g35623

H.W.Fander, M.Sc.

CENTRAL MINERALOGICAL SERVICES

Date: 18th March, 1970.

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

IDENTIFICATION 013
2564.
Drill-cuttings.

Job No. CMS 70/3/6 Date Received: 5/3/70

Reference Verbal request -- Mr. L.Denholm

Sample No. 2564

Nature of Sample: Drill-cuttings.

DESCRIPTION **SECTION No. --**

a. Hand Specimen:

b. Microscopic:

Portion of the sample was crushed, deshined and separated using TBE (SG=2.9).

The heavy fraction was tested for radioactivity with a scintillometer, but no significant reading was obtained.

The heavy fraction consists mainly of opaques (non oxides, including magnetite), tourmaline, rutile, monazite, staurolite, zircon, xenotime (trace), and amphibole.

Monazite comprises about 1% of the heavy fraction and occurs as grains generally below 0.1mm in size; however, this is probably not a maximum size since the rock has been crushed.

Remarks/Special Features

N.B.: Typewritten report will follow.

g35623

H.W.Fander, M.Sc.

192 MAGILL ROAD
NORWOOD. S.A. 5067

TELEPHONE 32 1708 OR 31 3019

014

File
Radium Hill

CENTRAL MINERALOGICAL SERVICES

14th July, 1970.

The Exploration Manager,
Longreach Group Management,
275 George Street,
SYDNEY. N.S.W. 2000.

REPORT CMS 70/6/39.

YOUR REFERENCE: Internal Application dated 19/6/70

DATE RECEIVED: 19/6/70

SAMPLE NOS: M1 to M6

SUBMITTED BY: Mr. Denholm

WORK REQUESTED: Petrography, Mineralogy.

for H.W.Fander, M.Sc.

cd.

CENTRAL MINERALOGICAL SERVICES

Date: 14th July, 1970.

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

IDENTIFICATION 015
M1.
Meta-Arkose.

Job No. CMS 70/6/39 Date Received: 19/6/70

Reference Internal application dated 19/6/70

Sample No. M1

Nature of Sample: D.D. Core.

DESCRIPTION **SECTION No.** 2520

a. Hand Specimen:

Cream-coloured, compact siliceous rock.

b. Microscopic:

This is a metamorphosed gritty arkose ("meta-arkose"). The main components are coarse-sand size and grit-size fragments of quartz, microcline and oligoclase, all showing strain-extinction, forming the framework of the rock.

The matrix/cement is fine-grained mosaic-quartz, with small muscovite flakes, and crystalline carbonate (probably calcite).

The rock was derived from granitic terrain and shows low-grade metamorphism. It may be fluvio-glacial in origin.

Remarks/Special Features

N.B.: Typewritten report will follow.

GILLINGHAM

H.W. Fander, M.Sc.

CENTRAL MINERALOGICAL SERVICES

Date: 14th July, 1970.

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

IDENTIFICATION	016
M2	
Quartz-muscovite Schist.	

Job No. CMS 70/6/39 Date Received: 19/6/70

Reference Internal application dated 19/6/70

Sample No. M2

Nature of Sample: D.D. Core.

DESCRIPTION **SECTION No.** 2521

a. Hand Specimen:

Dark, fine-grained schist or phyllite.

b. Microscopic:

This is a muscovite-schist, consisting of fine-sand to medium-sand sized angular fragments of quartz, microcline and oligoclase, and conspicuous euhedral crystals of magnetite altered to hematite, with a schistose matrix of well-foliated flakes of muscovite.

The dark colour of the rock is due to coarse and fine magnetite (altered to hematite).

The rock is thought to be a metamorphosed fine tillite.

Remarks/Special Features

N.B.: Typewritten report will follow.

GILLINGHAM

H.W.Fander, M.Sc.

CENTRAL MINERALOGICAL SERVICES

Date: 14th July, 1970.

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

IDENTIFICATION	017
M3	
Layered metasediment.	

Job No. CMS 70/6/39 Date Received: 19/6/70

Reference Internal application dated 19/6/70

Sample No. M3

Nature of Sample: D.D. Core.

DESCRIPTION **SECTION No.** 2522

a. Hand Specimen:

Layered or graded siliceous indurated sediment.

b. Microscopic:

A layered metasediment, consisting of finer and coarser layers of detrital, rounded quartz, microcline, plagioclase and occasional meta-quartzite rock-fragments, in a matrix of fine quartz and muscovite. Heavy-minerals, especially hematite and magnetite, are concentrated particularly in the coarser layers as would be expected, and occur between the large detrital grains in the matrix.

Other heavy minerals include rutile, zircon, tourmaline, ?allanite (orthite) and ?monazite (both altered, cloudy).

The rock is a low-grade metasediment; the grains are rounded and more worn than previous samples.

Remarks/Special Features

N.B.: Typewritten report will follow.

GILLINGHAM

H.W. Fander, M.Sc.

CENTRAL MINERALOGICAL SERVICES

Date: 14th July, 1970.

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

IDENTIFICATION	018
M4	
Malachite.	

Job No. CMS 70/6/39 Date Received: 19/6/70

Reference Internal application dated 19/6/70

Sample No. M4

Nature of Sample: D.D. Core.

DESCRIPTION **SECTION No.**

a. Hand Specimen:

b. Microscopic:

A grit of granitic provenance, with occasional interstitial veinlets and films of malachite accompanying calcite.

Remarks/Special Features

N.B.: Typewritten report will follow.

GILLINGHAM

H.W.Fander, M.Sc.

CENTRAL MINERALOGICAL SERVICES

Date: 14th July, 1970.

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

IDENTIFICATION 019
M5
Gritty Muscovite-schist.

Job No. CMS 70/6/39 Date Received: 19/6/70

Reference Internal application dated 19/6/70

Sample No. M5

Nature of Sample: D.D. Core.

DESCRIPTION **SECTION No.** 2524

a. Hand Specimen:

Gritty rock with pink feldspar fragments.

b. Microscopic:

The rock consists of grit and sand-sized subangular to rounded grains of quartz, microcline (pink in hand-specimen) minor plagioclase, and metaquartzite, in a foliated matrix of muscovite.

Occasional individual euhedral crystals and pockets of smaller magnetite (hematite) grains occur. Other heavy minerals include tourmaline and zircon.

The matrix of this rock has been recrystallized and it can be regarded as a low-grade metamorphosed sediment, quite similar to M2.

Remarks/Special Features

N.B.: Typewritten report will follow.

GILLINGHAM

H.W.Fander, M.Sc.

CENTRAL MINERALOGICAL SERVICES

Date: 14th July, 1970.

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

IDENTIFICATION 020
M6
Gritty Metasediment.

Job No. CMS 70/6/39 Date Received: 19/6/70

Reference Internal application dated 19/6/70

Sample No. M6

Nature of Sample: Hand-specimen

DESCRIPTION **SECTION No.** 2525

a. Hand Specimen:

Dark, gritty, schistose rock.

b. Microscopic:

This is a low-grade metasediment composed of grit-sized rounded fragments, of quartz and feldspars, in a matrix of finer grains of quartz and feldspars, with fine mosaic quartz and foliated muscovite forming the cement.

The rock is notable for the large quantity of detrital heavy-minerals it contains. These are mostly opaques (hematite-magnetite), but also abundant zircon, rutile, tourmaline, ?monazite and metamict ?allanite (orthite).

An autoradiograph is being prepared as a check on the radioactivity. If the results are significant, a further report will be issued.

Remarks/Special Features

N.B.: Typewritten report will follow.

GILLINGHAM

H.W.Fander, M.Sc.

192 MAGILL ROAD, NORWOOD
SOUTH AUSTRALIA 5067

TELEPHONE 32 1708 S.T.D. 082
AFTER HOURS 31 3019 OR 79 1577

021

CENTRAL MINERALOGICAL SERVICES

16th November, 1970.

The Senior Geologist,
Longreach Group Management Pty. Ltd.,
89 Wyman Street,
BROKEN HILL. N.S.W. 2880.

REPORT CMS 70/11/3.

YOUR REFERENCE: Sample Despatch and letter dated 30/10/7

DATE RECEIVED: 2/11/70

SAMPLE NOS: 15515, 15548 to 15553

SUBMITTED BY: Mr. A.Edwards

WORK REQUESTED: Petrography.

H.W.Pander, M.Sc.

c.c. The Exploration Manager,
Longreach Group Management Pty. Ltd.,
G.P.O. Box 4737,
SYDNEY. N.S.W. 2001.

cd.

CENTRAL MINERALOGICAL SERVICES

Date: 16th November, 1970.

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

IDENTIFICATION 022
15515
Sheared Trachyte.

Job No. CMS 70/11/3 Date Received: 2/11/70

Reference Letter dated 30/10/70

Sample No. 15515

Nature of Sample: Hand-specimen

DESCRIPTION **SECTION No.** 3205

a. Hand Specimen:

Dark micaceous, siliceous rock -- ?metamorphosed grit.

b. Microscopic:

This is in fact a volcanic rock -- specifically a sodic biotite-trachyte to some extent sheared.

It consists of fine laths of albite (tending to oligoclase), small biotite flakes, and very abundant oxide opaques. Trachytic texture -- the alignment of feldspar laths due to flow -- is quite well-developed. There are conspicuous lenses of mosaic quartz and crystalline carbonate; these are believed to represent recrystallized vesicles.

This rock shows many similarities to the Wooltana Trachyte, which is lower Proterozoic.

Remarks/Special Features

N.B.: Typewritten report will follow.

GILLINGHAM

H.V.Fander, M.Sc.

CENTRAL MINERALOGICAL SERVICES

Date: 16th November, 1970.

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

IDENTIFICATION	023
15548	
Trachyte.	

Job No. CMS 70/11/3 Date Received: 2/11/70

Reference Letter dated 30/10/70

Sample No. 15548

Nature of Sample: Hand-specimen

DESCRIPTION **SECTION No.** 3806

a. Hand Specimen:

Grey siliceous, schistose rock -- possibly sheared trachyte?

b. Microscopic:

Appears to be a similar trachyte to No. 15515, though generally finer-grained, with smaller vesicles.

It consists of subparallel laths of albite, fine biotite flakes, abundant fine-grained primary opaques (non-magnetic), and numerous small parallel lenses of mosaic-quartz thought to represent small vesicles recrystallized during low-grade metamorphism.

Secondary epidote occurs as small granular patches (poikiloblastic), and there is some carbonate.

The rock is mildly metamorphosed.

Remarks/Special Features

N.B.: Typewritten report will follow.

H.W.Fander, M.Sc.

GILLINGHAM

CENTRAL MINERALOGICAL SERVICES

Date: 16th November, 1970.

024

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

IDENTIFICATION
15549
Micaceous Carbonate-rock.

Job No. CMS 70/11/3 Date Received: 2/11/70

Reference Letter dated 30/10/70

Sample No. 15549

Nature of Sample: Hand-specimen

DESCRIPTION **SECTION No.** 3807

a. Hand Specimen:

Dark-grey fine-grained ?metasediment with conspicuous mica flakes.

b. Microscopic:

This is a very fine-grained, microcrystalline carbonate-rock (dolomite r magnesite) with interstitial carbonaceous matter.

Large, conspicuous porphyroblasts of phengite (magnesian muscovite) have developed. These are zoned, with central areas full of carbonaceous incluions. Minor amounts of colourless, magnesian chlorite also occur. The original rock would have been a chemical sediment. The micaceous minerals formed by metasomatism or replacement.

Remarks/Special Features

N.B.: Typewritten report will follow.

H.W.Fander, M.Sc.

GILLINGHAM

CENTRAL MINERALOGICAL SERVICES

Date: 16th November, 1970.

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

IDENTIFICATION 025
15550
Micaceous, feldspathic, indurated sandstone.

Job No. CMS 70/11/3 Date Received: 2/11/70

Reference Letter dated 30/10/70

Sample No. 15550

Nature of Sample: Hand-specimen

DESCRIPTION **SECTION No.** 3808

a. Hand Specimen:

Grey-buff siltstone.

b. Microscopic:

The rock is too coarse-grained for a siltstone, and is in fact a fine, micaceous, feldspathic sandstone. Some carbonate is present, and the grains are generally interlocking. Thus the rock is indurated.

The main components are small (<0.10mm) grains of quartz, feldspars, abundant flakes of muscovite (subparallel), granular carbonate (probably primary) and accessory heavy-minerals.

Bedding is vague but detectable and is due to the distribution and orientation of the muscovite flakes.

Remarks/Special Features

N.B.: Typewritten report will follow.

GILLINGHAM

H.W. Pander, M.Sc.

CENTRAL MINERALOGICAL SERVICES

Date: 16th November, 1970.

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

IDENTIFICATION 026
15551.
Schistose Sodic Trachyte.

Job No. CMS 70/11/3 Date Received: 2/11/70

Reference Letter dated 30/10/70

Sample No. 15551

Nature of Sample: Hand-specimen

DESCRIPTION **SECTION No.** 3809

a. Hand Specimen:

Dark, fine-grained schist with copper-staining.

b. Microscopic:

Regarded as a metamorphosed porphyritic sodic trachyte.

The original rock was a flow-layered trachyte consisting of microphenocrysts of albite in a groundmass of albite laths, opaques, biotite and chlorite, with granoblastic epidote conspicuously developed.

The rock has been mainly dynamically metamorphosed, superimposing schistosity upon the flow-structures and causing puckering or buckling, and fracturing of more coarsely-crystalline components (epidote, plagioclase). Malachite veinlets occur in fractures. A few small quartz-mosaics may be recrystallized vesicles.

Remarks/Special Features

N.B.: Typewritten report will follow.

GILLINGHAM

H.W.Fander, M.Sc.

CENTRAL MINERALOGICAL SERVICES

Date: 16th November, 1970.

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

IDENTIFICATION	027
15552	
Quartz-Mica Schist.	

Job No. CMS 70/11/3 Date Received: 2/11/70

Reference Letter dated 30/10/70

Sample No. 15552

Nature of Sample: Hand-specimen

DESCRIPTION **SECTION No.** 3810

a. Hand Specimen:

Grey micaceous schist with numerous thin films of copper stains.

b. Microscopic:

Apparently a twice-metamorphosed rock, and may be termed a sheared quartz-mica schist.

It consists of rather irregular layers and elongate lenses, buckled, puckered and fractured, composed of quartz, muscovite and chlorite. Porphyroblasts of tourmaline are fairly common and have formed subsequently to the first period of metamorphism, butpreceding the second period.

Planes of secondary schistosity are mica-rich, and are usually planes of weakness along which malachite veinlets have formed.

Remarks/Special Features

N.B.: Typewritten report will follow.

GILLINGHAM

H.W. Fander, M.Sc.

CENTRAL MINERALOGICAL SERVICES

Date: 16th November, 1970.

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

IDENTIFICATION 028
15553
Schistose ?Sodic Rhyolite?

Job No. CMS 70/11/3 Date Received: 2/11/70

Reference Letter dated 30/10/70

Sample No. 15553

Nature of Sample: Hand-specimen

DESCRIPTION **SECTION No.** 3811

a. Hand Specimen:

Grey/pink sheared feldspathic rock.

b. Microscopic:

Believed to be a sheared, recrystallized acid igneous extrusive, robably originally a sodic rhyolite.

The rock is composed of lenses of mosaic-quartz, with parallel orientation, and layers of fine-grained, interlocking albite and quartz with fine-grained opaques. The quartz-mosaic lenses may represent recrystallized quartz phenocrysts or vesicles.

There is a possibility that this is not igneous, but metasomatic in origin; field relationships should help to clarify this. Microscopic evidence is not sufficiently definite for a positive interpretation.

Remarks/Special Features

N.B.: Typewritten report will follow.

GILLINGHAM

H.W.Fander, M.Sc.

192 MAGILL ROAD, NORWOOD
SOUTH AUSTRALIA 5067
TELEPHONE 32 1708 S.T.D. 082
AFTER HOURS 31 3019 OR 79 1577

029

CENTRAL MINERALOGICAL SERVICES

16th December, 1970.

Mr. A. Edwards,
Longreach Group Management Pty. Ltd.,
89 Wyman Street,
BROKEN HILL. N.S.W. 2880.

REPORT CMS 70/12/25.

YOUR REFERENCE: Letter and Order No. 101 dated 9/12/70

DATE RECEIVED: 11/12/70

SAMPLE NOS: 15840, 15841, 15763, 15764

SUBMITTED BY: Mr. A.Edwards

WORK REQUESTED: Petrography, ore-microscopy.

H.W.Pander, M.Sc.

c.c. The Exploration Manager,
Longreach Group Management Pty. Ltd.,
G.P.O. Box 4737,
SYDNEY. N.S.W. 2001.

cd.

Date: 16th December, 1970.

CENTRAL MINERALOGICAL SERVICES

IDENTIFICATION	
15840	030

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

Job No. CMS 70/12/25 Date Received: 11/12/70

Reference Letter and Order No. 101

Sample No. 15840

Nature of Sample: D.D. Core

DESCRIPTION **SECTION No.** 4295

a. Hand Specimen:
Indurated or metamorphosed feldspathic grit.

b. Microscopic:
Very little opaque material is seen in polished section. There are a few detrital grains of ilmenite. Veinlets contain a little hematite and goethite, and three minute grains (<0.03mm) of chalcopyrite with covellite were seen.
If this intersection contains anomalous amounts of mercury, it will be necessary for the heavy components to be concentrated (by crushing and heavy-liquid separation) before and mercury-bearing minerals can be seen and identified.

Remarks/Special Features

N.B.: Typewritten report will follow.

H.W. Fander, M.Sc.

GILLINGHAM

CENTRAL MINERALOGICAL SERVICES

Date: 16th December, 1970.

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

IDENTIFICATION
15841 031

Job No. CMS 70/12/25 Date Received: 11/12/70

Reference Letter dated 9/12/70

Sample No. 15841

Nature of Sample: D.D.Core

DESCRIPTION **SECTION No.** 4296

a. Hand Specimen:

Metamorphosed grit.

b. Microscopic:

The opaque minerals in this sample are iron oxides. Detrital grains of ilmenite, and crystals of rutile are fairly common. Euhedral crystals of magnetite, generally extensively or completely oxidised to hematite, are conspicuous. No other opaque minerals were recognized.

If the mercury anomaly is significant, then, examination of a concentrat would be essential. Even then it could be necessary to resort to electron-probe microanalyses of individual minerals to trace the mercury

Remarks/Special Features

N.B.: Typewritten report will follow.

GILLINGHAM

H.W. Fander, M.Sc.

CENTRAL MINERALOGICAL SERVICES

Date: 16th December, 1970.

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

IDENTIFICATION
15763 032
Gritty Chlorite-schist.

Job No. CMS 70/12/25 Date Received: 11/12/70

Reference Letter dated 9/12/70

Sample No. 15763

Nature of Sample: Hand-specimen

DESCRIPTION **SECTION No.** 4297

a. Hand Specimen:

Chloritic, gritty schist with malachite staining.

b. Microscopic:

This chlorite-biotite schist is a metamorphosed grit. It consists of lenses (originally grit-sized) of rock fragments, including trachyte as the main representative, large fragments of quartz and feldspars, with parallel interleaved flakes of biotite and chlorite. There is evidence of hydrothermal acitivity in the presence of poikiloblastic tourmaline and rutile. Small patches (<0.20mm) of malachite are common throughout. Opaques occur.

The original rock was a grit composed of grit-size trachyte, quartz, granite and other fragments, with a sandy and argillaceous matrix. The rock has been metamorphosed to the greenschist facies.

Remarks/Special Features

In view of the presence of trachyte fragments in this rock, the question arises whether this is in fact the base, or whether there was an earlier generation of trachytes.

N.B.: Typewritten report will follow.

GILLINGHAM

H.W.Fander, M.Sc.

CENTRAL MINERALOGICAL SERVICES

Date: 16th December, 1970.

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

IDENTIFICATION
15764 033
Altered Diorite.

Job No. CMS 70/12/25 Date Received: 11/12/70

Reference Letter and Order No. 101

Sample No. 15764

Nature of Sample: Hand-specimen

DESCRIPTION **SECTION No.** 4298

a. Hand Specimen:

Green and buff igneous rock -- possibly hornblende-diorite.

b. Microscopic:

This rock is an altered diorite. It is composed principally of euhedral crystals of oligoclase/andesine, leucoxenised opaques, and chlorite-epidote pseudomorphs after ?hornblende. Epidote is very common throughout, as small and larger crystal groups; it is replacive. Small muscovite flakes also occur.

Apatite is a conspicuous accessory mineral (primary).

This rock is coarsely-crystalline, much more so than would be expected of a narrow dyke. Hence it is thought to be part of a much larger body.

Remarks/Special Features

N.B.: Typewritten report will follow.

GILLINGHAM

H.W. Fander, M.Sc.

034

REPORT ON

RADON DETERMINATIONS AND GAMMA LOGGING IN FOUR HOLES AT MUTOOROO S.A.

for

LONGREACH GROUP EXPLORATIONS

by

J. Iredale & J. E. Webb

March, 1970

INTRODUCTION

A radon gas determination and gamma ray bore-hole log were carried out on each of four percussion drill holes at Mutooroo Station S.A. The radon gas determination was carried out by first sealing the hole for 24 hours and then, inserting a piece of plastic tubing with a metal guarded filter and weight on the end into the bore hole and withdrawing some air from the hole by means of a suction pump. This air was drawn into an alpha scintillation chamber which was coupled to a photomultiplier. The photomultiplier pulses were recorded via the reading on a PUG-1 scintillation counter and a mechanical counter connected through the PUG-1.

Readings were taken at both 25 and 50 feet levels in the hole. The equipment was not designed for greater depths of testing, hence hole 101.5W 101.5N was not tested at its bottom. Background counts were made for 5 minutes each with readings being taken at 1 minute intervals before every hole reading. The initial readings were taken for 15 minutes with readings being noted every minute from which a mean and standard deviation were calculated. After leaving the holes sealed for a further 24 hours all radon readings were repeated for 10 minutes with the reading noted every minute. The means and standard deviations for corresponding readings were then compared for consistency.

The means of the radon measurements are simple arithmetic means of the fifteen and ten one minute readings with the standard deviations found from the best estimate given by

$$\text{standard deviation} = \sqrt{\frac{\Sigma(x-\bar{x})^2}{N-1}}$$

where:- x is the reading taken at intervals of 1 minute.

$\bar{x}$ is the mean of the 1 minute readings.

N is the total number of readings taken.

The Bore Hole Logs were obtained using a $\frac{3}{4}$" x $\frac{3}{4}$" thallium activated NaI crystal coupled to a $\frac{3}{4}$" photomultiplier tube mounted in a borehole probe and connected to a PUG-1 ratemeter. The probe was lowered down the drill hole with readings being taken at 1 foot intervals to a maximum depth of 50 feet.

Discussion of Results

The bore hole logs were plotted as histograms with a vertical scale of 1 inch representing 5 feet and a horizontal scale of 1 inch representing 50 counts per minute (c.p.m.). The bore hole logs yielded little evidence of gamma ray activity down the drill hole since the readings were essentially uniform for all holes. The readings in holes (101.5N, 101.5W)*(103N, 101W) (99N, 101W) were higher generally than those in the hole at (98N, 98W) as were the radon measurements.

The low gammas counts in the holes is in agreement with the low radiometric assays obtained from the cuttings.

Radon Detection

Radon was detected using the method described previously which

*The hole marked on the area map supplied as being drilled at (100.5N, 101.5W) was in fact, drilled at (101.5N, 101.5W).

makes use of the 5.40 MeV alpha particle which is the principle decay particle of Radon 222. No decrease in count rate due to a decrease in Radon content in the scintillation chamber was expected since the Half-life of Radon 222 is 3.8 days.

Hole 98N,98W. This hole showed very little activity insofar as alpha particles were concerned as the count rates were the lowest encountered in the four holes surveyed. As the bore-hole log showed, there was little gamma activity in this hole also, thus indicating that there may not be appreciable radioactive mineralisation in the immediate vicinity of this hole. The count rates obtained for this hole are as below:-

In all following sets of results, the mean and standard deviation for the set of results obtained at 1 minute intervals for 15 minutes will be first and the results obtained at 1 minute intervals for 10 minute shown secondly.

At 25 foot depth

15 mins Mean 61 c.p.m. Standard Deviation 6.4 c.p.m.

10 mins Mean 94 c.p.m. Standard Deviation 10.2 c.p.m.

The large difference in the means of these two results may be due to the fact that the background in the first set of results was 62 c.p.m. while the background for the latter set of results was 16 c.p.m.

At 50 foot depth

Mean 106 c.p.m. Standard Deviation 9.3 c.p.m.

Mean 95 c.p.m. Standard Deviation 9.3 c.p.m.

Hole 103N, 101W. This hole showed much more alpha particle activity and hence radon is present in much greater quantity in this drill hole.

Results are as follows:-

At 25 foot depth

Mean	266 c.p.m.	Standard Deviation	30.6 c.p.m.
Mean	262 c.p.m.	Standard Deviation	26.6 c.p.m.

At 50 foot depth

Mean	260 c.p.m.	Standard Deviation	16.5 c.p.m.
Mean	288 c.p.m.	Standard Deviation	21.6 c.p.m.

The borehole log shows a slight increase of gamma intensity near the surface but does not indicate any appreciable amount of uranium.

Hole 99N, 101W. This hole was much more active with regard to Radon and in fact the activity was verging on the limit of counting of the mechanical counters. Results are as follows:-

At 25 foot depth.

Mean	307 c.p.m.	Standard Deviation	22.8 c.p.m.
Mean	313 c.p.m.	Standard Deviation	15.3 c.p.m.

At 40 foot depth

Mean	366 c.p.m.	Standard Deviation	10.3 c.p.m.
Mean	328 c.p.m.	Standard Deviation	13.7 c.p.m.

The borehole log is also indicative of a higher gamma count near surface but again is not indicative of appreciable uranium.

Hole 101.5N, 101.5W. There was very great alpha particle activity in this hole, such that the mechanical counter could no longer keep up to

the number of pulses coming from the ratemeter on the PUG-1. Thus readings of the PUG-1 ratemeter were taken and when averaged gave a count rate of approximately 600 c.p.m. at the 25 foot level and a count rate of approximately 700 c.p.m. at the 50 foot level.

The borehole logs shows less gamma activity than hole 101W,99N but more than the other two holes. The greatest activity is at the bottom of the hole.

CONCLUSIONS

The percussion hole drilled at 98N, 98W seems to offer little evidence of radioactive mineralisation in either the borehole log or the radon detection measurements and it may be concluded that there is little further exploratory work to be carried out in the immediate vicinity of this hole at present. The other three holes show much more evidence of radon and gamma radioactivity with the greatest activity being in the hole at 101.5N, 101.5W. The greatest activity seems to be between this hole and the one at 99N, 101W which is the area of the highest total count anomaly on the original radiometric survey. Since there was a high alpha particle count rate in the radon detection measurements but low gamma ray activity in holes 101.5N, 101.5W and 99N, 101W we may conclude that the holes are possibly near a radioactive body but do not actually intersect it.

It is possible that radon testing in a grid of percussion hole would assist in locating the source of the radioactivity. In designing a radon survey the holes should be drilled to a uniform depth and sealed for 24 hours immediately after drilling and the radon check

taken at the expiration of the 24 hour period. A second check after another 24 hours would be advisable. The purpose of this proceedure is to ensure that similar hole volumes and accumulation times are used on all holes. It is also possible that a hole depth of 10 to 15 feet would be sufficient for a survey covering a larger area. A gamma reading at the bottom of each hole is also recommended.

Austral Exploration Services Pty Ltd

LONGREACH
GROUP MANAGEMENT PTY. LTD.

RADIOMETRIC BORE LOG

Location MUTOOROO

Hole No 101·5W 101·5N M1

Date 8·3·70.

COUNTS PER MINUTE

00 50 100 150 200 250 300 350

BACKGROUND

DEPTH IN FEET

00 5 10 15 20 25 30 35 40 45 50 55 56 57 58

ENV 1178(1)14

Austral Exploration Services Pty Ltd

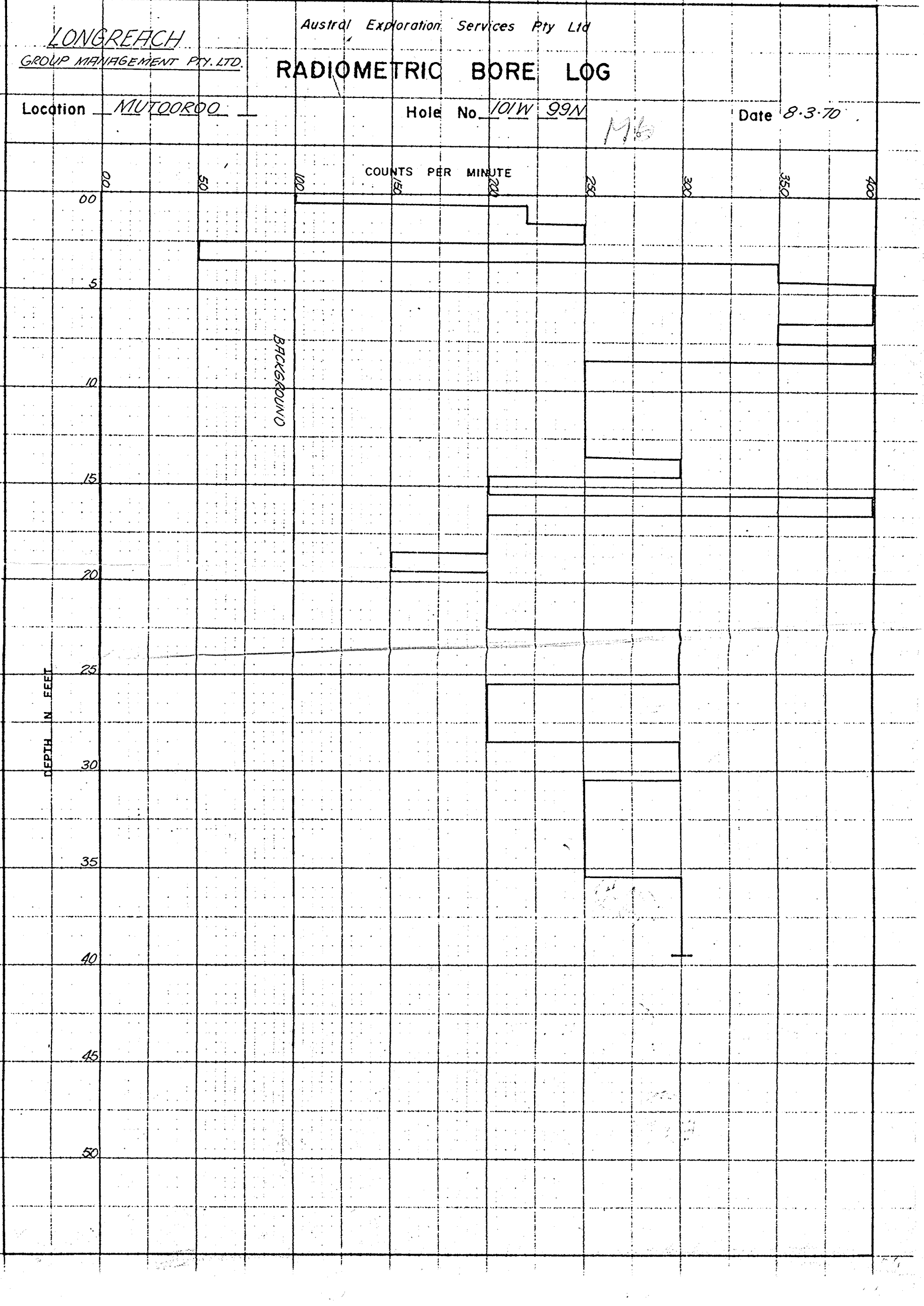
LONGREACH
GROUP MANAGEMENT PTY. LTD.

RADIOMETRIC BORE LOG

Location MUTOOROO

Hole No 101W 99N

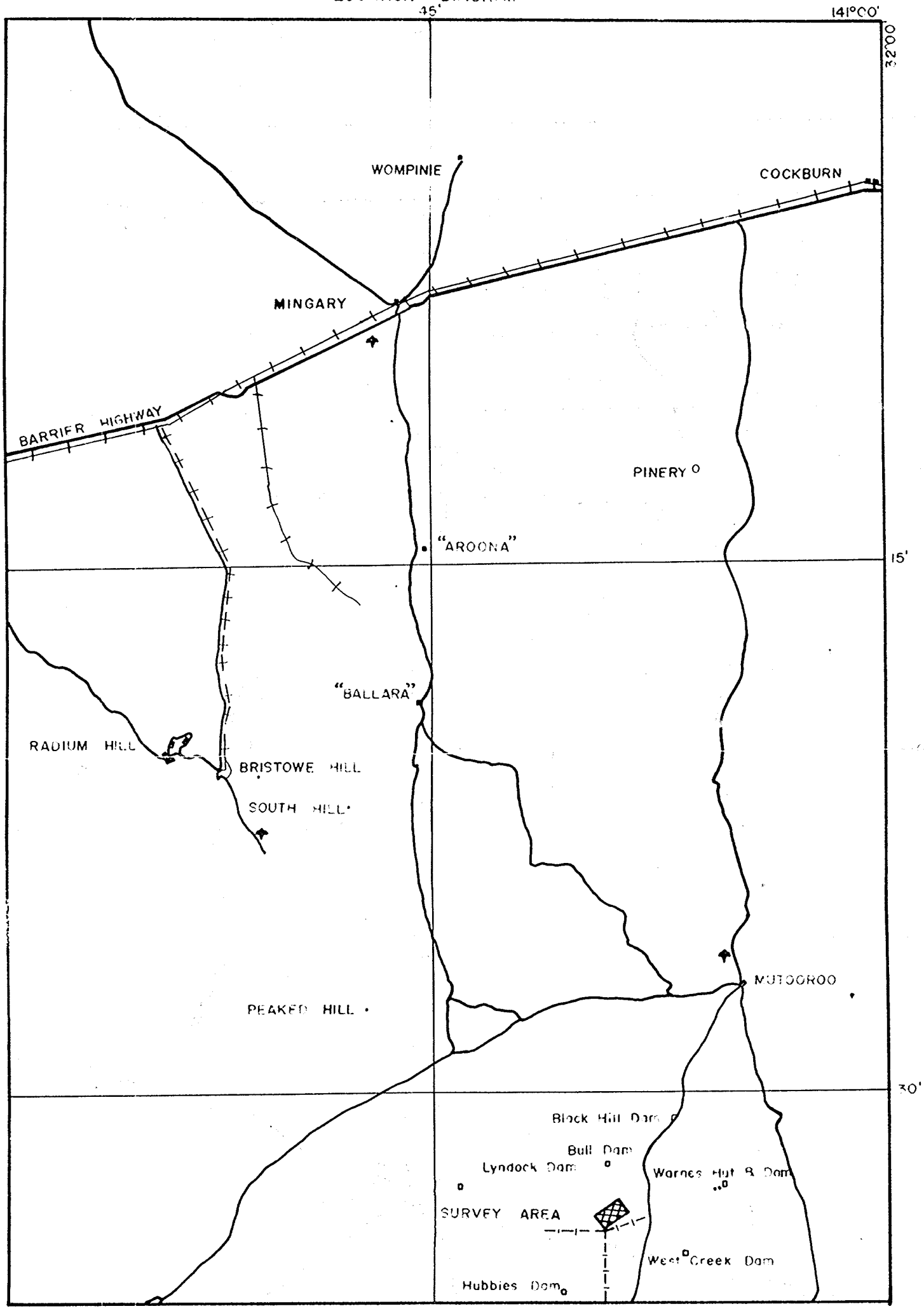
Date 8·3·70



MUTOOROO RADIOMETRIC SURVEY

ENV 11 18 1913

LOCATION DIAGRAM



ENV 11 18 (1)-16

Austral Exploration Services Pty Ltd

LONGREACH
GROUP MANAGEMENT PTY LTD.

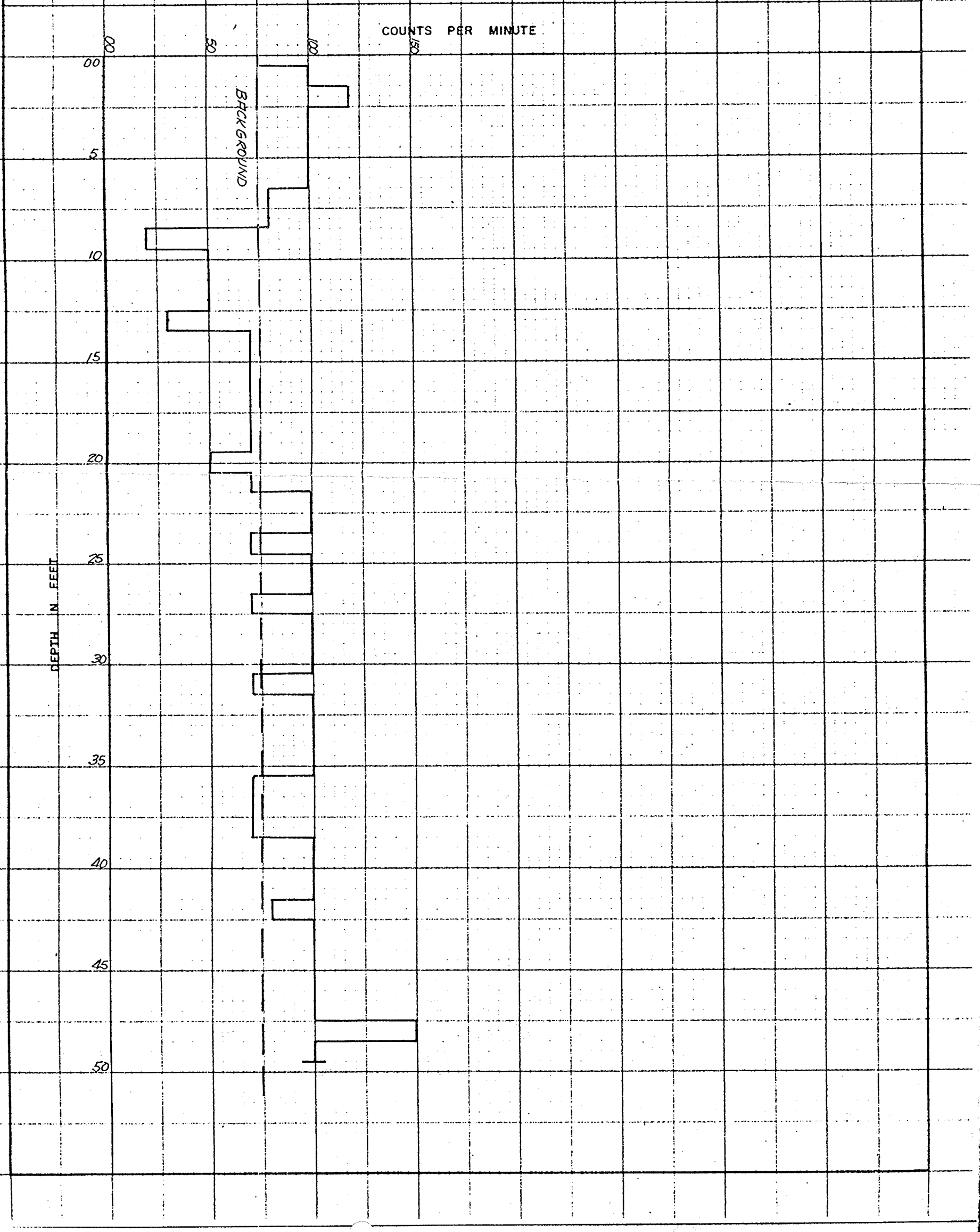
RADIOMETRIC BORE LOG

Location MUTOOROO

Hole No 98W 98N

M.5

Date 8·3·70.



ENV 1178(1) 17

Austral Exploration Services Pty Ltd

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GROUP MANAGEMENT PTY. LTD.

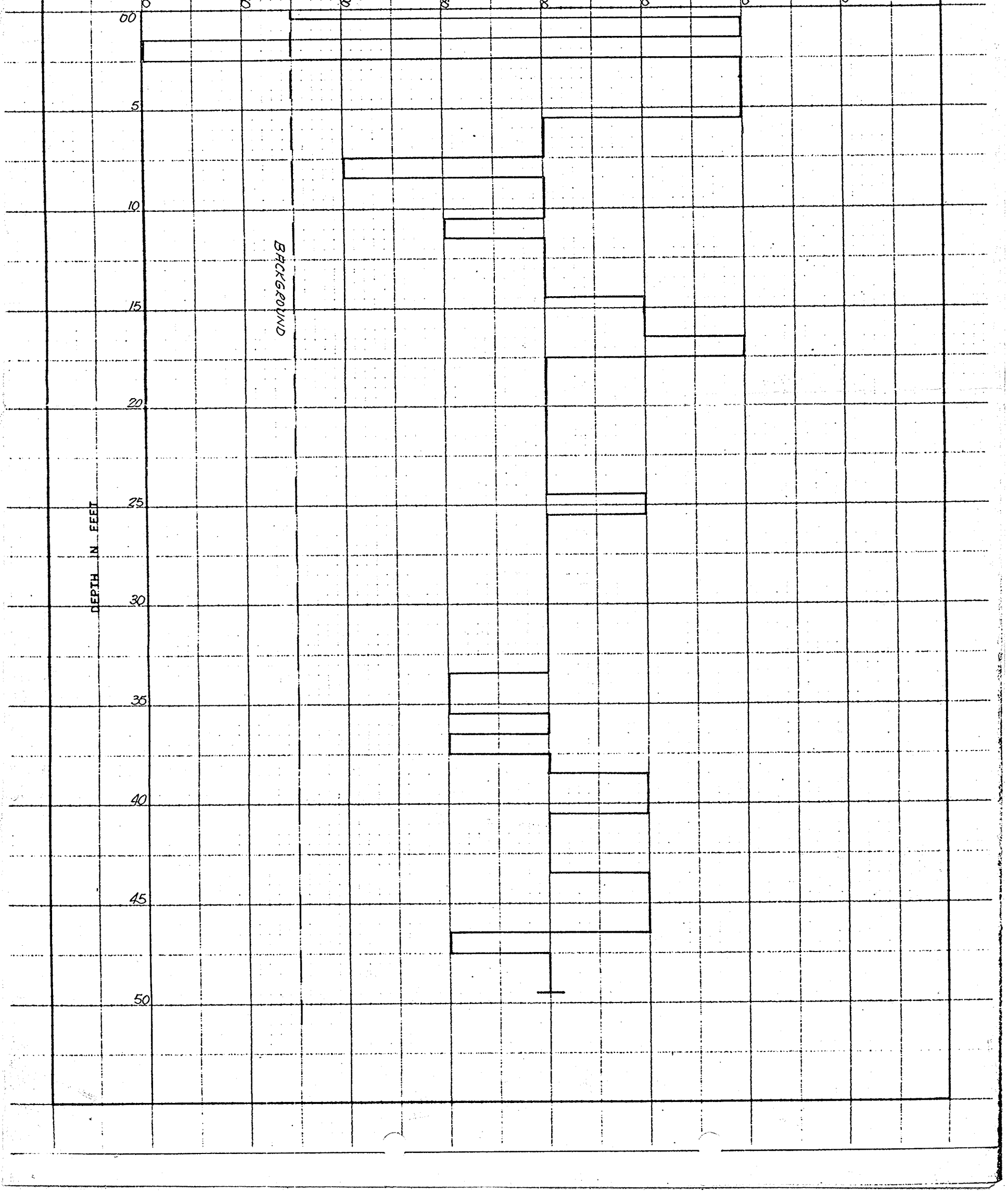
RADIOMETRIC BORE LOG

Location MUTOOROO

Hole No 103N 101W

M.3

Date 8·3·70.



041

REPORT ON

LOGGING OF DDH M1

AT

MUTOOROO S.A.

for

Longreach Group Management Pty. Ltd.

by

John E. Webb

August, 1970.

INTRODUCTION

Austral Exploration Services Pty. Ltd. arranged the geophysical logging of a hole at Mutooroo, South Australia by the South Australian Department of Mines on behalf of Longreach Group Management. The hole was logged for radioactivity, self potential and single point resistivity.

The logging was carried out on the 18th June, 1970.

DISCUSSION OF RESULTS

Radiometric and electrical logs are included in this report.

Radioactivity

The overall level of radioactivity was very low and would not indicate any economic accumulation of uranium. There are several intersections of activity above the background and these are listed for further consideration in geological logging of the hole:-

Depth	Peak Activity	Remarks
56 - 70 feet	290 cps	Active band, possibility of higher activity elsewhere within this band.
94 feet	170 cps	Sharp peak.
144-148 feet	155 cps	Two sharp peaks.
200-202 feet	176 cps	Sharp peak, highest reading in hole.
200-234 feet	176 cps	Include above peak. Wide band of activity.

While none of these radioactive intersections are approaching anything economic, they are above normal and over a long accumulation period could be responsible for the radon anomaly. This is not conclusive.

Self Potential and Resistivity

These logs are considered together as many of the features are common. In general the self potential increases with decrease in resistivity. The resistivity curve is more definitive.

The two curves show the ground traversed by the probe to be of a banded nature with a change of characteristic from bed to bed. The lows in the resistivity curve suggest intermediate beds of higher electrolyte content, i.e. more porous while the higher resistivity peaks represent more consolidated beds with less electrolyte content. It is not possible to give any interpretation of the nature of individual beds from the logs alone, however correlation with geological logs of the core should be possible. More particularly the log would allow correlation with the logs of other holes within the general vicinity.

Conclusions and Recommendations

It must be concluded that the hole DDH M1 did not intersect any area of economic uranium mineralisation. It is possible that sufficient radioactive material was intersected to provide accumulation of appreciable radon over a prolonged period and a bed between 56 and 70 feet in particular could have been responsible for the radon in the shallow holes previously drilled.

On the basis of this hole alone, no further drilling can be recommended.

John E. Webb
Geophysicist

TECHNICAL REPORT

ENV. 1178

044

LONGREACH METALS NO LIABILITY

ANNUAL REPORT ON S.M.L. 274

MARCH, 1969 TO FEBRUARY, 1970

RADIUM HILL AREA, SOUTH AUSTRALIA

BY

L.S. DENHOLM
Exploration Manager

6th April, 1970.
SYDNEY

CONTENTS

1. SUMMARY

An airborne magnetometer and spectrometer survey was carried out over the prospecting area. This survey revealed several local magnetic anomalies and two areas where anomalous radioactivity was recorded.

One of the radioactive areas, called the Mutooroo Prospect, has been examined in some detail on the ground. Ground exploration over this Prospect consisted of geological mapping, spectrometer surveys and percussion drilling. Enough encouragement has been received to continue for another 12 months exploration.

2. INTRODUCTION

The S.M.L. consisting of 797 square miles was initially granted for a term of one year to Longreach Metals N.L. on 1st March, 1969. Condition of granting the area was that a minimum of $60,000 was to be expended.

The S.M.L. area is located just south of the old Radium Hill mine and between latitudes 32°24' and 32°50' and longitudes 140°30' and 140°00' (Fig.1).

3. EXPLORATION DURING FIRST YEAR OF OCCUPANCY

The following exploration phases were carried out during the year:-

3.1. Airborne magnetometer and spectrometer survey. The survey was carried out by Geophysical Resources Development Company in April, 1969. Approximately 3,200 line miles were covered with lines a quarter of a mile apart. A description of the method is given in Appendix 5.3.

The magnetometer data showed that the northern half as well as the western most edge of the area is far more disturbed magnetically than the south-east. A number of zones where the magnetic picture does not conform with the immediate neighbourhood were discernible (see Fig.4). It has been recommended that these zones be investigated on the ground. The spectrometer survey revealed only two areas of interest. One area occurs near the western boundary of the S.M.L.while the other occurs about 10 miles south-west of the Mutooroo Station Homestead.

3.2. Ground Reconnaissance

A ground reconnaissance survey was carried out in October 1969. The radiometric anomaly near the Mutooroo Station was confirmed by a hand held BGS-1 broadband gamma ray scintillometer. The anomaly appeared to be related to fluvio-glacial sediments of Upper Proterozoic age.

A check on the anomalous airborne radioactivity near the western boundary of the S.M.L.failed to locate any source. The area was covered by fairly deep soil. A further examination is required.

3.3.1 Ground Radiometric Survey

A 1,000 foot square grid covering what appeared to be a representative area of the anomaly was gridded. Lines were run north-south at 100 feet intervals and pegged every 50 feet intervals.

The gridded area was surveyed with a Scintrex G.I.S.-2 integral spectrometer firstly on the broadband setting (all energy above 0.3 MeV) and then with discriminator setting of 1.65 MeV and 2.5 MeV to give indications of peaks

An indication of uranium was obtained by deducting the 2.5 MeV setting readings (thorium only) from the first readings (uranium and thorium).

The results were plotted as contours and shown in Fig.3 (3 plans). The "uranium" anomalies were taken as the best guide of a radioactive source.

The radiometric survey was carried out by Austral Exploration Services Pty.Ltd of Adelaide.

3.3.2. Geological Mapping

The gridded area was examined geologically. The rock types were all metasediments and appear to range from coarse grits to shales. They consistently strike N47^{o}E and dip north westerly at around 60 degrees. (Fig.2).

Petrologically they are described as fluvio-glacials (Appendix 5.2) and would appear to belong to the Upper Proterozoic.

3.3.3. Percussion Drilling

Four percussion holes totalling 240 feet were drilled in order to test the ground anomalies as delineated by the radiometric survey. The deepest hole was 100 feet.

The percussion samples were analysed, radiometrically, for uranium. All results were low, the highest being 116 ppm uranium.

3.3.4. Petrological and Mineragraphic Examinations

What appeared to be representative samples from the gridded area were examined petrologically and mineragraphically.

The results show that the rocks are composed of material from the Archaen shield - probably granitic. Of interest is the haematite,ilmenite, rutile complex which is associated with radioactivity in the Radium Hill area.

4. PROPOSED FUTURE EXPLORATION

It is intended to have radon gas determinations and gamma ray bore hole logs run on each of the four percussion drill holes at the Mutooroo Prospect.

Further regional investigation will be carried out at the Mutooroo Prospect and a total count survey run to localise other possible areas of radioactivity.

Ground examinations will be carried out over the most interesting magnetic anomalies in the S.M.L. and further investigation of the radioactive airborne anomaly located near the western boundary.

L.S.DENHOLM
Exploration Manager

5. APPENDICES

5.1. List of Plans.

Fig.1 Locality plan showing S.M.L. and Mutooroo Prospect.

Fig.2 Geological plan of Mutooroo Prospect showing percussion drill sites.

Fig.3 Plans of Radiometric Surveys

1. Total Counts
2. Uranium and Thorium
3. Uranium Only

Fig.4 Airborne Magnetometer and Spectrometer Surveys

5.2. Petrological and Mineragraphic Examinations

5.3. Report on Geophysical Method

GEOCHEMICAL AND MINERALOGICAL LABORATORIES PTY. LTD.

TELEPHONE: 31 9011 (8 LINES)
AFTER HOURS: 36 4904
TELEGRAMS & CABLES:
GEOCHEM-SYDNEY

76 McLACHLAN AVENUE,
RUSHCUTTERS BAY,
N.S.W., 2011

051

7915/FMJ

13 February, 1970.

Longreach Group Management Pty. Ltd.,
Box 4737, G.P.O.
Sydney, N.S.W. 2001.

PETROGRAPHIC REPORT

SAMPLE M1 2557

This is a laminated white mica-quartz-felspar schist, some layers of which are rich in vein like opaque material that appears to be largely limonite. However, other layers contain abundant opaque grains in a more granular form; these appear slightly silvery in a reflected light examination of the thin section, but would need examination of a polished section for identification. These opaque-rich layers are also rich in fine-grained white mica, and contain relatively large numbers of grains of zircon, tourmaline, and a yellow mineral with high relief that is probably monazite, but which would need x-ray diffraction for absolutely certain identification. This appears to be partly metamict and may well be the main radioactive mineral in the rock. It occurs in irregular to sub-prismatic grains, similar in size to those of the zircon and some of the opaque grains. The remaining (opaque poor) parts of the rock consist of irregular to lenticular grains and partly recrystallized grains of quartz, microcline and plagioclase interspersed with fine to medium-grained schistose to decussate white mica, scattered irregular opaque grains, accessory zircon and (?) monazite, and small to large grains of accessory tourmaline.

SAMPLE M2 2558

This is a laminated quartz-felspar-muscovite-schist, in which the coarser-grained layers tend to be more granular than schistose. Most of the layers consist of abundant irregular to lenticular grains and granoblastic aggregates of quartz, plagioclase and microcline, interspersed with irregular opaque grains (generally concentrated into thin layers in the rock), generally subordinate, fine-grained, random to foliated white mica.

.../2

Some layers are nearly devoid of opaque grains, but others consist largely of opaque grains, interspersed predominantly with fine white mica, minor quartz and felspar, and accessory grains (though quite numerous) of zircon and what appears to be monazite (as in 2557). The identification of the opaque mineral can only be sagely made by examination of a polished section. The zircon and (?) monazite are strongly concentrated into the opaque-rich layers, being virtually absent from the opaque-poor layers.

CENTRAL MINERALOGICAL SERVICES

Date: 18th March, 1970.

053

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

IDENTIFICATION
2562.
Meta-tillite.

Job No. CMS 70/3/6 Date Received: 5/3/70

Reference Verbal request -- Mr. L.Denholm

Sample No. 2562

Nature of Sample: Hand-specimen

DESCRIPTION SECTION No. 1694

a. Hand Specimen:

Grey, low-grade metasediment -- possible tillite.

Microscopic:

An autoradiograph was prepared of a slab of this rock, but even after 90 hours there was no effect on the film, indicating no radioactivity, at least in the area of the slab.

The rock consists of large and small rock and mineral-fragments in a lineated muscovite matrix. It is believed to be a meta-tillite of granitic provenance. The coarser fragments are virtually unsorted, angular or brecciated and strained, and consist of quartz, microcline, oligoclase and granitic fragments in a matrix of well-crystallized fresh muscovite, with conspicuous opaques, secondary rutile grains, some tourmaline (not detrital), detrital zircon and others.

Remarks/Special Features

Metamorphic grade is low-- greenschist facies. Radioactivity measured in the area must be a mass effect due to trace amounts of radioactive minerals.

N.B.: Typewritten report will follow.

g35623

What's this then?

H.W.Fander, M.Sc.

CENTRAL MINERALOGICAL SERVICES

Date: 18th March, 1970.

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

IDENTIFICATION	054
2563.	
Metasediment-	
mica schist.	

Job No. CMS 70/3/6 Date Received: 5/3/70

Reference Verbal request -- Mr. L.Denholm

Sample No. 2563

Nature of Sample: Hand-specimen

DESCRIPTION SECTION No. 1695

a. Hand Specimen:

Pale clastic rock -- low-grade metamorphic with conspicuous heavy-mineral layering.

b. Microscopic:

An autoradiograph with an exposure of over 90 hours failed to reveal any centres of radioactivity.

This rock is similar to 2562, though appreciably finer-grained, so that evidence of tillitic origin is not as clear-cut. In fact, in view of the false-bedded heavy mineral layers, the rock is most probably fluvio-glacial in origin. It is composed of poorly-sorted angular grains of quartz and feldspars, in a wide size-range, in a well-lineated muscovite matrix. It belongs to the greenschist facies. The heavy-mineral layers are composed of opaques (mainly magnetite), tourmaline, zircon, rutile (partly recrystallized) and minor xenotime.

Remarks/Special Features

The xenotime is possibly significant, as this mineral often contains some (variable) amounts of uranium.

N.B.: Typewritten report will follow.

K35623

H.W.Fander, M.Sc.

CENTRAL MINERALOGICAL SERVICES

Date: 18th March, 1970.

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

IDENTIFICATION 055

2564.

Drill-cuttings.

Job No. CMS 70/3/6 Date Received: 5/3/70

Reference Verbal request -- Mr. L.Denholm

Sample No. 2564

Nature of Sample: Drill-cuttings.

DESCRIPTION SECTION No. ---

a. Hand Specimen:

Microscopic:

Portion of the sample was crushed, deshined and separated using TBE (SG=2.9).

The heavy fraction was tested for radioactivity with a scintillometer, but no significant reading was obtained.

The heavy fraction consists mainly of opaques (non oxides, including magnetite), tourmaline, rutile, monazite, staurolite, zircon, xenotime (trace), and amphibole.

Monazite comprises about 1% of the heavy fraction and occurs as grains generally below 0.1mm in size; however, this is probably not a maximum size since the rock has been crushed.

Remarks/Special Features

N.B.: Typewritten report will follow.

gJ5623

H.W.Fander, M.Sc.

CENTRAL MINERALOGICAL SERVICES

Date: 20th February, 1970.

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

IDENTIFICATION 056

Oxide layers in rock.

Job No. CMS 70/2/25 Date Received: 18/2/70

Reference Day Book No. 7915

Sample No. M2 2558

Nature of Sample: Polished Section.

DESCRIPTION **SECTION No.**

a. Hand Specimen:

b. Microscopic:

The layers of opaques consist of grains of titaniferous hematite, showing complex irregular, often vernicular intergrowths with rutile, and with exsolution lamellae of ilmenite. There is a possibility that some of the titanhematite is intergrown with pseudobrookite -- the distinction between rutile and pseudobrookite in polished section is rather difficult.

In either case, the titanhematite-rutile (or pseudobrookite) intergrowths represent an exsolution of a titaniferous phase from a hematite saturated with Ti (about 10% Ti O_2).

Detrital grains of rutile also occur in the opaque layers.

Remarks/Special Features

N.B.: Typewritten report will follow.

635623

H.W. Fander, M.Sc.

CENTRAL MINERALOGICAL SERVICES

Date: 20th February, 1970.

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

IDENTIFICATION 057

Job No. CMS 70/2/25 Date Received: 18/2/70

Reference Day Book No. 7015

Sample No. M1 2557

Nature of Sample: Polished Section.

Radioactive Sample.

DESCRIPTION SECTION No.

a. Hand Specimen:

b. Microscopic:

The main opaques are martitised magnetite and complex intergrowths of rutile and ilmenite, with patches or detrital grains of rutile and detrital zircon.

There are very small patches of an intensely-yellow translucent mineral; in one case this contains a semi-opaque core, which has optical properties similar to that of pitchblende. This core is only 25 μ in size, and a Vickers microhardness reading was rather low for pitchblende. Another possibility is betafite, a complex uranium-bearing oxide.

It is possible that most of the radioactivity is due to secondary minerals, and some U may occur in goethite veinlets.

Remarks/Special Features

An autoradiograph should be prepared to pinpoint radioactive centres. This can be carried out if authorized.

N.B.: Typewritten report will follow.

KJ5623

H.W. Fander, M.Sc.

PRELIMINARY REPORT ON THE RESULTS OF INTERPRETATION OF THE AIRBORNE MAGNETOMETER AND SPECTROMETER SURVEY CARRIED OUT BY GRD ON BEHALF OF LONGREACH MINERALS N.L. IN THE RADIUM HILL AREA OF SOUTH AUSTRALIA.

The aircraft used was a Cessna 402, registration letters VH-BKL.

INSTRUMENTATION:

Equipment used during the survey was:-

i. A four channel Exploranium DGRS-1000 Spectrometer which has been developed to provide the mining industry with a system for obtaining precise quantitative radioactivity analysis from aircraft or ground vehicles.

The maximum capacity of the equipment is four channels. The four channels are:-

1. Potassium 40.
2. Bismuth 214.
3. Thallium 208.
4. Total count or integral.

Spectral interaction has been eliminated by using specially developed techniques and equipment, which results in 100% discrimination between the three

../2

radioactive elements in the case of secular radioactive equilibrium.

The pulse height at the output of the detector is maintained constant as a function of temperature by using spectrum stabilization techniques. As a reference source the radioactive isotope Cesium 137 is used.

Integrated circuits have been used throughout the system which resulted in a unique and small package and also providing maximum reliability. All analogue and pulse processing circuitry has been temperature compensated by using the latest integrated circuits.

Temperature compensated analogue computer circuits are used to eliminate spectral interaction resulting in 100% discrimination.

ii. An ASQ.10 high resolution Fluxgate magnetometer.

iii. The track of the aircraft was continuously recorded by a 35 mm. camera correlated to all recorder units by a fiducial system.

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iv. All magnetometer and spectrometer data was recorded on Moseley 10 inch recorders.

v. The height of the aircraft above the terrain was continuously monitored by a Bonzer TRN.70 Radar Altimeter and recorded on an Esterline Angus 6" Recorder.

PRESENTATION OF SPECTROMETER DATA:

After thorough examination of all relevant data, the most significant anomalous zones have been selected by the author and are indicated on the accompanying maps.

DISCUSSION OF RESULTS:

For the most part, the area is covered by alluvial deposits which cause a reduction of gamma ray emission and effectively reduce it to zero when the depth exceeds two to three feet. On this basis, only areas where rock actually outcrops, can a realistic examination of spectrometer data be made. Since there was the possibility that erosion by water might have brought radioactive material to the surface, the spectrometer data was closely examined wherever a flight line crossed a water course. This, however, revealed no anomalous radioactivity.

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All the anomalies that have been plotted on the maps are confined to a zone at the centre of the Western boundary of the area. They are associated with outcropping rock of reasonably intense magnetic character. Since no geology covering the area is available at the present moment, no more can be said about these anomalies until the magnetic interpretation of the area is completed.

I.A.B. McINTYRE.

pp P. Woytbun.

AUSTRALIA 1:250,000

This map has not been completely examined on the ground and is issued at this stage in order to permit early distribution of topographic information.

OLARY

EDITION 1 - DNM

REFER TO THIS MAP AS: SI 54-2
EDITION 1
SERIES R 502

REFERENCE S.M.L.274
LONGREACH GROUP MANAGEMENT PTY.LTD.
RADIUM HILL AREA S.A.

LOCALITY PLAN FOR AIRBORNE SPECTROMETRY & MAGNETOMETER SURVEY

PLAN No. M3/1/14

RECEIVED 16 DEC 1969 DEPT. OF MINES REGISTRY

ENV 1178

RELIABILITY DIAGRAM

Good | Fair | Photography

Using aerial photography 1964, 1955, 1965
Using graphical photogrammetric methods

LOCATION DIAGRAM

ANTANDOODA SH 53-12	COPLEY SH 54-9	FROME SH 54-10	CORNISH LAKE SH 54-11	WHITE CLIFFS SH 54-12
TORRENS SH 53-16	PARACHILNA SH 54-13	CURNAMONA SH 54-14	BARNDIOI HILL SH 54-15	WILCANNIA SH 54-16
PORT AUGUSTA SH 53-8	ODDNADOO SH 54-1	OLARY SH 54-2	NORNDIOIE SH 54-3	MARAKA SH 54-4
WHYALLA SH 53-4	BUDDA SH 54-5	CHOWILLA SH 54-6	ANA BRANCH SH 54-7	POONCARIE SH 54-8
MAITLAND SH 53-1	ADELAIDE SH 54-9	RENMARK SH 54-10	MILDURA SH 54-11	BALRANALD SH 54-12

LEGEND

- Railway; built-up area
- Road, sealed surface first class; route marker
- Road, sealed surface second class; mileage
- Road, loose surface all weather first class
- Road, loose surface all weather second class
- Road, loose surface dry weather
- Road, unimproved earth
- Bridge road; bridge railway
- Railway multiple track
- Railway single track
- Light railway or tramway
- Station; siding; station with siding
- Telephone line; power transmission line
- Fence; stone wall
- Levee or dyke; quarry
- Mine; windpump; yard
- Building (s); church; school
- Post office; wireless transceiver; cemetery
- Airport or airfield; landing ground
- Control point major, minor; astronomical
- Spot elevation in feet; accurate; approximate
- Bench mark; mud; gravel
- Sand; cliffs
- Sand ridges; sand dunes
- Relief shading
- Forest dense; forest medium
- Forest coniferous or pine plantation; scrub
- Vineyard; orchard or plantation
- Waterhole; water tank; dam; dry lake
- Lake, river or stream perennial
- Lake, river or stream intermittent
- Dam or weir; falls; rapids
- Drain or ditch perennial, intermittent
- Spring perennial, intermittent; ricefields
- Marsh or swamp; perennial; intermittent
- Seaplane anchorage; seaplane base
- Breakwater, pier, dock or wharf
- Fathom line; low water mark; lighthouse
- Wreck sunken, exposed; vessel anchorage
- Rocks submerged, bare or awash
- Reef, rocky or coral

EDITION 1 - DNM
SERIES R 502

NMP/65/097

Prepared under the direction of the Minister for National Development, by the Division of National Mapping as part of the National Mapping programme. Surveys control established by South Australia Government Departments. Manuscripts prepared in 1968 by Department of Mines, South Australia from 1954 and 1955 aerial photographs. Minor amendments by Division of National Mapping in 1966 using 1965 aerial photography. Distributed by the Defence Services by the Royal Australian Survey Corps and to all other users by the Department of National Development.

Scale 1:250,000

5 0 5 10 15 20 25 Statute Miles
5 0 5 10 15 20 Nautical Miles
10,000 0 10,000 20,000 30,000 Yards
5 0 5 10 15 20 25 Kilometres

ELEVATIONS SHOWN IN FEET
VERTICAL DATUM IS BASED ON MEAN SEA LEVEL

TRANSVERSE MERCATOR PROJECTION
HORIZONTAL DATUM IS BASED ON MEAN ASTRONOMICAL DETERMINATIONS

BLACK NUMBERED LINES INDICATE THE 10,000 YARD TRANSVERSE MERCATOR GRID, ZONE 6 (AUSTRALIA SERIES) CLARKE 1858 SPHEROID
THE LAST FOUR DIGITS OF THE GRID NUMBERS ARE OMITTED

1965 MAGNETIC DECLINATION FOR THIS SHEET VARIES FROM 7°30' EASTERLY FOR THE CENTRE OF THE WEST EDGE TO 8°00' EASTERLY FOR THE CENTRE OF THE EAST EDGE. MEAN ANNUAL CHANGE IS 3' EASTERLY.

TO GIVE A GRID REFERENCE ON THIS SHEET
Pay no attention to the smaller co-ordinate figures at the corners and in the margins – they are for feeding full co-ordinates.
PAY ATTENTION TO LARGER MARGINAL FIGURES AND TO THOSE PRINTED ON THE FACE OF THE MAP.

POINT * "Taltabooka"

East		North	
Take west edge of square on which point lies and read the figures printed opposite this line (on north or south margin) or on the line itself (on the face of the map). Estimate tenths Eastward.	32	Take south edge of square on which point lies and read the figures printed opposite this line (on east or west margin) or on the line itself (on the face of the map). Estimate tenths Northward.	97
	320		970

REFERENCE 329979

Unit	Yard
Square	10,000
Reference to nearest	1,000
Nearest similar reference distant	300 miles

ENV 1178(II)-22

OLARY
SOUTH AUSTRALIA

108 N
107 N
106 N
105 N
104 N
103 N
102 N
101 N
100 N
99 N
98 N
97 N
96 N
95 N
94 N
93 N

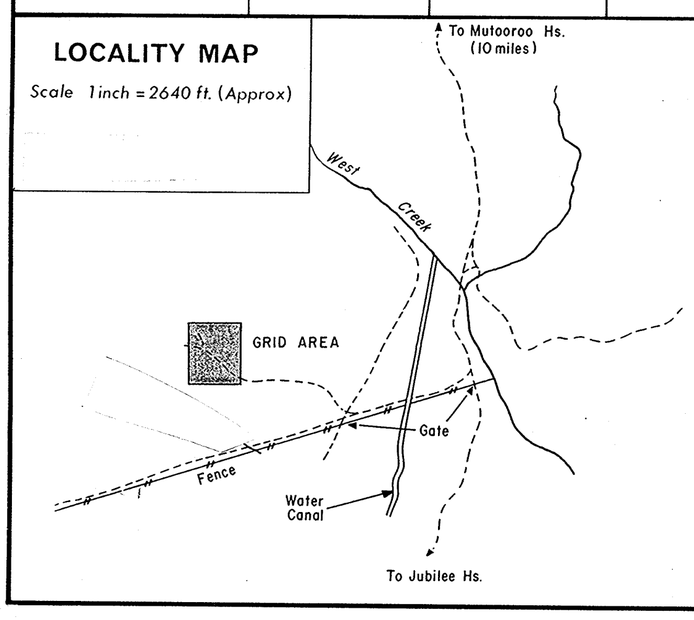
105 W
104 W
103 W
102 W
101 W
100 W
99 W
98 W
97 W
96 W
95 W

N

V
Cg
Fg
P.D.H.
T.D. 50ft.
P.H.D.
T.D. 100 ft.
P.D.H.
T.D. 40ft.
P.D.H.
T.D. 50ft.
60°
70°
Creek

LOCALITY MAP

Scale 1inch = 2640 ft. (Approx)



LEGEND

- Percussion holes drilled
- Quartz veins
- Meta Shales, some Grey Mica Schists and Pink Shale
- Fg — Fine grained Quartz grit
- Cg — Coarse Quartz grits and some narrower Shales
- V — Alluvium and shallow soil cover
- 60° — Dip symbol

LONGREACH GROUP MANAGEMENT PTY. LTD.

LONGREACH METALS N.L.

MUTOOROO PROSPECT
S.M.L. 274
(RADIUM HILL AREA)

PLAN SHOWING GEOLOGY AND LOCATION OF DRILL SITES

SCALE 1INCH = 66·7 FEET			DWG. No.
BASED ON			
DRAWN BY: M. CHATENAY	REVISED	DATE	M3/1/29
DATE: 20 FEB. 1970			
APPROVED: L.S.D.			
UTM CODE			

ENV 1178(I)-2

Fig. 2

108 N
107 N
106 N
105 N
104 N
103 N
102 N
101 N
100 N
99 N
98 N
97 N
96 N
95 N
94 N
93 N

105 W
104 W
103 W
102 W
101 W
100 W
99 W
98 W
97 W
96 W
95 W

SCALE 1:800

FEET 0 100 200 300 400 FEET

LONGREACH MINERAL
RADIOMETRIC SURVEY
MUTOOROO AREA
TOTAL COUNT

FILE NO R102 SHEET NO 1

Austral Exploration Services Pty Ltd

EAM 11701(T) 9

108 N
107 N
106 N
105 N
104 N
103 N
102 N
101 N
100 N
99 N
98 N
97 N
96 N
95 N
94 N
93 N

105 W
104 W
103 W
102 W
101 W
100 W
99 W
98 W
97 W
96 W
95 W

SCALE 1:800

FEET 0 100 200 300 400 FEET

NOTE: ENERGY > 1·65 MeV

LONGREACH MINERAL
RADIOMETRIC SURVEY
MUTOOROO AREA
URANIUM & THORIUM COUNT

FILE NO R102 SHEET NO 2

Austral Exploration Services Pty. Ltd

ENV 11178(7)-4

Fig. 3b
Dwg. M3/1/30

108 N
107 N
106 N
105 N
104 N
103 N
102 N
101 N
100 N
99 N
98 N
97 N
96 N
95 N
94 N
93 N

105 W
104 W
103 W
102 W
101 W
100 W
99 W
98 W
97 W
96 W
95 W

SCALE 1:800

FEET 0 100 200 300 400 FEET

NOTE 1·65 MeV < ENERGY < 2·5 MeV

LONGREACH MINERAL RADIOMETRIC SURVEY
MUTOOROO AREA
URANIUM ONLY COUNT

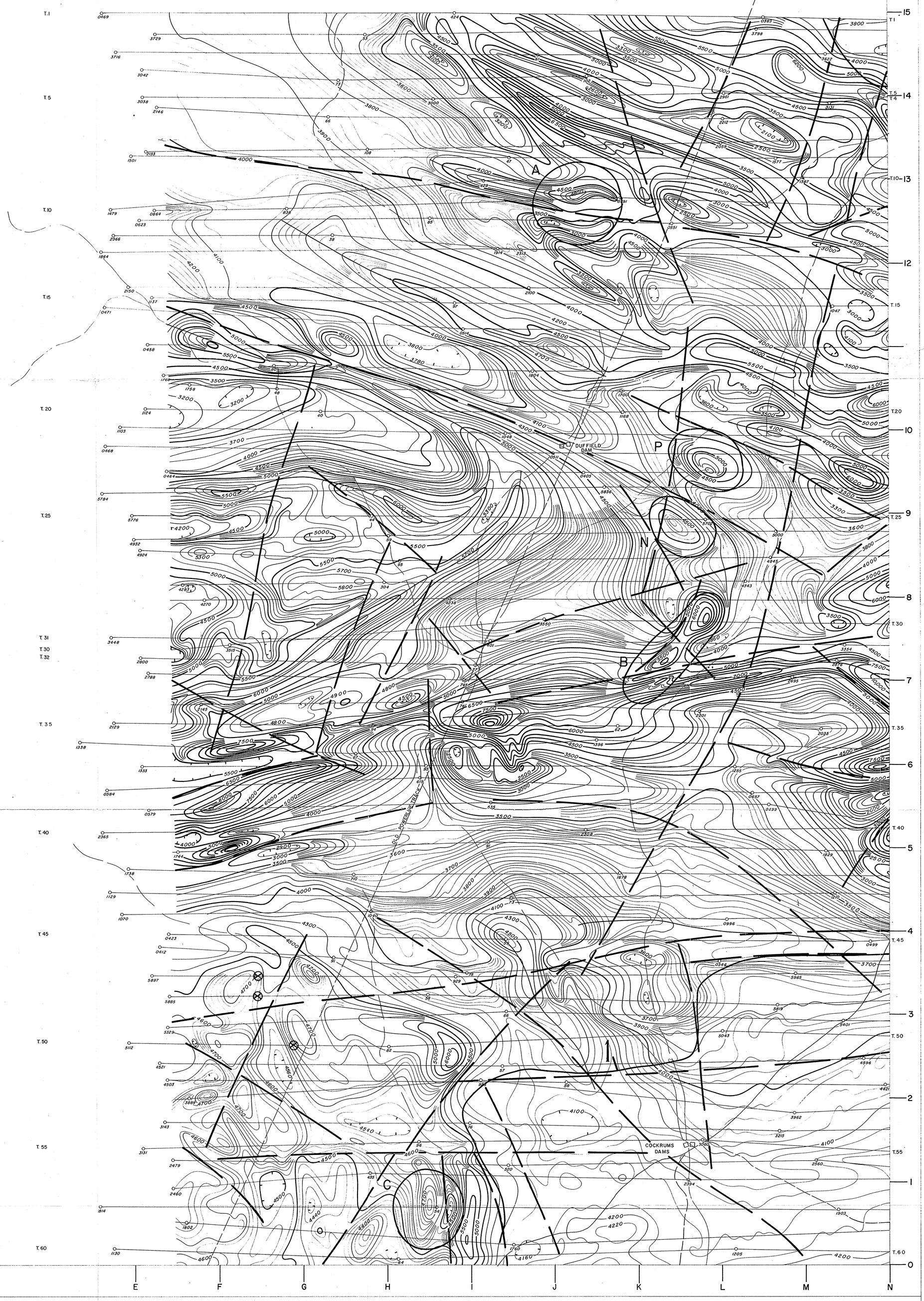
FILE NO R102 SHEET NO 3

Austral Exploration Services Pty. Ltd.

ENV 1178(1)-5

Fig. 3c

Dwg. M3/1/31



LEGEND

1 — ZONE BOUNDARIES

C — AREA OF MAGNETIC ANOMALY

GEOPHYSICAL DISCONTINUITIES

STRATIGRAPHICAL TREND

RADIOMETRIC ANOMALIES ⊗

FLIGHT LINE INTERVAL	— 1/4 MILE
FLIGHT ALTITUDE	— 300' M.T.C.
CONTOUR INTERVAL	— 20 GAMMA
BASE INTENSITY	— ARBITRARY
HORIZONTAL CONTROL BASED ON PHOTO ASSEMBLY COMPILED BY GEOPHYSICAL RESOURCES DEVELOPMENT CO., RAMSGATE, N.S.W.	

SHEET INDEX

1	2	3
4	5	6

N (APPROX.)

TOTAL MAGNETIC INTENSITY

AIRBORNE MAGNETOMETER SURVEY

RADIUM HILL AREA – S.A.

LONGREACH MINERALS N.L.

SCALE 1" = 2640' (APPROX.)

GRD SURVEYED AND COMPILED 1969 BY GEOPHYSICAL RESOURCES DEVELOPMENT CO, RAMSGATE, N.S.W.

SHEET 1

ENV 1178(I)-6

Dwg. M3/12C
Fig. 4

NORTH DAM

NORTH EAST CATCH

BLACK HILL DAM

IRONSTONE SOUTH DAM

DUFFIELDS SOUTH PLAIN DAM

SUNSET DAM

SUNRISE DAM

DYKE ?

DYKE ?

DYKE ?

Creek

LEGEND

2 — ZONE BOUNDARIES

D — AREA OF MAGNETIC ANOMALY

GEOPHYSICAL DISCONTINUITIES

STRATIGRAPHICAL TREND

RADIOMETRIC ANOMALIES ⊗

FLIGHT LINE INTERVAL	—	1/4 MILE
FLIGHT ALTITUDE	—	300' M.T.C.
CONTOUR INTERVAL	—	20 GAMMA
BASE INTENSITY	—	ARBITRARY

HORIZONTAL CONTROL BASED ON PHOTO ASSEMBLY COMPILED BY GEOPHYSICAL RESOURCES DEVELOPMENT CO., RAMSGATE, N. S. W.

SHEET INDEX

1	2	3
4	5	6

N (APPROX.)

TOTAL MAGNETIC INTENSITY

AIRBORNE MAGNETOMETER SURVEY
RADIUM HILL AREA — S. A.

LONGREACH MINERALS N.L.

SCALE 1" = 2640' (APPROX.)

GRD

SURVEYED AND COMPILED 1969 BY
GEOPHYSICAL RESOURCES DEVELOPMENT CO.,
RAMSGATE, N. S. W.

SHEET 2

ENV 1178(I) - 7

Dwg. M3/1/3C
Fig. 4

SOUTH AUSTRALIA
NEW SOUTH WALES

WHITE DAM

MUTOOROO DAM

STATION DAMS

WARNES HUT & DAM

WEST CREEK DAM

LAMBERTS DAM

PERSEVERANCE DAM

DYKE ?

DYKE ?

DYKE ?

E

F

G

H

4

T.1 T.5 T.10 T.15 T.20 T.25 T.30 T.35 T.40 T.45 T.50 T.55 T.57 T.56 T.60

LEGEND

8-4 ZONE BOUNDARIES

8 H AREA OF MAGNETIC ANOMALY

GEOPHYSICAL DISCONTINUITIES

STRATIGRAPHICAL TREND

FLIGHT LINE INTERVAL — 1/4 MILE
FLIGHT ALTITUDE — 300' M.T.C.
CONTOUR INTERVAL — 20 GAMMA
BASE INTENSITY — ARBITRARY
HORIZONTAL CONTROL BASED ON PHOTO
ASSEMBLY COMPILED BY GEOPHYSICAL RESOURCES DEVELOPMENT CO., RAMSGATE, N.S.W.

SHEET INDEX

1	2	3
4	5	6

N (APPROX.)

TOTAL MAGNETIC INTENSITY

AIRBORNE MAGNETOMETER SURVEY
RADIUM HILL AREA — S.A.

LONGREACH MINERALS N.L.

SCALE 1" = 2640' (APPROX.)

GRD SURVEYED AND COMPILED 1969 BY GEOPHYSICAL RESOURCES DEVELOPMENT CO., RAMSGATE, N.S.W.

SHEET 3

ENV 1178 (I) - 8

Dwg. H3/1/4c
Fig. 4

GREAT EASTERN DAM

PIGEON DAM

SATIRE DAM

DINNERTIME DAM

MULGA DAM

R

M

1

T.61 T.65 T.70 T.75 T.80 T.85 T.90 T.95 T.100 T.105 T.110 T.115 T.120

15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0

E F G H I J K L M N

LEGEND

1 — ZONE BOUNDARIES

R — AREA OF MAGNETIC ANOMALY

GEOPHYSICAL DISCONTINUITIES

STRATIGRAPHICAL TREND

FLIGHT LINE INTERVAL	—	1/4 MILE
FLIGHT ALTITUDE	—	300' M.T.C.
CONTOUR INTERVAL	—	20 GAMMA
BASE INTENSITY	—	ARBITRARY

HORIZONTAL CONTROL BASED ON PHOTO

ASSEMBLY COMPILED BY GEOPHYSICAL RESOURCES DEVELOPMENT CO., RAMSGATE, N.S.W.

SHEET INDEX

1	2	3
4	5	6

N (APPROX.)

TOTAL MAGNETIC INTENSITY

AIRBORNE MAGNETOMETER SURVEY
RADIUM HILL AREA — S.A.

LONGREACH MINERALS N.L.

SCALE 1" = 2640' (APPROX.)

GRD

SURVEYED AND COMPILED 1969 BY
GEOPHYSICAL RESOURCES DEVELOPMENT CO.,
RAMSGATE, N.S.W.

SHEET 4

ENV 1178(I) - 9

Dwg. H3/115c
Fig 4

MIDDAY DAM

JUBILEE DAMS

JONES DAM

JUBILEE SCRUB DAM

GAIRLOCH DAM

LOCH HAZARD DAM

J

K

L

6

LEGEND

6 — ZONE BOUNDARIES

K — AREA OF MAGNETIC ANOMALY

GEOPHYSICAL DISCONTINUITIES

STRATIGRAPHICAL TREND

FLIGHT LINE INTERVAL	—	1/4 MILE
FLIGHT ALTITUDE	—	300' M.T.C.
CONTOUR INTERVAL	—	20 GAMMA
BASE INTENSITY	—	ARBITRARY

HORIZONTAL CONTROL BASED ON PHOTO ASSEMBLY COMPILED BY GEOPHYSICAL RESOURCES DEVELOPMENT CO, RAMSGATE, N.S.W.

SHEET INDEX

1	2	3
4	5	6

N (APPROX.)

TOTAL MAGNETIC INTENSITY

AIRBORNE MAGNETOMETER SURVEY
RADIUM HILL AREA — S.A.

LONGREACH MINERALS N.L.

SCALE 1" = 2640' (APPROX.)

GRD — SURVEYED AND COMPILED 1969 BY GEOPHYSICAL RESOURCES DEVELOPMENT CO, RAMSGATE, N.S.W.

SHEET 5

ENV 1178(I)-10

Dwg. M3/11/Gc Fig. 4

LEGEND

8-4 ZONE BOUNDARIES

8H AREA OF MAGNETIC ANOMALY

GEOPHYSICAL DISCONTINUITIES

STRATIGRAPHICAL TREND

FLIGHT LINE INTERVAL	—	1/4 MILE
FLIGHT ALTITUDE	—	300' M.T.C.
CONTOUR INTERVAL	—	20 GAMMA
BASE INTENSITY	—	ARBITRARY

HORIZONTAL CONTROL BASED ON PHOTO ASSEMBLY COMPILED BY GEOPHYSICAL RESOURCES DEVELOPMENT CO., RAMSGATE, N.S.W.

SHEET INDEX

1	2	3
4	5	6

N (APPROX.)

TOTAL MAGNETIC INTENSITY

AIRBORNE MAGNETOMETER SURVEY

RADIUM HILL AREA — S.A.

LONGREACH MINERALS N.L.

SCALE 1" = 2640' (APPROX.)

SURVEYED AND COMPILED 1969 BY
GEOPHYSICAL RESOURCES DEVELOPMENT CO,
RAMSGATE, N.S.W.

SHEET 6

ENV1178(T)-11

Dwg. 43/1/7C

MALDORKIE

PEAK HILL

PARADISE

DUFFIELDS NORTH

DUFFIELDS CENTRAL

DUFFIELDS SOUTH

BLACK HILL

RIDGE PROSPECT

DYKE 2

DYKE 3

DYKE 7

WESTERN RADIOMETRIC

COCKBURNS

GREAT EASTERN

MULGA

JUBILEE

SOUTH AUSTRALIA / NEW SOUTH WALES

LEGEND

1 ZONE BOUNDARIES

R AREA OF MAGNETIC ANOMALY

GEOPHYSICAL DISCONTINUITIES

STRATIGRAPHICAL TREND

FLIGHT LINE INTERVAL — 1/5 MILE
FLIGHT ALTITUDE — 300' M.T.C.
CONTOUR INTERVAL — 20 GAMMA
BASE INTENSITY — ARBITRARY
HORIZONTAL CONTROL BASED ON PHOTO
ASSEMBLY COMPILED BY GEOPHYSICAL RESOURCES DEVELOPMENT CO. MARKETS, N.S.W.

SHEET INDEX

TOTAL MAGNETIC INTENSITY

AIRBORNE MAGNETOMETER SURVEY
RADIUM HILL AREA — S.A.

LONGREACH MINERALS N.L.

SCALE 1" = 2640' (APPROX.)

SURVEYED AND COMPILED 1969 BY GEOPHYSICAL RESOURCES DEVELOPMENT CO. MARKETS, N.S.W.

9

LEGEND

6 ZONE BOUNDARIES

K AREA OF MAGNETIC ANOMALY

GEOPHYSICAL DISCONTINUITIES

STRATIGRAPHICAL TREND

FLIGHT LINE INTERVAL — 1/5 MILE
FLIGHT ALTITUDE — 300' M.T.C.
CONTOUR INTERVAL — 20 GAMMA
BASE INTENSITY — ARBITRARY
HORIZONTAL CONTROL BASED ON PHOTO
ASSEMBLY COMPILED BY GEOPHYSICAL RESOURCES DEVELOPMENT CO. MARKETS, N.S.W.

SHEET INDEX

TOTAL MAGNETIC INTENSITY

AIRBORNE MAGNETOMETER SURVEY
RADIUM HILL AREA — S.A.

LONGREACH MINERALS N.L.

SCALE 1" = 2640' (APPROX.)

SURVEYED AND COMPILED 1969 BY GEOPHYSICAL RESOURCES DEVELOPMENT CO. MARKETS, N.S.W.

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LEGEND

4 ZONE BOUNDARIES

H AREA OF MAGNETIC ANOMALY

GEOPHYSICAL DISCONTINUITIES

STRATIGRAPHICAL TREND

FLIGHT LINE INTERVAL — 1/5 MILE
FLIGHT ALTITUDE — 300' M.T.C.
CONTOUR INTERVAL — 20 GAMMA
BASE INTENSITY — ARBITRARY
HORIZONTAL CONTROL BASED ON PHOTO
ASSEMBLY COMPILED BY GEOPHYSICAL RESOURCES DEVELOPMENT CO. MARKETS, N.S.W.

SHEET INDEX

TOTAL MAGNETIC INTENSITY

AIRBORNE MAGNETOMETER SURVEY
RADIUM HILL AREA — S.A.

LONGREACH MINERALS N.L.

SCALE 1" = 2640' (APPROX.)

SURVEYED AND COMPILED 1969 BY GEOPHYSICAL RESOURCES DEVELOPMENT CO. MARKETS, N.S.W.

SHEET 6

ENV 1178 (I) – 12

TYPE OF LOG (S): Gamma-ray.

DATE: 18-6-70 TIME: 2·30pm / / /

AREA: MUTOOROO LOCATION: Lat. Long.

WELL: DDH MI

ELEVATION G. L.: K.B.: Log from 0 feet Above G.L. DEPTH SCALE: 20 ft/in.

RUN NUMBER: / / / / /

FIRST READING: 411 / / / / LAST READING: 0 / / / /

CASING SHOE DEPTH ("):LOG feet DRILL feet TOTAL DEPTH:LOG 411 feet DRILL 448 feet

MUD: Type Density Viscosity Resistivity @ °F FHT @ °F

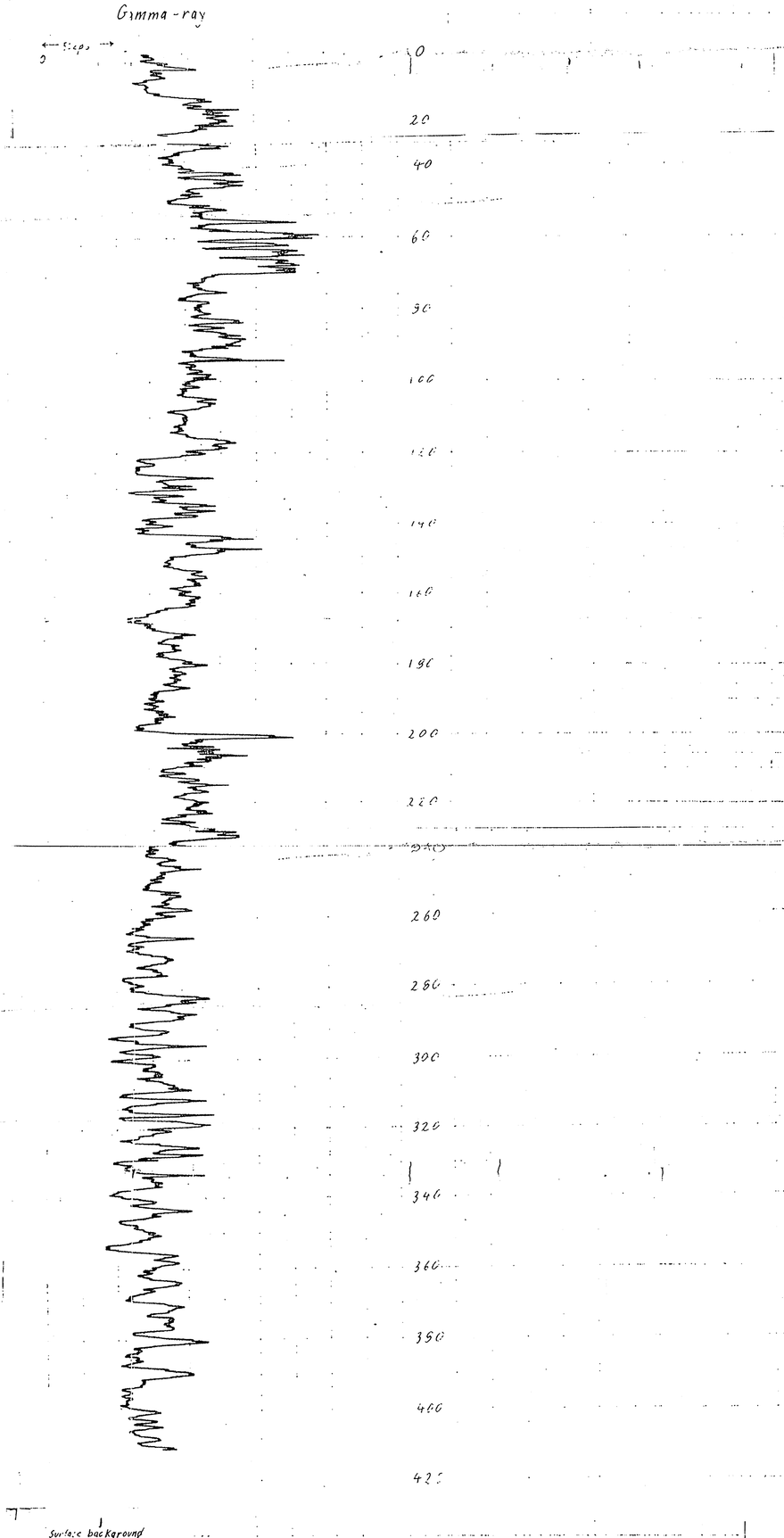
pH Fluid Loss cc/30 min. Filter Cake 32nd R_{mf} @ °F R_{mc} @ °F

BIT SIZE: " ADDITIONAL CASING: (1) " set at feet (2) " set at feet

OPERATING TIME: 1 hour / / / /

RECORDED BY: B P Taylor

REMARKS: Calibration source = 650 cps
= 2764 API units
= 266 mr/hr.
= 170 micro grams radium/ton.



1178 (II)-6

TYPE OF LOG (S): S. P., Point Resistivity

DATE: 18-6-70 TIME: 3·30pm / / /

AREA: MUTOOROO LOCATION: Lat. Long.

WELL: DDH MI

ELEVATION G. L.: K. B.: Log from 0 feet above G. L. DEPTH SCALE: 20ft/in

RUN NUMBER: / / / /

- FIRST READING: 372 / / / / LAST READING: 39 / / / /

CASING SHOE DEPTH ("):LOG feet DRILL feet TOTAL DEPTH:LOG 372 feet DRILL 448 feet

MUD: Type Density Viscosity Resistivity @ °F BHT @ °F

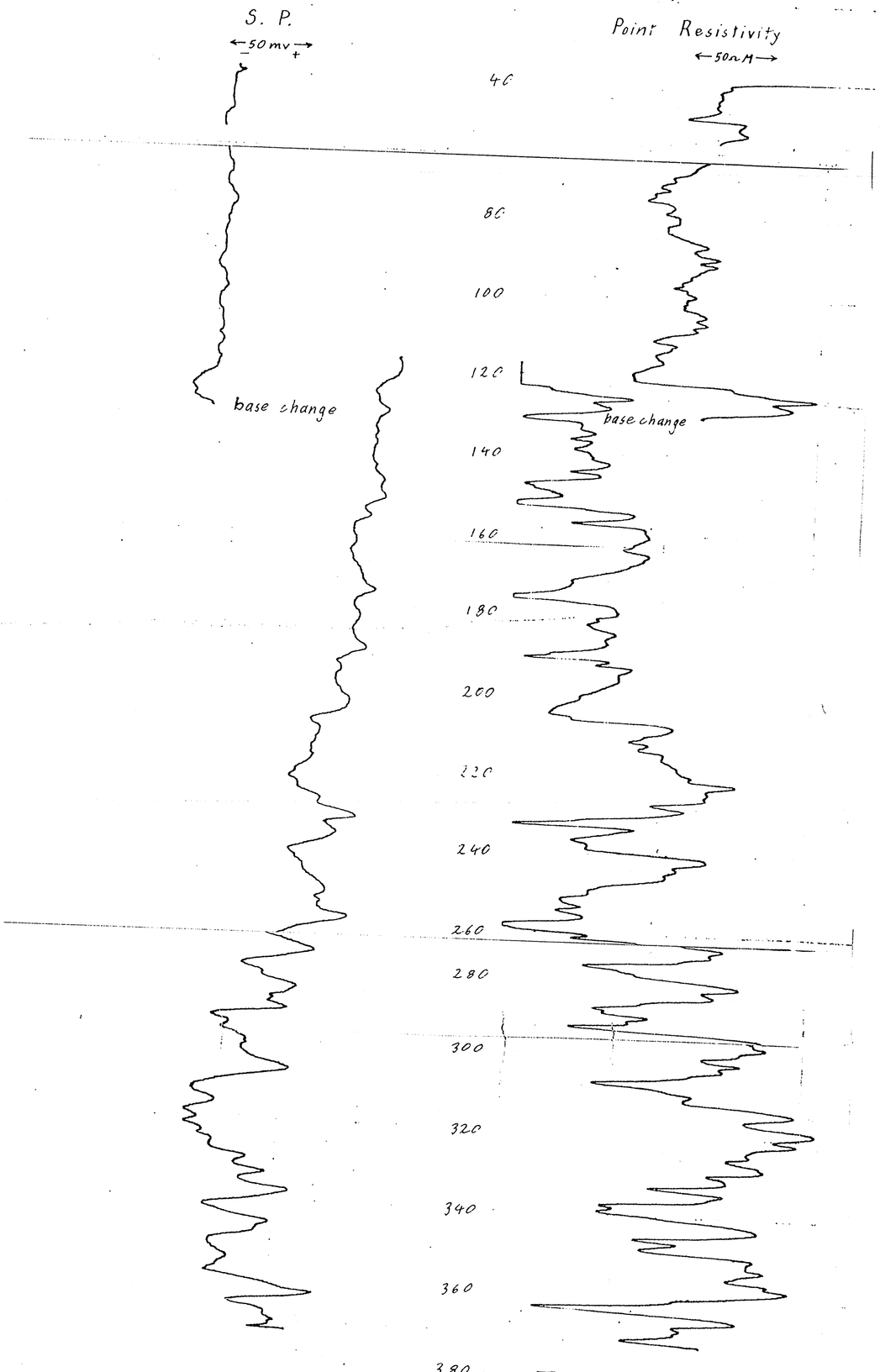
pH Fluid Loss cc/30 min. Filter Cake /32" R_{mf} @ °F R_{mc} @ °F

BIT SIZE: " ADDITIONAL CASING: (1) " set at feet (2) " set at feet

OPERATING TIME: 30mins / / / /

RECORDED BY: B. P. Taylor

REMARKS:



1178(II)-7

TECHNICAL REPORT

LONGREACH GROUP MANAGEMENT PTY. LIMITED

S.M.L. 274
MUTOOROO AREA
SOUTH AUSTRALIA

REPORT ON ACTIVITIES IN 1970

BY

A.C. EDWARDS

BROKEN HILL
March, 1971

CONTENTS

LIST OF FIGURES

SUMMARY

The exploration programme conducted in S.M.L. 274 between March, 1970 and March, 1971, was designed to evaluate the airborne radiometric and magnetic anomalies delineated during the previous year, and to investigate the areas of known copper mineralization.

Radon gas determinations and gamma ray bore hole logging of percussion holes drilled during the previous year at the Mutooroo Prospect, revealed a high level of radioactivity in one hole. A diamond drill hole designed to test this zone of high activity did not reveal any significant uranium mineralization.

Ground investigations supported by an auger drilling programme were conducted over the remaining radiometric and magnetic anomalies. The presence of a well developed travertine layer over some magnetic anomalies severely hampered this programme.

An integrated programme of geological mapping, geochemical soil sampling and magnetometer and induced polarization surveys, was conducted over the Lyndock and Ridge Prospects. A zone of highly deformed trachytic lavas and tuffs, in the ridge area was isolated for testing by diamond drilling. A diamond drilling programme consisting of five holes is now in progress.

1. INTRODUCTION

1.1 Tenancy

S.M.L. 274, which consists of 799 sq. miles was initially granted to Longreach Metals N.L. on March 1st, 1969. $60,000 was to be expended in exploring the area in the 1970-71 period.

1.2 Location and Access

The S.M.L. area is located just south of the old Radium Hill Mine, between latitudes 32° 24' and 32° 50' and longtitudes 140° 30' and 140° 00'.

Access to the area is by way of a formed road, which turns off the main Adelaide - Broken Hill road some 4 miles west of Cockburn. The formed road terminates at the Mutooroo Homestead which lies in the north east corner of the S.M.L. area. Access within the area is by station tracks.

1.3 Topography

The southern half of the area is flat. The vegetation ranges from open saltbush and bluebush plains in the centre of the area, to thick mulga scrub with eucalypts and saltbush in the south.

The northern half of the area generally shows more relief. The gently undulating plains are broken by occasional ridges of quartzite and tillite. The Maldorky Hills in the N.W. of the area form the highest point on the S.M.L. The forms of vegetation in the northern half of the area are saltbush and bluebush with a few sparse clumps of mulga.

The area is drained by a number of south easterly flowing creeks.

2. PREVIOUS WORK IN THE AREA

2.1 Geological Mapping

The northern margin of the area was initially mapped by R.C. Sprigg during 1951. The whole of the area has since been remapped as part of the South Australian Mines Department's mapping programme in the Olary Province. This was conducted between 1967 and 1969.

The Mutooroo area was mapped by A.F. Williams. R.A. Callen re-mapped the southernmost portion of the Ballara sheet.

An investigation of mineral leases 3038, 3039 and 3040 was conducted by N. Heims during 1956. An account of this work is given in Mining Review

2.2 Geophysics

The area has been covered by aerial magnetometer surveys conducted by the South Australian Mines Department and the Bureau of Mineral Resources between 1953 and 1955.

3. REGIONAL GEOLOGY

3.1 Archean

The oldest rocks in the area are the granite gneisses of the Willyama complex. These rocks outcrop in the north east of the S.M.L. area, and are inferred in the north of the area from aeromagnetics. Associated with the granite gneisses in the Mutooroo Homestead area are a number of north easterly trending amphibolite dykes.

The Willyama blocks are bounded by north westerly and north easterly tending shears which are parallel with the Macdonald shear zone and the Anabama Redan fault zone respectively. These are the major basement lineaments in the area.

3.2 The Adelaide System

The rocks of the Adelaide system occupy a large triangular area north of the Anabama Redan fault zone, which trends almost diagonally across the area. These rocks are complexly folded in the zone of adjustment surrounding the Macdonald shear zone where it intersects the nose of the north easterly trending Wadnamnga Anticlinorium. The effects of this are well illustrated in Fig.(2).

The main stratigraphic units present in the area are:-

a) Burra Group(?)

This unit, which consists of interbedded conglomerates, coarse grained arkoses and siltstones with trachytes, sodic rhyolites and associated tuffs, occurs as a north easterly trending ridge some 7 miles south of the Mutooroo Homestead. The presence of the volcanics within the sequence would suggest that this unit might be better grouped with the lower Callana Beds, as the volcanics identified would appear to be the equivalent of the Wooltana and Roopena Volcanics. These rocks are described in more detail in (5.3.) below. This unit is apparently overlain by greyish phyllitic siltstones with minor dolomite which are possible equivalent to the Rhynie Sandstone.

b) Yudnamutna Sub Group

This unit includes, tillites with some hematite lenses quartzites, dolomites and siltstones. This unit overlies the Willyama complex unconformably in

3.3 Recent Deposits

Much of the area is covered by a thin veneer of sand silt and gravel with well developed horizons of calcrete.

3.4 Igneous Rocks

a) Anabama Granite -

From the aeromagnetic survey, it is believed that the Anabama Granite extends into the far west of the S.M.L. area. Auger drilling in two locations in the area has confirmed this. The granite does not outcrop.

b) Pegmatities

A number of small dykes of pegmatite have been found intruding the lower Burra group sediments. The rock consists of pink plagioclase and quartz, and often contains coarse grained ilmenite.

c) Diorite

A course grained altered diorite, occuring in a narrow dyke had been found intruding the trachytes mentioned above. The rock is principally composed of oligoclase/andesine, leucoxenized opaques and chlorite epidote pseudomorphs after hornblende. Minor malachite staining was also observed.

4. SUMMARY OF EXPLORATION BY LONGREACH METALS N.L. IN THE S.M.L. AREA PRIOR TO MARCH, 1970

An airborne magnetometer and spectrometer survey was carried out over the S.M.L. area. This survey revealed sixteen local magnetic anomalies and two areas of anomalous radioactivity.

One of the areas of anomalous radioactivity known as the Mutooroo Prospect has been examined in some detail on the ground. Ground exploration included geological mapping spectrometer surveys and a percussion drilling programme of four holes. Results of the percussion drilling were encouraging and it was decided to retain the area for a further year.

5. EXPLORATION IN THE YEAR MARCH, 1970 - MARCH, 1971

5.1 Cockrums Radiometric Anomaly

The Cockrums radiometric anomaly was confirmed on the ground by a hand held B.G.S.-1 Broad Band Gamma Ray Scintillometer. The area has a relatively thick soil cover which obscured any possible source of radioactivity.

A series of ten Jacro Auger drill holes averaging 21' in depth were drilled over the anomaly. Bottom samples were taken for radiometric assay for U O. The samples were sent to Austral Exploration Services of

the radioactivity is probably associated with a potassium rich portion of the Anabama Granite.

5.1.2. The Mutooroo Prospect (See Fig.1 for location)

Radon gas determinations and gamma ray borehole logs were carried out on each of the four percussion holes drilled during January,1970. The radon gas determinations were carried out at 25' and 50' levels in all holes. The gamma ray borehole logs consist of readings taken at one foot intervals to a maximum of 50'. The highest alphaparticle activity was detected in hole 101.5N 101.5W. Gamma ray activity in this hole was low. Details of the methods used and the results are given in Appendix I.

DDH M1 was put down to 525' near 101.5N 101.5W to determine the radon source. No uranium mineralisation was detected in this hole but several above background results were obtained from analyses.

Self potential, resistivity and gamma ray logging were carried out in DDH M1. Minor variations in resistivity and self potential readings are attributed to lithological characteristics. A peak radio-activity of 290 cps was recorded from 56' to 70'. The corresponding analyses between 41 and 71 feet averaged 60 ppm (max 90 ppm) U_3O_8. Results of this work are given in appendix 1.

The radioactive intersections are not economic however they are above normal and could have provided sufficient accumulation of radon over a prolonged period to explain the response obtained in the percussion holes.

5.2 Magnetic Anomalies

The aerial magnetometer conducted in April,1969 (see previous reports for details) revealed 16 zones which were considered to be locally anomalous. The locations of these zones are shown in Fig.2.

5.2.1 Reconnaissance Investigations

Reconnaissance investigations, consisting of magnetometer traverses with supporting geological mapping and soil sampling where soil cover permitted, were conducted over all anomalous areas, with the exception of the Ridge Prospect (see 5.3 below) and the Mulga Anomaly which could not be definitely located.

As a result of these investigations the Black Hill, Peak Hill, and Duffields South anomalies were not considered to warrant further work. These anomalies could be directly attributed to ferruginous siltstones and B.I.F's in association with tillites and soft grey friable siltstones. The Maldorkies anomaly was also written off for lack of any geochemical or geological encouragement.

5.2.2. Auger Drilling

The drilling programme was carried out between 13.2.71 and 26.2.71 using a Jacro auger mounted on the back of a flat topped FWD Toyota. Samples were taken from the bottom auger flight for assay for Cu, Pb, Zn, Ag and Au. These results are not yet to hand.

Considerable difficulty was experienced in drilling the Paradise, Great Eastern and Jubilee areas. Well developed silcrete and calcrete horizons restricted the penetration of the augers to less than 10 feet.

5.2.3 Conclusions

No further work is required in the Black Hill, Peaked Hill, Duffields South and Maldorkies anomalies.

The Paradise, Great Eastern and Jubilee areas have not yet been adequately tested due to the difficulties experienced during the auger drilling programme.

The Duffields North and Central anomalies have been attributed to lenses of ferruginous siltstone and B.I.F.'s in weathered argillaceous and arenaceous schists. The Cockrums anomaly occurs on the contact of a granite mass. The contact zone was found to be overlain by a heavy red-brown clay horizon that could not be penetrated by the augers.

5.3 The Ridge Copper Prospect (See Fig. 1 for Location)

The area of interest consists of a north easterly trending ridge, rising 150' above the level of the plains to the south. Outcrop conditions in the area are generally good.

5.3.1 Geology

5.3.1.1 Method - The Prospect area (See Fig 4.1) was mapped on a scale of 1" = 400' by tape and compass from the existing soil grid. The "drill site" area (Fig. 4.1 see inset) was mapped on a scale of 1" = 100'.

5.3.1.2 Rock Types -

a) Arkosic conglomerates and sandstones

The conglomerates consist of angular quartzite pebbles with minor shale fragments in a matrix of chlorite and sericite schist. Heavy mineral bands are common. The sandstones, which are compositionally equivalent, range from coarse to fine grained types.

b) Quartz Muscovite Schists

These rocks are fine grained with quartz mullions and blebs

In general they occur as grey-green friable schists. Sedimentary laminations are retained in some areas.

In the drillsite, two types of schist could be differentiated.

i) Meta Volcanics

These are dark grey schists, commonly vesicular with quartz and carbonate infilling the vesicles. The original rock was thought to have been a sodic trachyte. (See Appendix II Sample Nos. 15551 and 15548).

ii) Chlorite Biotite schists derived from silts and tuffs. These are mainly greenish black schists, with grey interbeds and occasional lenses of quartzitic pebbles and grit fragments. (See Appendix II Sample No. 15763).

d) Rhyolites and Rhyolite Schists

The rhyolite is a fine grained blocky siliceous rock consisting of pink and grey phases which define intricately folded laminations. The grey phase, which is more prominent appears vesicular in some localities. When sheared the rhyolite forms a grey and white spotted schist. (Appendix II Sample No. 15553).

5.3.1.3. Structure

The rock mass has suffered intense shear slip folding which resulted in a major horizontal anticlinal structure trending sub parallel to the length of the ridge. This folding was accompanied by transposition. Numerous small folds occur on the limbs of the major structure.

A second episode of shear slip folding transverse to the first episode has occurred in the drillsite area. The secondary folding has been attributed to a strong horizontal movement to the southwest on the Anabama Redan Fault Zone, which lies to the immediate south of the prospect area. This movement resulted in a wedge of rock consisting of quartz muscovite schist and chlorite biotite schist, being forced between the competent conglomerate sandstone and rhyolite masses. The chlorite biotite schists, being the least competent unit present adjusted by flowage.

This same period of movement, resulted in dragfolding the sandstone conglomerate unit in the east of the area. Synclinal remnants of less competent chlorite biotite schist have been strongly deformed as a result.

5.3.1.4

Mineralization

a) Copper Mineralization

i) Veins - copper mineralisation in the form of malachite occurs mainly within quartz veins. Many of the quartz veins also contain hematite and magnetite with minor pyrite gossans.

ii) Malachite staining on shear planes within the chlorite biotite schists and quartz muscovite schists. These stainings are generally not associated with gossans.

Mineralization of this type is mainly restricted to the two zones of more intense deformation. In the drillsite area the malachite tends to be concentrated at the base of the trachytic volcanics in the gritty chlorite biotite schist bands.

b) Barite Mineralization

Barite occurs as irregular veins up to 2' in width. The barite veins tend to be localized within a sinuous zone of chlorite biotite schist which run from around 288E/114N to 324E/102N. A second zone of mineralization occurs in the sandstones conglomerates and grits around 116E/124N.

c) Fluorite

Fluorite has been observed in two locations in the area. One fluorite vein at 324E/90N is 1' - 2' in width and appears to be somewhat irregular. This vein is at present being worked by a prospector. The other occurrence of fluorite is at 260E/100N. Here the fluorite occurs in a 2' vein with barite, quartz and malachite. The mineralization cannot be traced along strike.

5.3.2 Geochemistry

Method

The area was soil sampled on an 800' x 200' grid. In the drillsite area, the sample interval was reduced to 400' x 200'.

The samples were sent to Geochemical and Mineralogical Laboratories Pty. Ltd. where they were analysed for Cu, Pb, Zn, Co. The results of this work are shown in Figs. 4.2.1 - 4.2.4.

5.3.3 Geophysics

5.3.3.1 Magnetometer Survey

Magnetometer traverses were run over the prospect area at 800' intervals using a Sintrex MF2 fluxgate magnetometer. Readings were taken at 50' intervals. The traverse spacing was reduced to 400'

These results were plotted as a series of raw data profiles (Fig. 4.3). No diurnal corrections have been made to these results, and no attempt has been made to tie in the traverses.

5.3.3.2 Induced Polarization Survey

An induced polarization survey was undertaken by Heinrichs Geoexploration (Australasia) Pty. Ltd. between the 6th and the 28th November, 1970. The equipment used was of the Geoex designed multiselectible frequency type. Frequencies of 3.0 H_2 and 0.3 H_2 were employed. The spreads were run using a symmetrical colinear dipole configuration with either 5 or 7 current electrodes per spread.

Fifteen lines were run using a 300' dipole spacing. Two additional spreads were run on 172E using a 150' dipole spacing. The data is presented in the form of contoured sectional dataplots. A plan of the I.P anomalies is given in 4.4.

5.3.4 Costeaning

Three costeans were dug in the drillsite area. These were located on lines 184E, 180E and 172E in an attempt to find a basis for detailed correlation with the later diamond drilling.

A fourth costean was dug at 116E/124N to ascertain the extent of barite mineralisation in the area. One 18" vein was exposed.

5.3.5 Discussion of Results

The I.P. survey revealed moderate to strong well defined anomalies on all lines surveyed.

The most significant of these I.P. anomalies are those located between lines 180E and 196E. These anomalies coincide with the known mineralisation in the gritty chlorite biotite schist and its possible extensions.

The I.P. anomaly on line 172E coincides with a sharp magnetic peak and a zinc anomaly. This area is believed to contain a possible shear zone and/or anticlinal axis. This anomaly was strongly recommended for drilling by Heinrichs Geoexploration Pty. Ltd.

The I.P. anomaly delineated on line 164E does not coincide with either a geochemical or a magnetic anomaly. The I.P. anomaly may straddle the rhyolite/chlorite brotite schist contact.

response. This possibility is supported by the strong magentic response of the conglomerate sandstone unit.

Diamond Drilling

A programme of four diamond drill holes was designed to test the zone of known mineralisation located between lines 180E and 188E. The sites of these proposed diamond drill holes are shown in Fig. 4.1. An additional hole has been proposed to test the I.P. anomaly on line 172E.

DDH M2 was drilled to a depth of 448'4" at an angle of 45° (see Fig 4.5). Copper mineralisation mainly in the form of malachite was encountered in the intervals of 134'0"-152'9", 186'0"-206'3", 239'0" - 240'0", 249'3"-252'0", 259'9"-269'0", 328'0"-331'0" and 428'11"-429'5". The drill core was split and sent to Geochemical and Mineralogical Laboratories Pty. Ltd., for assay for Cu, Pb, Zn, Ag, Au. Full assay results are not yet to hand.

Due to the heavy core losses in DDH M2, a second hole - DDH M3, was drilled from the location at an angle of 55° to a depth of 447'8" (see Fig 4.5). Copper mineralisation in the form of malachite was encountered in the intervals 186'6"-187'3", 204'8"-239'0", 243'7"-248'4", 297'7"-300'6", 329'9"-330'0". This hole has not yet been assayed.

A third drill hole, DDH M4, is in progress.

5.4 Lyndock Prospect

The Lyndock prospect is located 9 miles south west of the Mutooroo Homestead (see Fig 1). The area is located on the northern flank of a low East-West trending ridge. Outcrop in the area is generally sparse.

5.4.1 Geology (Fig. 5.2.1)

The main rock types present are:-

a) Soft grey friable phyllitic siltstones - these occasionally contain limonite pseudomorphs after pyrite.

b) Fine grained buff coloured micaceous felspathic sandstone (see appendix II Sample No. 15550).

c) Grey micaceous carbonate rocks. This is a microcrystalline carbonate rock with large conspicuous phengite porphyroblasts. (See appendix II Sample No. 15549).

d) Brown to buff coloured massive dolomites.

Copper mineralization in the form of malachite occurs in a number of quartz veins in the area. The quartz veins are parallel with the overall strike. Minor traces of malachite occur in the sandstones surrounding the quartz veins.

5.4.2 Geochemistry

Five soil sample traverses were run over the area. Samples were taken at 200' intervals initially. The sample interval was later reduced to 50' over the strongest I.P. anomaly.

The samples were analysed by Geochemical and Mineralogical Laboratories Pty. Ltd. of Sydney for Cu, Pb, Zn and Co. The results, which are shown on Figs 5.2.2 - 5.2.4, revealed no significant anomalies.

5.4.3 Geophysics

5.4.3.1 Magnetometer Traverses

A number of magnetometer traverses were run over the gridded area in the hope that these would aid in geological interpretation. The area was found to be magnetically flat.

5.4.3.2 Induced Polarization

An I.P. survey was carried out by Heinrichs GEOEXploration in conjunction with the survey of the Ridge Prospect. Five single spread lines were run, two with a 150' dipole spacing, and three with a 300' dipole spacing.

The results of the survey are shown in the form of contoured sectional data plots and on plan (See Fig 5.3.).

The survey revealed a south westerly trending zone of strong to moderate I.P. anomalism on lines 100E, 108E and 116E. The causative body was found to be a narrow steeply dipping zone of schists. These contained limonitic boxworks, apparently after sulphide. This material assayed 66 ppm Cu, 8 ppm Pb, 40 ppm Zn and 6 ppm Co.

A weak zone of anomalism was located on line 124E in the vicinity of 106N. This anomaly coincides with the known mineralized quartz veins.

5.4.4 Conclusion

The limited size of the known mineralization, combined with the lack of significant geophysical and geochemical responses dis-

The strong I.P. anomalies on lines 100E, 108E and 116E are almost certainly caused by pyrite, hence, no further investigation is warranted.

6. FUTURE EXPLORATION IN S.M.L. 274

1) Diamond Drilling in the Ridge Area

The present drilling programme of five holes will be completed. The need for additional drilling will be assessed on completion of the present programme.

2) Sedimentary Uranium

The sedimentary environment in the Murray Basin to the south of the Anabama Redan fault zone, is thought to be suitable for the deposition of sedimentary uranium because:-

a) the area forms part of the shelf of the Murray Basin. The area would probably have been a low plain drained by braided streams. Deltaic and lacustrine environments are thought to have prevailed.

b) the sediments would have been derived from the Archean rocks of the Olary province.

c) leaching of the Archean of the Olary Province over the long period available could result in uraniferous solutions being formed. Uranium could have been precipitated from these solutions under the environmental conditions envisaged.

d) the sediments are believed to be relatively undisturbed.

A programme of deep rotary percussion drilling is at present being considered to explore this possibility. Drilling will probably be concentrated around the Olary Creek, this being the largest creek in the area. Holes would be drilled to a depth of at least 200' and would be tested for radon and gamma ray activity.

A. EDWARDS
Resident Geologist

AUSTRALIA 1:250,000

This map has not been completely examined on the ground and is issued at this stage in order to permit early distribution of topographic information.

OLARY

EDITION 1 - DNM

REFER TO THIS MAP AS: SI 54-2
EDITION 1
SERIES R 502

LONGREACH GROUP MANAGEMENT PTY LTD

RADIUM HILL AREA – S.A.

MUTOOROO PROSPECT

LOCALITY MAP SHOWING
GRID AREA –
AERO MAGNETIC SHEET INDEX

RELIABILITY DIAGRAM

Good | Fair | Photography

Using aerial photography 1954, 1955, 1965
Using graphical photogrammetric methods

LOCATION DIAGRAM

ANDAMOOKA SH 53-12	COPLEY SH 54-9	ETADUNNA SH 54-10	CORNISH LAKE SH 54-11	WHITE CLIFFS SH 54-12
TORRENS SH 53-16	PARACHILNA SH 54-13	CURDIMURKA SH 54-14	BROKEN HILL SH 54-15	WILCANNIA SH 54-16
PORT AUGUSTA SI 53-4	OODNADATTA SI 54-1	OLARY SI 54-2	MENINDEE SI 54-3	MANNUM SI 54-4
WINNINGA SI 53-8	BURRA SI 54-5	CHOWILLA SI 54-6	ANA BRANCH SI 54-7	POONCARIE SI 54-8
MARYBOROUGH SI 53-12	ADELAIDE SI 54-9	RENMARK SI 54-10	HUNGERFORD SI 54-11	BALRANALD SI 54-12

LEGEND

- Highway; built-up area
- Road, sealed surface first class; route marker
- Road, sealed surface second class; mileage
- Road, loose surface all weather first class
- Road, loose surface all weather second class
- Road, loose surface dry weather
- Road, unimproved earth
- Bridge road; bridge railway
- Railway multiple track
- Railway single track
- Light railway or tramway
- Station; siding; station with siding
- Telephone line; power transmission line
- Fence; stone wall
- Levee or dyke; quarry
- Mine; windpump; yard
- Building (s); church; school
- Post office; wireless transceiver; cemetery
- Airport or airfield; landing ground
- Control point major, minor; astronomical
- Spot elevation in feet; accurate; approximate. 750 ~750
- Bench mark; mud; gravel BM 750
- Sand; cliffs
- Sand ridges; sand dunes
- Relief shading
- Forest dense; forest medium
- Forest coniferous or pine plantation; scrub
- Vineyard; orchard or plantation
- Waterhole; water tank; dam; dry lake
- Lake, river or stream perennial
- Lake, river or stream intermittent
- Dam or weir; falls; rapids
- Drain or ditch perennial, intermittent
- Spring perennial, intermittent; ricefields
- Marsh or swamp; perennial; intermittent
- Seaplane anchorage; seaplane base
- Breakwater, pier, dock or wharf
- Fathom line; low water mark; lighthouse
- Wreck sunken, exposed; vessel anchorage
- Rocks submerged, bare or awash
- Reef, rocky or coral

EDITION 1 - DNM

SERIES R 502

NMP/65/097

Prepared under the direction of the Minister for National Development, by the Division of National Mapping as part of the National Mapping programme. Survey control established by South Australia Government Departments. Manuscripts prepared in 1966 by Department of Mines, South Australia from 1954 and 1955 aerial photographs. Minor amendments by Division of National Mapping in 1966 using 1965 aerial photographs. Distributed by the Defence Services by the Royal Australian Survey Corps and to all other users by the Department of National Development.

Scale 1:250,000

5 0 5 10 15 20 25 Statute Miles
5 0 5 10 15 20 Nautical Miles
10,000 0 10,000 20,000 30,000 Yards
5 0 5 10 15 20 25 Kilometres

ELEVATIONS SHOWN IN FEET
VERTICAL DATUM IS BASED ON MEAN SEA LEVEL

TRANSVERSE MERCATOR PROJECTION
HORIZONTAL DATUM IS BASED ON MEAN ASTRONOMICAL DETERMINATIONS

BLACK NUMBERED LINES INDICATE THE 10,000 YARD TRANSVERSE MERCATOR GRID, ZONE 6 (AUSTRALIA SERIES) CLARKE 1858 SPHEROID
THE LAST FOUR DIGITS OF THE GRID NUMBERS ARE OMITTED

1965 MAGNETIC DECLINATION FOR THIS SHEET VARIES FROM 7° 50' EASTERLY FOR THE CENTRE OF THE WEST EDGE TO 8° 00' EASTERLY FOR THE CENTRE OF THE EAST EDGE. MEAN ANNUAL CHANGE IS 3' EASTERLY.

TO GIVE A GRID REFERENCE ON THIS SHEET
Pay no attention to the smaller co-ordinate figures at the corners and in the margins – they are for finding full co-ordinates.
PAY ATTENTION TO LARGER MARGINAL FIGURES AND TO THOSE PRINTED ON THE FACE OF THE MAP.

POINT • "Taltabooka"

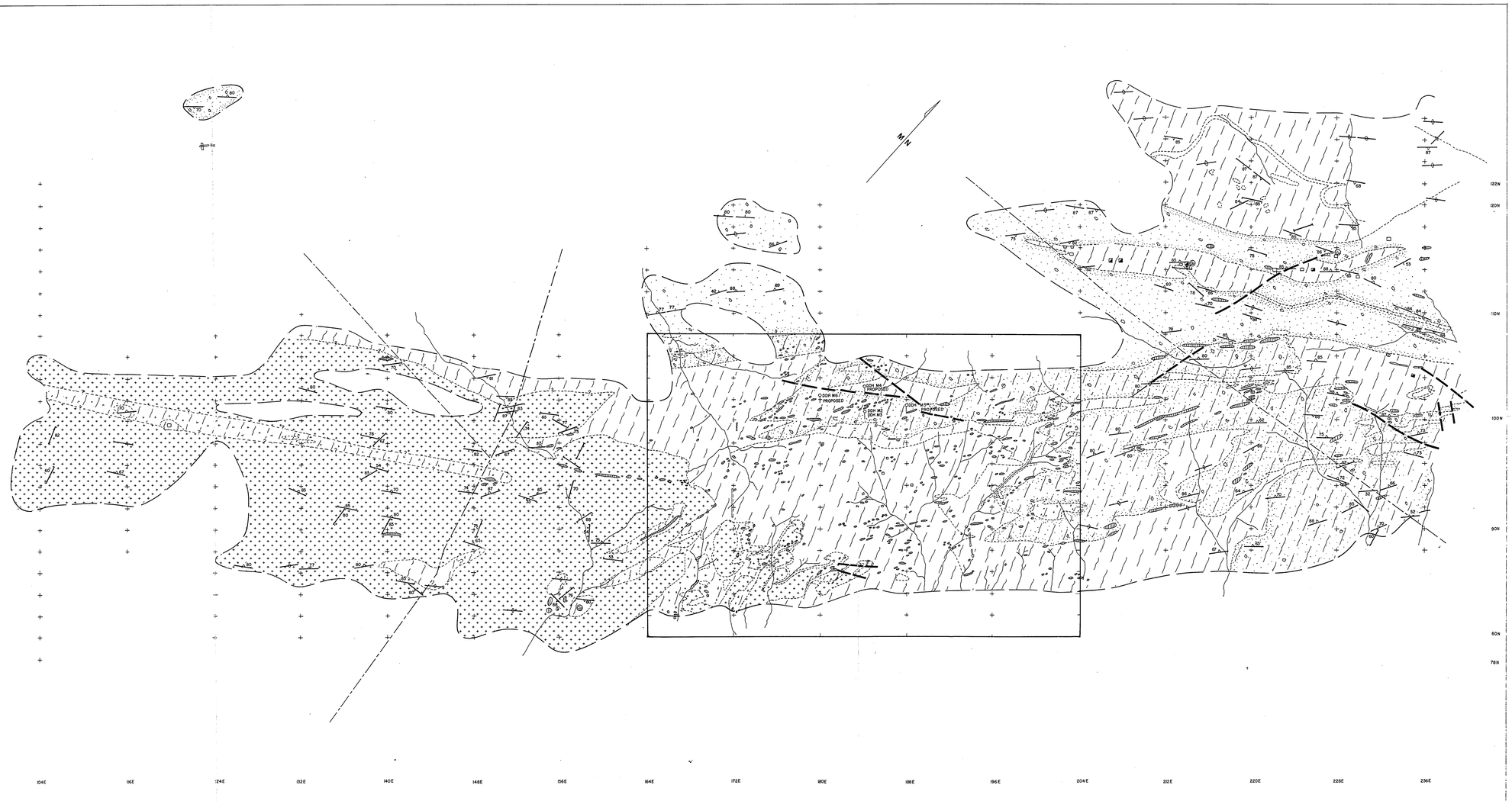
East		North
Take west edge of square in which point lies and read the figures printed opposite this line (or the next south margin or on the line itself (on the face of the map). Estimate tenths, Eastward.	32	Take south edge of square in which point lies and read the figures printed opposite this line (or the next north margin) or on the line itself (on the face of the map). Estimate tenths Northward.
329		979

REFERENCE 329972

Unit ..... Yard
Square 10,000
Reference to nearest 1,000
Nearest similar reference distant ..... 300 miles

ENV 1178(I)-1

OLARY
SOUTH AUSTRALIA



Feldspathic conglomerates and sandstones, moderately deformed sedimentary features recognisable

Undifferentiated chlorite biotite schist

Quartz mica schist metaphosed conglomerate and sandstone intensely deformed

Rhyolite

Sheared Rhyolite

Quartz

Barite Vein

shaft
pit
trench
foliation — vertical foliation
cleavage — vertical cleavage
bedding — overturned bedding — vertical bedding
fault
malachite stain
fence
soil sample grid points
drill site area. see map no. 4-1(b)

10 400 E

RECEIVED
20 APR 1971
DEPT. OF MINES
SECURITY
1178 II

LONGREACH GROUP MANAGEMENT PTY. LTD.

LONGREACH METALS N.L.

S.M.L. 274
MUTOOROO RIDGE PROSPECT

SURFACE GEOLOGY

Sheet 1

SCALE- 1"-400			DWG. No.
BASED ON- Field Map by Alastair Edwards			
DRAWN BY- Greg Croft	REVISED	DATE	4-1
DATE- 6th April 1971			
APPROVED BY- L S Denholm			
UTM CODE			

ENV 1178 (II) – 1

MN

130N

120N

110N

100N

90N

86N

M.L. 5596

236E 244E 252E 260E 268E 276E 284E 292E 300E 308E 316E 324E 332E

33 200 E

LEGEND

- Feldspathic conglomerates and sandstones, moderately deformed sedimentary features recognisable
- Undifferentiated chlorite biotite schist
- Quartz mica schist — metamorphosed conglomerate and sandstone intensely deformed
- Rhyolite
- Sheared rhyolite
- Quartz
- Barite vein

- shaft
- pit
- trench
- foliation — vertical foliation
- cleavage — vertical cleavage
- bedding — overturned bedding — vertical bedding
- joint — vertical joint
- fault
- malachite stain
- fence
- lease boundary
- soil sample grid points

LONGREACH GROUP MANAGEMENT PTY. LTD.

LONGREACH METALS N.L.

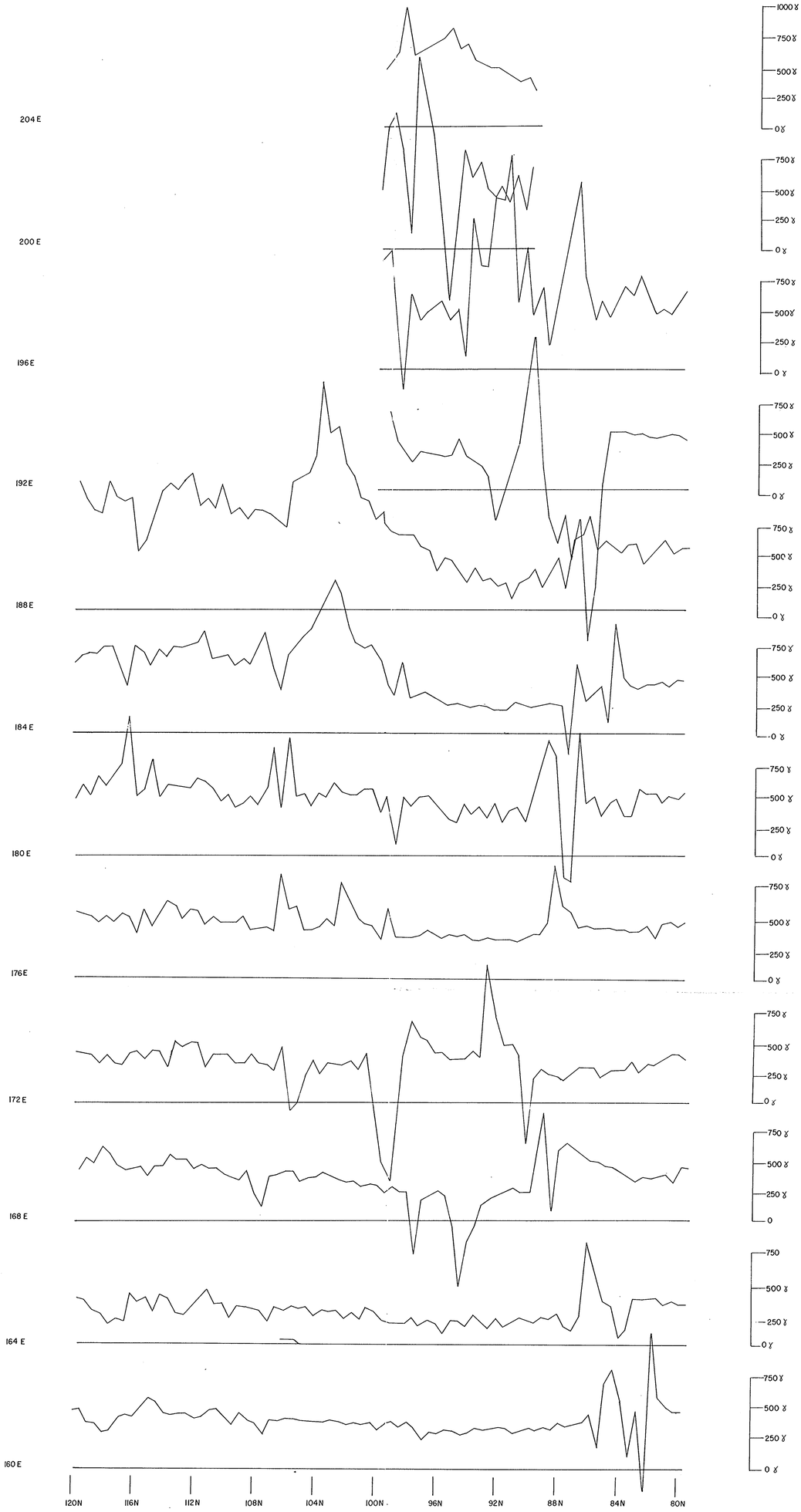
S.M.L. 274

MUTOOROO RIDGE PROSPECT

SURFACE GEOLOGY
Sheet 2

SCALE- 1" = 400'			DWG. No.:
BASED ON- Field Map by Alastair Edwards			
DRAWN BY- Greg. Croft	REVISED	DATE	4-1
DATE- 6th. April 1971			
APPROVED BY- L. S. Denholm			
UTM. CODE			

ENV 1178(II) - 2



LONGREACH GROUP MANAGEMENT PTY. LTD.

LONGREACH METALS N.L.

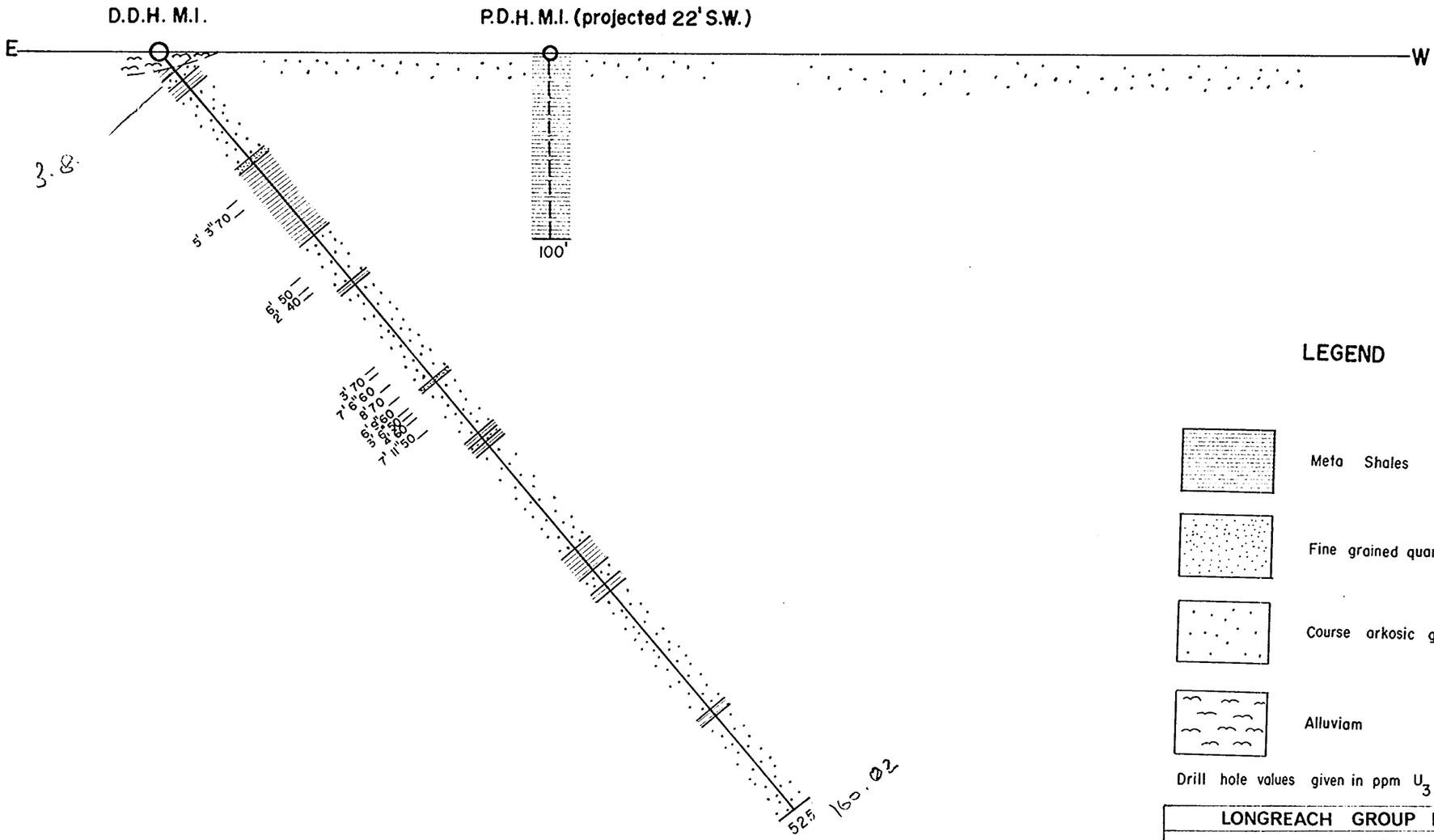
S.M.L. 274

MUTOOROO RIDGE PROSPECT

UNCONTROLLED MAGNETIC PROFILES

SCALE - Graph 1" = 400, between lines 1"=200			DWG. No.
BASED ON - Information given by A. Edwards			
DRAWN BY - Greg Croft	REVISED	DATE	4·3(b)
DATE - 20th April 1971			
APPROVED BY - D. Clare			
UTM CODE			

ENV 117B(II) — 3



LEGEND

Meta Shales

Fine grained quartz grit

Course arkosic grits

Alluviam

Drill hole values given in ppm U_3O_8

LONGREACH GROUP MANAGEMENT PTY. LTD.

LONGREACH METALS N.L.

S.M.L. 274

MUTOOROO RIDGE PROSPECT

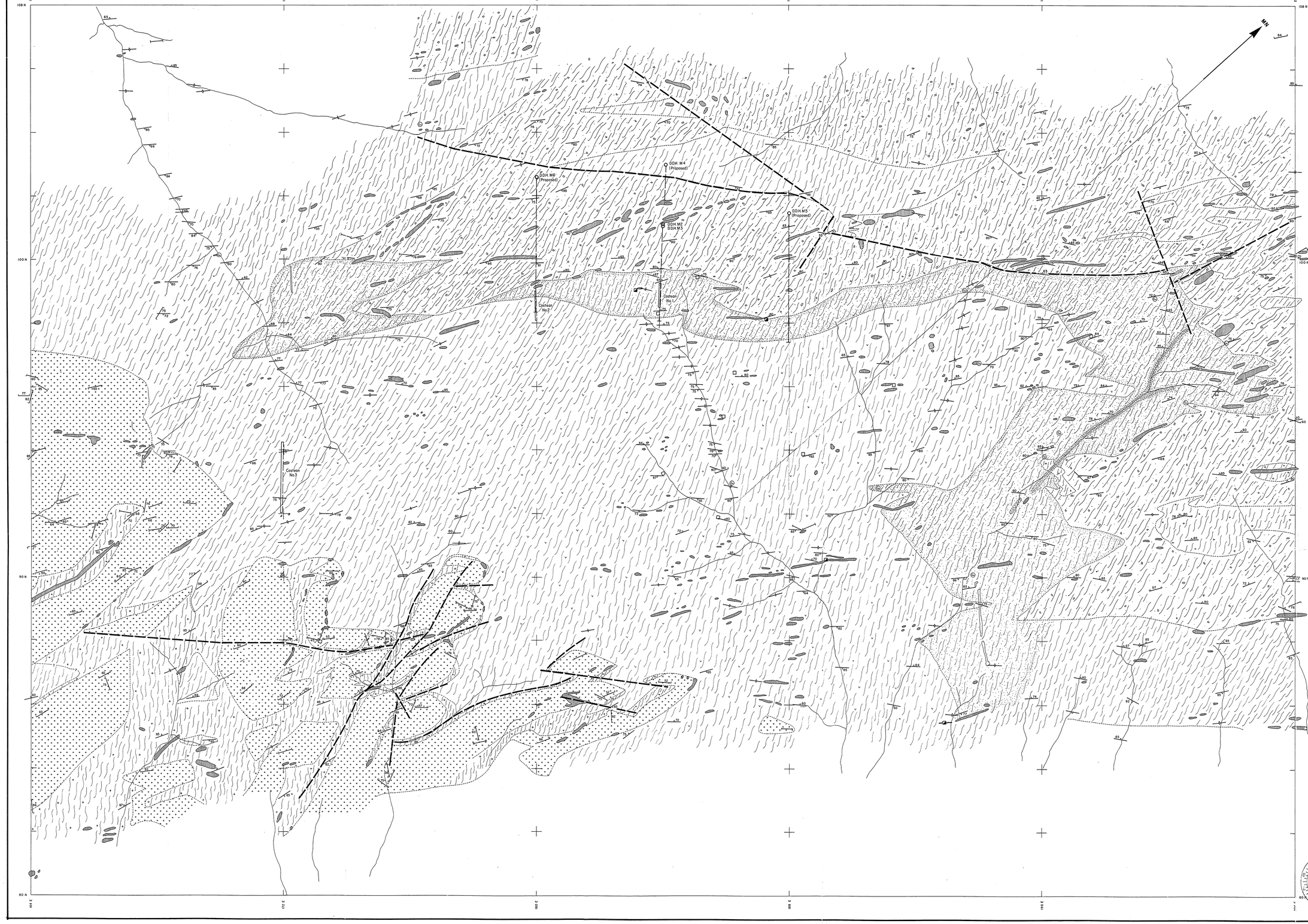
CROSS SECTION ALONG

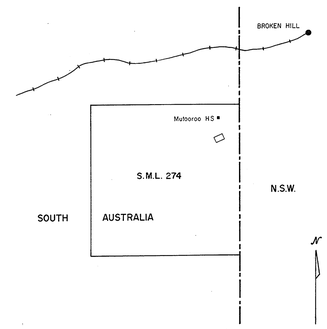
D.D.H. M.1.

looking north east

SCALE- 1"=66·7'			DWG. NO.
BASED ON- Map by A. Edwards			
DRAWN BY-Greg Croft	REVISED	DATE	3·2
DATE- 21 April 1971			
APPROVED- D.Clare			
UTM CODE			

ENV 1178(II)-4





LOCALITY PLAN

LEGEND

- Undifferentiated chlorite-biotite schist
- Chlorite-biotite schist, metamorphosed volcanics
- Chlorite-biotite schist, metamorphosed sediments
- Quartz Muscovite schist, metamorphosed quartzitic and arkosic conglomerate and sandstone
- Rhyolite
- Grey and white quartz-muscovite schist, metamorphosed rhyolite
- Dionite dyke
- Quartz
- Foliation
- Cleavage
- Joint
- Fault
- Shaft
- Pit
- Trench
- Malachite stain
- Soil sample grid point

LONREACH GROUP MANAGEMENT PTY. LTD.

LONGREACH METALS N.L.

MUTOOROO RIDGE PROSPECT

GEOLOGY OF DRILL SITE AREA

SCALE 1" = 100'			DWG. No.
BASED ON Field Map by Alistair Edwards			
DRAWN BY L Frost	REVISED	DATE	4.1(b)
DATE MARCH 1971			
APPROVED BY L.S DENHOLM			
UTM. CODE			

ENV 1178(II)- 5

To Adelaide — Railway Line — To Broken Hill

MALDORKY

PARADISE

PEAKED HILL

BLACK HILL

DUFFIELD NORTH

DUFFIELD CENTRAL

DUFFIELD SOUTH

LYNDOCK

100E

140E

MUTOOROO

104E

236E

RIDGE PROSPECT

N

SOUTH AUSTRALIA

N.S.W.

COCKRUMS

MULGA

S.M.L. 274

(799 sq. mls.)

GREAT EASTERN

JUBILEE

LEGEND

- Copper Prospects
- Radiometric Anomalies
- Magnetic Anomalies
- Geochemical Grid
- I.P. Anomalies

LONGREACH GROUP MANAGEMENT PTY. LTD.

LONGREACH METALS N.L.

S.M.L. 274

MUTOOROO RIDGE PROSPECT

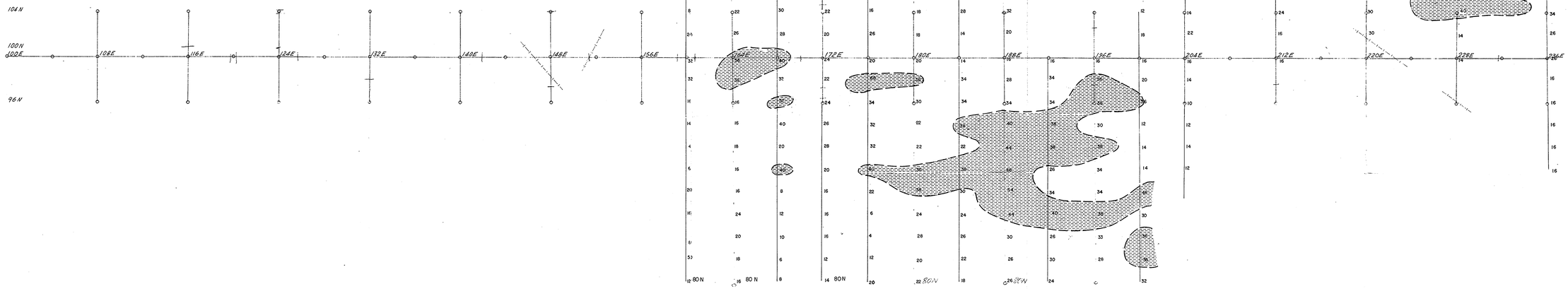
LOCALITY PLAN

Showing Areas Investigated

SCALE - 1" = 2·5mls.			DWG. No.
BASED ON			
DRAWN BY - Greg Croft	REVISED	DATE	
DATE - 27 April 1971			1
APPROVED BY - D.Clare			
UTM CODE			

Measured North

104 N
100 N
96 N
100E
108E
116E
124E
132E
140E
148E
156E
164E
172E
180E
188E
196E
204E
212E
220E
228E
236E
120N
80 N



LEGEND

1st Order Anomaly > 35 ppm

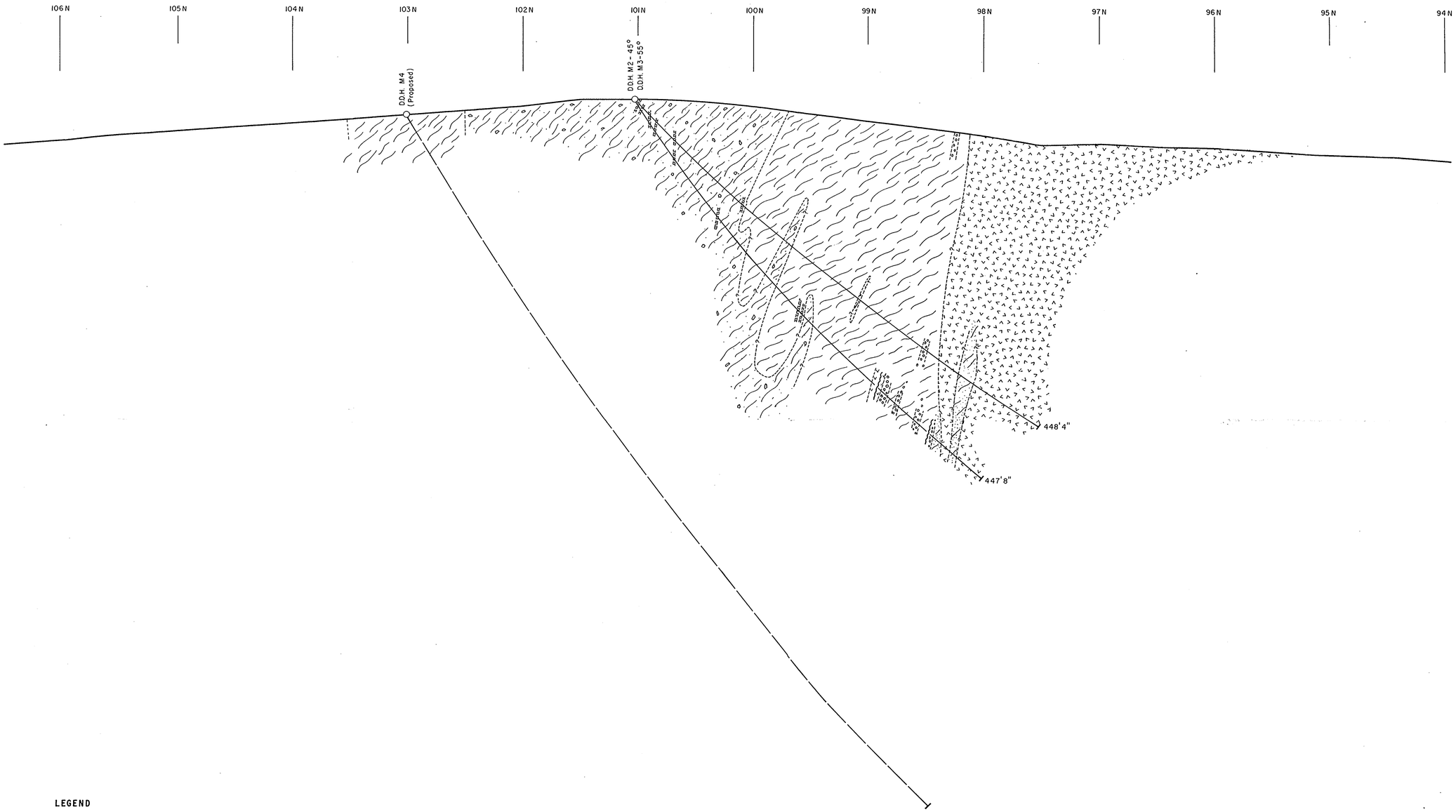
Longreach Group Management P/L.
Longreach Metals N.L.

MUTOOROO RIDGE PROSPECT
Soil Geochemistry
COBALT

RECEIVED
10 APR 1979
DEPT. OF MINES
SECURITY
A179

DRAWN	G.J.C		SCALE: 1 INCH = 400 FEET
TRACED			SHEET No.1
CHECKED			Fig.4-2-3
APPROVED			

ENV 1178(11) – 9



LEGEND

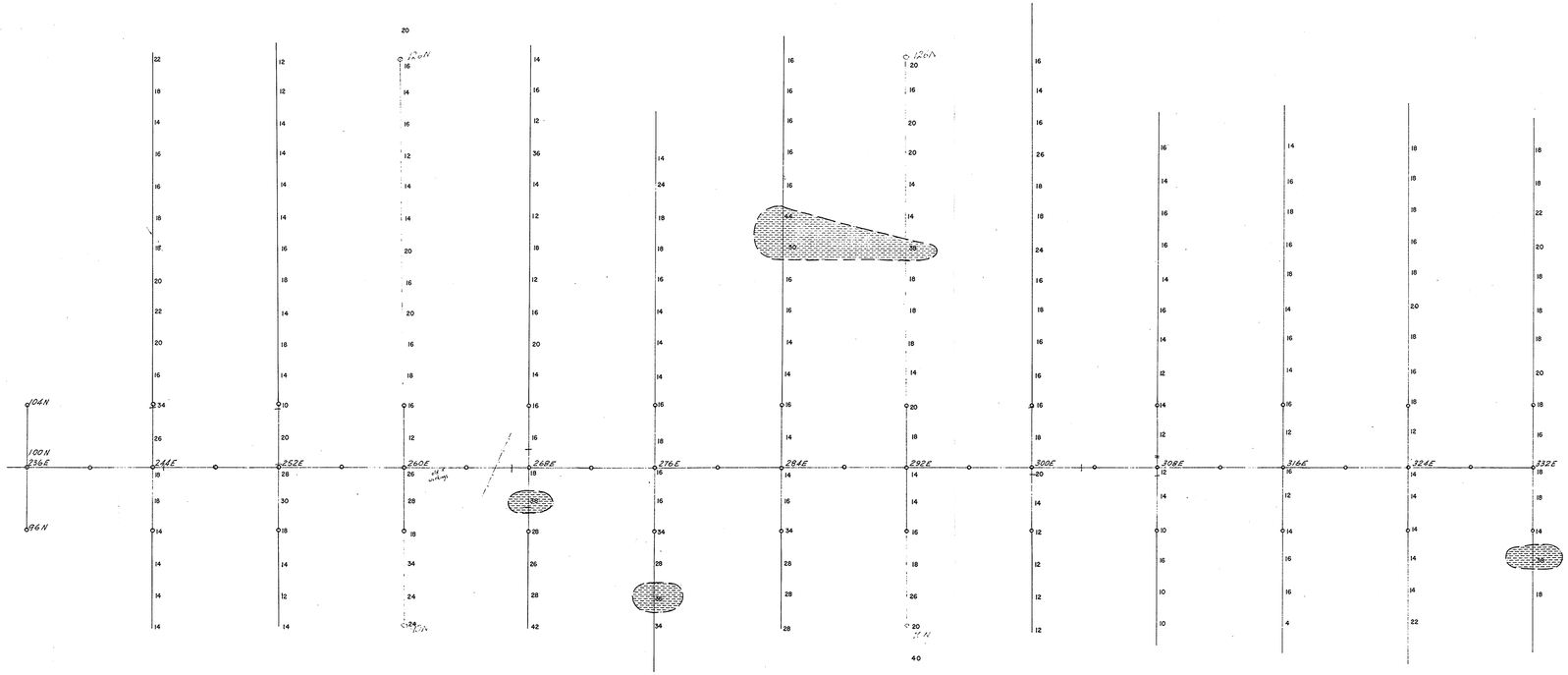
- Metatrachyte
- Pebbly Chloritic Schists
- Gritty Chloritic Schists
- Undiff. Chloritic Schists
- Quartz Mica Schists
- Quartz veins
- Shear

For location of drill holes see plan no.4-1(b)

LONGREACH GROUP MANAGEMENT PTY. LTD.
LONGREACH METALS N.L.
S.M.L. 274
MUTOOROO RIDGE PROSPECT
SECTION THROUGH DDH M2, M3
ALONG LINE 184E LOOKING EAST

SCALE - 1" : 50'			DWG. No.
BASED ON -			
DRAWN BY - L. Frost	REVISED	DATE	4·5
DATE - 6th April 1971			
APPROVED BY - L.S. Denholm			
UTM CODE			

EN 1178(II) - 10



LEGEND

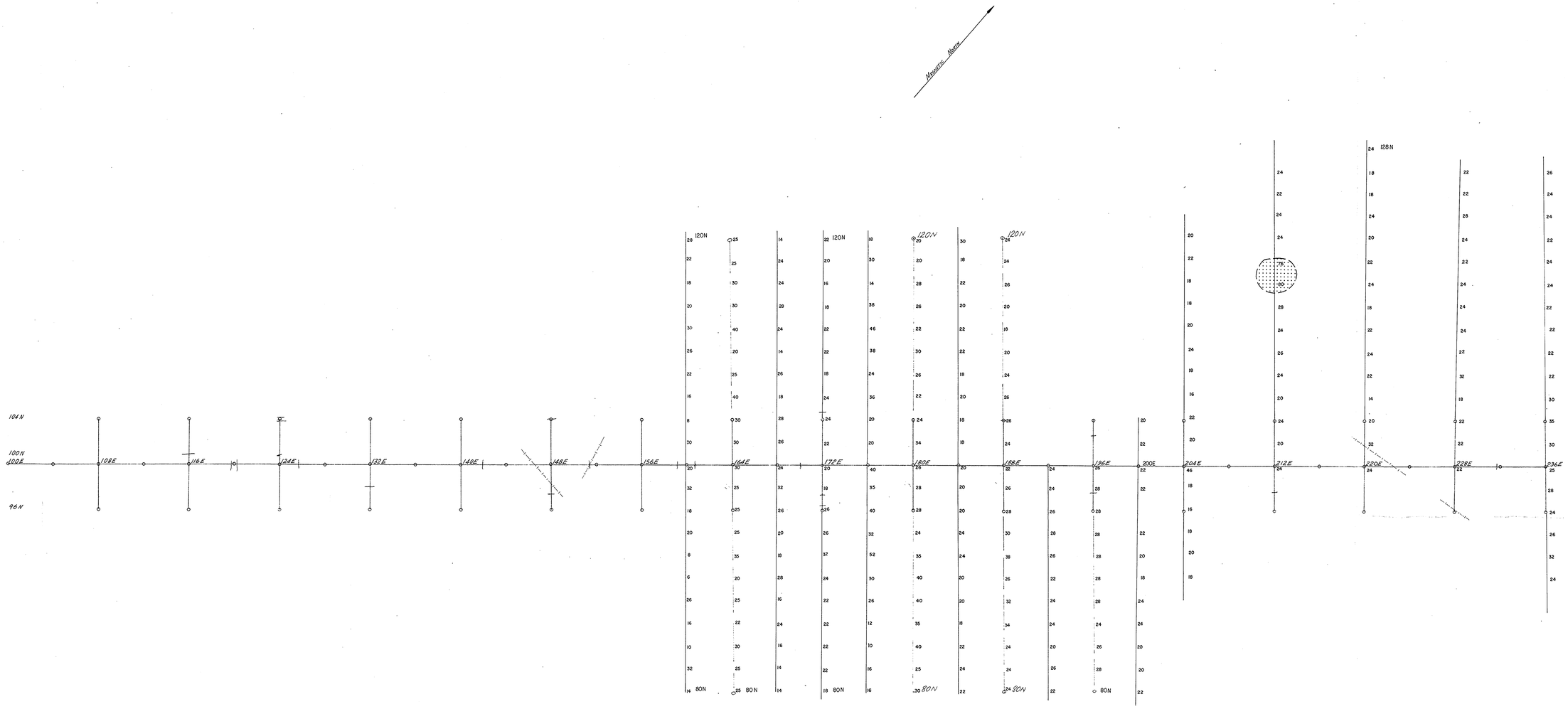
1st Order Anomaly >35 ppm

Longreach Group Management P/L.
Longreach Metals N.L.

MUTOOROO RIDGE PROSPECT
Soil Geochemistry
COBALT

DRAWN	G.J.C		SCALE: 1 INCH = 400 FEET
TRACED			SHEET No.2
CHECKED			Fig.4-2-3
APPROVED			

ENV 1178(M) - 11



LEGEND

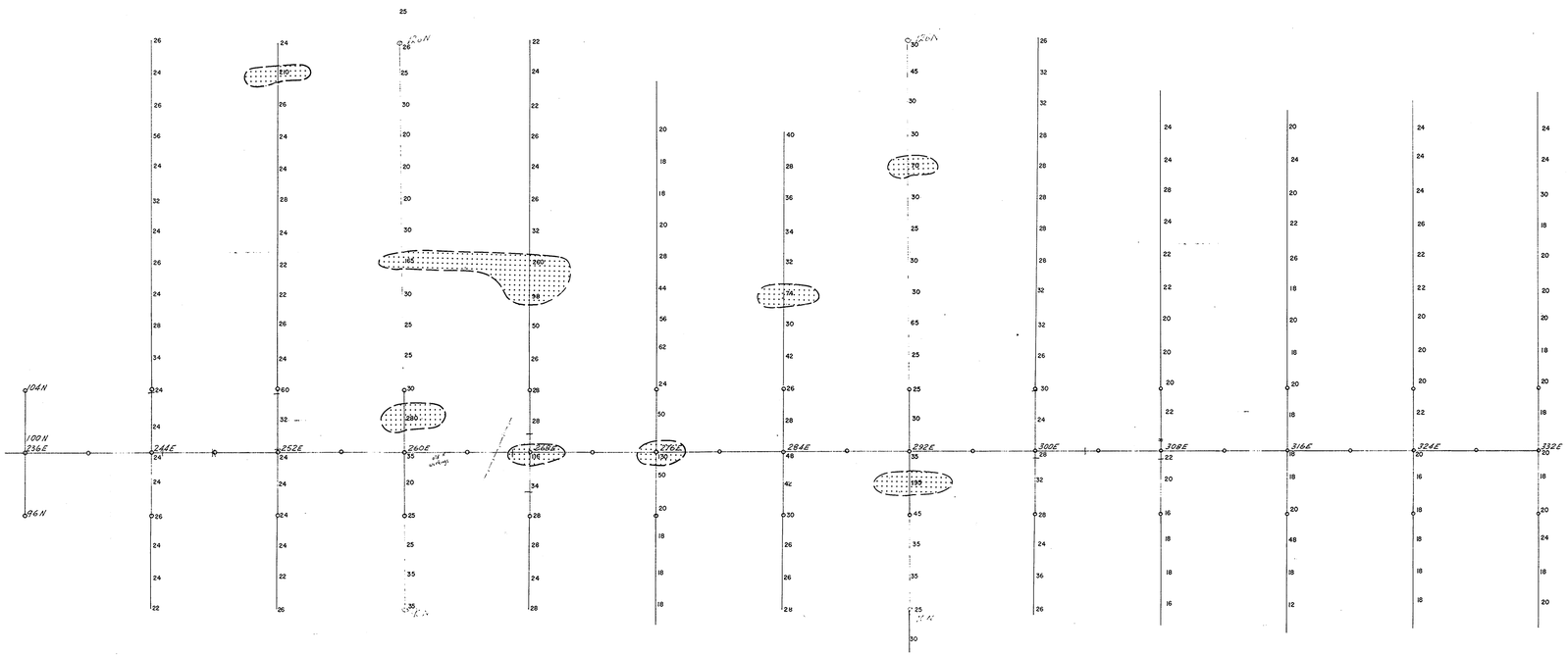
1st Order Anomaly > 70ppm

Longreach Group Management P/L.
Longreach Metals N.L.

MUTOOROO RIDGE PROSPECT
Soil Geochemistry
LEAD

DRAWN	G.J.C		SCALE: 1 INCH = 400 FEET
TRACED			SHEET No.1
CHECKED			
APPROVED			Fig.4-2-4

ENV 1178(II) - 12



LEGEND

1st Order Anomaly > 70ppm

Longreach Group Management P/L.
Longreach Metals N.L.

MUTOOROO RIDGE PROSPECT
Soil Geochemistry
LEAD

DRAWN	G.J.C		SCALE: 1 INCH = 400 FEET
TRACED			SHEET No.2
CHECKED			4·2·4
APPROVED			

ENV 1178(11)-13

108 N

107 N

106 N

105 N

104 N

103 N

102 N

101 N

100 N

99 N

98 N

97 N

96 N

95 N

94 N

93 N

105 W

104 W

103 W

102 W

101 W

100 W

99 W

98 W

97 W

96 W

95 W

N

D.D.H. M.1

P.D.H. M.3
T.D. 50ft.

P.D.H. M.1
T.D. 100ft.

P.D.H. M.6
T.D. 40ft.

P.D.H. M.5
T.D. 50ft.

Cg

fg

SCATTERED

OUTCROP

60°

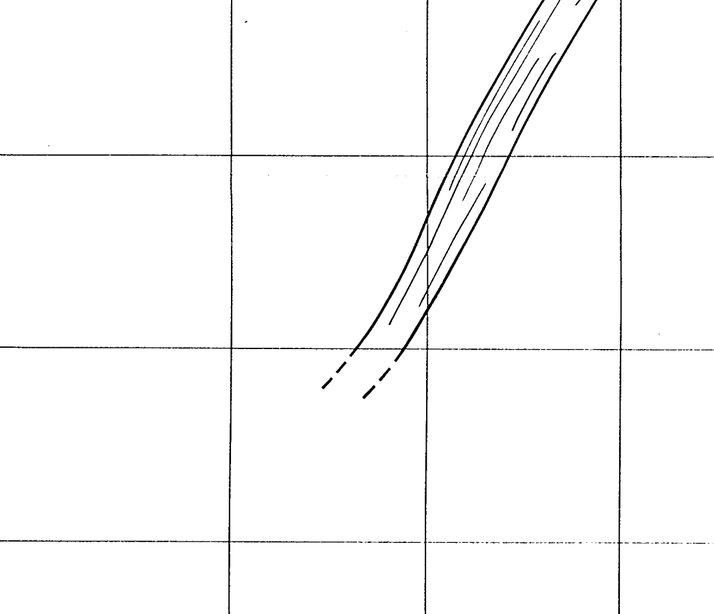
70°

Creek

LOCALITY MAP

Scale 1inch = 2640 ft. (Approx)

Area of high radioactivity



D.D.H. M.1 surface geology

Percussion holes drilled (vertical)

Quartz veins

Meta Shales, some Grey Mica Schists and Pink Shale

fg. Fine grained Quartz grit

Cg Coarse Quartz grits and some narrower Shales

Geological boundary

60° Dip symbol

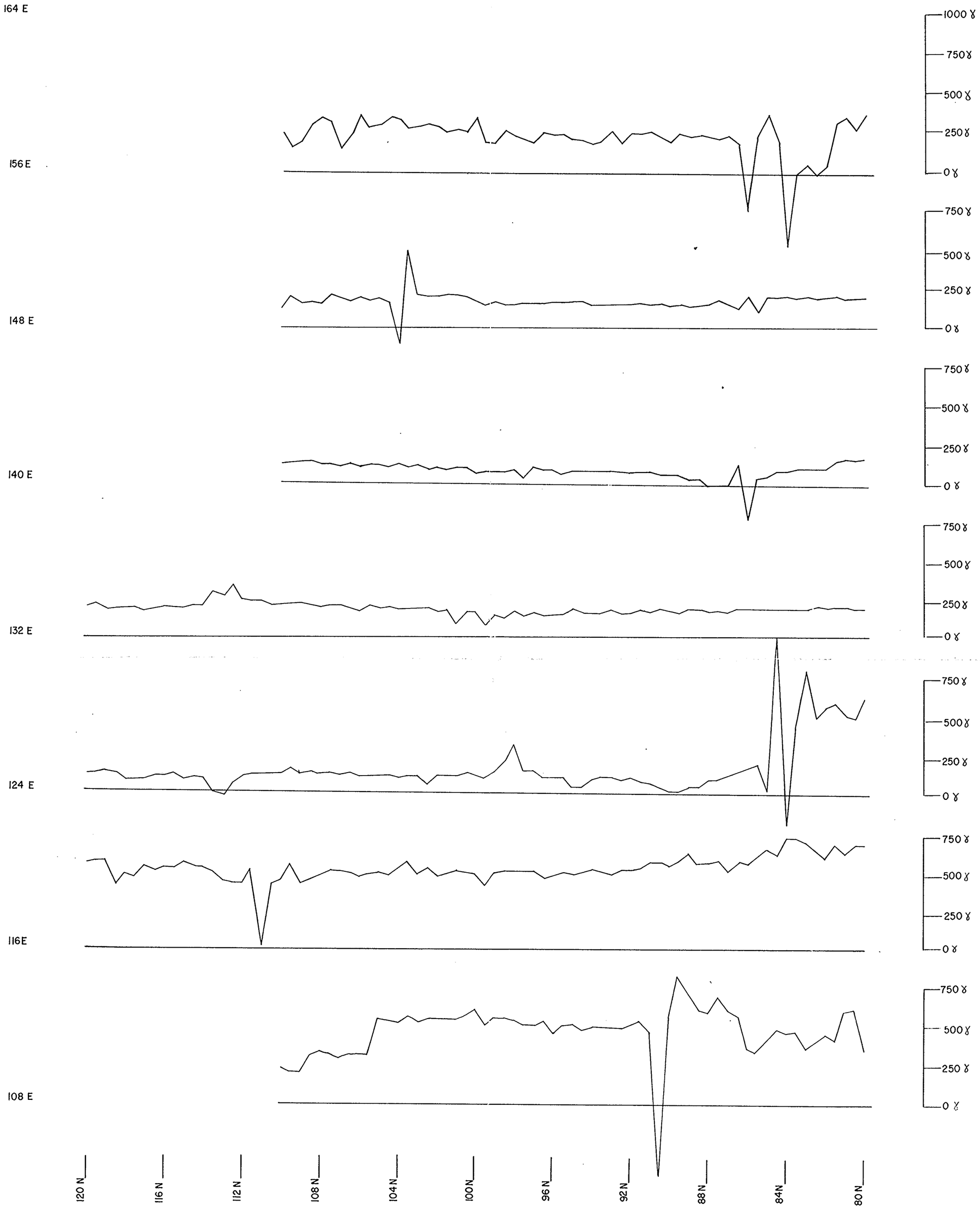
LONGREACH GROUP MANAGEMENT PTY. LTD.

LONGREACH METALS N.L.

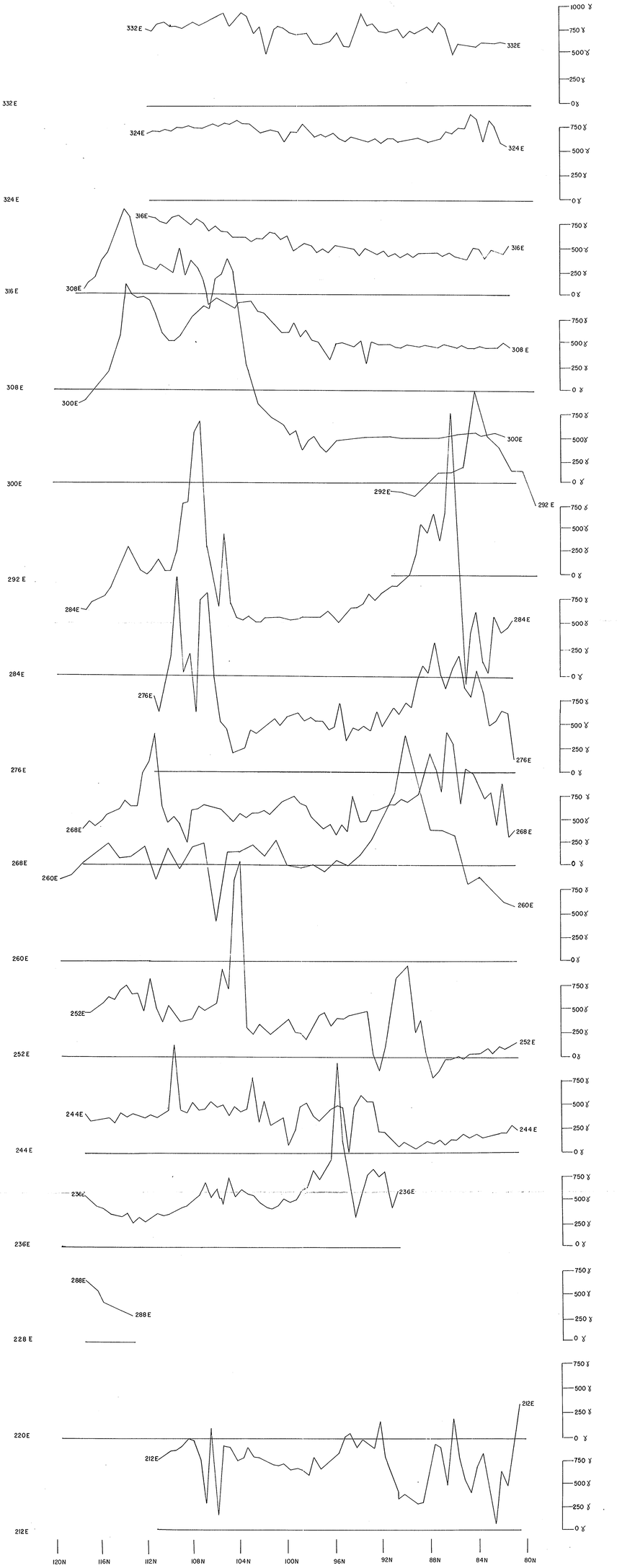
S.M.L. 274
MUTOOROO RIDGE PROSPECT
LOCATION OF D.D.H. M.1, PERCUSSION HOLES AND GEOLOGY

SCALE 1INCH = 66·7 FEET			DWG No.
BASED ON			
DRAWN BY: M. CHÂTENAY	REVISED	DATE	3 · 1
DATE: 20 FEB. 1970	G. CROFT	22 APRIL 1971	
APPROVED: L.S.D.			
UTM CODE			

ENV 1178(II) – 14



LONGREACH GROUP MANAGEMENT PTY. LTD.			
LONGREACH METALS N.L.			
S.M.L. 274			
MUTOOROO RIDGE PROSPECT			
UNCONTROLLED MAGNETIC			
PROFILES			
SCALE- 1" = 400'			DWG. No.
BASED ON - Information given by A. Edwards			
DRAWN BY - Greg Croft	REVISED	DATE	4·3(a)
DATE- 20th April 1971			
APPROVED BY - D. Clare			
UTM CODE			



LONGREACH GROUP MANAGEMENT PTY. LTD.

LONGREACH METALS N.L.

S.M.L. 274

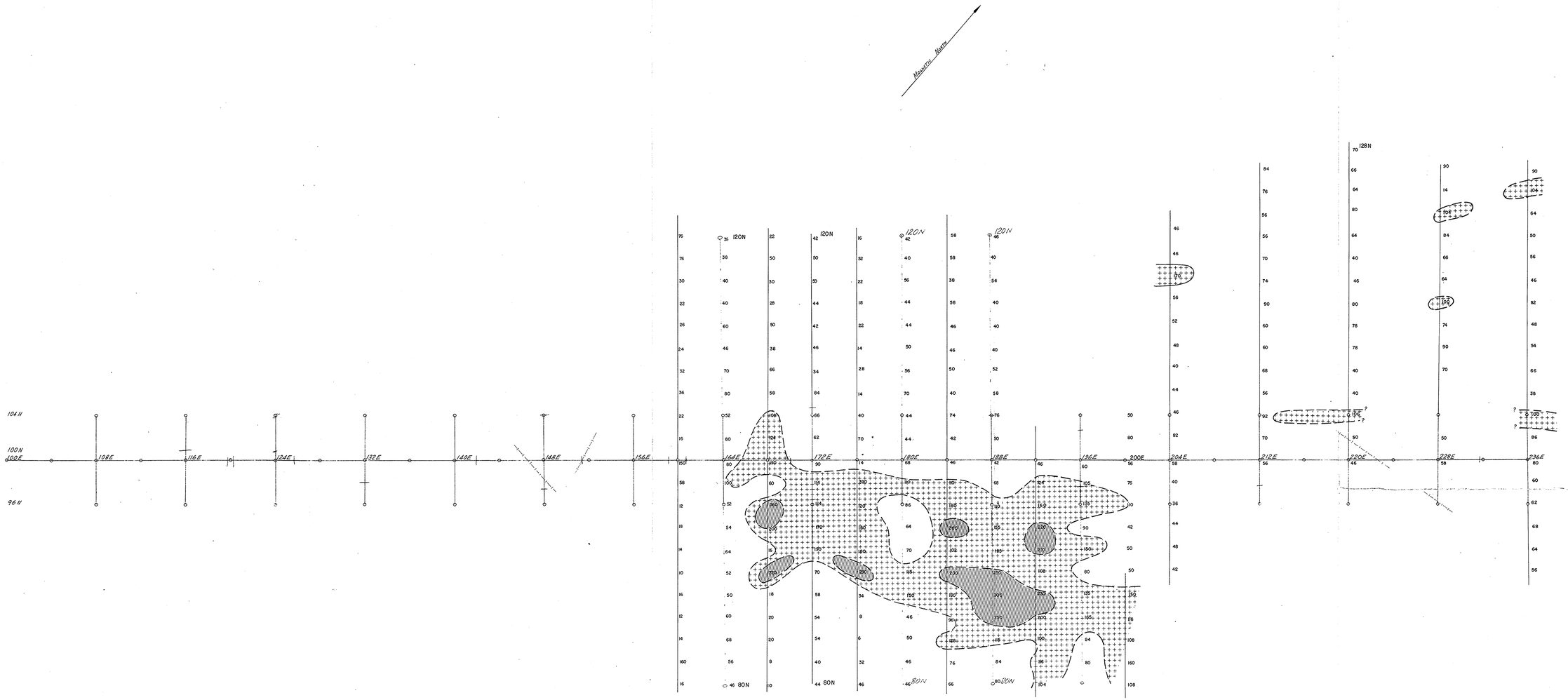
MUTOOROO RIDGE PROSPECT

UNCONTROLLED MAGNETIC

PROFILES

SCALE - 1:400			DWG. No.
BASED ON- Information given by A. Edwards			4·3(c)
DRAWN BY - Greg Croft	REVISED	DATE	
DATE - 20th April 1971			
APPROVED - D.Clore			
UTM CODE			

ENV 1178(II)-16

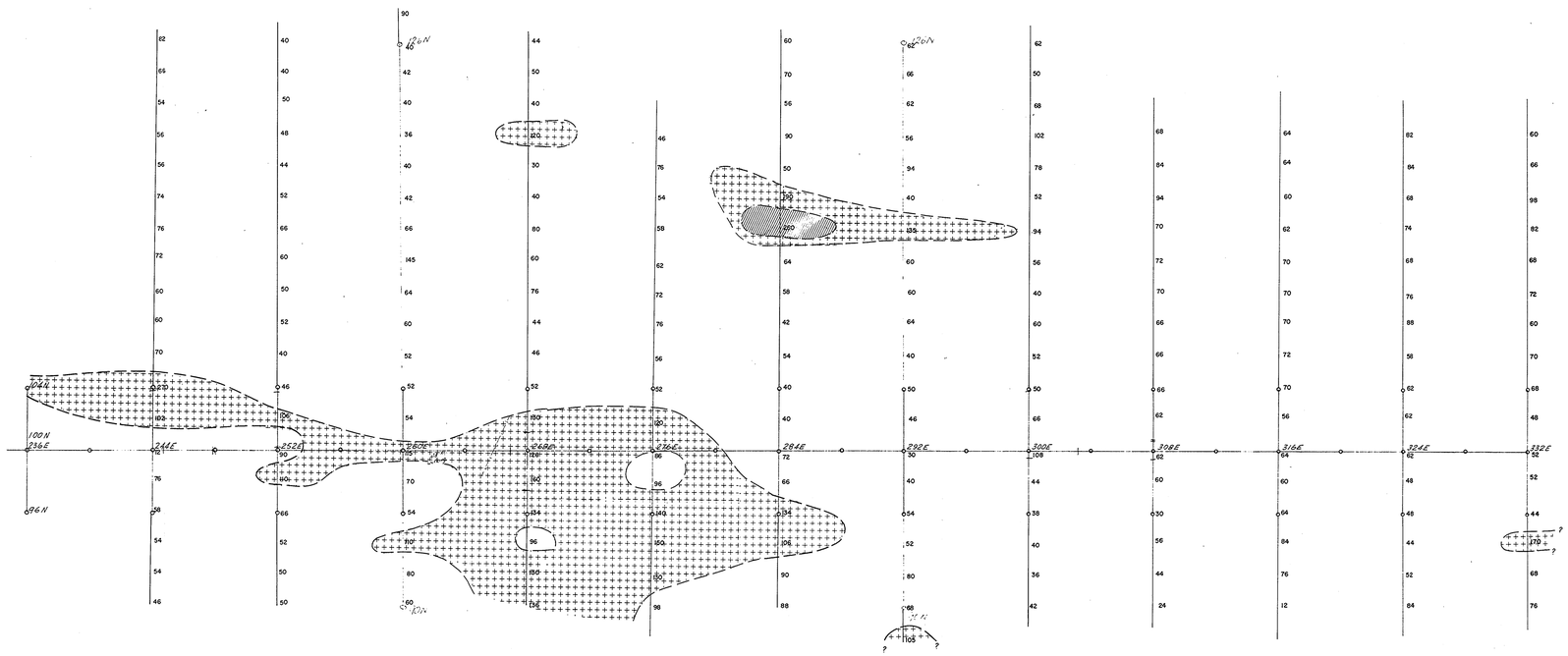


Longreach Group Management P/L.
Longreach Metals N.L.

MUTOOROO RIDGE PROSPECT
Soil Geochemistry
ZINC

DRAWN	G.J.C		SCALE: 1 INCH = 400 FEET
TRACED			SHEET No.1
CHECKED			Fig. 4.2.2
APPROVED			

ENV 1178 (II) – 17



LEGEND

2nd Order Anomaly — 100-199 ppm

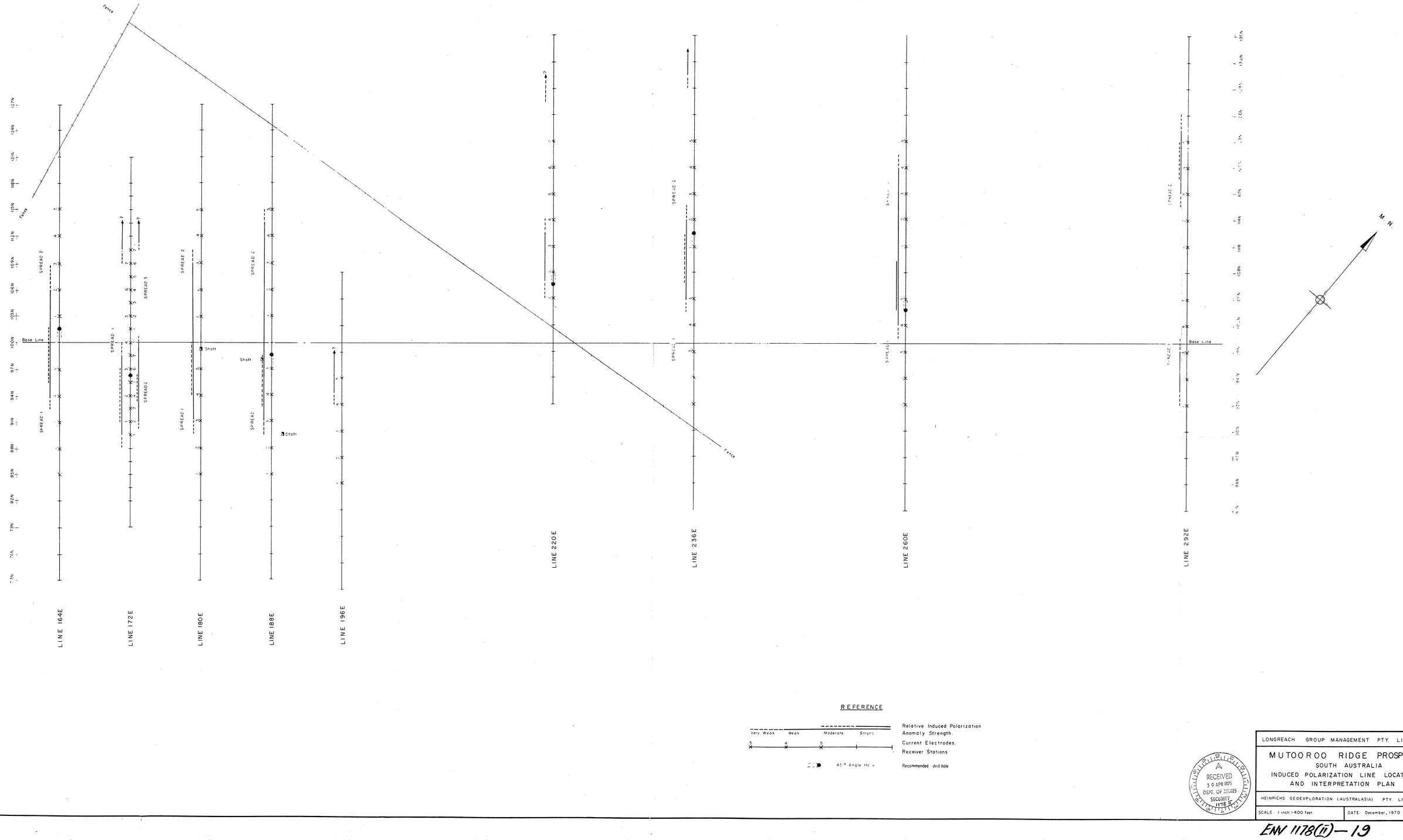
1st Order Anomaly — > 200 ppm

Longreach Group Management P/L
Longreach Metals N.L.

MUTOOROO RIDGE PROSPECT
Soil Geochemistry
ZINC

DRAWN	G.J.C		SCALE: 1 INCH = 400 FEET
TRACED			SHEET No.2
CHECKED			Fig 4-2-2
APPROVED			

ENV 1178 (II) - 18



REFERENCE

Very Weak — Weak — Moderate — Strong

Relative Induced Polarization Anomaly Strength.

Current Electrodes.

Receiver Stations

45° Angle Hole

Recommended drill hole

LONGREACH GROUP MANAGEMENT PTY. LIMITED.

MUTOOROO RIDGE PROSPECT

SOUTH AUSTRALIA

INDUCED POLARIZATION LINE LOCATION AND INTERPRETATION PLAN

HEINRICHS GEOEXPLORATION (AUSTRALASIA) PTY. LIMITED.

SCALE: 1 inch = 400 feet | DATE: December, 1970 | 4-4

ENV 1178(m) — 19

Magnetic North

LEGEND

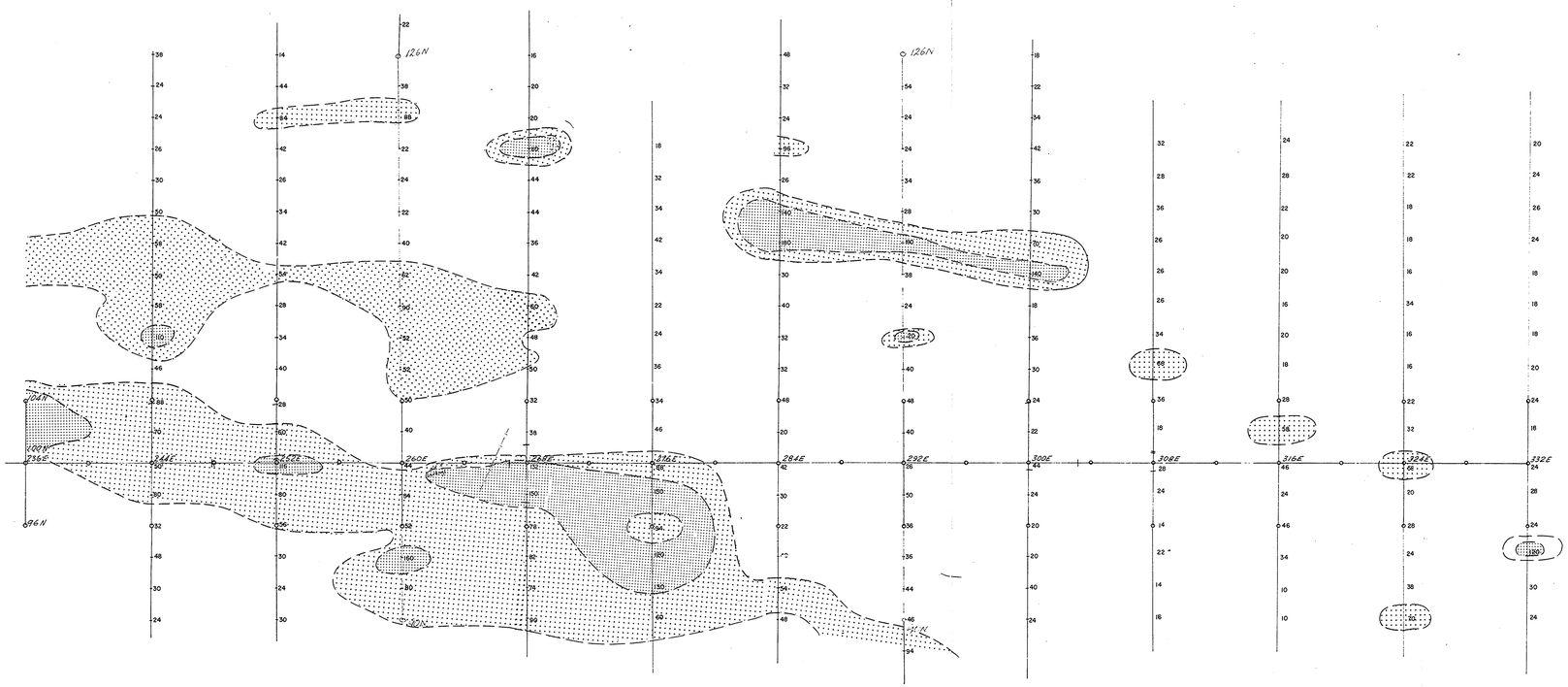
1st Order Anomaly		> 200 ppm
2nd Order Anomaly		100ppm - 199ppm
3rd Order Anomaly		50ppm - 99ppm

Longreach Group Management P/L.
Longreach Metals N.L.

MUTOOROO RIDGE PROSPECT
Soil Geochemistry
COPPER

DRAWN	G.J.C		SCALE: 1 INCH = 400 FEET
TRACED			SHEET No.1
CHECKED			Fig. 4-2-1
APPROVED			

ENV 1178(11) - 20



LEGEND

3rd Order Anomaly — 50-99 ppm

2nd Order Anomaly — 100-199 ppm

Longreach Group Management P/L.
Longreach Metals N.L.

MUTOOROO RIDGE PROSPECT
Soil Geochemistry
COPPER

DRAWN	G.J.C		SCALE: 1 INCH = 400 FEET
TRACED			SHEET No.2
CHECKED			Fig. 4.2.1
APPROVED			

ENV 1178(II) – 21

MN

120N 120N 120N

102 N

100N 100E

98N

92N 92N 92N

102E 106E 108E 110E 112E 114E 116E 118E 120E 122E 124E 126E 128E 130E 132E 134E 136E 138E 140E 142E 144E 146E 148E 150E 152E 154E 156E 158E 160E 162E 164E 166E 168E 170E 172E 174E 176E 178E 180E 182E 184E 186E 188E

OLD QUARRY

track

LEGEND

- Siltstones
- Micaseous Carbonate Rock
- Dolomite
- Quartz
- Pit
- Malachite Staining
- Schistosity

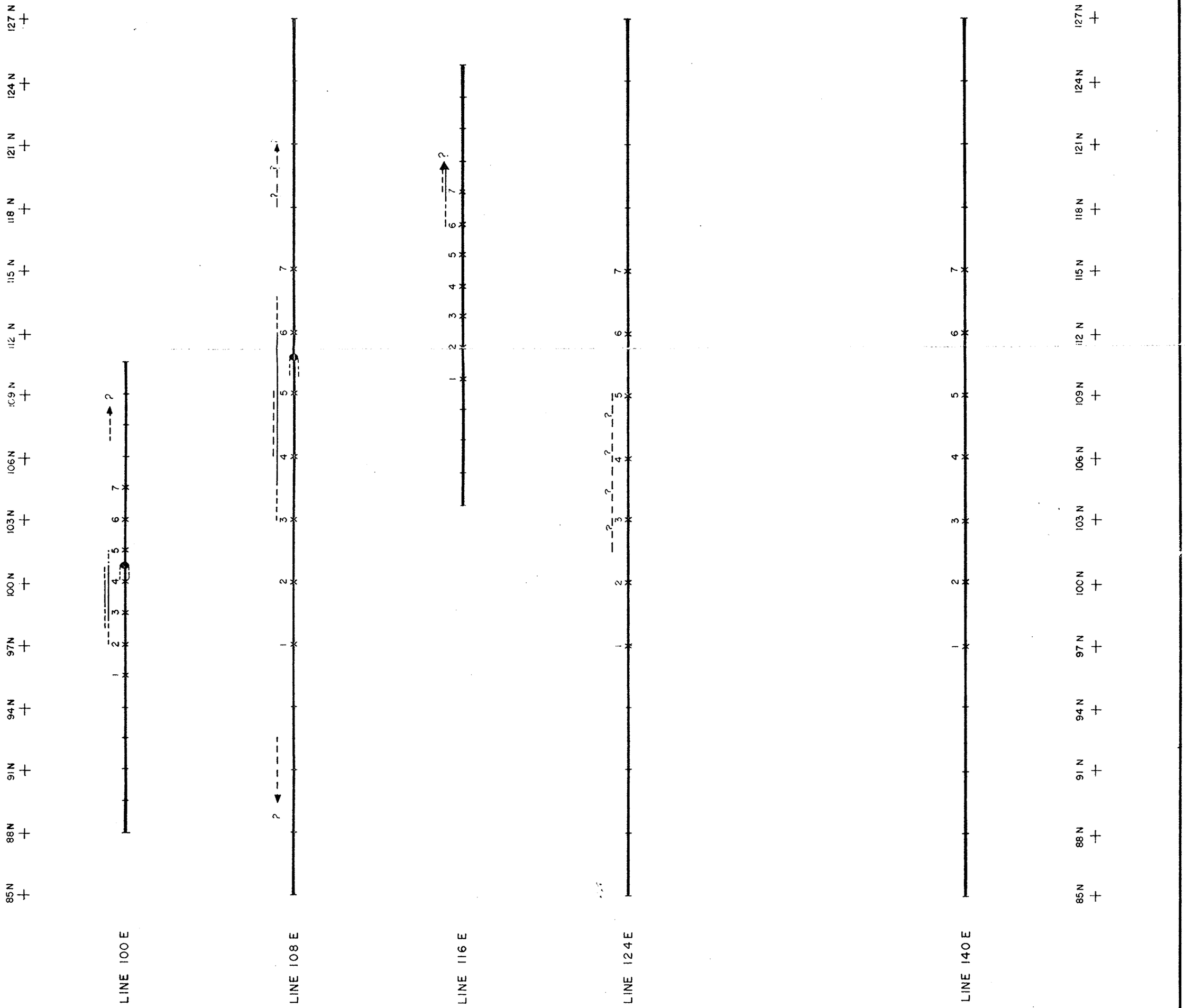
LONGREACH GROUP MANAGEMENT PTY. LTD.

LONGREACH METALS N.L

LYNDOCK PROSPECT

GEOLOGY

SCALE- 1" = 400 ft.			DWG. No.
BASED ON- Field Map by Alastair Edwards			
DRAWN BY- Greg Croft	REVISED	DATE	5·1
DATE- 2nd April 1971			
APPROVED BY- L.S. Denholm			
UTM CODE			



LONGREACH GROUP MANAGEMENT PTY. LIMITED.

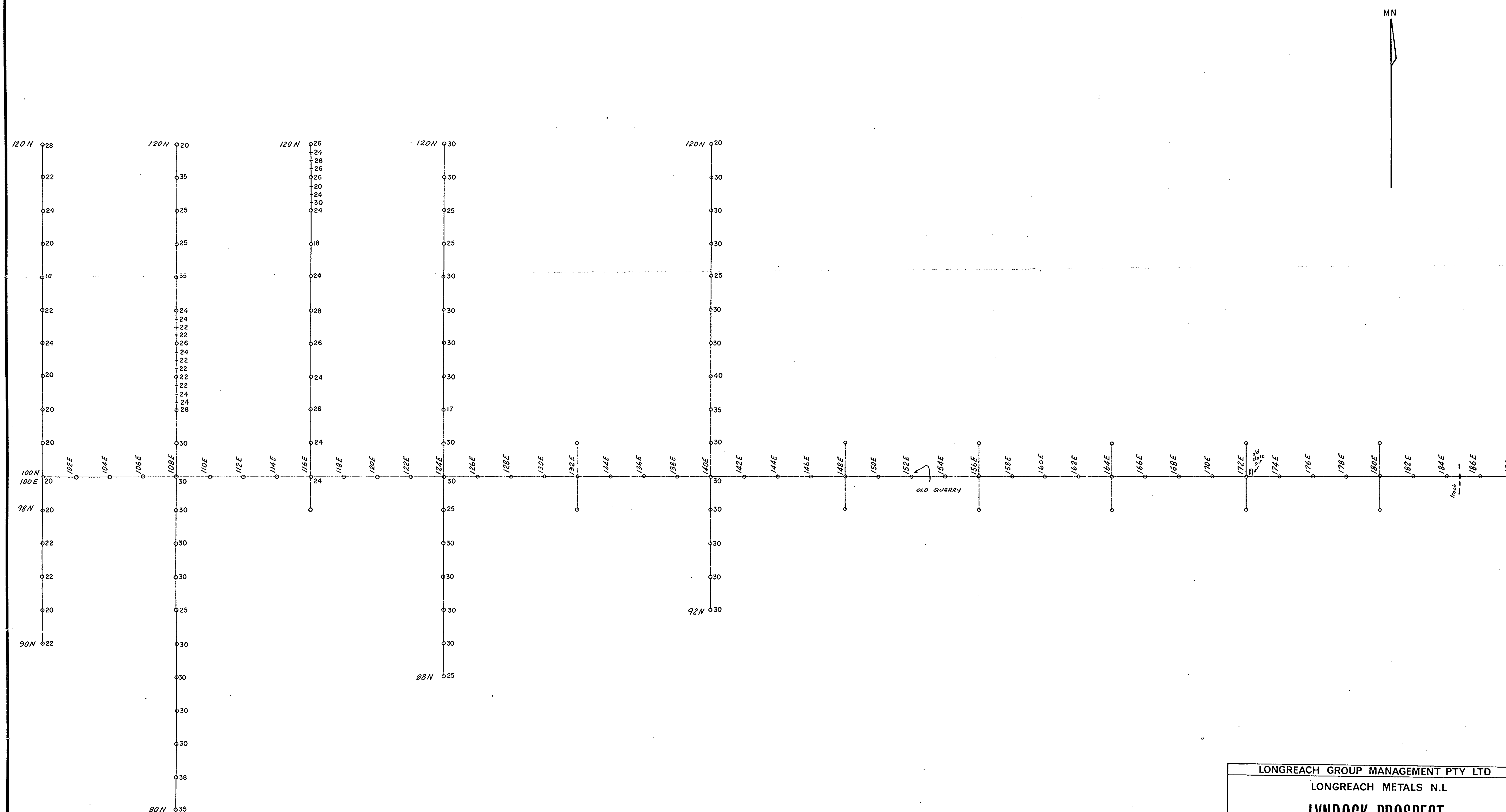
LYNDOCK PROSPECT

SOUTH AUSTRALIA

INDUCED POLARIZATION LINE LOCATION AND INTERPRETATION PLAN

HEINRICHS GEOEXPLORATION (AUSTRALASIA) PTY. LIMITED

SCALE : 1 INCH = 400 FEET	DATE : DECEMBER, 1970.	5·3



LONGREACH GROUP MANAGEMENT PTY LTD

LONGREACH METALS N.L

LYNDOCK PROSPECT

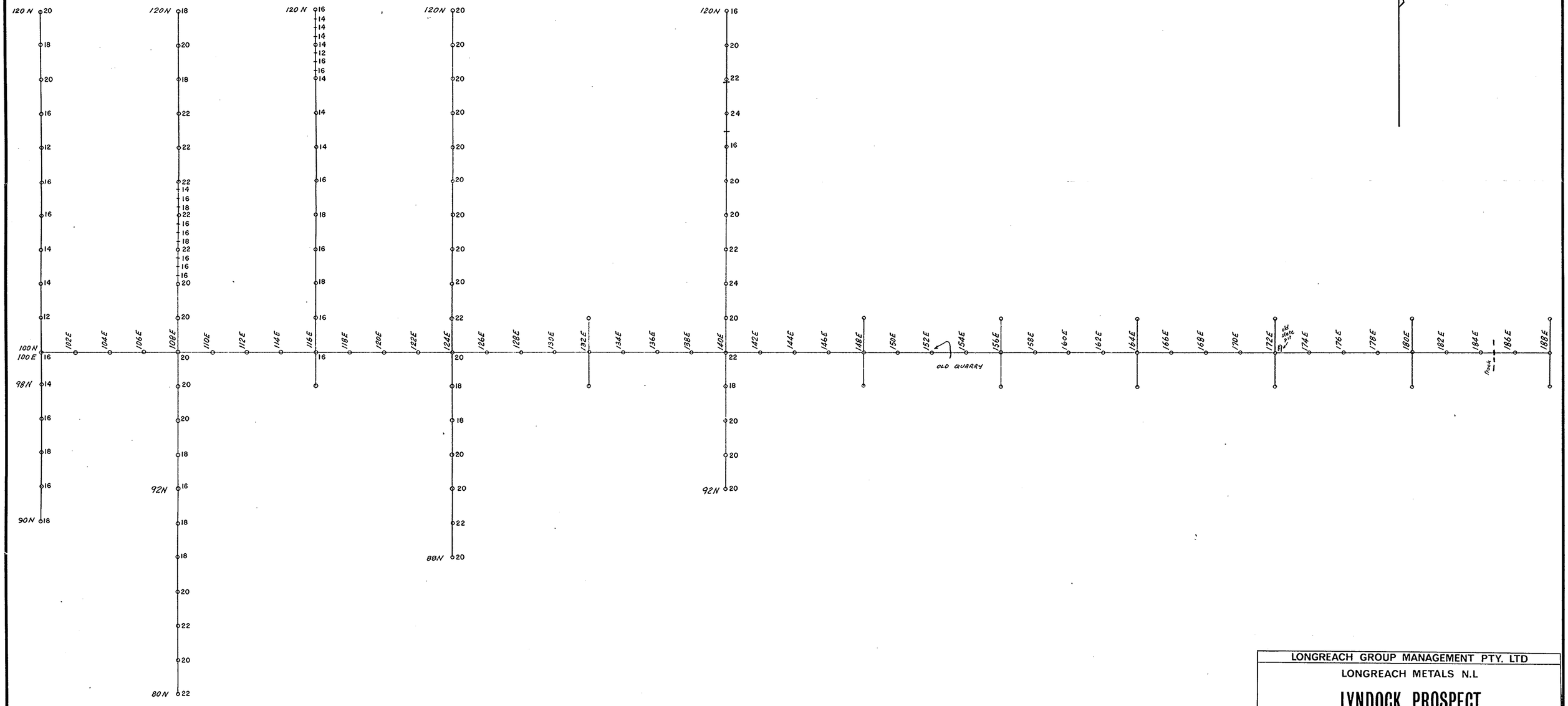
Soil Geochemistry

LEAD

all values in ppm

SCALE 1" = 400'			DWG. No.
BASED ON Field Map by Alistair Edwards			
DRAWN BY Greg Croft	REVISED	DATE	5·2·2
DATE 5th April 1971			
APPROVED BY L.S.Denholm			
UTM CODE			

ENV 1178(II) – 25



LONGREACH GROUP MANAGEMENT PTY. LTD

LONGREACH METALS N.L

LYNDOCK PROSPECT

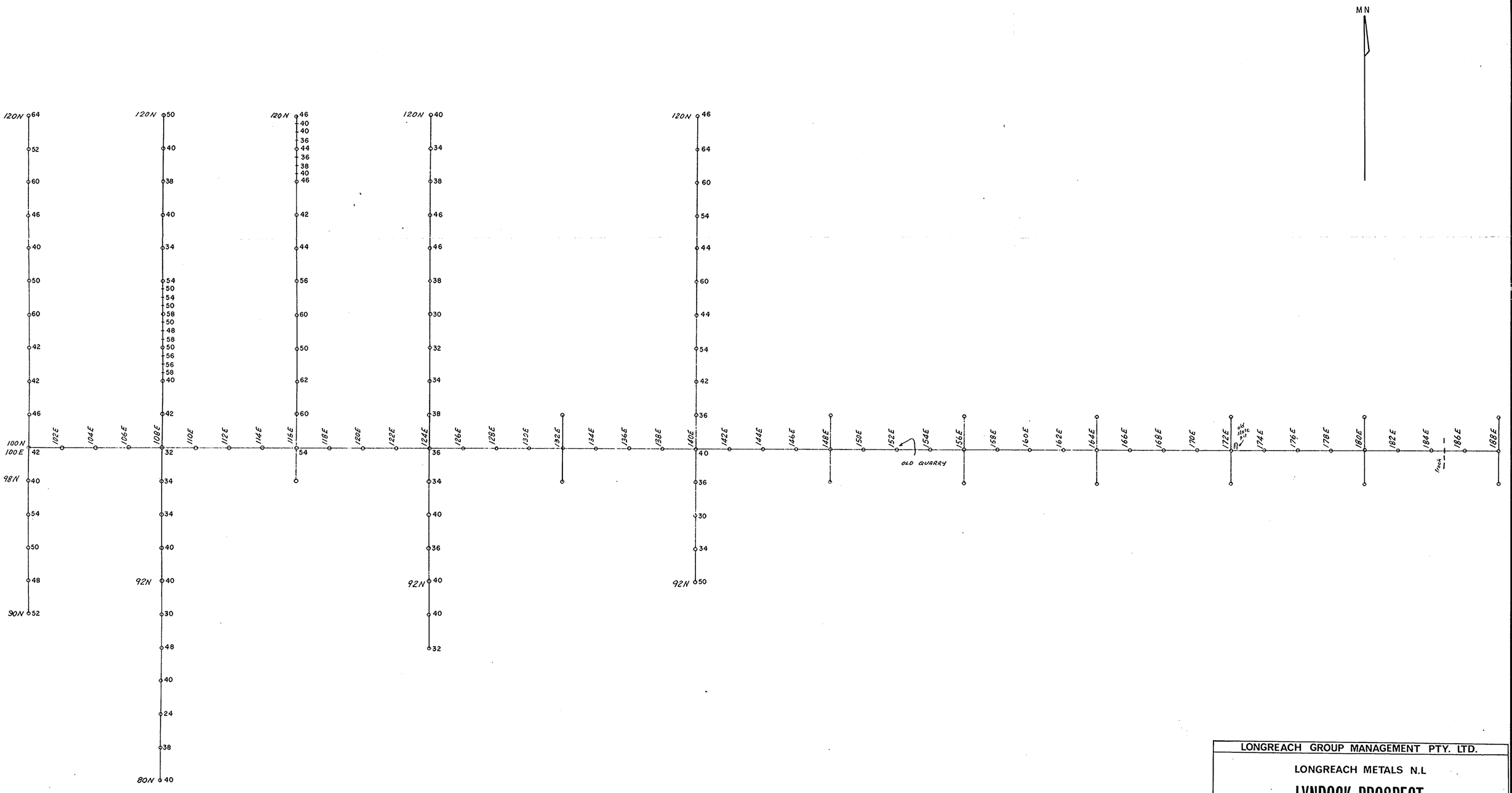
Soil Geochemistry

COBALT

all values in ppm

SCALE 1" = 400'			DWG. No.
BASED ON Field Map by Alistair Edwards			
DRAWN BY Greg Croft	REVISED	DATE	5·2·4
DATE 5th April 1971			
APPROVED BY LS Denholm			
UTM CODE			

ENV 1178 (II) – 26



LONGREACH GROUP MANAGEMENT PTY. LTD.

LONGREACH METALS N.L

LYNDOCK PROSPECT

Soil Geochemistry

ZINC

all values in ppm

SCALE 1" = 400'			DWG. No.
BASED ON Field Map by Alistair Edwards			5·2·3
DRAWN BY Greg Croft	REVISED	DATE	
DATE 5th April 1971			
APPROVED BY L.S.Denholm			
UTM CODE			

ENV 1178(II) - 27

MN

120N 30 22 26 22 16 18 22 16 20

120N 18 18 16 20 20 20 24 22 26 24 24 26 24 34 24 26 26 26 18 24

120N 34 20 18 16 24 14 14 18 22 16 22 30 32 30 34 64

120N 20 20 20 22 26 22 24 28 24 18 14 24 18 24 24 18 18

120N 16 24 24 26 18 26 22 20 18 24 20 16 14 14 20

100N 100E 26 16 20 14 16 16

98N 20 24 24 20 18 22 24 24 16 14 24 22 12 18 18 24 16 18

90N 18

80N 18

88N 18

92N 20

102E 104E 106E 108E 110E 112E 114E 116E 118E 120E 122E 124E 126E 128E 130E 132E 134E 136E 138E 140E 142E 144E 146E 148E 150E 152E 154E 156E 158E 160E 162E 164E 166E 168E 170E 172E 174E 176E 178E 180E 182E 184E 186E 188E

OLD QUARRY

Track

RECEIVED
30 APR 1971
DEPT. OF MINES
SECURITY
1178 II

LONGREACH GROUP MANAGEMENT PTY. LTD

LONGREACH METALS N.L

LYNDOCK PROSPECT

Soil Geochemistry

COPPER

all values in ppm

SCALE 1" = 400'			DWG. No.
BASED ON Field Map by Alistair Edwards			5·2·1
DRAWN BY Greg Croft	REVISED	DATE	
DATE 5th April 1971			
APPROVED BY L.S. Denholm			
UTM CODE			

(95)

ENV 1178(II)– 28