UR1983_35

1983/35. Luina and Wombat Flat exempt areas: a review of previous exploration and a reconnaissance survey of an aeromagnetic anomaly.

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Abstract

Exploration previously undertaken in the Luina and Wombat Flat exempt areas did not locate any highly prospective targets, but several aeromagnetic, low-order Dighem and soil geochemical anomalies have been defined over prospective geological environments and warrant further investigation. A reconnaissance ground magnetic survey and soil geochemical survey over an aeromagnetic anomaly at the Arthur Dam defined a pronounced, narrow, north-east trending linear magnetic anomaly and adjacent low-order Cu-Pb-Zn and (Sn) soil geochemical anomaly. A second, more pronounced Zn-Pb-Cu soil geochemical anomaly was located 200-250 m north-west of the magnetic anomaly.

INTRODUCTION

The Luina and Wombat Flat exempt areas are located between Luina and Waratah in north-western Tasmania (fig. 1). Access to the Luina exempt area (10 km^2) is afforded by the Corinna Road and Betts Track. Access to the Wombat Flat exempt area (4 km^2) is by the Mt Ramsay track (fig. 1). The areas are relatively flat, with Wombat Hill the principal topographic feature.

The two areas were relinquished in 1982 from exploration licence 1/63 (held by Cleveland Tin Ltd) and have been exempted from the Mining Act for an assessment of prospectivity and to establish whether previous exploration had located targets worthy of follow-up investigation by the Department of Mines. Exemption from the Mining Act was gazetted on 30 March 1983, effective from 5 April 1983 (Statutory Rule 64 of 1983).

This report reviews the economic potential and previous exploration within the exempt areas, and details a reconnaissance investigation of an aeromagnetic anomaly adjacent to the Arthur Dam.

GEOLOGY AND MINERALISATION

The exempt areas are underlain by Eocambrian-Cambrian sedimentary and mafic volcanic sequences and tectonically emplaced mafic volcanic-ultramafic complexes, and Devonian biotite granite (fig. 2). Tertiary basalt and basal and interflow sediments blanket the area east of Wombat Flat, and Quaternary-Recent alluvial sediments occur locally.

Cambrian sequence

The Cambrian volcano-sedimentary sequence consists predominantly of grey-brown turbiditic greywacke, siltstone, and mudstone with intercalated spilitic, tholeiitic basalt and mafic tuff (Collins, 1981). The rocks generally have been folded about north-east trending axes. At Whyte Hill, in the north-west corner of the Luina exempt area, spilitic basalt and intercalated sediments are equivalent to the host sequence at the Cleveland mine, four kilometres to the south-west (Collins, 1981). The sedimentary/mafic volcanic sequence is part of the Arthur River sequence of Groves (1968), and is correlated with the Crimson Creek Formation (Groves, 1968; Groves *et al.*, 1972; Collins, 1981).

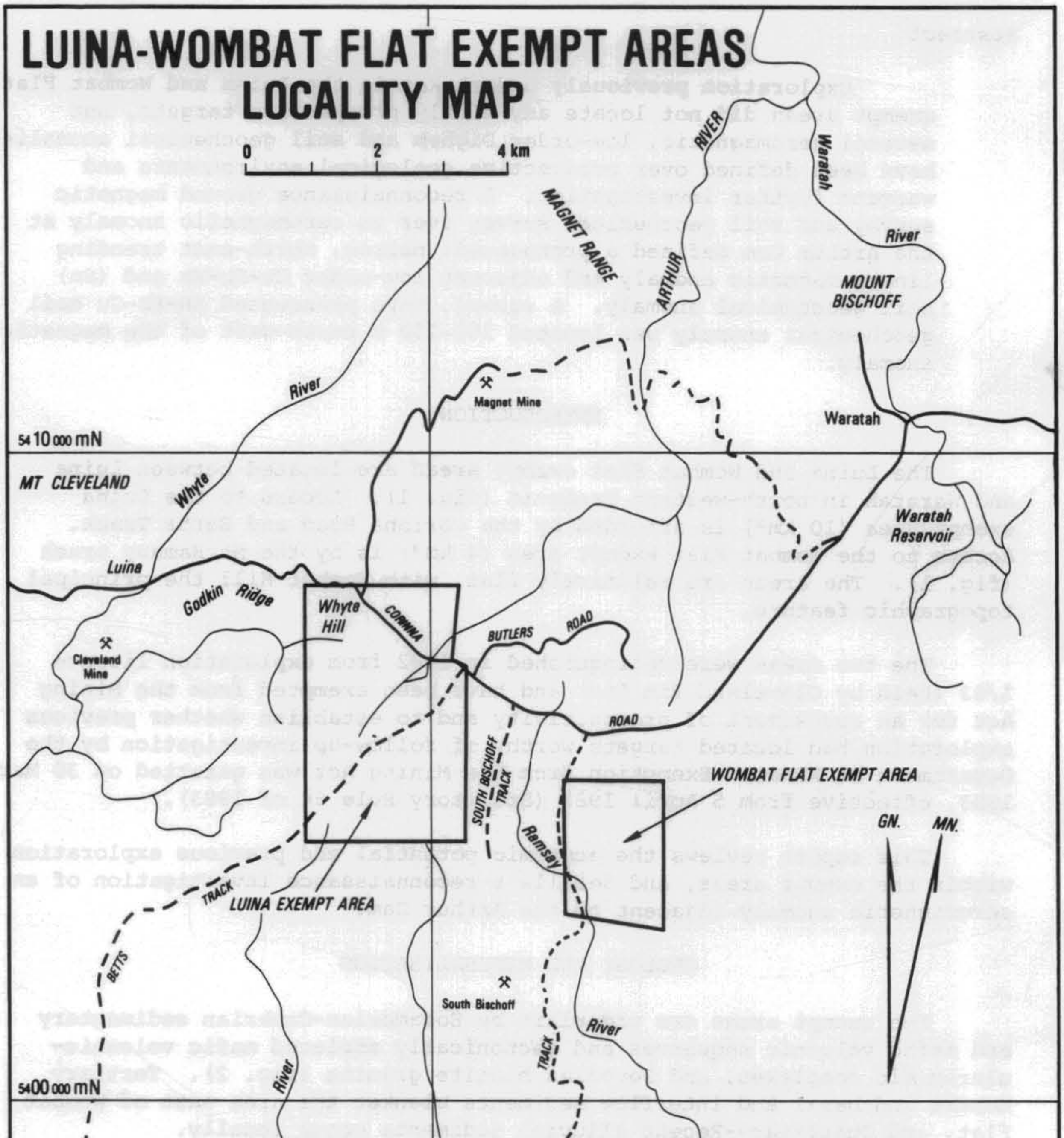
LUINA-WOMBAT FLAT EXEMPT AREAS
LOCALITY MAP
0
2
4 km
MAGNET RANGE
ARTHUR
RIVER
Waratah
River
MOUNT BISCHOFF
River
Magnet Mine
Waratah
5410 000 mN
MT CLEVELAND
Whyte
Waratah Reservoir
Luina
Godkin
Ridge
Whyte Hill
CORINNA
BUTLERS
ROAD
Cleveland Mine
ROAD
SOUTH BISCHOFF TRACK
WOMBAT FLAT EXEMPT AREA
GN.
MN.
Ramsay
TRACK
LUINA EXEMPT AREA
BETTS
South Bischoff
River
TRACK
River
5400 000 mN
MT RAMSAY
Creek
370 000 mE
Wilson
Johnson

Figure 1.

5 cm

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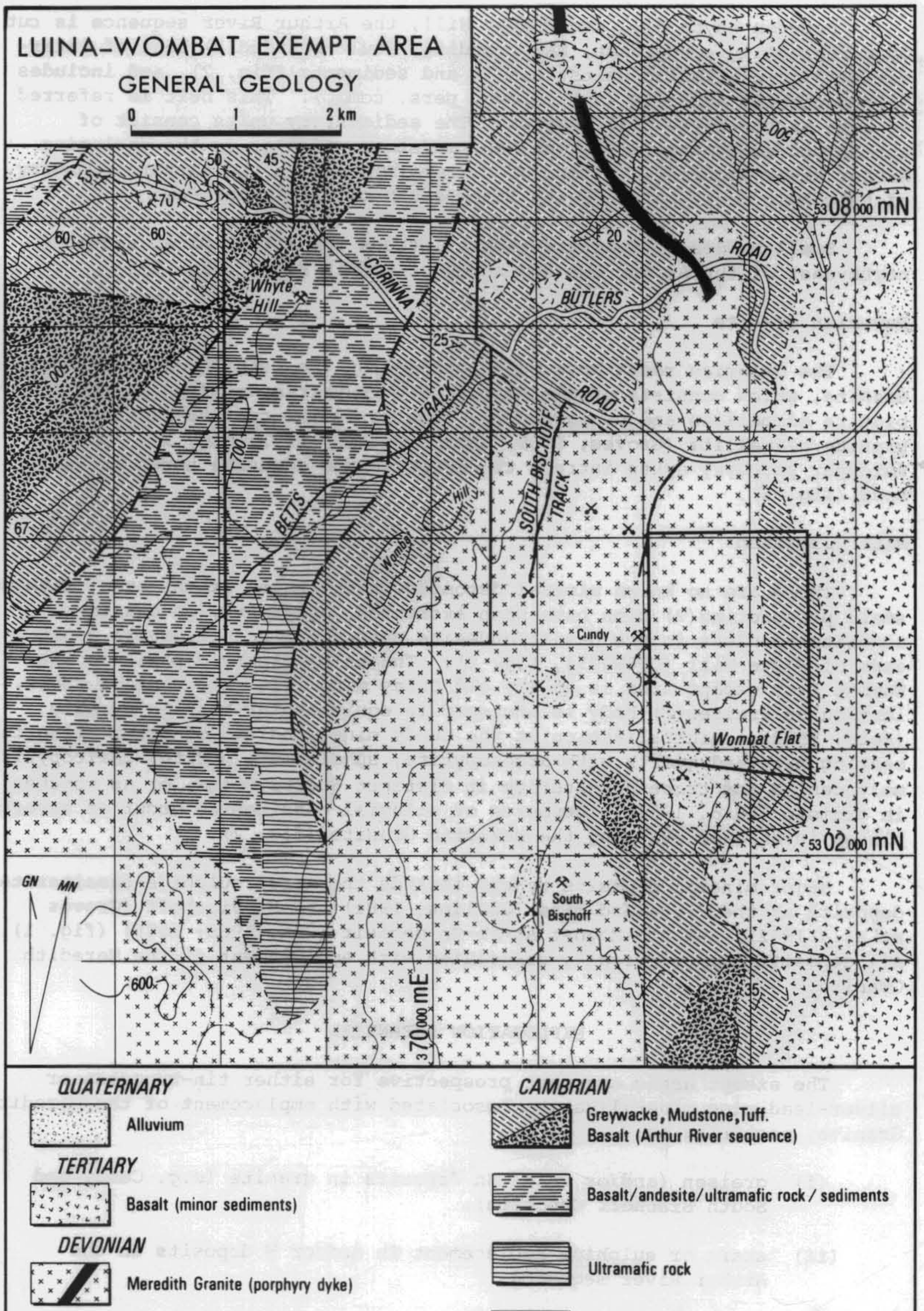


Figure 2.

5 cm

Between Whyte Hill and Wombat Hill, the Arthur River sequence is cut by a regionally concordant, NNE trending, fault-bounded(?) belt of intermixed mafic-ultramafic units, basalt and sediments (fig. 2), and includes high-magnesium andesite (A.V. Brown, pers. comm.). This belt is referred to here as the Whyte Hill complex. The sedimentary units consist of turbiditic greywacke, siltstone, and mudstone, similar to the enclosing Arthur River sequence. A lens of ultramafic rock on the eastern boundary of this belt crops out on Betts Track south of the Arthur Dam.

Small bodies of dolerite-gabbro intrude the Arthur River sequence north-east of the Arthur Dam and north of Godkin Ridge (fig. 2).

Devonian granite

The Cambrian rocks have been intruded by the late Devonian Meredith Granite, which consists predominantly of porphyritic, medium-grained biotite adamellite and equigranular, fine to medium-grained biotite granite/adamellite (Groves, 1968; Groves *et al.*, 1972; fig. 2). Quartz-feldspar porphyry dykes intrude the Arthur River sequence north of Butlers Road (fig. 2).

Mineralisation

There are no known mineral deposits in the Luina exempt area, although small prospecting(?) pits have been excavated, apparently on quartz-siderite veinlets in the basalt/andesite unit about one kilometre south-east of Whyte Hill (CQ689074, fig. 2). The only primary deposit in the Wombat Flat exempt area is at the old Cundy mine (fig. 2), where a short, lenticular greisen(?) body is enclosed in equigranular biotite granite (Reid, 1923). Mineralisation at the Cundy mine consists of green, fluorine-bearing mica and quartz with arsenopyrite, sphalerite, pyrite, chalcopyrite, molybdenite and trace cassiterite in distinct quartz veins, or as bunches in greisen (Reid, 1923). Deposits of alluvial cassiterite occur at several places in streams draining the Meredith Granite (fig. 2).

Major mineral deposits nearby include the large sulphide-cassiterite deposits at the Cleveland mine (Collins, 1981) and Mt Bischoff (Groves *et al.*, 1972), and the Magnet Ag-Pb-Zn deposit (Cox, 1968; 1975) (fig. 1). All deposits are genetically associated with emplacement of the Meredith Granite.

EXPLORATION POTENTIAL

The exempt areas are most prospective for either tin-tungsten or silver-lead-zinc mineralisation associated with emplacement of the Meredith Granite, occurring as:

(i) greisen (and/or vein) Sn deposits in granite (*e.g.* Cundy and South Bischoff deposits);

(ii) skarn or sulphide replacement Sn and/or W deposits in the Arthur River sequence;

(iii) fault-controlled, Sn-W or Ag-Pb-Zn mineralisation associated with major faults, such as the postulated fault between the Arthur River sequence and the Whyte Hill complex; and

(iv) stockwork vein Sn/W mineralisation.

Any undiscovered mineralisation that is present within the exempt area will most likely not crop out, and exploration should be directed at detecting subsurface mineralisation (*i.e.* depth >50 m) through the use of geological, geochemical, and geophysical techniques. Geological and geochemical methods should be designed and interpreted with the view of detecting alteration haloes (*e.g.* potassic alteration minerals, metals such as As and Pb known to occur in haloes to tin deposits). It is unlikely that intra-granitic deposits and vein deposits will give a significant geophysical response, thus placing a greater reliance upon geochemical techniques.

REVIEW OF PREVIOUS EXPLORATION

All recorded previous exploration in the exempt areas has been undertaken by the Aberfoyle Group, within Cleveland Tin Limited's exploration licence E.L. 1/63. The exempt areas have been well covered by airborne geophysical surveys (magnetic and electro-magnetic) and by reconnaissance geochemical surveys. An area to the south-east of Betts track, at Wombat Hill, has been gridded and soil geochemistry has been completed, but ground geophysical techniques have not been employed.

A regional stream sediment sampling programme undertaken in 1974 indicated that an area to the south and east of the Arthur Dam (designated the "South Magnet Dam area") is anomalous in Sn and Zn and weakly anomalous in Pb (Stuart-Smith, 1974; Palmer, 1975*a*). The area of anomalous Zn geochemistry is confined to streams draining the western flank of Wombat Hill south of the Arthur Dam (fig. 3).

An airborne (helicopter) magnetometer survey was flown in October 1974 over the western part of E.L. 1/63 (line spacing of 152 m and mean terrain (sensor) clearance of 76 m), but data quality was impaired by inaccurate flight path recovery (Palmer, 1975*a*). The survey revealed a "non-magnetic" "greenstone"/sediment unit west of the Arthur River (equivalent to the Whyte Hill complex) and a magnetically anomalous area to the east, but no distinct aeromagnetic anomalies were defined (Palmer, 1975*b*).

During 1975 and 1976, a C horizon (?) soil sampling survey was undertaken on grids established in the "South Magnet Dam" and "Wombat" areas (fig. 3; Ransom, 1976*a*, *b*). Samples taken at 12.5 m intervals were analysed for Cu, Pb, Zn, and Sn by emission spectroscopy and samples with in excess of 50 ppm Sn were reanalysed for Sn by X-ray fluorescence spectrography. Sn values exceeding 50 ppm (by emission spectroscopy) were considered anomalous on the basis of previous orientation work in the Cleveland mine area (Ransom, 1976*b*). Most soil samples with anomalous tin geochemistry were from areas underlain by the Meredith Granite (fig. 3), and the anomalies have been attributed to a high tin background in soil over granite (Ransom, 1976*b*).

An area of consistent anomalous tin geochemistry at the eastern end of lines 2850N to 3075N in the "South Magnet Dam" area has coincident anomalous lead and zinc geochemistry, but much of the anomalous area appears to lie outside the Luina exempt area (fig. 3). The area of anomalous tin is underlain by granite, and the only other grid lines that extend across the Meredith Granite (1200N, 2100N) also have sporadic elevated tin values. Several isolated anomalous tin values to the west of the granite contact were considered to be unrelated to any anomalous tin population (Ransom, 1976*b*).

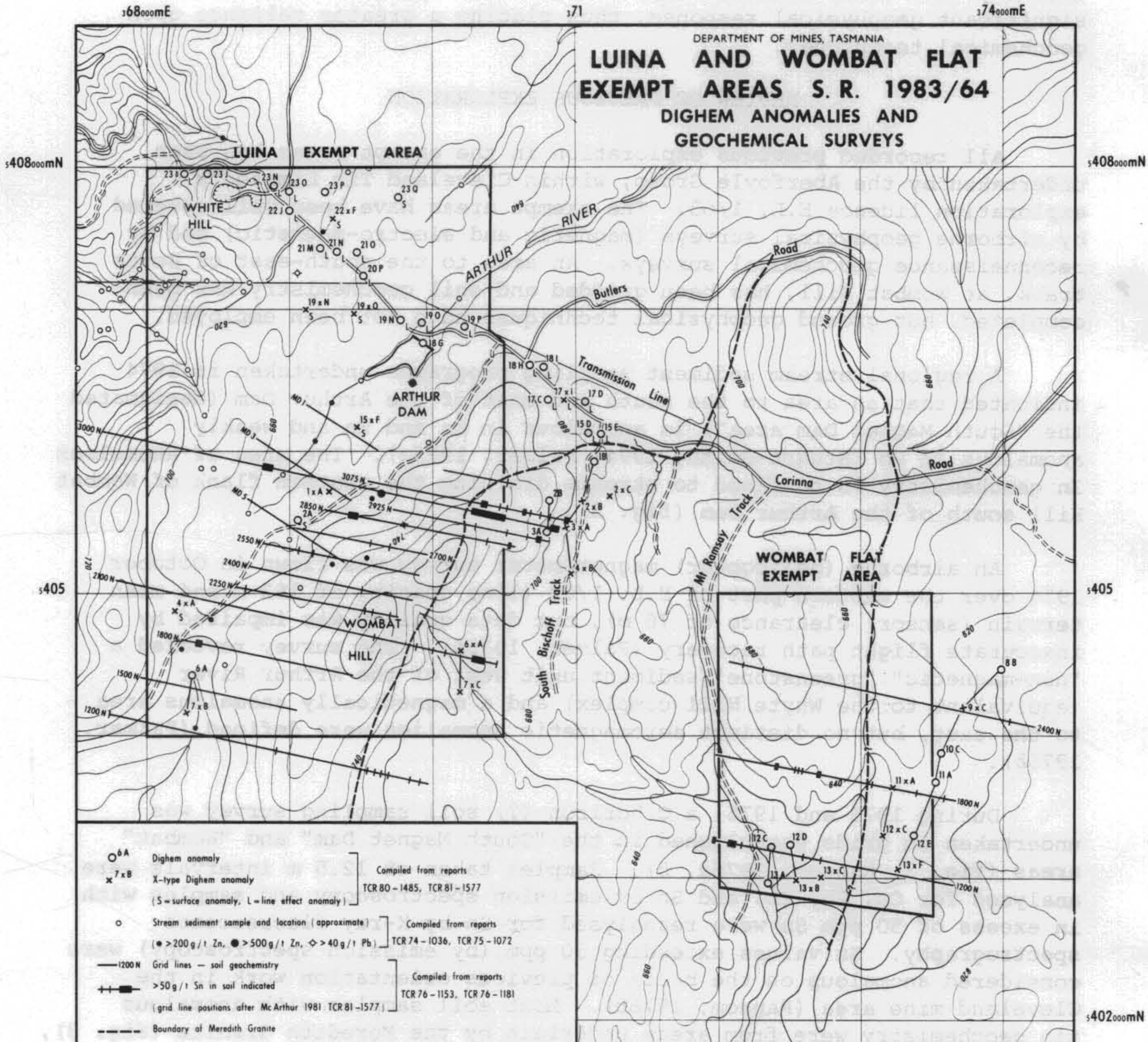
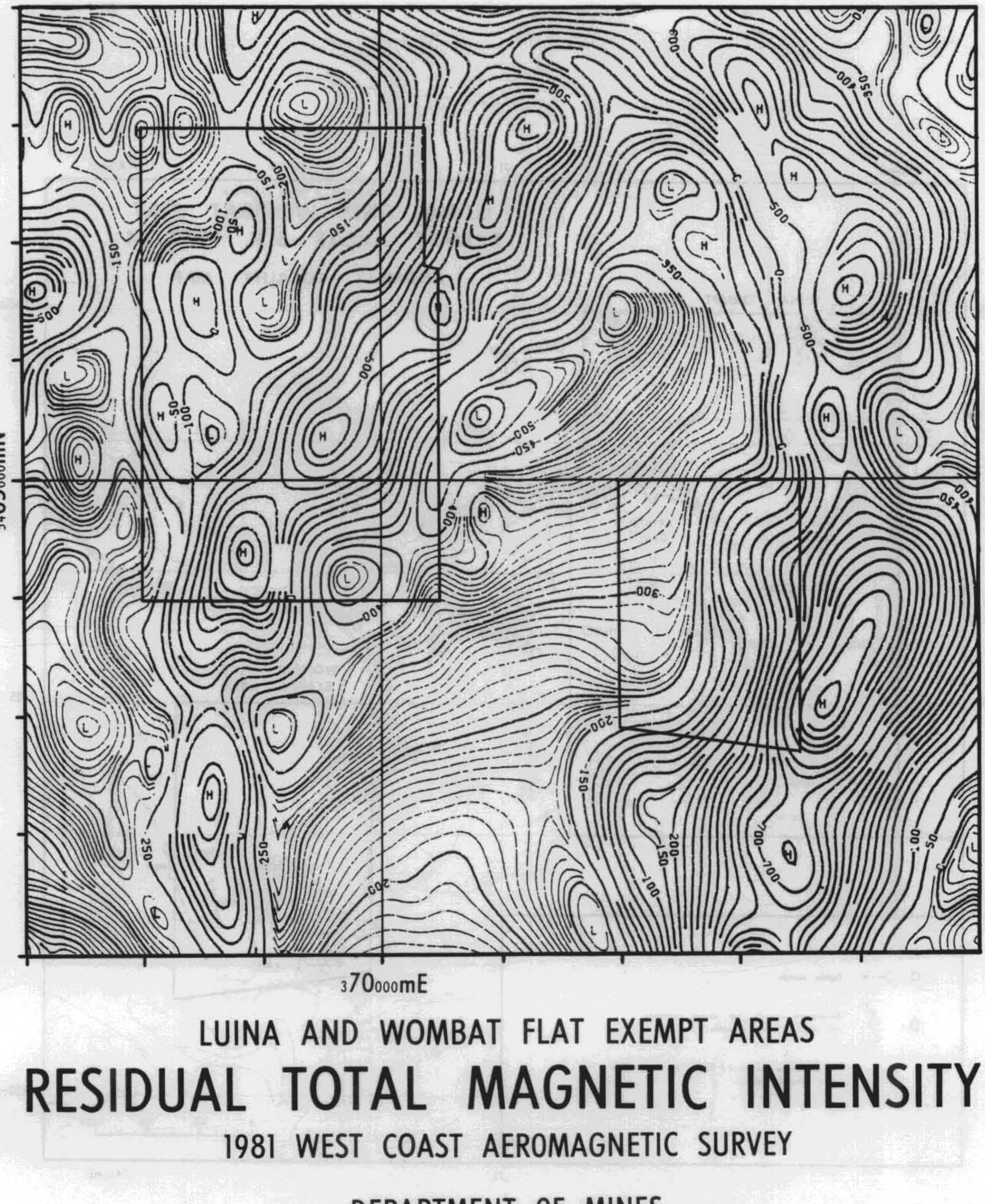

DEPARTMENT OF MINES, TASMANIA
LUINA AND WOMBAT FLAT
EXEMPT AREAS S. R. 1983/64
DIGHEM ANOMALIES AND
GEOCHEMICAL SURVEYS
368000mE
371
374000mE
5408000mN
5405
5402000mN
LUINA EXEMPT AREA
WOMBAT FLAT
EXEMPT AREA
WHITE
HILL
ARTHUR
RIVER
ARTHUR
DAM
WOMBAT
HILL
Butlers
Road
Transmission
Line
Corinna
Road
Mt Ramsay
Track
South
Bischoff
Track
Dighem anomaly
X-type Dighem anomaly
(S = surface anomaly, L = line effect anomaly)
Compiled from reports
TCR 80 - 1485, TCR 81 - 1577
Stream sediment sample and location (approximate)
(● >200 g/t Zn, ● >500 g/t Zn, ◇ >40 g/t Pb)
Compiled from reports
TCR 74 - 1036, TCR 75 - 1072
Grid lines — soil geochemistry
>50 g/t Sn in soil indicated
(grid line positions after McArthur 1981 TCR 81-1577)
Compiled from reports
TCR 76 - 1153, TCR 76 - 1181
Boundary of Meredith Granite
0
400
800
1200 m

Figure 3.

5 cm

Figure 4.



LUINA AND WOMBAT FLAT EXEMPT AREAS

RESIDUAL TOTAL MAGNETIC INTENSITY

1981 WEST COAST AEROMAGNETIC SURVEY

DEPARTMENT OF MINES

0 — 4km

Outline of exempt areas

Figure 4.

5 cm

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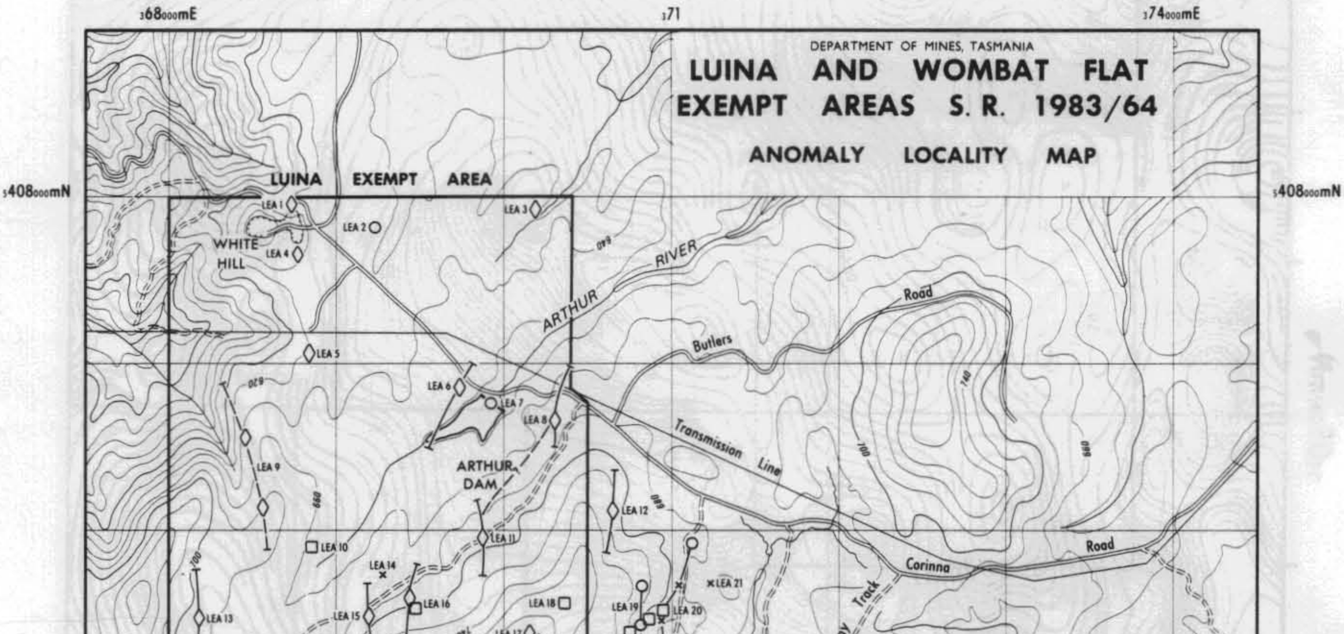

Figure 5.

5 cm

The southern half of the Luina exempt area and the Wombat Flat exempt area have been covered by a Dighem survey flown in February-March 1980 (Ellis, 1980*a, b*), and the remainder of the Luina exempt area has been covered by a Dighem II survey flown in February 1981 (McArthur, 1981; 1982). All EM anomalies detected are shown in Figure 3. In the Wombat Flat exempt area, several low-order EM anomalies (8B-13xF, 12C, 12D, *etc.*) have an associated resistivity low and probably represent bedrock conductors (Ellis, 1980*b*). Follow-up investigations indicated that the main anomaly (8B-13xF) coincides with the edge of Tertiary basalt, and it has been concluded that this EM anomaly is due to gravel (and associated groundwater) beneath a thin basalt cover (McArthur, 1981). The other anomalies have not been explained.

The Dighem surveys in the Luina exempt area indicate several low-order EM anomalies and possible conductors (*i.e.* 12P, 18G, 1xA, 6A-7xB, 6xA-7xC). Only anomaly 18G, a non-magnetic bedrock conductor, was considered worthy of follow-up investigation, but this was not done as the anomaly coincides with, and has been attributed to, the wall of the Arthur Dam (McArthur, 1982; fig. 3). A series of low order EM anomalies attributed to cultural sources (*e.g.* telecommunication cables) closely follow the Corinna Road (fig. 3). Low order EM anomalies 2B-3A and 1B-4xB near the South Bischoff track coincide with an area of anomalous Sn soil geochemistry (fig. 3), but lie outside the Luina exempt area.

The exempt areas have also been covered by the Department of Mines 1981 West Coast aeromagnetic survey (Corbett *et al.*, 1982) which highlighted the NNE-trending magnetically anomalous zone on the western edge of the magnetically 'quiet' Meredith Granite in the Luina exempt area, and a similar zone east of the Meredith Granite on the eastern side of the Wombat Flat exempt area (fig. 4). The survey also confirmed the magnetically 'quiet' basalt/andesite/sediment unit (Whyte Hill complex) west of the Arthur River. Several additional features may be interpreted from the line profiles, but these are not revealed on the contour diagram (due to 'smoothing' of profiles).

Summary and recommendations

In summary, previous exploration failed to locate any readily definable targets within the exempt areas, but several geochemical anomalies, aeromagnetic anomalies, and low-order EM anomalies and possible conductors have been defined and warrant further investigation. All anomalies defined from previous exploration are listed in Table 1, and their locations are shown on Figure 5. Anomalies worthy of further investigation are indicated in Table 1 and include:

(i) An area of anomalous Sn soil geochemistry and coincident(?) Dighem anomalies on the north-east flank of Wombat Hill (LEA18, 19, 20, and 21). Although this warrants a high priority, much of the anomalous area lies outside the Luina exempt area.

(ii) A similar coincident low-order Dighem anomaly and anomalous Sn in soil in the south-east corner of the Luina exempt area (LEA28).

(iii) Discrete linear aeromagnetic anomalies on the eastern boundary of the Whyte Hill complex and the Arthur River sequence (LEA6, 16, and 25). Although the anomalies may be due to ultramafic rocks, they are ideally placed for fault-controlled mineralisation, and at LEA16 there is coincident anomalous Sn in soil.

Table 1. LUINA AND WOMBAT FLAT EXEMPT AREAS - ANOMALIES DEFINED FROM PREVIOUS EXPLORATION

Anomaly No.	Character of anomaly	Comments	Follow-up investigation	Priority
LEA1	Aeromagnetic anomaly	South end of linear anomaly - probably due to Cambrian basalt or ultramafic rocks.		-
LEA2	Dighem anomaly 23P	Within Whyte Hill complex.	Ground check - low priority.	3
LEA3	Aeromagnetic anomaly	On boundary of Whyte Hill complex and Arthur River sequence. Also, may be due to Tertiary basalt.	Ground check - low priority.	3
LEA4	Aeromagnetic anomaly	Western edge of Whyte Hill complex - probably due to Cambrian basalt or ultramafic rocks.		-
LEA5	Aeromagnetic anomaly	Within Whyte Hill complex - source probably similar to LEA4.		-
LEA6	Aeromagnetic anomaly	Discrete linear anomaly on boundary of Whyte Hill complex and Arthur River sequence.	Reconnaissance ground magnetics and soil geochemistry.	1
LEA7	Dighem anomaly 18G	Coincides with wall of Arthur Dam and attributed to dam wall (McArthur, 1982).	Ground check	2
LEA8	Aeromagnetic anomaly	Pronounced, broad, north-trending anomaly - probably reflects contact metamorphism of Arthur River sequence (contains varying amounts of magnetite).		-
LEA9	Aeromagnetic anomaly	Broad linear anomaly within Whyte Hill complex - source probably similar to LEA 4 & 5.		-
LEA10	Soil geochemical anomaly	≥50 g/t Sn in four samples over 60 m, line 3000 N. Also anomalous Pb in soil.	Ground check - repeat soil sampling (if grid line relocated).	2
LEA11	Aeromagnetic anomaly	Pronounced, broad, north-trending anomaly - source similar to LEA8.		-
LEA12	Aeromagnetic anomaly	As for LEA11.		-

Table 1. (continued)

Anomaly No.	Character of anomaly	Comments	Follow-up investigation	Priority
LEA13	Aeromagnetic anomaly	Discrete linear anomaly within Whyte Hill complex - source similar to LEA4, 5, & 9.		-
LEA14	Dighem anomaly 1xA	Within Whyte Hill complex, close to grid line MD3.	Ground check.	2
LEA15	Aeromagnetic anomaly	Within Whyte Hill complex - probably due to ultramafic rocks.	Ground check (in association with LEA16).	3
LEA16	Aeromagnetic anomaly *and* soil geochemical anomaly.	Discrete, linear anomaly on boundary of Whyte Hill complex and Arthur River sequence (similar to LEA6) and adjacent/coincident soil geochemical anomaly on line 2850N (≧50 g/t Sn in six samples over 100 m).	Reconnaissance ground magnetics and repeat soil sampling. Relocate grid line.	1
LEA17	Aeromagnetic anomaly	As for LEA11, 12.		-
LEA18	Soil geochemical anomaly	≧50 g/t Sn in 20 samples (up to 500 g/t Sn; up to 210 g/t Sn by XRF) over about 200 m, line 3000N. Anomalous Sn in soil on adjoining lines. Also a slight broad magnetic anomaly. Area of anomalous Sn in soil is underlain by the Meredith Granite.	Reconnaissance ground magnetics and repeat soil sampling on lines 2850N to 3075N. Relocate grid lines. Geochemical orientation survey required.	1
LEA19	Dighem anomaly 2B-3A *and* soil geochemical anomaly	Underlain by the Meredith Granite. ≧50 g/t Sn in soil over 50-60 m on lines 2925N and 3000N coincident with Dighem anomaly 3A.	As for LEA18, but lies outside the exempt area.	1
LEA20	Dighem anomaly 1B-4xB *and* soil geochemical anomaly.	Underlain by the Meredith Granite. Apparent coincidence of Dighem anomaly 3xA and anomalous Sn in soil on line 3075N (the only grid line to extend far enough east).	As for LEA19.	1
LEA21	Dighem anomaly 2xC	Underlain by Meredith Granite - no obvious source.	As for LEA19.	1

Table 1. (continued)

Anomaly No.	Character of anomaly	Comments	Follow-up investigation	Priority
LEA22	Aeromagnetic anomaly	As for LEA11, 12. Isolated anomalous Sn in soil on lines 2250N and 2400N.		-
LEA23	Soil geochemical anomaly	≥50 g/t Sn in six samples over 60 m, line 1800N. Within Whyte Hill complex.	Ground check - reconnaissance ground magnetics and repeat soil sampling on line 1800N.	2
LEA24	Dighem anomaly 6A-7xB	Within Whyte Hill complex - no obvious source.	Ground check on line 1500N.	3
LEA25	Aeromagnetic anomaly	Pronounced linear anomaly on eastern edge of Whyte Hill complex - source similar to LEA15 and 16.		-
LEA26	Aeromagnetic anomaly	As for LEA11, 12.		-
LEA27	Aeromagnetic anomaly	As for LEA11, 12.		-
LEA28	Dighem anomaly 6xA-7xC *and* soil geochemical anomaly.	X-type Dighem anomaly and adjacent anomalous Sn in soil (≥50 g/t Sn in 11 samples over 150 m) on line 2100N. Underlain by Meredith Granite.	Reconnaissance ground magnetics and repeat soil sampling on line 2100N.	2
WEA1	Aeromagnetic anomaly	Anomaly apparently underlain by granite but may be due to Tertiary basalt. Small coincident soil geochemical anomaly.	Ground check on line 1800N.	3
WEA2	Aeromagnetic anomaly	Anomaly apparently underlain by Arthur River sequence but may be due to Tertiary basalt.	Ground check.	3
WEA3	Dighem anomaly 11xA-12xC	Apparently underlain by the Arthur River sequence - no obvious source.	Ground check (line 1800N) of 11xA.	3
WEA4	Dighem anomaly 8B-13xF	Coincides with the western edge of Tertiary basalt and has been attributed to edge effects of basalt cover (McArthur, 1981).	Ground check.	3

Table 1. (continued)

Anomaly No.	Character of anomaly	Comments	Follow-up investigation	Priority
WEA5	Soil geochemical anomaly	≥50 g/t Sn in 12 soil samples over about 150 m, line 1200N. Underlain by the Meredith Granite.	Ground check - repeat soil sampling.	3
WEA6	Dighem anomaly 12C-13A	Underlain by the Meredith Granite - no obvious source.	Ground check - line 1200N.	3
WEA7	Dighem anomaly 120-13xB	As for WEA6.	As for WEA6.	3
WEA8	Dighem anomaly 13xC	As for WEA6.	As for WEA6.	3

Compiled from reports listed in References. Anomaly locations shown on Figure 5. Priority indicates relative priority for follow-up investigation (1 = first priority). Soil geochemical analyses by emission spectroscopy unless otherwise indicated.

35-14

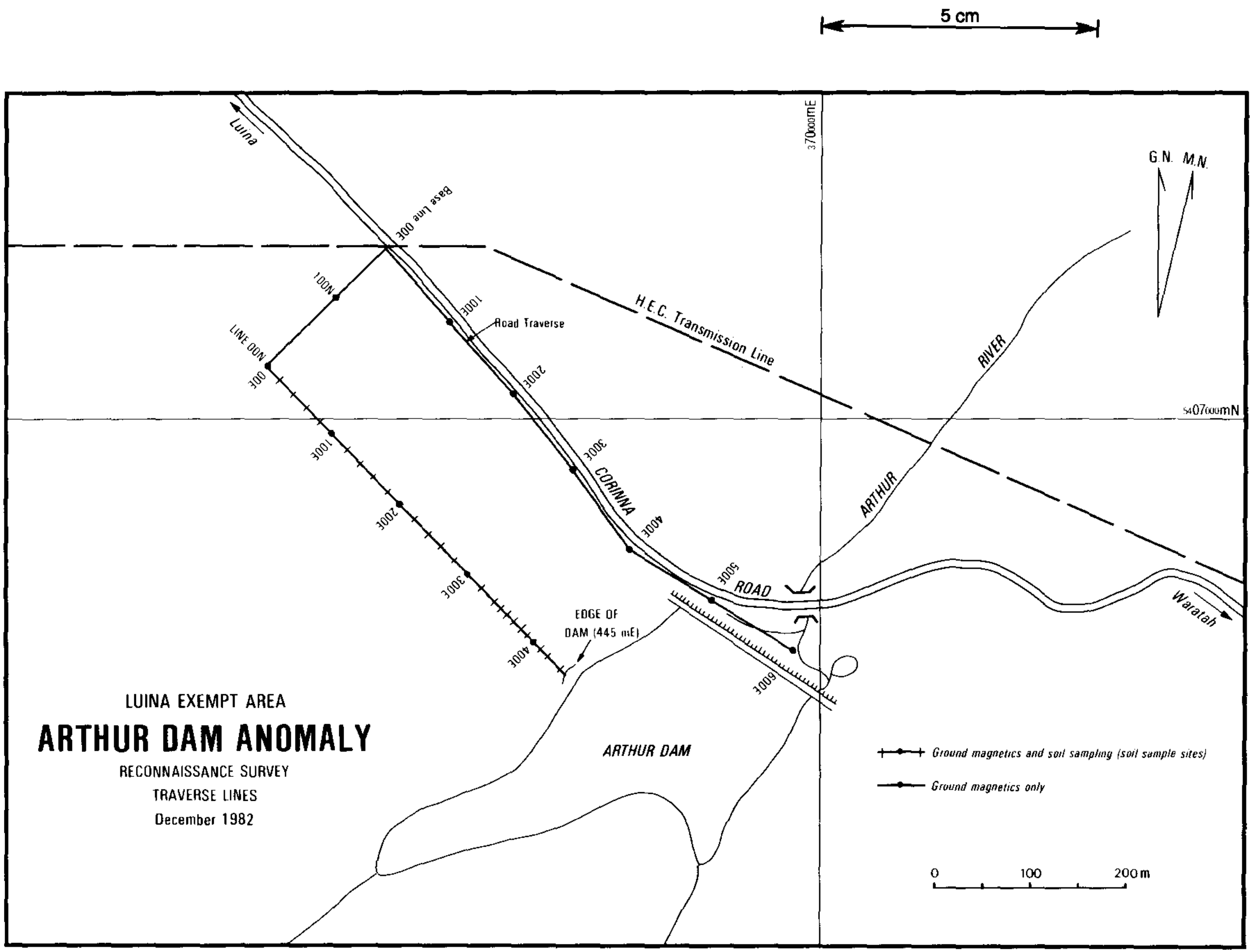

Figure 6.

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These are the most significant anomalies and further investigation at a reconnaissance level is recommended. Several other anomalies in both the exempt areas warrant ground checking, but have a much lower priority.

Initially, it is recommended that a reconnaissance ground magnetic and soil sampling and geochemical survey of the aeromagnetic anomaly adjacent to the Arthur Dam (LEA6) be undertaken, as this will assist in interpretation of similar anomalies LEA16, 25, and 15(?). Anomaly LEA6 is referred to as the Arthur Dam anomaly (ADA) and details of a reconnaissance survey completed during preparation of this report are given below.

ARTHUR DAM AEROMAGNETIC ANOMALY

An aeromagnetic anomaly located adjacent to the north-western bank of the Arthur Dam forms a prominent north-east trending linear anomaly which shows on all aeromagnetic surveys, and is sufficiently isolated from the pronounced magnetically anomalous zone over Wombat Hill to be considered a discrete anomaly. In Aberfoyle's 1974 survey, the anomaly has a magnitude of about 280 nT and is centred about 150 m south of the Corinna Road (see Palmer, 1975*a*, *b*). The anomaly has been better defined by the 1981 Dighem survey which indicated a NNE-trending anomaly with a magnitude of about 400 nT (4000 nT enhanced magnetics) centred over the Corinna Road (see McArthur, 1981). A 'line effect' Dighem anomaly (19N) is located over the peak of the magnetic anomaly. The Department of Mines 1981 West Coast aeromagnetic survey indicated a single line anomaly with a magnitude of about 200 nT.

The aeromagnetic anomaly is located over a postulated fault boundary between the Whyte Hill complex to the west and the Arthur River sequence to the east. Contact metamorphism of Cambrian sediments underlying Wombat Hill is the likely cause of the magnetically anomalous zone adjacent to the Meredith Granite, but is unlikely to be the source of the Arthur Dam anomaly. Possible sources of this anomaly include:

(i) hydrothermal, fault-controlled magnetite and/or pyrrhotite-rich mineralisation;

(ii) a tectonically emplaced sliver of ultramafic rock; and

(iii) a magnetite/pyrrhotite-bearing basic dyke or basalt.

A reconnaissance survey was undertaken in December 1982 to define the anomaly on the ground and attempt to determine its origin. The survey involved cutting a base line and a 445 m grid line (line 00N) across the anomaly (approximately 150 m south of the Corinna Road) followed by magnetometer traverses along the road and grid line, and soil sampling along the grid line (fig. 6).

MAGNETOMETER TRAVERSES

The total magnetic field intensity was measured with a McPhar GP-70 proton precession magnetometer, and the vertical component of the magnetic field was measured with a McPhar M700 fluxgate magnetometer. A base station was established at 00N, 00E and the fluxgate magnetometer was zeroed at this point. Repeat measurements at the base station indicate an accuracy of ± 1 nT for total field measurements and ± 10 nT for the vertical field component. All readings have been corrected for diurnal variation. Results are shown in Figures 7 and 8 and profiles are included in Figures 12 and 13.

Measurements of the total magnetic field on line 00N indicate a 1000 nT anomaly centred at 370-380 mE, and a single station 100 nT anomaly at 120 mE (figs 7, 12). The Corinna Road traverse revealed a pronounced 3000-3500 nT anomaly centred at 370 mE and a single station 200 nT anomaly on the flank of the main anomaly at 280 mE (figs 7, 13).

Measurement of the vertical field component gave similar results, with a 1200 nT anomaly centred at 370-380 mE on line 00N, and a 130 nT anomaly at 120 mE (figs 8, 12). The road traverse indicated a pronounced 3500-4000 nT anomaly centred at 370 mE and a 150 nT anomaly at 280 mE (figs 8, 13).

The magnetometer surveys therefore indicate a pronounced, north-east trending magnetic anomaly (the Arthur Dam anomaly) located 50-100 m north-west of the Arthur Dam (figs 7, 8), and which is parallel to, and coincident with, a postulated major fault. Characteristic features of the Arthur Dam anomaly are a pronounced, relatively narrow peak, a 'tailing-off' on the north-western flank, and an associated negative anomaly on the south-eastern flank (figs 12, 13). These indicate a probable vertical to steep NW dipping sheet-like body.

General features of the magnetic survey include the magnetically inactive Whyte Hill complex to the west of the Arthur Dam anomaly, and the lower magnetic response of sediments to the east (figs 12, 13).

SOIL GEOCHEMISTRY

C horizon soil sampling was undertaken at 20 m intervals on line 00N but sampling reduced to 10 m over the Arthur Dam anomaly. Samples were collected by hand auger at depths of between 0.4 and 1.4 m (Table 1). Samples were dried and pummelled, then a split of half of the sample was sieved with a 70# mesh (212 µm) cloth screen. The minus 70# mesh fraction was submitted to the Department of Mines laboratories, Launceston for XRF analysis for Cu, Pb, Zn, Sn, W, Cr, and Ni. Samples were ground in a Cr-steel vessel on a swing mill and may contain some Cr and Ni as contaminants.

Analytical results are listed in Table 1 and indicated on Figures 9-11, and illustrated in profiles on Figure 12. Statistical treatment of results has not been undertaken because of the limited extent and small number of samples.

Copper

Most samples contain less than 100 g/t Cu, with possible anomalous values of 195 g/t Cu at 100 mE, 320 g/t at 120 mE, and 370 g/t at 410 mE (fig. 12).

Lead

Most samples contain less than 50 g/t Pb, with probable anomalous samples at 120-160 mE (120-255 g/t Pb) and 170 g/t at 410 mE (fig. 12).

Zinc

The majority of samples contain less than 150 g/t Zn. A pronounced anomaly of 920 g/t Zn is centred at 140 mE (spread between 120-160 mE) and coincides with anomalous Pb values (fig. 12). Possible anomalous values of up to 270 g/t Zn occur between 380 and 410 mE, coincident with the magnetic anomaly (fig. 12). A single sample with 350 g/t Zn was collected at 00N.

Tin

Samples range from <5 to 15 g/t Sn and there are no pronounced anomalous values. However, tin values are slightly elevated at 120-160 mE (maximum 15 g/t), and between 370 and 410 mE (maximum 15 g/t) coincident with the magnetic anomaly (fig. 12).

Tungsten

All samples are below the detection limit of 11 g/t W, except for an enigmatic 16 g/t W at 60 mE.

Chromium and nickel

Cr and Ni were analysed to determine whether the magnetic anomaly is due to ultramafic rock. The Cr and Ni values exhibit a sympathetic relationship (fig. 12) and fall into two distinct populations: a low Ni (<150 g/t), low Cr (<500 g/t) group and a high Ni (most >300 g/t), high Cr (most >2500 g/t) group. Samples with high Ni and high Cr values are probably underlain by mafic-ultramafic rocks, and the low Ni, low Cr samples (040-140 mE) probably define a sedimentary unit.

At the eastern end of line 00N, Cr and Ni values decrease over the Arthur Dam anomaly but are relatively high at 420 and 440 mE, which is inconsistent with sedimentary rock east of the anomaly. The low Cr and Ni values over the magnetic anomaly indicate that it may not be caused by a mafic-ultramafic unit, but the isolated high Cr and Ni values at 400 mE coincides with lower Sn, Pb, and Zn values and may reflect a sliver of mafic-ultramafic rock within a fault zone.

The anomalous Pb and Zn zone at 120-160 mE coincides with changing Cr and Ni values and may reflect fault-controlled mineralisation.

SUMMARY

A reconnaissance survey of the Arthur Dam aeromagnetic anomaly has defined a pronounced, narrow, north-east trending magnetic anomaly (up to 3500 nT above background) attributable to a steep, north-west dipping, sheet-like magnetic body. Soil sampling indicates anomalous(?) Cu, Pb, Zn, and Sn in soil adjacent to, and north-east of, the magnetic anomaly, possibly associated with fault controlled mineralisation. A second, more pronounced Zn, Pb, and Cu anomaly is located 200-250 m north-east of the magnetic anomaly. Nickel and Cr values in soil were inconclusive in defining whether the magnetic anomaly is due to an ultramafic body.

Further investigation of the Arthur Dam anomaly and the adjacent soil geochemical anomaly(?) (or ADA), and of the second soil geochemical anomaly is warranted, though a thorough investigation of ADA is hampered by the close proximity of the Arthur Dam.

CONCLUSIONS AND RECOMMENDATIONS

The Luina and Wombat Flat exempt areas are most prospective for granite-associated Sn-W greisen, stockwork vein, and replacement styles of mineralisation and for Sn-W or Ag-Pb-Zn fault-controlled mineralisation. Previous exploration failed to locate any significant targets but several aeromagnetic, low-order Dighem and soil geochemical anomalies have been defined and warrant further investigation.

Areas nominated for immediate further investigation are confined to the Luina exempt area and include:

(i) an area on the north-east flank of Wombat Hill which is underlain by the Meredith Granite and has anomalous Sn in soil and coincident(?) low-order Dighem anomalies; and

(ii) the major fault boundary between the Arthur River sequence and the eastern margin of the Whyte Hill complex, which is defined by linear aeromagnetic anomalies, but in one example with coincident anomalous Sn in soil.

A reconnaissance ground magnetic and soil geochemical survey over one of the aeromagnetic anomalies along the Arthur River sequence/Whyte Hill complex fault boundary (Arthur Dam anomaly) defined a pronounced, north-east trending, narrow magnetic anomaly and adjacent low-order soil geochemical anomaly (Cu, Pb, Zn, and Sn). A second, more pronounced soil geochemical anomaly (Zn, Pb, Cu) was located 200-250 m north-west of the magnetic anomaly.

It is recommended that the following work be undertaken in the Luina exempt area:

(1) *Arthur Dam anomaly.* Establish a grid to cover the Arthur Dam anomaly and nearby soil geochemical anomaly and undertake ground magnetometer and soil geochemical surveys.

(2) Relocate Aberfoyle's grid line in the Wombat Hill area and undertake reconnaissance surveys (ground magnetics and repeat soil sampling) of anomalies LEA16 (similar to the Arthur Dam anomaly; line 2850N), LEA18 (lines 2850N-3075N) and LEA28 (line 2100N).

Any further investigation of the exempt areas will depend on the results of the above programme, though ground checking of readily accessible anomalies should also be implemented.

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[10 August 1983]

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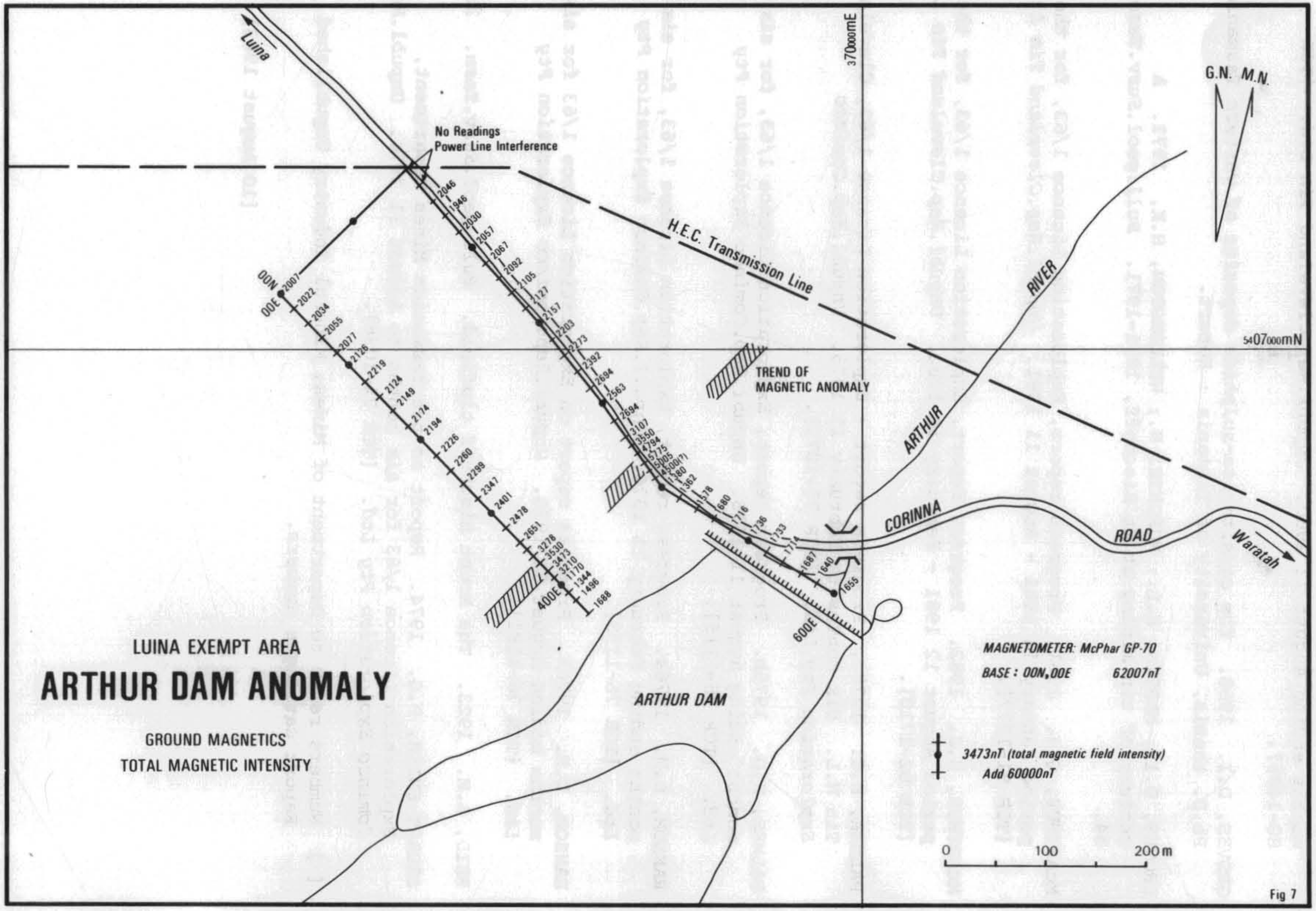

Figure 7.

35-20

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35-21

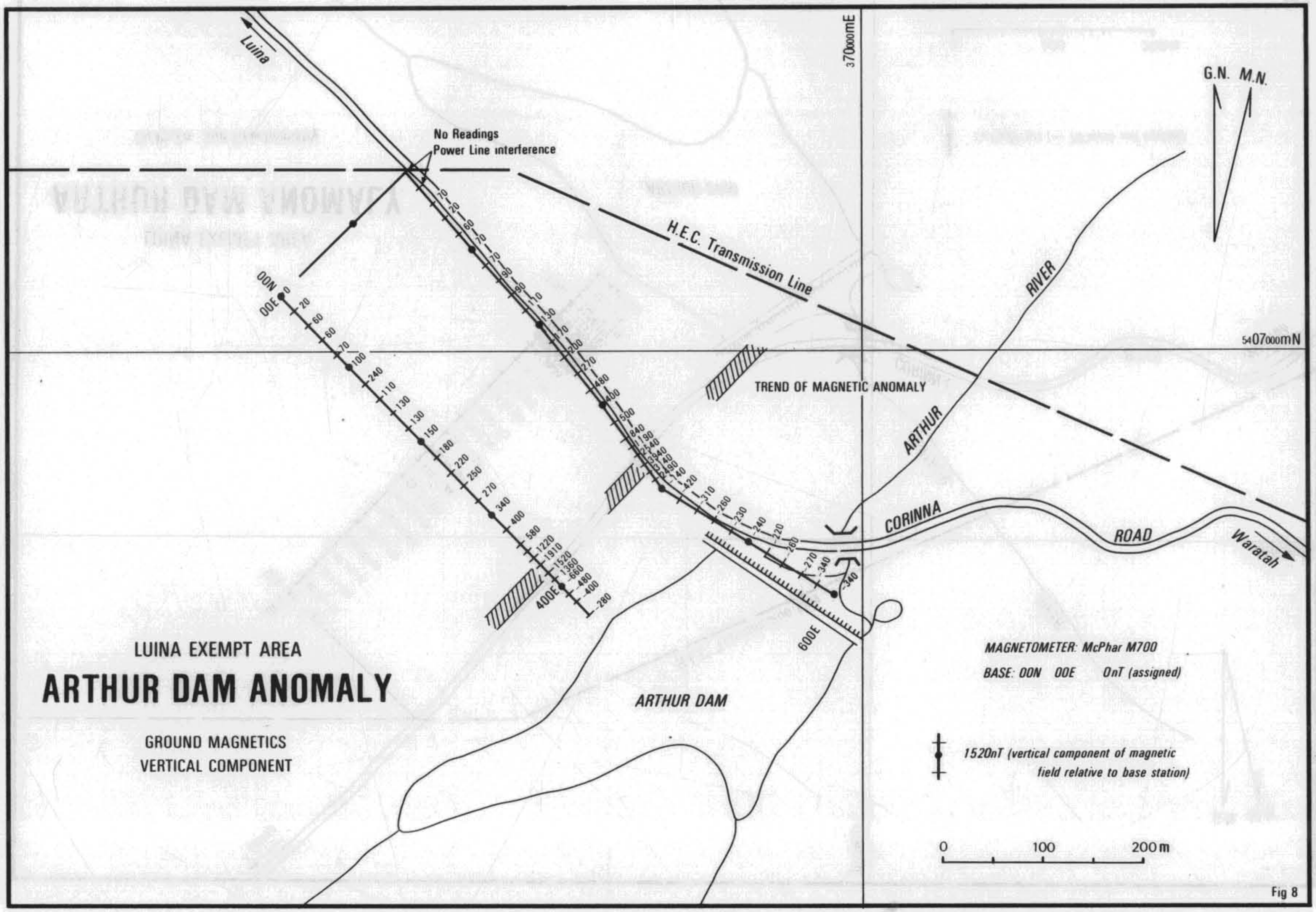

Figure 8.

5 cm

21/28

5 cm

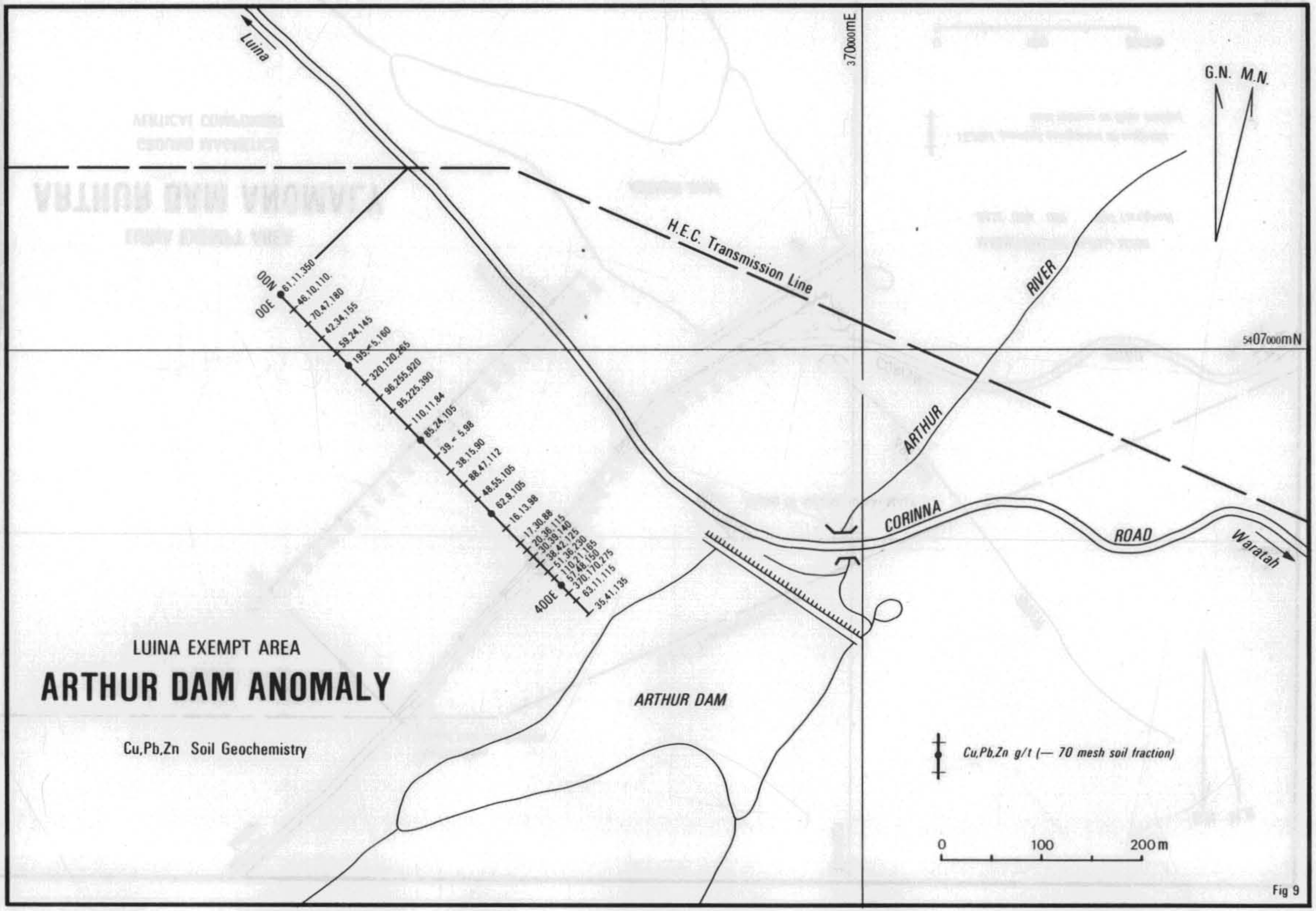

Figure 9.

35-22

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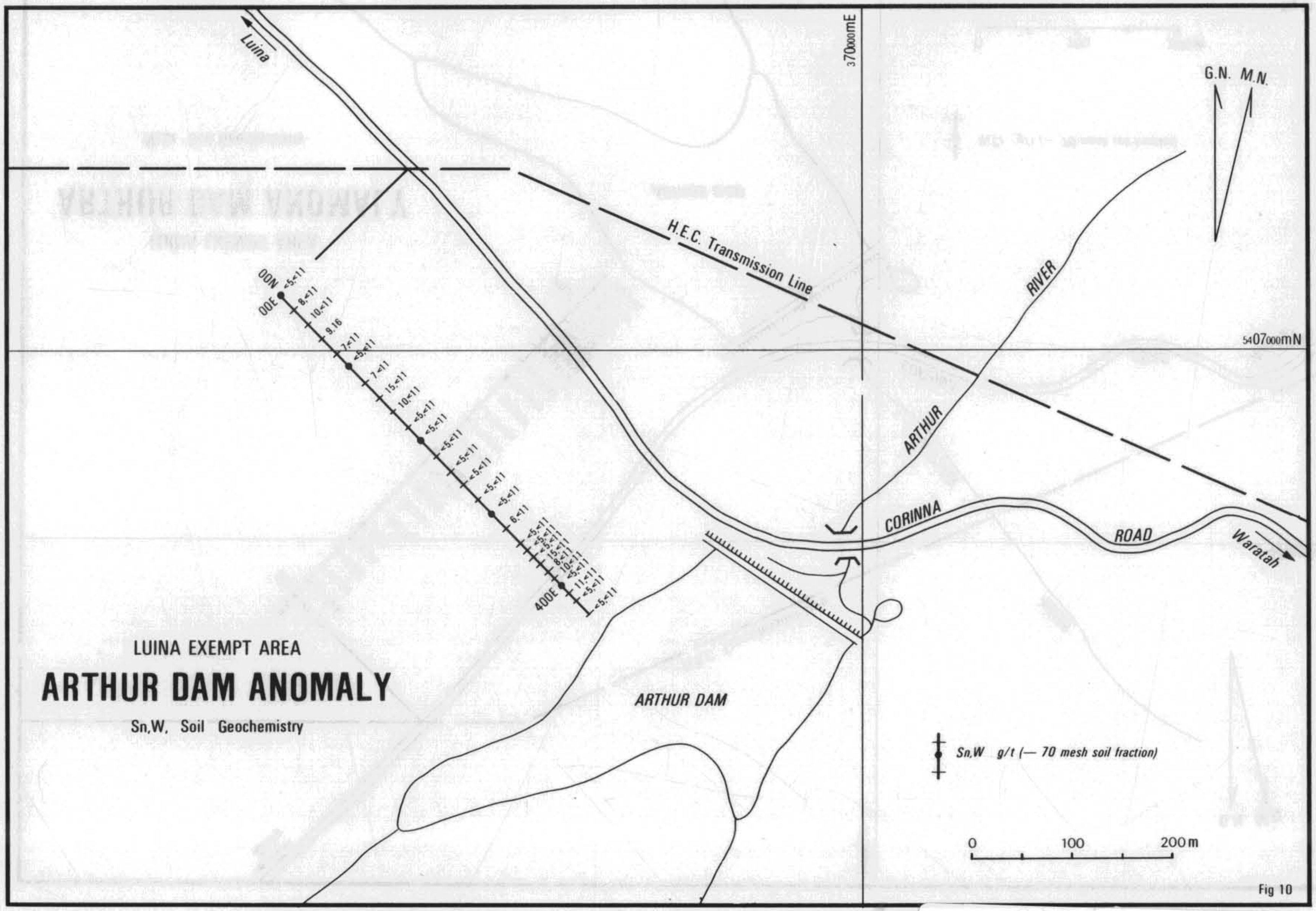

Figure 10.

5 cm

35-24

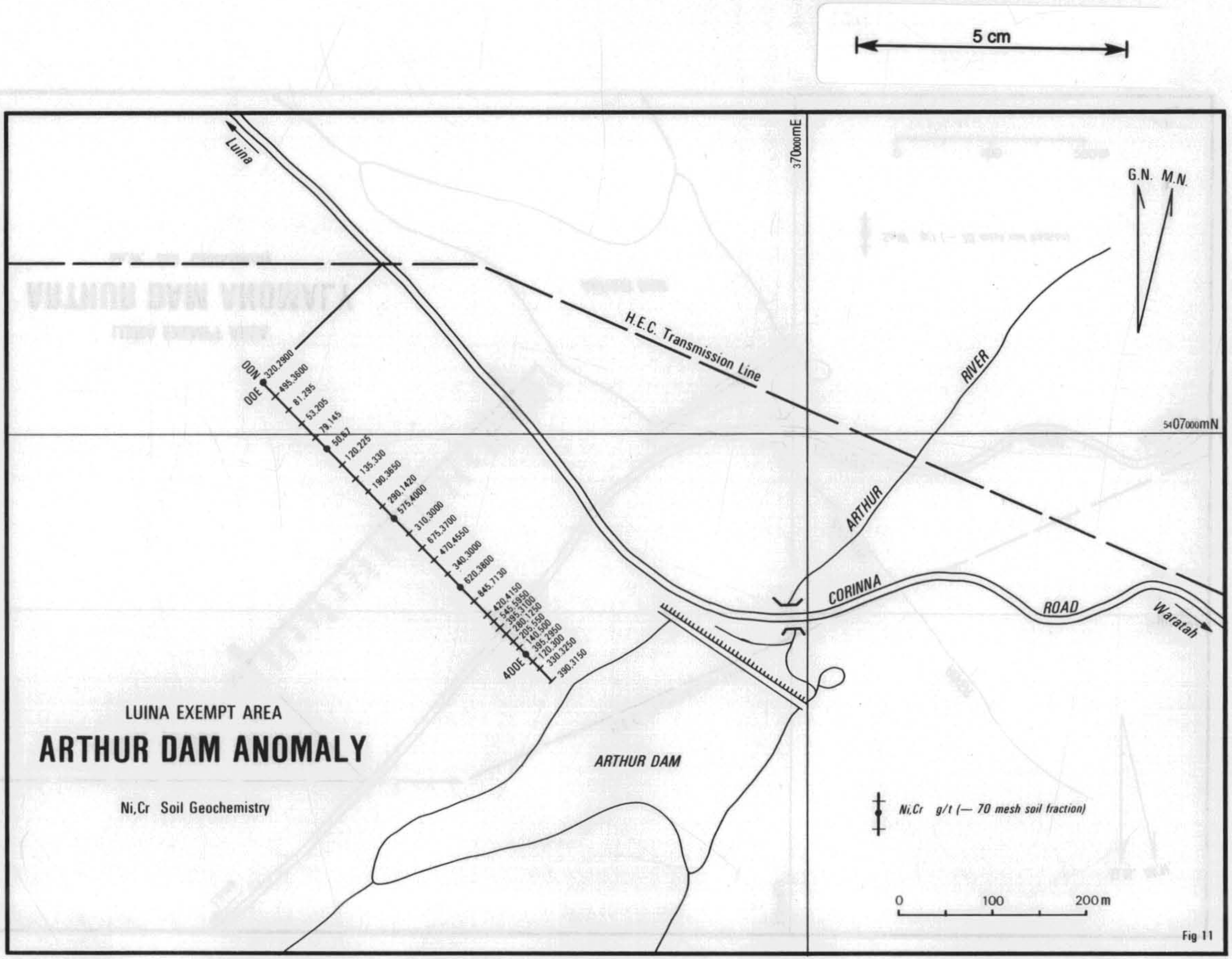

Figure 11.

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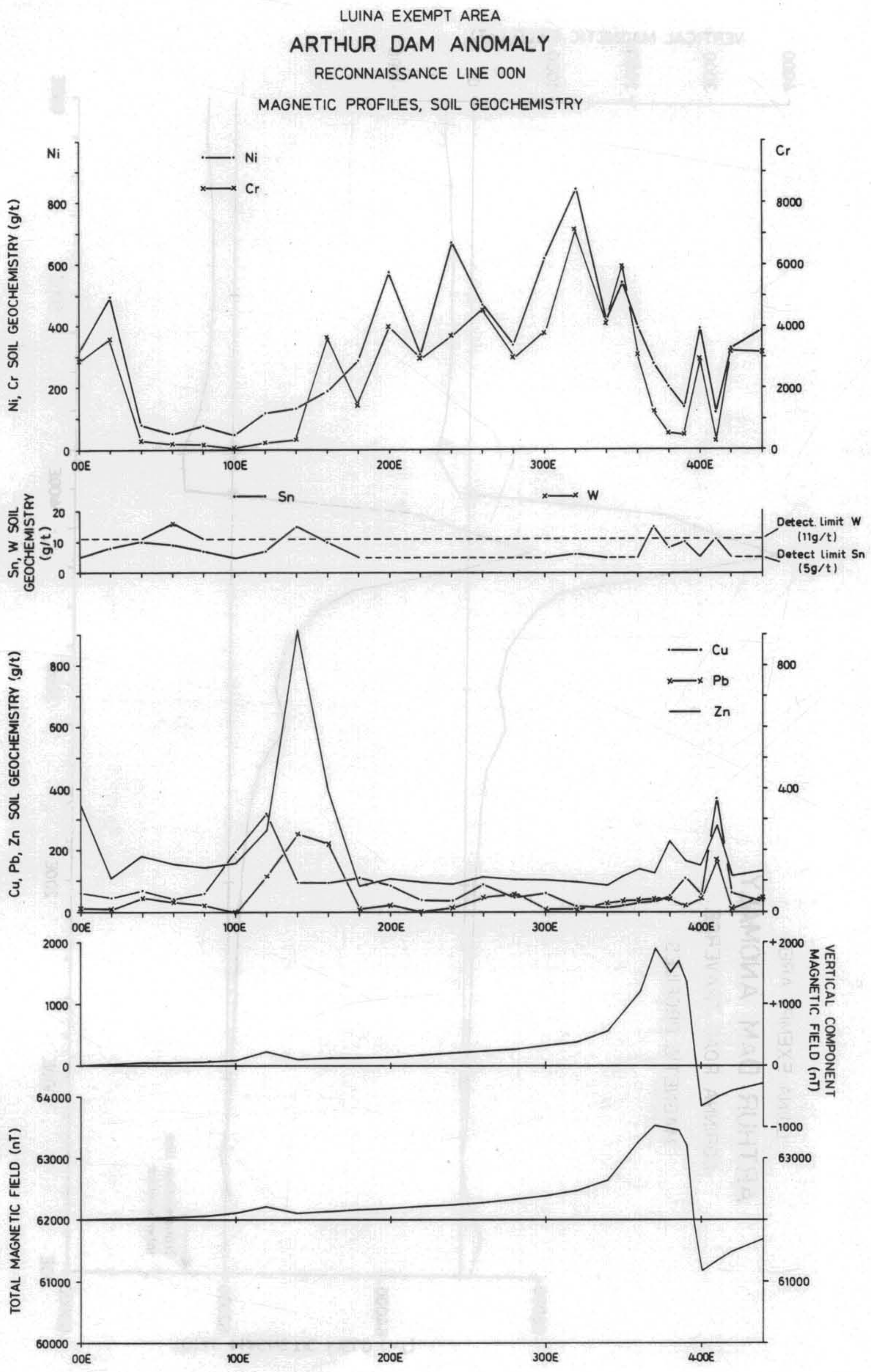

Figure 12.

5 cm

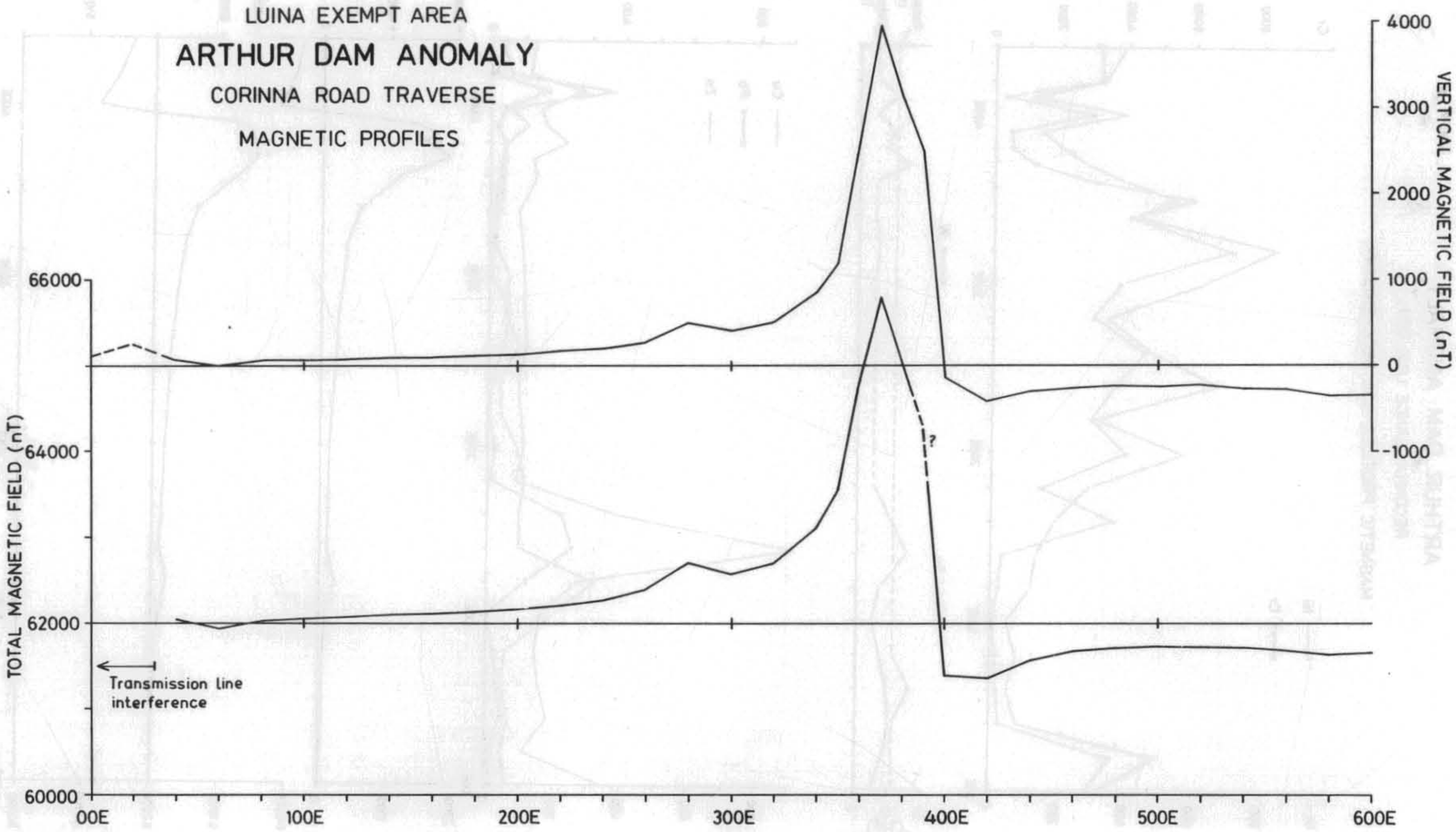

Figure 13.

35-26

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Table 2. SOIL SAMPLING AND GEOCHEMICAL DATA, ARTHUR DAM ANOMALY

Sample no.		Analytical Data*							Sample depth (m)	Sample description
Reg. no.	Grid co-ordinates	Cu	Pb	Zn	Sn	W	Ni	Cr		
821895	00N 00 E	61	11	350	<5	<11	320	2900	1.4	Grey-brown soil
821896	00N 020 E	46	10	110	8	<11	495	3600	1.0	Brown-grey soil with mafic green rock fragments
821897	00N 040 E	70	47	180	10	<11	81	295	0.8	Light brown soil
821898	00N 060 E	42	34	155	9	16	53	205	0.6	Grey soil with mafic green rock fragments
821899	00N 080 E	59	24	145	7	<11	79	145	0.8	Brown-grey soil
821900	00N 100 E	195	<5	160	<5	<11	50	67	1.0	Grey soil with sheared mafic green rock fragments
821901	00N 120 E	320	120	265	7	<11	120	225	0.5	Yellow-brown soil with greywacke fragments
821902	00N 140 E	96	255	920	15	<11	135	330	1.2	Cream-brown soil with greywacke fragments
821903	00N 160 E	95	225	390	10	<11	190	3650	1.2	Cream-brown soil with siltstone fragments
821904	00N 180 E	110	11	84	<5	<11	290	1420	1.0	Olive-brown soil with greywacke fragments
821905	00N 200 E	85	24	105	<5	<11	575	4000	0.8	Light brown soil
821906	00N 220 E	39	<5	98	<5	<11	310	3000	1.0	Grey-brown soil with greywacke fragments
821907	00N 240 E	38	15	90	<5	<11	675	3700	1.0	Light brown soil with weathered pyroxene(?) flakes.
821908	00N 260 E	88	47	112	<5	<11	470	4550	1.0	Grey soil with weathered grey/green igneous rock fragments.
821909	00N 280 E	48	55	105	<5	<11	340	3000	0.6	Brown-grey soil with weathered green-grey igneous rock and chert fragments
821910	00N 300 E	62	9	105	<5	<11	620	3800	0.5	Grey soil with weathered green rock fragments and angular quartz grains
821911	00N 320 E	16	13	98	6	<11	845	7130	1.0	Grey soil with weathered, sheared, ultramafic(?) and chert fragments

Table 2. (continued)

Sample no.		Analytical Data*							Sample depth (m)	Sample description
Reg. no.	Grid co-ordinates	Cu	Pb	Zn	Sn	W	Ni	Cr		
821912	00N 340 E	17	30	88	<5	<11	420	4150	0.8	Green-grey soil with weathered, sheared mafic green rock fragments
821913	00N 350 E	20	36	115	<5	<11	545	5950	1.0	Grey-brown soil with green rock fragments and angular quartz grains
821914	00N 360 E	30	39	140	<5	<11	395	3100	0.6	Grey soil with sheared grey-green rock fragments
821915	00N 370 E	38	42	125	15	<11	280	1250	0.7	Light brown soil with large, weathered pyroxene(?) flakes
821916	00N 380 E	51	36	230	8	<11	205	550	0.4	Cream-brown soil with large, weathered pyroxene(?) flakes
821917	00N 390 E	110	21	165	10	<11	140	500	0.8	Dark brown soil with angular quartz grains, angular chert fragments and rounded quartz pebbles.
821918	00N 400 E	57	48	150	<5	<11	395	2950	0.7	Light brown soil with chert fragments
821919	00N 410 E	370	170	275	11	<11	120	300	0.7	Light brown soil with greywacke fragments
821920	00N 420 E	63	11	115	<5	<11	330	3250	1.2	Light brown soil
821921	00N 440 E	35	41	135	<5	<11	390	3150	0.8	Brown soil

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