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MINERAL EXPLORATION AND ENGINEERING CONSULTANTS

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A SUMMARY REPORT ON THE 1982  
 GEOPHYSICAL SURVEYS OVER THE LITTLE WILSON  
 RIVER INFILL GRID, EL 17/77

for

RENISON LTD.

by

Dr. J.R. BISHOP

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ABSTRACT

Gradient array IP and magnetic surveys were carried out over the Little Wilson River Grid as part of an exploration program for skarn mineralisation. Disappointing results were recorded by the former but some magnetic anomalies were defined over Gordon Limestone and Crotty Quartzite near their contact with the Meredith Granite, as well as over the Cambrian ultrabasics. The most prospective of these anomalies is a 2000 gamma response over a contact between ultrabasics and limestone (anomaly no. 4, Figure 2). It has associated tin responses and may have offset (faulted) extensions to the south, giving it a total strike length of some 500m. A drill hole has been proposed to intersect the magnetic source and to examine the country rocks through to the granite. However this anomaly is shorter and much less intense than one, or possibly two, responses over similar rocks on the nearby Laurel Creek grids.

Details of the proposed hole are: collar coordinates; 50m. (grid) north of 15.5N/20E: azimuth;  $283^{\circ}$  mag.: dip;  $50^{\circ}$ : projected length; 350m. Before drilling, a magnetic survey should be carried out on the projected line over the drill hole to confirm and better define the anomaly. Further, since magnetic remanence may be important in these areas, measurements should be made of representative samples: this will require the core to be oriented. Such measurements will permit a more accurate interpretation of the area's magnetic anomalies and possibly a better recognition of anomalies caused by potentially economic mineralisation.



## INTRODUCTION

The Little Wilson River Grid is a more detailed area on the eastern side of the Harman River Grid (see Figure 1). The grid encompasses part of the contact zone around the tin-bearing Meredith Granite where the granite has intruded Cambrian basic and ultrabasic rocks, Ordovician limestones and Silurian sediments. Part of the area is covered by alluvium which in places may be up to 10m. thick.

This report evaluates the results of gradient array IP and magnetic surveys carried out in early 1982.

## EXPLORATION TARGET AND GEOLOGIC SETTING

A tin or tin-tungsten skarn deposit is the expected style of mineralisation and although the favoured host is the Gordon Limestone, carbonate sequences also occur within the Silurian sediments and may occur in altered ultrabasics.

The skarns may be either magnetite rich or sulphide rich: both types should show strong magnetic anomalies, but IP or EM would probably only respond to the latter. The geologic noise for both magnetics and IP is often high: the ultrabasics may be quite magnetic and graphitic shales occur within the sediments. Also, sulphide and magnetite content generally increase as the granite is approached (Schellekens and Newham, 1974).

A second possible target is for primary tin within the granite. The extreme (and simplified) types of mineralised granite are sulphide rich areas such as Sweeney's on the Heemskirk Granite (see Bishop, 1981) or the altered, but sulphide poor areas such as Tadpole Hill on the Meredith Granite (see Bishop, 1982). For the former case and for the various grades down to sulphide poor, IP is a diagnostic exploration method. For areas such as Tadpole Hill, the response is subtle and may not be diagnostic. A magnetic response may occur, but more often will not: a magnetic low may occur over areas of alteration within magnetically active granite.

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### PREVIOUS GEOPHYSICS

The Harman River Grid was surveyed by gradient array IP and magnetics in February 1980, at a 400m. line, and 25m. station, spacing. The results have been presented as chargeability and resistivity contours at 1:5000 scale and as profiles at 1:2000 (Howland-Rose, 1980).

The IP and magnetic profiles are on Renison's 1:5000 composite profiles and the magnetics has been contoured on to Renison's standard sheets, again at 1:5000 scale.

Although the IP recorded a number of strong anomalies, the responses in the Little Wilson River area were generally low (less than 20 mV/V). Similarly, in this region the magnetics, away from the ultrabasics, was quiet, although one potentially interesting anomaly was defined. Martin (1981) proposed a more detailed search of the area, at a 100m. line spacing, mainly on geological and geochemical grounds.

### THE 1982 GRADIENT ARRAY IP SURVEY

Scintrex carried out a gradient array IP survey over 13 lines (between 12N and 18N) in January, 1982. A 25m. dipole and station spacing was used. The results have been plotted on to Renison's composite profiles at 1:5000 scale and have been presented as contour plans by Howland-Rose (1982), who has given a detailed description of the data.

With the exception of one high reading of 84 mV/V, low chargeabilities were recorded throughout the grid (generally less than 20 mV/V). Zones of 20-30 mV/V were recorded in the north west corner over ultrabasics near the granite contact (associated with some soil tin anomalies on line 20N, which is outside of this grid), and some spot values of 20+ mV/V were distributed throughout the grid on a background of 10-15 mV/V. Thus the chargeabilities were disappointing and indicated only minor disseminations of sulphides. Further, the chargeability plan and profiles were of little assistance when trying to interpret the geology from the geophysical results.

The resistivities were mostly between 1000 and 2000 ohm-m, with zones of less than 500 ohm-m occurring over all rock types. Surprisingly the

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results did not reflect the mapped granite boundaries (usually granites are seen as more resistive units). Neither are the other lithological units distinguishable from the resistivity contour plan. Resistive units which intersect the granite contact may indicate extensions of the granite into the country rock, either as (near) outcrop or at a shallow depth. This interpretation is indicated in Figure 3.

#### THE 1982 MAGNETICS SURVEY

The magnetics were recorded using a 10m. station spacing and the results have been presented on Renison's 1:5000 composite profiles and in Howland-Rose (1982) as a 1:5000 contour plan.

Several anomalies were defined, but mostly with amplitudes of several hundreds of gammas, rather than the several thousands of gammas which are typical of skarn deposits. However the term 'skarn' covers a wide range of mineral assemblages and it is possible that magnetic remanence with an opposing field is important (as occurs at the nearby Mt. Lindsay skarns).

The magnetics did not outline the ultrabasics as indicated on the geology map, but rather they reinforced the interpretation of the resistivity results; namely that the granite intrudes further to the south into what has been mapped as Cambrian ultrabasics (Figure 3).

#### DISCUSSION

The lack of correspondence between the geophysical 'anomalies' or between the geophysics and the anomalous tin soil geochemistry (see Figure 2) confirms the disappointment expressed in the individual results above. (The two geochemical zones labelled A and B are mostly associated with alluvium, although this may not be so for the bulge in the south west corner of B.)

As suggested above, magnetics should be the most useful geophysical method for detecting skarns, since a magnetic response should occur over most, if not all, types of skarns. The magnetic anomalies are indicated in Figure 2 and are briefly discussed below.

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(1) This anomaly occurs over Crotty Quartzite and its centre is within 100m. of the granite contact. It has an amplitude of the order of 300 gammas and probably has a deeper source than any other 'prospective' anomaly on the grid (and thus if due to potentially economic mineralisation, its depth may explain the lack of an associated geochemical response). Whilst skarns so close to the granite might well be poor in sulphides, a higher magnetite content would be expected than is indicated by this response (although the 'genie' of reversed remanent magnetism can again be invoked to explain this low amplitude). A strike length of about 300m. is indicated, but it is poorly defined and would require further definition before any follow up work was planned around this anomaly.

(2) This anomaly, also located within Crotty Quartzite, is even more poorly defined than (1). It has an amplitude of 600-800 gammas and a strike length of more than 200m. It is located partly over the Wilson River and could perhaps be explained by examining (?) outcrop in the river. The underlying geochemical response comes from alluvium and does not represent in-situ values.

(3) This is a poorly defined anomaly near the contact between the Gordon Limestone and the Crotty Quartzite: its apparently small size and lack of complementary anomalies from other methods suggest it has little economic potential.

(4) This is an intense anomaly with a maximum amplitude of about 2000 gammas. It is the best defined of the 'prospective anomalies', being recorded on three lines. The strike length is approximately 300m. (but see comments on (5) below) and it overlays an interpreted contact between the ultrabasics and the limestones. (The granite contact has been mapped through the northern part of the anomaly: see discussion on interpretation of the geological boundaries below). On line 16.5W a quite shallow source to the anomaly is indicated and the associated soil geochemistry (150 ppm Sn) is apparently from residual soils.

(5) This anomaly has a maximum amplitude of over 2500 gammas on line 15.5N, where a very shallow source is indicated: the source deepens to the south. The geological map (Figure 3) shows a dextral fault between (4) and (5), and it seems likely that (5) is a southern extension of (4).



(6) This 400 gamma anomaly is well defined on line 15N, but it was not recorded on adjacent lines. Like (4) and (5) it occurs over the mapped contact between the ultrabasics and limestones. It is very similar in form to anomaly (5) on 15N, and may be an offset (faulted) extension of (5) (see Figure 3).

(7) This anomaly is one of a series (others not shown on the Little Wilson River magnetics contour map) extending to the west on line 18N over ultrabasics. Despite the associated chargeability 'high', it is not considered to be prospective.

(8) This anomaly is most intensely developed on line 13N (~1000 gammas): it is seen weakly (~200 gammas) on line 14N and has been interpreted as extending to line 15N (Howland-Rose, 1982, plate 3). Although the underlying rocks are ultrabasics which might be expected to be magnetic, there are down slope geochemical highs of 500 and 650 ppm Sn on line 14N as well as a nearby magnetic low which may be significant. Thus anomaly (8) and its associated geochemical responses are of possible interest.

(9), (10) and (11) are within the ultrabasics and despite the minor geochemical high (40 ppm Sn) overlapping part of (11), these anomalies are not considered to be prospective.

The only IP response of note is the 84 mV/V recorded at 13N/20.5E, however this is a single reading and there are no corresponding magnetic or tin geochemical anomalies. Although low amplitude IP anomalies over granite may be significant, none appear so from this survey: there are no geophysical (or geochemical) anomalies over the one mapped occurrence of altered (tourmalinised) granite which is on line 18N.

Although the contrasts in the physical parameters are not as clear as might be expected over these rock types (e.g. ultrabasics usually magnetic and of low resistivity; granites usually non magnetic and of high resistivity), there are some changes which may be used to assist the geological mapping: Figure 3 shows some postulated alterations to the existing map. These are mostly changes in the granite contact; the

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large tongue on the western side of the grid is suggested by magnetic character as well as by a higher resistivity. It is also supported by geological mapping on line 15N. The variation near line 16.5N avoids the contact crossing (at a high angle) the strong magnetic anomaly (4). The fault suggested between lines 15N and 15.5N parallels the main NW-SE fault to the north. A second suggested fault between lines 13N and 14N is more doubtful, but the change in magnetic character at these positions on each line is quite definite.

#### CONCLUSIONS AND RECOMMENDATIONS

The IP survey over the Little Wilson River Grid produced minor anomalies, only one of which indicated other than minor sulphides and this anomaly was probably due to a very local and shallow source of barren sulphides. The minor chargeability anomalies which occurred over the granite are also probably not significant and there seems little potential for an economic tin deposit within the granite in the area covered by the survey.

Several magnetic anomalies were defined over Gordon Limestone and Crotty Quartzite. Although mostly of a lower amplitude than might be expected for skarn mineralisation; such responses, over these rock types and near the granite, are of interest. Anomalies (1), (2) and (4) are of sufficient areal extent to have economic potential and I have suggested that anomalies (5) and (6) may be offset extensions of anomaly (4). Anomaly (8), over ultrabasics, may be associated with good geochemical responses, but it is of limited extent. Anomaly (1) is of low amplitude and the inferred deeper source may negate the lack of coincident tin geochemical response. Anomaly (2) is poorly defined, but could perhaps be examined for favourable host rocks in that section of the river over which the anomaly occurs. Thus perhaps more by a process of elimination than by merit, anomaly (4) is the one to be investigated, if further work is decided upon. Between 16N/19E and 16.5N/20.6E, a thin, near-vertical tabular source is indicated with a depth to the top of the body of about 20m. and a susceptibility thickness product of about 0.2 (i.e. for an assumed thickness of 5m., the source has the relatively high susceptibility of 0.04 cgs units). This interpretation assumes (with little justification) no effect from magnetic remanence.

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A proposed hole to test this magnetic body as well as to hopefully intersect Gordon Limestone, Cambrian ultrabasics and the Meredith Granite is shown in Figure 3. Before drilling, a magnetic survey should be carried out along the projected line of the drill hole. Results of this profile should be interpreted in more detail. During drilling, mineralised sections of the hole should be oriented: in inclined holes, this may be achieved by using (down-hole) a metal cone with an offset apex to mark the lower side of the core. Details of the proposed hole

are: coordinates: 50m. (grid) north of 15.5N/20E  
azimuth: ~283° (magnetic)  
dip: ~50°  
projected depth: ~350m.

J.R. Bishop

September, 1982

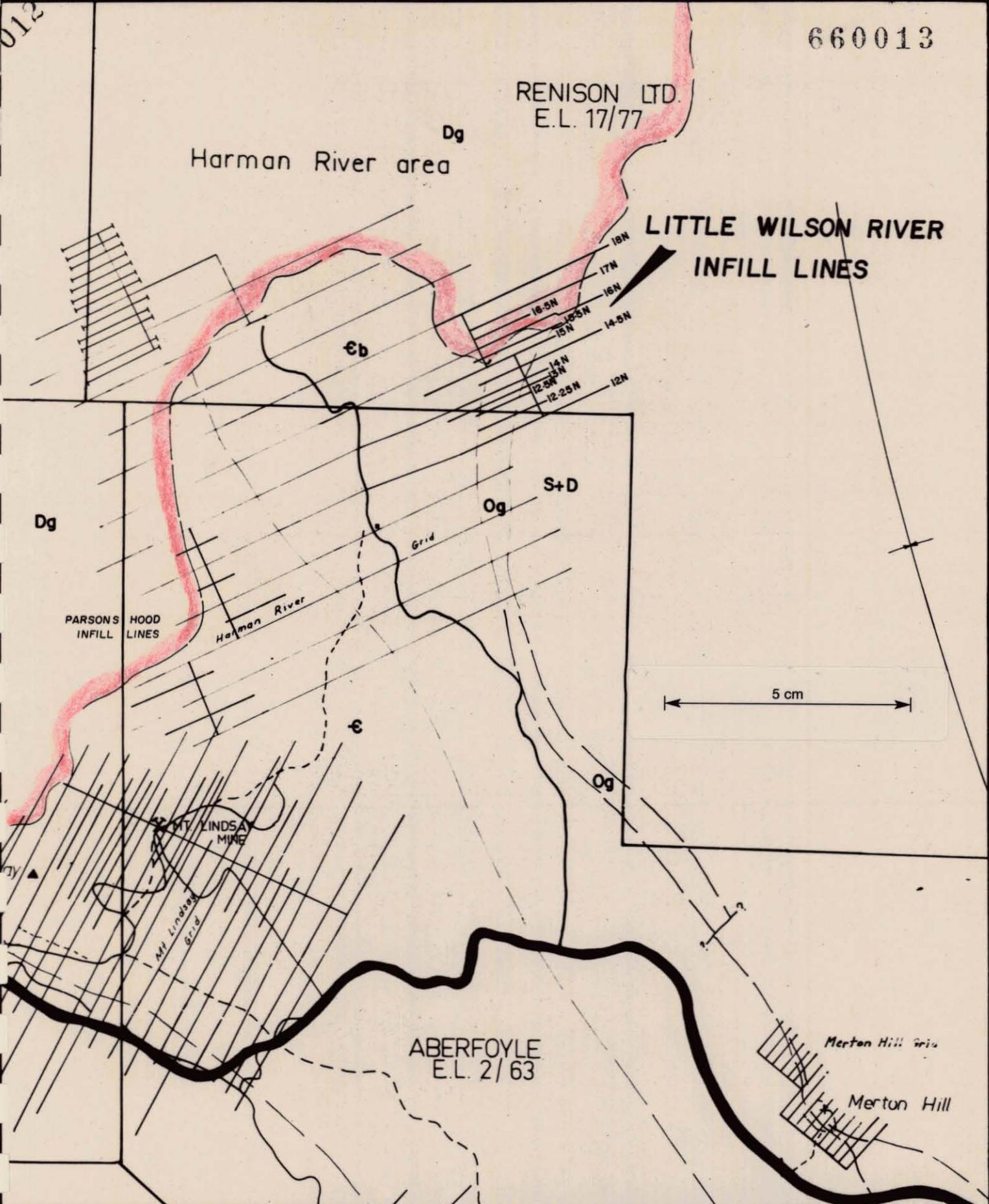
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RENISON LTD.  
E.L. 17/77

Harman River area

LITTLE WILSON RIVER  
INFILL LINES



5 cm

ABERFOYLE  
E.L. 2/63

Merton Hill Grid  
Merton Hill

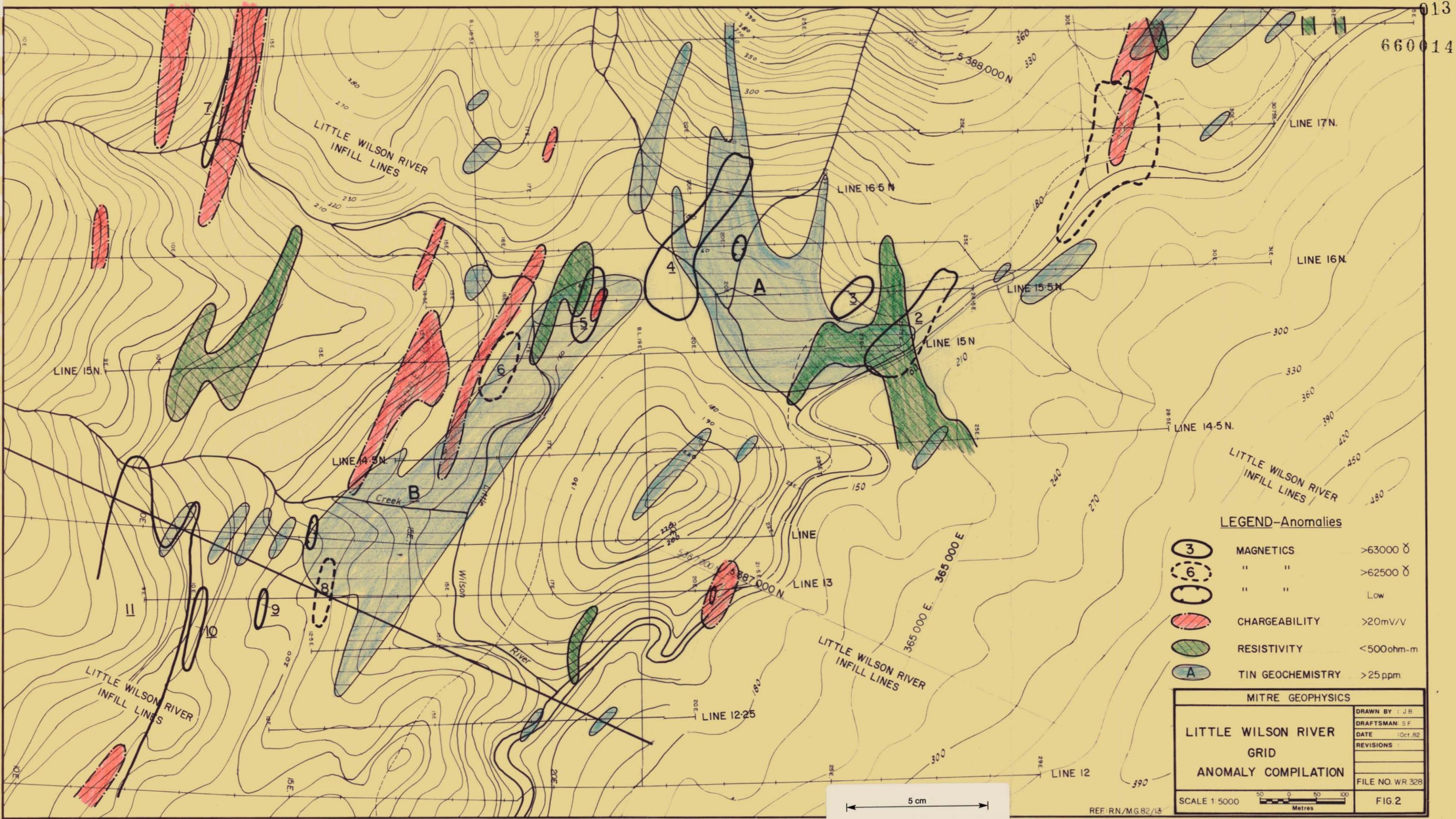
<b>S+D</b>	Silurian + Devonian Sediments	<b>Eb</b>	Cambrian Basic + Ultrabasic Intrusives
<b>Og</b>	Ordovician Gordon Limestone	<b>Dg</b>	Devonian Granite Intrusives
<b>E</b>	Cambrian Sediments + Volcanics		

MITRE GEOPHYSICS PTY. LTD.

LITTLE WILSON RIVER  
GRID  
Location Plan

W.R.011

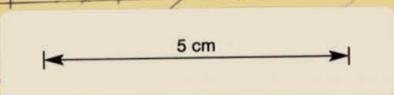
SCALE 1:50,000	DRAWN BY L.M./J.B.	FIG 1
DATE SEPT, 1982	DRAFTSMAN S.F.	



LEGEND-Anomalies

-  MAGNETICS >63000  $\gamma$
-  " " >62500  $\gamma$
-  " " Low
-  CHARGEABILITY >20mV/V
-  RESISTIVITY <500ohm-m
-  TIN GEOCHEMISTRY >25 ppm

MITRE GEOPHYSICS	
<b>LITTLE WILSON RIVER GRID ANOMALY COMPILATION</b>	
DRAWN BY : JB	FILE NO. WR 328
DRAFTSMAN: SF	FIG. 2
DATE : Oct. 82	
REVISIONS :	
SCALE 1:5000	



REF:RN/MG 82/13

