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Prospect 602

CSR LIMITED - ALUMINIUM, MINERALS AND CHEMICALS DIVISION

EXPLORATION & DEVELOPMENT GROUP

RELINQUISHMENT REPORT

PART OF E.L. 15/76

DUNDAS, TASMANIA

EMR 56/84

HOBART

JUNE 1984

P.D. ELLIS

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KEYWORDS

TASMANIA	EXPLORATION
TIN	MINERALISATION
GOLD	DRAINAGE
COPPER	SOIL
LEAD	GEOLOGY
ZINC	GEOCHEMISTRY
EL 15/76	SAMPLING
VLF-EM	DIGHEM
MAGNETICS	GEOPHYSICS
PANNED CONCENTRATES	8SK-55-03

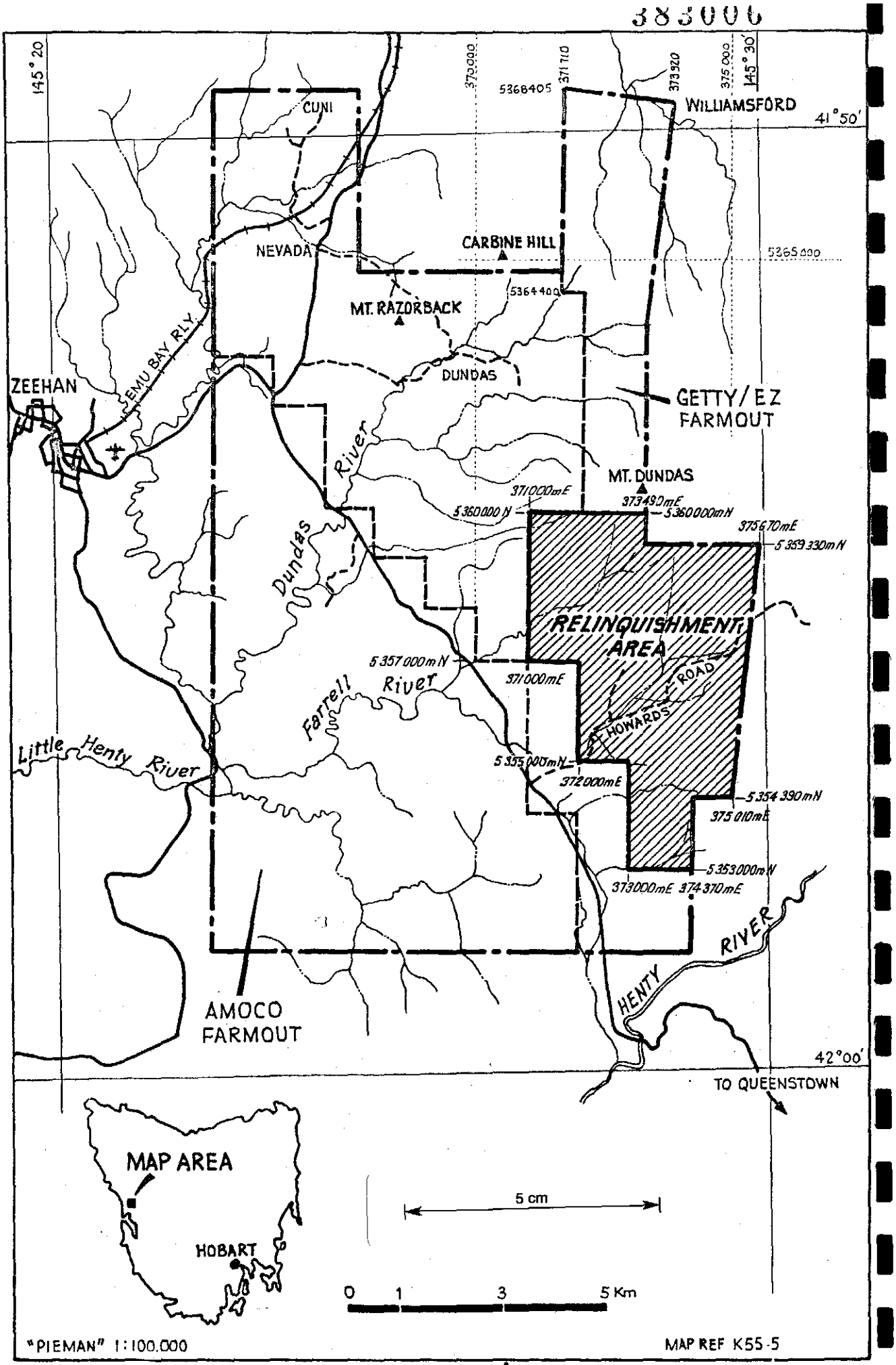

FIG. 1 LOCATION MAP E.L. 15/76 DUNDAS, TASMANIA SHOWING RELINQUISHMENT AREA

1. INTRODUCTION

Exploration Licence (EL 15/76) was granted to CSR Limited on 2nd August, 1976. The Licence covered an area of 145 km^2, centred approximately 4 km east of Zeehan on the West Coast of Tasmania. It extended south from Melba Flats and Williamsford to the Henty River and west from Mt. Dundas to the Little Henty River (Figure 1).

This area contains small silver/lead/zinc deposits (Dundas), a small tin orebody (Mt. Razorback), small copper/nickel shows (Cuni-Lead Blocks), small complex lead/antimony-rich sulphides with minor Sn, Ag, Bi, W (Montezuma) and several small lead/zinc/fluorite concentrations (Mariposa). There is also potential for silver/lead/zinc mineralisation with tin sulphides in the upper units of the Oonah Formation (Oonah Mine-type), copper/zinc/lead/silver/tin associations in the acid volcanics of the Dundas Group and Renison-style tin replacement deposits.

Prior to 1976 the area was intensely prospected by many companies and individuals as well as investigated by government researchers. Since 1976, CSR has undertaken exploration to evaluate the Licence. Recently, two portions of the Licence were joint ventured to Amoco (west of the Murchison Highway) and E.Z./Getty (northeast Montezuma area).

In April, 1984, CSR Limited decided to reduce the area of the Licence to 124 km^2 to conform to the Department of Mines revised Exploration Licence conditions. An area of 21.78 km^2 was relinquished from the southeastern corner of the Licence (Figure 1).

This report summarises all CSR Limited data relating to the area relinquished from E.L. 15/76 in 1984.

2. SUMMARY

The new conditions for Exploration Licences set by the Tasmanian Department of Mines required EL 15/76 to be reduced by 20 km^2 in August, 1984. Geochemical and geophysical exploration showed the Howards Road area to have a very low economic potential and thus could be relinquished without loss of economic potential.

Stream geochemistry (stream sediment and panned concentrates) defined an area of Au anomaly. Channel sampling of the soil profile showed the gold to be from a fluvioglacial rather than bedrock source.

Airborne EM (input and Dighem) and magnetics failed to locate any EM conductors or significant magnetic responses.

Grid soil geochemistry, magnetics and VLF-EM failed to locate any significant responses.

The area has a low economic potential and has been relinquished.

3. GENERAL INFORMATION

The area of EL 15/76 relinquished comprised a 3 by 7 km area in the southeast of the original Licence (Figure 1). The area is described as:

> Commencing at a point (AMG coordinates 5360000mN 373490mE) on the eastern boundary of EL 15/76, then west along AMG 5360000mN to coordinates 5360000mN 371000mE, then grid south to 5357000mN 371000mE, then grid east to 5357000mN 372000mE, then grid south to 5355000mN 372000mE, then grid east to 5355000mN 373000mE, then grid south to 5353000mN 373000mE, then grid east to the eastern boundary of EL 15/76, then northwards along the eastern boundary of EL 15/76 to the point of commencement.

This area is to the south of Mt. Dundas and to the east of the sealed Murchison Highway. It is traversed by the all-weather, gravel-surfaced Howards Road from which a series of tracks and tramways give reasonable access to most parts of the area.

The relinquished area is drained by tributaries of the Farrell Rivulet and the Henty River. Most of the streams are small and steep; typically "young" streams draining areas of high relief.

Vegetation cover on the Cambrian volcaniclastic sediments of the relinquished area is basically cool temperate rain forest with large areas of dense "horizontal" scrub and minor patches of dense ti-tree/sword grass/bowrah scrub.

4. PAST EXPLORATION

The relinquished area was held by Rio Tinto (EL 4/59), Costigan Mines (EL 5/63), Utah (EL 2/67), Pickands Mather (EL 12/65), A.R. Dobson (EL 6/69), McKintyre (SPL 46) and Geophoto (SPL 89, SPL 113, EL 7/68) prior to being obtained by CSR. Work completed by these companies included airborne magnetic and electromagnetic surveys and airphoto geological interpretation by Rio Tinto, an AFMAG survey by Comstaff (for Costigan Mines), detailed stream sediment sampling for Cu, Pb, Zn and Sn by McKintyre and a Turair EM survey by Geophoto.

McKintyre and Geophoto regional work located several anomalies for follow-up:

(i) a McKintyre Cu anomaly south of Howards Road 3 km east of the Murchison Highway - unrepeatable during further sampling.

(ii) a zone of Geophoto primary Turair EM anomalies south of the South Comet workings - covered by ground magnetics and VLF-EM and soil geochemistry for Cu, Pb, Zn and Ni with anomalous results over thin galena veinlets.

No further work by company geologists or government researchers showed any significant anomalies. The area was obtained by CSR in 1976 after relinquishment by Geophoto.

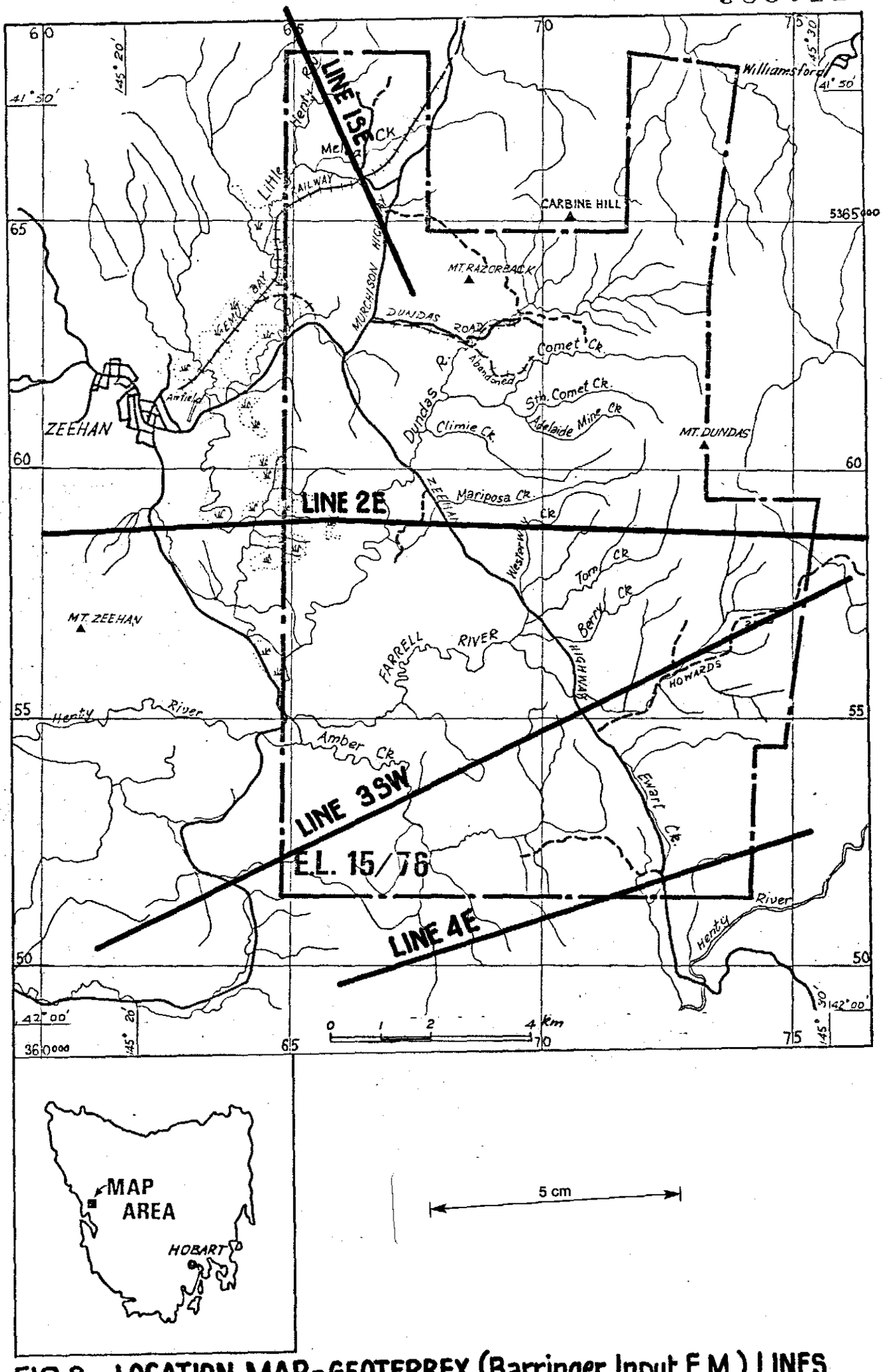

FIG.2. LOCATION MAP-GEOTERREX (Barringer Input E.M.) LINES E.L.15/76 DUNDAS TASMANIA

5. CSR EXPLORATION

An initial wide-spaced drainage sampling programme outlined an anomalous zone in the Howards Road area (Macnamara, 1979). Panned concentrates from this area showed anomalous Sn (to 300 ppm), Sb (to 3000 ppm), W (to 1000 ppm) and Ag (to 20 ppm).

Further drainage sampling in 1979 and 1981/82 defined an area of anomalous Au in the Howards Road area. The Howards Road grid was cut to cover the area of anomalous drainage. This grid was traversed with soil geochemistry, ground magnetics and VLF-EM (Macnamara, 1983).

Both Macnamara, 1979 (1976-77 drainage) and 1983 (Howards Road grid work) should be on open file and will not be discussed further. The only work not on open file from this relinquished area is the drainage sampling of the 1979-82 period, a trial Dighem survey in 1982, an airborne input EM/magnetic test in 1978 and the 1983-84 follow-up.

5.1 Airborne Input EM/Magnetic Survey

Geoterrex Pty. Ltd. flew 4 airborne input/magnetic test lines over EL 15/76 in May, 1978 (Figure 2). A Geoterrex report on this survey is included as Appendix I and on Drawing Nos. K555-21 and K555-22. CSR Chief Geophysicist's comments are included as Appendix II.

The only lines in the relinquished area are lines 2E and 3SW. On line 2E the magnetic signature shows moderate variations on the fine scale. No conductors of interest were recorded and EM response is poor on channels 5 and 6.

On line 3SW a magnetic high east of fiducial 191.30 may represent an extension of serpentinites observed on

tracks to the south. Another magnetic high at 193.10 may represent a dyke-like body.

5.2 Dighem Trial

A Dighem II airborne electromagnetic/resistivity/ magnetic survey was flown along 2 lines (42 and 43) in the relinquished area in February, 1982 (Drawing No. K555-48). This was part of a much larger survey of the northern part of the Dundas Licence.

The results from lines 42 and 43 are included as Appendix III. This shows there were no EM anomalies although there were two magnetic peaks on both lines. These peaks were in the position predicted from the input magnetic work and indicate zones of ultrabasics and geological contacts.

5.3 Drainage Sampling

The 1977-78 drainage survey (Macnamara, 1979) located an area of anomalous Sn, W, Sb, Ag drainages in the Howards Road area. Follow-up drainage sampling (Sheet K555-47) in 1979-80 located an area of anomalous Pb/Zn to the south of Mt. Dundas, an area of anomalous Ag in the central Howards Road area and an area of anomalous Au in the east central Howards Road area. Macnamara's comments on these areas are included as Appendix IV. Analyses of the samples are shown in Appendix V.

Further drainage sampling was completed in the 1981-83 period. Sample locations in the relinquished area are shown on Sheet K555-47 with analyses given in Appendix VI. Macnamara's comments on the Au anomalies are included as Appendix VII. Heavy mineral work on samples from the 1979 and 1981-83 programmes are shown in Appendices IV and VII.

TABLE 1 - HOWARDS ROAD SOIL PROFILE SAMPLE ANALYSES (PPM)

Sample No.	Sn	As	W	Cu	Pb	Zn	Ni	Co	Bi	Ag	Au	Sample Composition	Sample Location (see K555-47)
A161563	8	<2	35	10	6	4	10	<4	<4	<1	<0.005	gravel	)
A161564	8	<2	15	50	26	95	85	8	<4	<1	IS	weathered clay	) S.L. 1
A161565	6	7	<10	34	22	80	80	8	12	<1	<0.005	partially weathered in-situ sediments	)
A161566	6	5	20	38	28	65	60	6	<4	<1	<0.005	gravel	)
A161567	14	<2	10	170	42	155	65	6	<4	<1	IS	weathered clay	) S.L. 2
A161568	8	6	<10	55	20	70	55	<4	<4	<1	<0.005	partially weathered in-situ sediments	)
A161569	10	<2	20	10	6	14	20	<4	<4	<1	<0.005	gravel	)
A161570	6	<2	10	50	24	120	90	14	12	<1	IS	weathered clay	) S.L. 3
A161571	8	2	10	14	10	75	70	8	6	<1	<0.005	partially weathered in-situ sediments	)
A161572	12	5	35	28	24	46	32	4	<4	<1	<0.005	gravel	)
A161573	6	6	15	100	38	120	65	8	4	<1	IS	weathered clay	) S.L. 4
A161574	6	7	10	44	22	75	60	6	4	<1	<0.005	partially weathered in-situ sediments	)
A161575	10	<2	20	18	32	30	10	<4	<4	<1	<0.005	gravel	)
A161576	8	7	10	80	38	70	34	8	10	<1	<0.005	weathered clay	) S.L. 5
A161577	4	6	10	30	28	44	12	6	<4	<1	<0.005	partially weathered in-situ sediments	)
A161578	10	<2	30	18	16	6	<4	<4	<4	<1	<0.005	gravel	)
A161579	10	2	20	55	16	46	14	34	12	<1	<0.005	weathered clay	) S.L. 6
A161580	16	6	<10	46	32	46	28	<4	8	<1	<0.005	partially weathered in-situ sediments	)

5.4 1983-84 Exploration

Since Macnamara (1983) completed the Howards Road grid work (geochemistry and geophysics) the only other work completed was the determination of the source of the anomalous gold.

Initially, 18 samples from six road cuts along the gold anomalous area of Howards Road were taken. The three samples at each site consisted of a channel sample from the fluvioglacial gravel cover, one from the weathered clay horizon beneath the gravel horizon and one from the partially weathered in-situ sediments. These samples were analysed for Sn, As, W, Cu, Pb, Zn, Ni, Co, Bi, Ag and Au. The results (Table 1) were inconclusive as no Au values were obtained. Minor Cu and Zn anomalies occurred in the weathered clay horizon, probably due to a concentrating effect of weathering in this unit.

A further 11 samples were obtained from pits in the central part of the Au anomalies. Again, separate samples were taken from the fluvioglacial gravel cover and the partially weathered in-situ sediments. The analyses of these samples (Table 2) showed the gold to be reporting in the gravel samples and not in the in-situ sediments. No further work is required on this gold anomaly.

TABLE 2 - PIT SAMPLE ANALYSES - HOWARDS ROAD GOLD ANOMALY

Sample Location (see K555-47)	Sample Number	Au (AAS)	Au (fire assay)	Sample Composition
P.S. 1	) A118102	<0.005	0.02	gravel
	) A118103	<0.005	<0.01	shale
P.S. 2	) A118104	<0.005	0.04	gravel
	) A118105	<0.005	0.02	partially weathered shale (contaminated)
P.S. 3	) A118106	<0.005	<0.01	gravel
	) A118107	<0.005	<0.01	shale
	) A118108	<0.005	<0.01	top soil
P.S. 4	) A118109	<0.005	0.07	gravel
	) A118110	<0.005	<0.01	shale
P.S. 5	) A118111	<0.005	<0.01	shale
	) A118112	<0.005	<0.01	gravel
	) Quoted	0.057	0.057	
Standard GX1H	) A118903A	<0.005	0.045	
	) A118912A	<0.005	0.055	

Note : The samples were initially analysed using AAS and a carbon rod. However, the standards were reported with no gold. The samples were re-analysed using fire assay and gave reasonable values for the standards.

8. REFERENCES

MACNAMARA, P.M., 1979 : Drainage Sampling 1977-1978, EL 15/76, Dundas, West Tasmania
CSR Limited Report No. PMR 5/79

MACNAMARA, P.M., 1980 : The 1979 Drainage Sampling, Dundas, EL 15/76, West Tasmania
CSR Limited Report No. EMR 60/80 (unpubl.)
Note : Relevant parts included in this Report.

MACNAMARA, P.M., 1983 : Soil Sampling Magnetics and VLF-EM, Howards Road Grid, EL 15/76, Dundas
CSR Limited Report No. EMR 24/83 (unpubl.)

MACNAMARA, P.M., 1984 : Drainage Sampling 1982-1983, Dundas, EL 15/76, West Tasmania
CSR Limited Report No. EMR 21/84 (unpubl.)
Note : Relevant parts included in this Report.

PDE/SGL
June 1984

APPENDIX I

GEOTERREX REPORT - INPUT EM SURVEY

ROSEBERY AREA

613A ELIZABETH ST.,
REDFERN, N.S.W. 2016
AUSTRALIA

GEOTEX PTY. LTD.

TELEPHONE: (02) 699-6438.
TELEX: AA 25505

3rd October, 1978.

Mr. W. Langren, 4/10.
Pacminex Pty. Ltd.,
8th Floor,
O'Connell House,
15-19 Bent Street,
SYDNEY. N.S.W. 2000.

Dear Bill,

Enclosed is the report on your INPUT test near Renison. I have suggested three of the anomalies for possible followup, but two of these (on Lines 1 and 3) most probably have surficial sources. I've also commented on the terrain clearance of the aircraft and I recommend against further flying very close to Mt. Dundas. However the ground west of Mt. Dundas could be flown at approximately 150 metre clearance. If you become interested to undertake more flying in this area we could fly lines shorter than our normal minimum to keep the total kilometres down.

I will be making several trips downtown over the next few weeks to show some new INPUT test data around. I hope I can see you for lunch someday.

Yours sincerely,

Graham.

G. R. Butt.
Geophysicist.

020

383020

AIRBORNE ELECTROMAGNETIC SURVEY

BARRINGER INPUT SYSTEM

of

ROSEBERY AREA

TASMANIA

for

PACMINEX PTY. LIMITED.,

by

GEOTERREX PTY. LIMITED.,

(83-287)

SYDNEY, AUSTRALIA

SEPTEMBER, 1979.

I. INTRODUCTION

An airborne INPUT/magnetic test was flown for Pacminex Pty. Limited near Rosebery, Tasmania on May 16, 1979 from an operational base at Devonport, Tasmania. The test consisted of four lines flown with various orientations and was designed to test the performance of the aircraft and the INPUT system south of Renison Bell. A total of 39 kilometres was flown, with some portions of lines being aborted due to the very rugged terrain.

The survey was conducted with a Super Canso PBY-5A, under registration VH-EXG, which is operated by Executive Air Services on charter to Geoterrex Pty. Ltd. It was equipped with a Barringer Mark V INPUT system, a Geometrics 803 nuclear precession magnetometer, a Honeywell visicorder, a Bonzer TRH-70 radar altimeter, a 50Hz monitor and a Geocam 35 mm continuous strip tracking camera.

Navigation was by visual means utilizing individual air photo at a scale of 1:40,000.

II. PERSONNEL

The following Geoterrex personnel participated in the test survey :

Pilot	: John Edwards
Co-Pilot	: C. Moody
Aircraft Engineer	: T. Duggan
Electronics Technician	: L. Williams J. Da Costa
Data Compiler	: K. Thomas
Geophysicists	: T. Whiting G. Butt.

III. DATA PRESENTATION

The original geophysical analogue records are presented in a folder and the pertinent EM anomalies recorded are portrayed on field drawn overlays to the flight path, recovered onto the air photographs. INPUT anomalies are plotted according to Geoterrex normal procedure. The flight logs allow cross reference between the analogue data, the flight film and the path recovery.

IV. INTERPRETATION

A normal interpretation involving line to line correlation of conductors and geology has not been attempted owing to the large separation of the flight lines.

Line 1-SE

This line is the one flown closest to Renison Bell. It displays an ideal low conductivity background for EM exploration, as do the other three lines. A very sharp response has been recorded at Fid 183.16 near a magnetic inflection. The anomaly is too wide on the late channels to be caused by a man made source, but the apparent conductivity is not high enough to indicate a favourable bedrock conductor. The source is possibly a narrow conductive fault zone.

The average altitude on this line is 140 metres, although the northern end of the line was flown close to 130 metres.

Line 2-E

There is no conductor of interest recorded on this line. The average terrain clearance is 145 metres, with the eastern end of the line flown at approximately 200 metres due to a ridge on the southern side of Mt. Dundas.

Line 3-SW

Several weak, fast decaying anomalies are recorded on Line 3. Of potential interest are the responses at Fid 196.69 (15/0.5) at Fid 202.35 (82/2.9) and at Fid 203.20 (36/2.5)

The anomaly at Fid 196.69 has a narrow response on channel four, but its decay rate is rather fast, indicating intermediate to low conductivity.

The other two anomalies are recorded off the airphoto at the end of the flight line. The large amplitude recorded at Fid 202.35 indicates a near surface source. The more interesting of the two anomalies is recorded at Fid 203.00 since it indicates a highly conductive source. However it was flown rather high at 210 metres and the amplitude, being rather large, suggests a surficial source as well.

The average terrain clearance on this line is 115 metres, if the northeast end of the line is not taken into account. Here the average was closer to 180 metres and this terrain represents a difficult contouring problem.

Line 4-NE

The only response of any interest on this line is recorded at Fid 206.15. It is a very sharp four channel anomaly. It's character suggests a possible cultural source, but the location is quite remote and a bedrock source could be the cause.

The average terrain clearance of this line is close to 150 metres, with the eastern end closer to 180 metres.

V. CONCLUSIONS

1. The area covered by the four test lines has proven to be generally resistive and is ideal for airborne EM exploration for massive sulphides or tin - pyrrhotite deposits.

2. The contouring performance of the Super Canso allowed an average terrain clearance of 150 metres west of the road skirting Mt. Dundas. This height would still provide a depth penetration of at least 100 metres. On the immediate slopes of

Mt. Dundas, however a terrain clearance of 150 metres could not be maintained. Any flying in this area would probably be at 200 metres plus, and the depth penetration at this altitude would be only of the order of 40 metres.

3. The following responses are recommended for further investigation, although the lack of detailed coverage makes interpretation somewhat unreliable:

Line 1 SE	Fid 183.16	46/1.2
Line 3 SW	Fid 203.20	36/2.5
Line 4 NE	Fid 206.45	5/0.2

Respectfully Submitted,

G. R. Butt.

INSTRUMENT SPECIFICATIONS

MARK V INPUT SYSTEM

TRANSMITTER: Pulse Width : 0.8

Pulse separation : 2.67msecs.

RECEIVER:

CHANNEL	GATE CENTRE (usec)	GATE WIDTH (usec)	CALIBRATION 2mV per
1	350	200	2.0"
2	550	200	2.0"
3	750	400	3.0"
4	1150	400	3.0"
5	1550	600	3.0"
6	1950	600	3.0"

Primary field at cable amplifier input = 1.5V

MAGNETOMETER: Geometrics Model 803.

	Sensitivity	Scale
Fine Scale : 200nT Full Scale	± 2nT	inch 40nT
Coarse Scale : 2000nT Full Scale	± 20nT	inch 400nT

Total field increases upwards.

Magnetometer reads every 1.0 sec.

ALTIMETER: Model Bonzer TRN-70

Approximate scale : 1 inch = 60 metres approximately.

Height increases downwards.

FIDUCIAL SYSTEM:

1 fiducial = 20 secs = 20 magnetometer readings.

INPUT lag = 4.0 secs = 0.2 fiducials.

APPENDIX II

MEMORANDUM FROM W.J. LANGRON

INPUT FLIGHTS, DUNDAS AREA

383028

PACMINEX PTY. LIMITED

MEMORANDUM TO: MR. P.M. MACNAMARA, ZEEHAN. OUR REF: WJL/SS/602

FROM: W.J. LANGRON DATE: 31st May, 1978.

INPUT FLIGHTS, DUNDAS AREA, TASMANIA

Mr. Vicary and I have examined the edited flight tapes in relation to the flight paths and known geology and he has passed the essential information to you for consideration before your return if you can manage it.

There are some annotations on the tapes which I do not understand and these will have to wait clarification until Graham Butt's return to Sydney early in June. However, there are several conductors indicated on the flight lines. Generally these are broad, of poor conductivity and do not extend beyond the 3rd or 4th channel; often they have a "lean" (e.g. at fid. 200 on L3SW/1). Taken together, these characteristics suggest broad conductive zones and/or conductive overburden. Many of these anomalies, too, are associated with extreme variations in aircraft height and/or excessive altitude. The locations of these conductive zones should be examined in terms of geological boundaries.

There are some INPUT anomalies of particular interest. One is located at fid.183.15 on L-1SE/1. The anomaly is narrow, sharp and large amplitude in the 1st channel. It is almost certainly a cultural feature and plots on a bridge on the old Zeehan-Melba Flats railway line. There is an associated small magnetic anomaly on the shoulder of a large amplitude, broad magnetic anomaly due presumably to gabbro-serpentine rocks. Neither Mr. Vicary or I remember the railway line still being in place and it is desirable that the exact location of the anomaly be pinpointed from the strip film before making a final assessment of it.

The INPUT anomaly at fid.202.35 on L-3SW/1 is also narrow but has higher 1st channel amplitude and better conductivity than the first anomaly discussed. It is coincident with a small, isolated magnetic anomaly and should be examined on the ground. The anomaly location is just off the edge of the airphoto provided and probably occurs in shales; it lies outside our lease area. A poorer quality INPUT anomaly at fid.200.0 on this flight line appears to be located in a similar shale environment but does not have an associated magnetic anomaly.

The only other INPUT anomaly of interest is located about fid.207.3 on L-4NE/4. The anomaly itself is broad, ill-defined but with reasonable conductivity. Its possible attraction is its closeness to a well-defined magnetic anomaly. It may represent a contact situation or it may be too far removed from the magnetic body to be related to it. The location is about the Zeehan-Queenstown road and should be inspected for possible interest.

The value of the magnetics could be established only by flying some sort of regular pattern. Some anomalies (e.g. that at fid.193.1 on L-3SW/1) are obviously dyke-like intrusives and lend themselves to depth estimates. Other large magnetic variations (such as on L-1SE/1 and L-2E/1) are due to deeper related sources or larger bodies.

For most of the work flown the aircraft was within altitude tolerance, but the most prospective portions of the area had to be left out of the programme because of rugged topography. Obviously HEM-400 could cover more of the country but it is questionable whether the results would be any more meangingful than those we have from INPUT. Any ground follow-up of the INPUT anomalies discussed above will help us in our decision regarding further airborne EM work at Dundas.

W.J. LANGRON

c.c. M.J. Vicary

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APPENDIX III

DIGHEM II SURVEY OF ZEEHAN AREA

REPORT NO. 355

DIGHEM^{II} SURVEY

OF

ZEEHAN AREA, TASMANIA

FOR

C.S.R. LIMITED (MINERALS DIVISION)

BY

DIGHEM LIMITED

W.S. PETERS
GEOPHYSICIST

D.C. FRASER
PRESIDENT

TORONTO, CANADA
APRIL 28, 1982

SUMMARY

A DIGHEM^{II} airborne electromagnetic/resistivity/magnetic survey totalling 276 line-km was flown for CSR Limited (Minerals Division) near Zeehan, Tasmania during February 1982.

The environment in the survey area varied from resistive to highly conductive. EM and resistivity anomalies occurred due to culture, bedrock conductors, and conductive overburden.

A number of targets have been located which warrant ground follow-up work.

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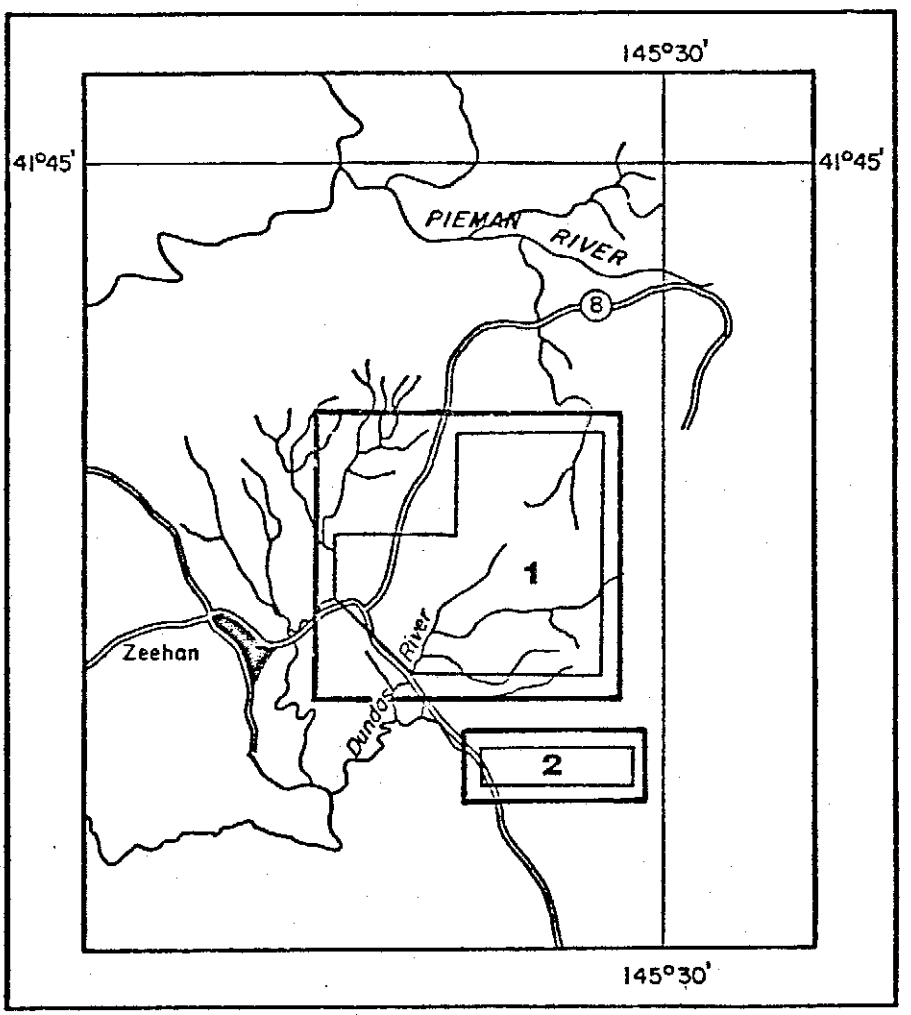
LOCATION MAP



Scale 1:250,000

Figure 1 The Survey Area

5 cm

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INTRODUCTION

A DIGHEM^{II} survey of 276 line-km was flown with a 200 m line-spacing for CSR Limited (Minerals Division), from February 22 to February 24, 1982 in the Zeehan area, Tasmania (Figure 1).

The Lama VH-BQT turbine helicopter flew with an average airspeed of 110 km/h and EM bird height of 36 m. Ancillary equipment consisted of a Geometrics 803 magnetometer with its bird at an average height of 51 m, a Sperry radio altimeter, Geocam sequence camera, Barringer 8-channel hot pen analog recorder, and a Geometrics G-714 digital data acquisition system with a Kennedy 9700 9-track 800-bpi magnetic tape recorder. The analog equipment recorded four channels of EM data at approximately 900 Hz, two ambient EM noise channels (for the coaxial and coplanar receivers), and one channel each of magnetics and radio altitude. The digital equipment recorded the EM data with a sensitivity of 0.25 ppm/bit and the magnetic field to one gamma/bit.

Appendix A provides details on the data channels, their respective noise levels, and the data reduction procedure. The quoted noise levels are generally valid for wind speeds up to 35 km/h. Higher winds may cause the system to be grounded because excessive bird swinging

produces difficulties in flying the helicopter. The swinging results from the 5 m^2 of area which is presented by the bird to broadside gusts. The DIGHEM system nevertheless can be flown under wind conditions that seriously degrade other AEM systems.

ELECTROMAGNETICS

DIGHEM electromagnetic responses fall into two general classes, discrete and broad. The discrete class consists of sharp, well defined anomalies from discrete conductors such as sulfide lenses and steeply dipping sheets of graphite and sulfides. The broad class consists of wide anomalies from conductors having a large horizontal surface such as flatly dipping graphite or sulfide sheets, saline water-saturated sedimentary formations, conductive overburden and rock, and geothermal zones. A vertical conductive slab with a width of 100 m would straddle these two classes.

The vertical sheet (half plane) is the most common model used for the analysis of discrete conductors. All anomalies plotted on the electromagnetic map are interpreted according to this model. The following section entitled Discrete conductor analysis describes this model in detail,

including the effect of using it on anomalies caused by broad conductors such as conductive overburden.

The conductive earth (half space) model is suitable for broad conductors. Resistivity contour maps result from the use of this model. A later section entitled Resistivity mapping describes the method further, including the effect of using it on anomalies caused by discrete conductors such as sulfide bodies.

Discrete conductor analysis

The EM anomalies appearing on the electromagnetic map are interpreted by computer to give the conductance (i.e., conductivity-thickness product) in mhos of a vertical sheet model. DIGHEM anomalies are divided into six grades of conductance, as shown in Table I. The conductance in mhos is the reciprocal of resistance in ohms.

Table I. EM Anomaly Grades

Anomaly Grade	Mho Range
6	$\geq$ 100
5	50 - 99
4	20 - 49
3	10 - 19
2	5 - 9
1	< 5

The mho value is a geological parameter because it is a characteristic of the conductor alone; it generally is independent of frequency, and of flying height or depth of burial apart from the averaging over a greater portion of the conductor as height increases.[1] Small anomalies from deeply buried strong conductors are not confused with small anomalies from shallow weak conductors because the former will have larger mho values.

Conductive overburden generally produces broad EM responses which are not plotted on the EM maps. However, patchy conductive overburden in otherwise resistive areas can yield discrete-like anomalies with a conductance grade (cf. Table I) of 1, or even of 2 for conducting clays which have resistivities as low as 50 ohm-m. In areas where ground resistivities can be below 1 ohm-m, anomalies caused by weathering variations and similar causes can have any conductance grade. The anomaly shapes from the multiple coils often allow such surface conductors to be recognized, and these are indicated by the letter S on the map. The remaining anomalies in such areas could be bedrock

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[1]This statement is an approximation. DIGHEM, with its short coil separation, tends to yield larger and more accurate mho values than airborne systems having a larger coil separation.

conductors. The higher grades indicate increasingly higher conductances. Examples: DIGHEM's New Insco copper discovery (Noranda, Quebec, Canada) yielded a grade 4 anomaly, as did the neighbouring copper-zinc Magusi River ore body; Mattabi (copper-zinc, Sturgeon Lake, Ontario, Canada) and Whistle (nickel, Sudbury, Ontario, Canada) gave grade 5; and DIGHEM's Montcalm nickel-copper discovery (Timmins, Ontario, Canada) yielded a grade 6 anomaly. Graphite and sulfides can span all grades but, in any particular survey area, field work may show that the different grades indicate different types of conductors.

Strong conductors (i.e., grades 5 and 6) are characteristic of massive sulfides or graphite. Moderate conductors (grades 3 and 4) typically reflect sulfides of a less massive character or graphite, while weak bedrock conductors (grades 1 and 2) can signify poorly connected graphite or heavily disseminated sulfides. Grade 1 conductors may not respond to ground EM equipment using frequencies less than 2000 Hz.

The presence of sphalerite or gangue can result in ore deposits having weak to moderate conductances. As an example, the three million ton lead-zinc deposit of Restigouche Mining Corporation near Bathurst, New Brunswick,

Canada, yielded a well defined grade 1 conductor. The 10 percent by volume of sphalerite occurs as a coating around the fine grained massive pyrite, thereby inhibiting electrical conduction.

Faults, fractures and shear zones may produce anomalies which typically have low conductances (e.g., grades 1 and 2). Conductive rock formations can yield anomalies of any conductance grade. The conductive materials in such rock formations can be salt water, weathered products such as clays, original depositional clays, and carbonaceous material.

On the electromagnetic map, the actual mho value and a letter are plotted beside the EM grade symbol. The letter is the anomaly identifier. The horizontal rows of dots, beside each anomaly symbol, indicate the anomaly amplitude on the flight record. The vertical column of dots gives the estimated depth. In areas where anomalies are crowded, the identifiers, dots and mho values may be obliterated. The EM grade symbols, however, will always be discernible, and the obliterated information can be obtained from the anomaly listing appended to this report.

The purpose of indicating the anomaly amplitude by dots is to provide an estimate of the reliability of the conductance calculation. Thus, a conductance value obtained from a large ppm anomaly (3 or 4 dots) will tend to be accurate whereas one obtained from a small ppm anomaly (no dots) could be quite inaccurate. The absence of amplitude dots indicates that the anomaly from the coaxial coil-pair is 5 ppm or less on both the inphase and quadrature channels. Such small anomalies could reflect a weak conductor at the surface or a stronger conductor at depth. The mho value and depth estimate will illustrate which of these possibilities fits the recorded data best.

Flight line deviations occasionally yield cases where two anomalies, having similar mho values but dramatically different depth estimates, occur close together on the same conductor. Such examples illustrate the reliability of the conductance measurement while showing that the depth estimate can be unreliable. There are a number of factors which can produce an error in the depth estimate, including the averaging of topographic variations by the altimeter, overlying conductive overburden, and the location and attitude of the conductor relative to the flight line. Conductor location and attitude can provide an erroneous depth estimate because the stronger part of the conductor may be

deeper or to one side of the flight line, or because it has a shallow dip. A heavy tree cover can also produce errors in depth estimates. This is because the depth estimate is computed as the distance of bird from conductor, minus the altimeter reading. The altimeter can lock on the top of a dense forest canopy. This situation yields an erroneously large depth estimate but does not affect the conductance estimate.

Dip symbols are used to indicate the direction of dip of conductors. These symbols are used only when the anomaly shapes are unambiguous, which usually requires a fairly resistive environment.

A further interpretation is presented on the EM map by means of the line-to-line correlation of anomalies, which is based on a comparison of anomaly shapes on adjacent lines. This provides conductor axes which may define the geological structure over portions of the survey area. The absence of conductor axes in an area implies that anomalies could not be correlated from line to line with reasonable confidence.

DIGHEM electromagnetic maps are designed to provide a correct impression of conductor quality by means of the conductance grade symbols. The symbols can stand alone with

geology when planning a follow-up program. The actual mho values are plotted for those who wish quantitative data. The anomaly ppm and depth are indicated by inconspicuous dots which should not distract from the conductor patterns, while being helpful to those who wish this information. The map provides an interpretation of conductors in terms of length, strike direction, conductance, depth, thickness (see below), and dip. The accuracy is comparable to an interpretation from a high quality ground EM survey having the same line spacing.

An EM anomaly list attached to each survey report provides a tabulation of anomalies in ppm, and in mhos and estimated depth for the vertical sheet model. The EM anomaly list also shows the conductance in mhos and the depth for a thin horizontal sheet (whole plane) model, but only the vertical sheet parameters appear on the EM map. The horizontal sheet model is suitable for a flatly dipping thin bedrock conductor such as a sulfide sheet having a thickness less than 15 m. The list also shows the resistivity and depth for a conductive earth (half space) model, which is suitable for thicker slabs such as thick conductive overburden. In the EM anomaly list, a depth value of zero for the conductive earth model, in an area of thick cover, warns that the anomaly may be caused by conductive overburden.

Since discrete bodies normally are the targets of EM surveys, local base (or zero) levels are used to compute local anomaly amplitudes. This contrasts with the use of true zero levels which are used to compute true EM amplitudes. Local anomaly amplitudes are shown in the EM anomaly list and these are used to compute the vertical sheet parameters of conductance and depth. Not shown in the EM anomaly list are the true amplitudes which are used to compute the horizontal sheet and conductive earth parameters.

X-type electromagnetic responses

DIGHEM^{II} maps contain x-type EM responses in addition to EM anomalies. An x-type response is below the noise threshold of 3 ppm, and reflects one of the following: a weak conductor near the surface, a strong conductor at depth (e.g., 100 to 120 m below surface) or to one side of a flight line, or aerodynamic noise. Those responses that have the appearance of valid bedrock anomalies on the flight profiles are mentioned in the report. The others should not be followed up unless their locations are of considerable geological interest.

The thickness parameter

DIGHEM^{II} can provide an indication of the thickness of a steeply dipping conductor. The ratio of the anomaly amplitude of channel 24/channel 22 generally increases as the apparent thickness increases, i.e., the thickness in the horizontal plane along the flight line. This thickness is equal to the conductor width if the conductor dips at 90 degrees and strikes at right angles to the flight line. This report refers to a conductor as thin when the thickness is likely to be less than 3 m, and thick when in excess of 10 m. In base metal exploration applications, thick conductors can be high priority targets because most massive sulfide ore bodies are thick, whereas non-economic bedrock conductors are usually thin. An estimate of thickness cannot be obtained when the strike of the conductor is subparallel to the flight line, when the conductor has a shallow dip, when the anomaly amplitudes are small, or when the resistivity of the environment is below 100 ohm-m.

Resistivity mapping

Areas of widespread conductivity are commonly encountered during surveys. In such areas, anomalies can be generated by decreases of only 5 m in survey altitude as

well as by increases in conductivity. The typical flight record in conductive areas is characterized by inphase and quadrature channels which are continuously active; local peaks reflect either increases in conductivity of the earth or decreases in survey altitude. For such conductive areas, apparent resistivity profiles and contour maps are necessary for the interpretation of the airborne data. The advantage of the resistivity parameter is that anomalies caused by altitude changes are virtually eliminated, so the resistivity data reflect only those anomalies caused by conductivity changes. This helps the interpreter to differentiate between conductive trends in the bedrock and those patterns typical of conductive overburden. Discrete conductors will generally appear as narrow lows on the contour map and broad conductors will appear as wide lows.

Channel 40 (see Appendix) and the resistivity contour map present the apparent resistivity using the so-called pseudo-layer (or buried) half space model defined in Fraser (1978)[2]. This model consists of a resistive layer overlying a conductive half space. Channel 41 gives the apparent depth below surface of the conductive material.

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[2]Resistivity mapping with an airborne multicoil electromagnetic system: Geophysics, v 43, p. 144-172.

The apparent depth is simply the apparent thickness of the overlying resistive layer. The apparent depth (or thickness) parameter will be positive when the upper layer is more resistive than the underlying material, in which case the apparent depth may be quite close to the true depth.

The apparent depth will be negative when the upper layer is more conductive than the underlying material, and will be zero when a homogeneous half space exists. The apparent depth parameter must be interpreted cautiously because it will contain any errors which may exist in the measured altitude of the EM bird (e.g., as caused by a dense tree cover). The inputs to the resistivity algorithm are the inphase and quadrature components of the coplanar coil-pair. The outputs are the apparent resistivity of the conductive half space (the source) and the sensor-source distance. The flying height is not an input variable, and the output resistivity and sensor-source distance are independent of the flying height. The apparent depth, discussed above, is simply the sensor-source distance minus the measured altitude or flying height. Consequently, errors in the measured altitude will affect the apparent depth parameter but not the apparent resistivity parameter.

The apparent depth parameter is a useful indicator of simple layering in areas lacking a heavy tree cover. The DIGHEM^{II} system has been flown for the purpose of permafrost mapping, where positive apparent depths were used as a measure of permafrost thickness. However, little quantitative use has been made of negative apparent depths because the absolute value of the negative depth is not a measure of the thickness of the conductive upper layer and, therefore, is not meaningful physically. Qualitatively, a negative apparent depth estimate usually shows that the EM anomaly is caused by conductive overburden. Consequently, the apparent depth channel 41 can be of significant help in distinguishing between overburden and bedrock conductors.

Interpretation in conductive environments

Environments having background resistivities below 30 ohm-m cause all airborne EM systems to yield very large responses from the conductive ground. This usually prohibits the recognition of bedrock conductors. The processing of DIGHEM^{II} data, however, produces six channels which contribute significantly to the recognition of bedrock conductors. These are the inphase and quadrature difference channels (#33 and 34), the resistivity and depth channels (#40 and 41), the conductivity contrast channel (#42), and the product of the conductivity contrast and depth contrast channels (#44).

The EM difference channels (33 and 34) eliminate up to 99% of the response of conductive ground, leaving responses from bedrock conductors, cultural features (e.g., telephone lines, fences, etc.) and edge effects. An edge effect arises when the conductivity of the ground suddenly changes, and this is a source of geologic noise. While edge effects yield anomalies on the EM difference channels, they do not produce resistivity anomalies. Consequently, the resistivity channel aids in eliminating anomalies due to edge effects. On the other hand, resistivity anomalies will coincide with the most highly conductive sections of conductive ground, and this is another source of geologic noise. The recognition of a bedrock conductor in a highly conductive environment therefore is based on the anomalous responses of the two difference channels (33 and 34) and the resistivity channel (40). The most favourable situation is where anomalies coincide on all three channels.

Channel 41, which is the apparent depth to the conductive material, also helps determine whether a conductive response arises from surficial material or from a conductive zone in the bedrock. When this channel rides above the zero level on the electrostatic chart paper (i.e., it is negative), it implies that the EM and resistivity profiles are responding primarily to a conductive upper layer, i.e.,

conductive overburden. If channel 41 is below the zero level, it indicates that a resistive upper layer exists, and this usually implies the existence of a bedrock conductor.

The conductivity contrast channel (#42) highlights local resistivity lows. This channel, and the depth contrast (#43), both yield positive anomalies from conductors at depth. Channel 44 is the multiple 42*43 and it is highly sensitive to conductors at depth. The interpretation of channels 42 and 44 has to be done carefully, however, because they may also respond in a similar fashion to a local thickening in the conductive cover as, for example, over a buried river channel. Channels 42 and 43 are derived from channels 40 and 41 using digital filter techniques.

Channels 35, 36 and 42 are the anomaly recognition functions. They are used to trigger the conductance channel 37 which identifies discrete conductors. In highly conducting environments, channel 36 is deactivated because it is subject to corruption by highly conductive earth signals. Some of the automatically selected anomalies (channel 37) are discarded by the human interpreter. The automatic selection algorithm is intentionally oversensitive to assure that no meaningful responses are missed. The interpreter then classifies the anomalies according to their source and eliminates those that are not substantiated by

the data, such as those arising from geologic or aerodynamic noise.

The resistivity map often yields more useful information on conductivity distributions than the EM map. In comparing the EM and resistivity maps, keep in mind the following:

(a) The resistivity map portrays the absolute value of the earth's resistivity.

(b) The EM map portrays anomalies in the earth's resistivity. An anomaly by definition is a change from the norm and so the EM map displays anomalies, (i) over narrow, conductive bodies and (ii) over the boundary zone between two wide formations of differing conductivity.

The resistivity map might be likened to a total field map and the EM map to a horizontal gradient in the direction of flight[3]. Because gradient maps are usually more sensitive than total field maps, the EM map therefore is to be

[3]The gradient analogy is only valid with regard to the identification of anomalous locations. The calculation of conductance is based on EM amplitudes relative to a local base level, rather than to an absolute zero level as for the resistivity calculation.

preferred in resistive areas. However, in conductive areas, the absolute character of the resistivity map usually causes it to be more useful than the EM map.

Reduction of geologic noise

Geologic noise refers to unwanted geophysical responses. For purposes of airborne EM surveying, geologic noise refers to EM responses caused by conductive overburden and magnetic permeability. It was mentioned above that the EM difference channels (i.e., channel 33 for inphase and 34 for quadrature) tend to eliminate the response of conductive overburden. This marked a unique development in airborne EM technology, as DIGHEM^{II} is the only EM system which yields channels having an exceptionally high degree of immunity to conductive overburden.

Magnetite produces a form of geological noise on the inphase channels of all EM systems. Rocks containing less than 1% magnetite can yield negative inphase anomalies caused by magnetic permeability. When magnetite is widely distributed throughout a survey area, the inphase EM channels may continuously rise and fall reflecting variations in the magnetite percentage, flying height, and overburden thickness. This can lead to difficulties in recognizing

deeply buried bedrock conductors, particularly if conductive overburden also exists. However, the response of broadly distributed magnetite generally vanishes on the inphase difference channel 33. This feature can be a significant aid in the recognition of conductors which occur in rocks containing accessory magnetite.

EM magnetite mapping

The information content of DIGHEM^{II} data consists of a combination of conductive eddy current response and magnetic permeability response. The secondary field resulting from conductive eddy current flow is frequency-dependent and consists of both inphase and quadrature components, which are positive in sign. On the other hand, the secondary field resulting from magnetic permeability is independent of frequency and consists of only an inphase component which is negative in sign. When magnetic permeability manifests itself by decreasing the measured amount of positive inphase, its presence may be difficult to recognize. However, when it manifests itself by yielding a negative inphase anomaly (e.g., in the absence of eddy current flow), its presence is assured. In this latter case, the negative component can be used to estimate the percent magnetite content.

A magnetite mapping technique was developed for the coplanar coil-pair of DIGHEM^{II}. The technique yields channel 50 which displays apparent weight percent magnetite according to a homogeneous half space model. The method can be complementary to magnetometer mapping in certain cases. Compared to magnetometry, it is far less sensitive but is more able to resolve closely spaced magnetite zones, as well as providing an estimate of the amount of magnetite in the rock. The method is sensitive to 1/4% magnetite by weight when the EM sensor is at a height of 30 m above a magnetitic half space. It can individually resolve steeply dipping narrow magnetite-rich bands which are separated by 60 m.

The EM magnetite mapping technique provides estimates of magnetite content which are usually correct within a factor of 2 when the magnetite is fairly uniformly distributed. EM magnetite maps can be generated when magnetic permeability is evident as indicated by anomalies in channel 50.

The EM magnetite algorithm is basically quite simple because a linear relationship exists between volume percent magnetite and the negative inphase response in ppm. This linear relationship is true for a fixed survey altitude when

demagnetization effects are disregarded and when a fixed susceptibility-volume percent relationship is assumed. The technique in practice involves, first, correcting the actual EM response for variations in flying altitude and, second, calibrating the negative inphase ppms in terms of volume percent magnetite.

EM magnetite mapping provides another method of airborne geologic mapping. It thus joins resistivity mapping, magnetometer mapping, spectrometry, photogeology, etc., as a possible means by which geologic information can be obtained from airborne techniques. It is not nearly as useful in the general sense as the other airborne mapping techniques, but can be of value in cases where the magnetite content gives an indication of lithology.

Like magnetometry, the EM magnetite method maps only bedrock features, provided that the overburden is characterized by a general lack of magnetite. This contrasts with resistivity mapping which portrays the combined effect of bedrock and overburden.

MAGNETICS

The existence of a magnetic correlation with an EM anomaly is indicated directly on the EM map. An EM anomaly with magnetic correlation has a greater likelihood of being produced by sulfides than one that is non-magnetic. However, sulfide ore bodies may be non-magnetic (e.g., the Kidd Creek deposit near Timmins, Ontario, Canada) as well as magnetic (e.g., the Mattabi deposit near Sturgeon Lake, Ontario).

The magnetometer data are digitally recorded in the aircraft to an accuracy of one gamma. The digital tape is processed by computer to yield a standard total field magnetic map which is usually contoured at 25 gamma intervals. The magnetic data also are treated mathematically to enhance the magnetic response of the near-surface geology, and an enhanced magnetic map is produced with a 100 gamma contour interval. The response of the enhancement operator in the frequency domain is shown in Figure 2. The 100 gamma contour interval is equivalent to a 5 gamma interval for the passband components of the airborne data. This is because these components are amplified 20 times by the operator of Figure 2.

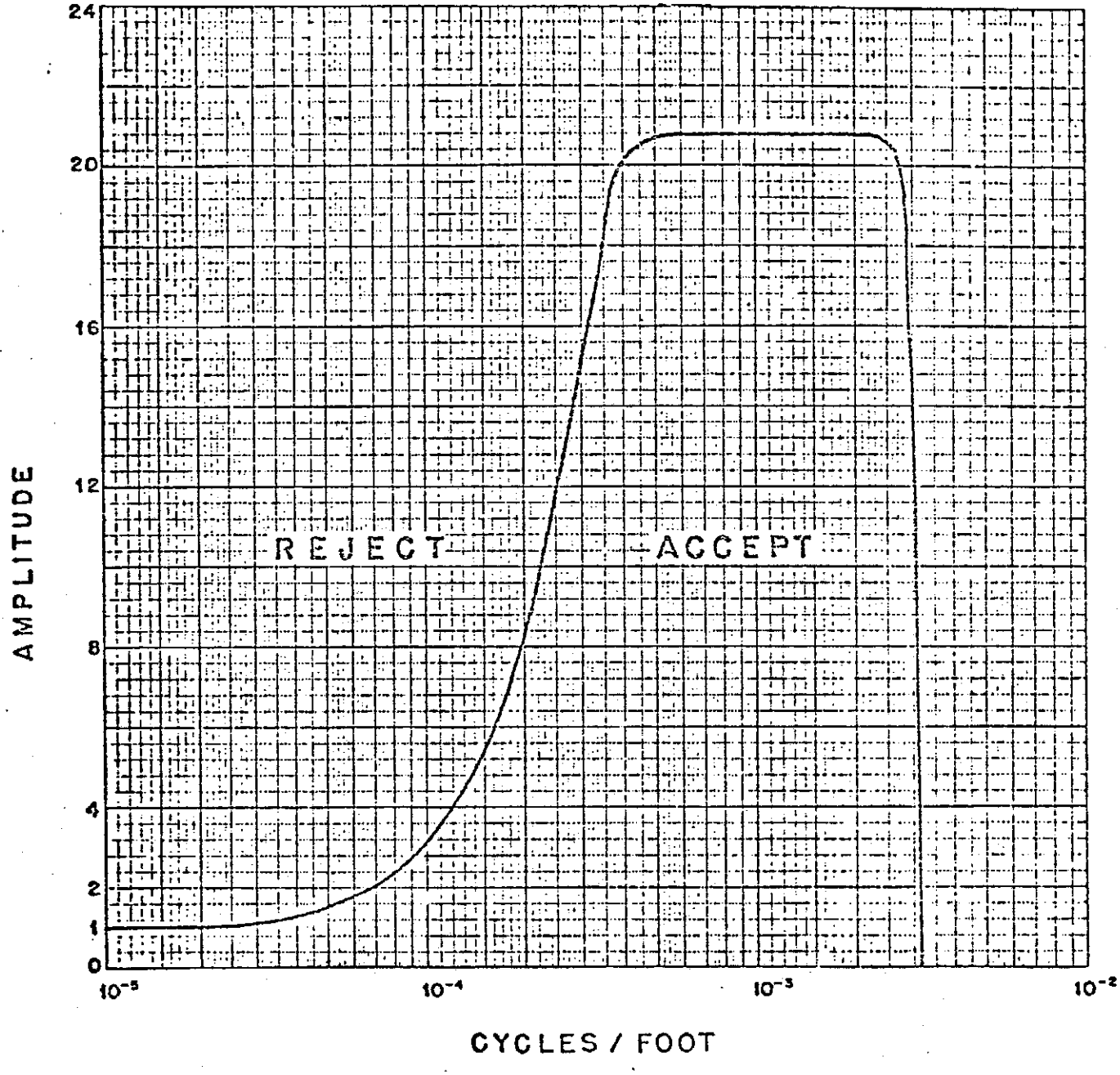

Figure 2 Frequency response of magnetic operator

The enhanced map, which bears a resemblance to a downward continuation map, is produced by digital bandpass filtering the total field data. The enhancement is equivalent to continuing the field downward to a level (above the source) which is 1/20th of the actual sensor-source distance.

Because the enhanced magnetic map bears a resemblance to a ground magnetic map, it simplifies the recognition of trends in the rock strata and the interpretation of geological structure. The contour interval of 100 gammas is suitable for defining the near-surface local geology while de-emphasizing deep-seated regional features.

CONDUCTORS IN THE SURVEY AREA

The electromagnetic map shows the locations of conductors and their interpreted conductance (i.e., conductivity-thickness product), depth and, occasionally, dip. Their strike direction and length are also shown when anomalies can be correlated from line to line. When studying the maps for follow-up planning, consult the anomaly listings appended to this report to ensure that none of the conductors are overlooked.

The survey consisted of one main block (Sheet 1) east of Zeehan, Tasmania and two test lines (Sheet 2) about 3 km south of the main block. The flight line direction was always east-west. The amounts flown are as indicated below:

Area	Line-spacing	Line-number	Line-km
Sheet 1	200 m	1 - 41	265.0
Sheet 2	2,000 m	42 - 43	11.0
TOTAL			276.0

The EM maps indicate which anomalies are believed to be caused by cultural or surficial sources. Generally, such anomalies are not commented on below as the discussions are directed to identifying bedrock features.

Sheet 2

This sheet contains two test lines (42 and 43) flown east-west 2 km apart. There are no magnetic, enhanced magnetic, or resistivity contour maps as the data are too sparse for contouring.

The magnetic profiles show several distinct peaks on both lines.

The resistivity profiles show no values below 1000 ohm-m on line 42. There are several minor conductive overburden responses on line 43.

The EM anomaly map has no anomalies and has only been produced to provide a record of the flight path.

Respectfully submitted,
DIGHEM LIMITED

W.S. Peters
Geophysicist

D.C. Fraser
President

Five map sheets accompany this report.

Electromagnetics	2 map sheets
Resistivity	1 map sheet
Magnetics	1 map sheet
Enhanced magnetics	1 map sheet

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APPENDIX A

THE FLIGHT RECORD AND PATH RECOVERY

Both analog and digital flight records are produced. The analog profiles are recorded on green chart paper in the aircraft during the survey. The digital profiles are generated later by computer and plotted on electrostatic chart paper at 1:15,000 or at map scale, whichever is larger. The digital profiles, which may be displayed, are as follows:

Channel Number	Parameter	Scale units/mm
20	magnetics	10 gamma
21	bird height	3 m
22	vertical coaxial coil-pair inphase (freq #1)	1 ppm
23	vertical coaxial coil-pair quadrature (freq #1)	1 ppm
24	horizontal coplanar coil-pair inphase (freq #2)	1 ppm
25	horizontal coplanar coil-pair quadrature (freq #2)	1 ppm
26	VLF-EM total field	1 %
27	VLF-EM vertical quadrature	1 %
28	ambient noise monitor (coaxial receiver)	1 ppm
29	ambient noise monitor (coplanar receiver)	1 ppm
33	difference function inphase from channels 22 and 24	1 ppm
34	difference function quadrature from channels 23 and 25	1 ppm
35	first anomaly recognition function	1 ppm
36	second anomaly recognition function	1 ppm
37	conductance	1 mho
40	log resistivity (at freq #2)	.03 decade
41	apparent depth or thickness (at freq #2)	3 m
42	conductivity contrast (at freq #2)	arbitrary
43	depth contrast (at freq #2)	arbitrary
44	product 42*43 (at freq #2)	arbitrary
45	log resistivity (at freq #1)	.03 decade
46	apparent depth or thickness (at freq #1)	3 m
47	conductivity contrast (at freq #1)	arbitrary
48	depth contrast (at freq #1)	arbitrary
49	product 47*48 (at freq #1)	arbitrary
50	apparent weight percent magnetite	0.25%

The log resistivity scale of 0.03 decade/mm means that the resistivity changes by an order of magnitude in 33 mm. The resistivities at 0, 33, 67 and 100 mm up from the bottom of the chart are respectively 1, 10, 100 and 1000 ohm-m.

The fiducial marks on the flight records represent points on the ground which were recovered from camera film. Continuous photographic coverage allowed accurate photo-path recovery locations for the fiducials, which were then plotted on the geophysical maps to provide the track of the aircraft.

The fiducial locations on both the flight records and flight path maps were examined by a computer for unusual helicopter speed changes. Such changes may denote an error in flight path recovery. The resulting flight path locations therefore reflect a more stringent checking than is provided by standard flight path recovery techniques.

The following brief description of DIGHEM^{II} illustrates the information content of the various profiles*.

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*For a detailed description, see D.C. Fraser, Geophysics, v.44, p.1367-1394.

Single-frequency surveying

The DIGHEM^{II} system has two transmitter coils which are mounted at right angles to each other. Both coils transmit at approximately the same frequency. (This frequency is given in the Introduction.) Thus, the system provides two completely independent surveys at one pass. In addition, the digital profiles (generated by computer) include an inphase channel and a quadrature channel which essentially are free of the response of conductive overburden. Also, the EM channels may indicate whether the conductor is thin (e.g., less than 3 m), or has a substantial width (e.g., greater than 10 m). Further, the EM channels include channels of resistivity, apparent depth and conductance. A minimum of 14 EM channels are provided. The DIGHEM^{II} system gives information in one pass which cannot be obtained by any other airborne or ground EM technique.

Figure A1 shows a DIGHEM^{II} flight profile over a conductive ore body in Australia. It will serve to identify the majority of the available channels.

Channels 20 and 21 are respectively the magnetics and the EM bird height. Channels 22 and 23 are the inphase and quadrature of the coaxial coil-pair. This coil-pair is

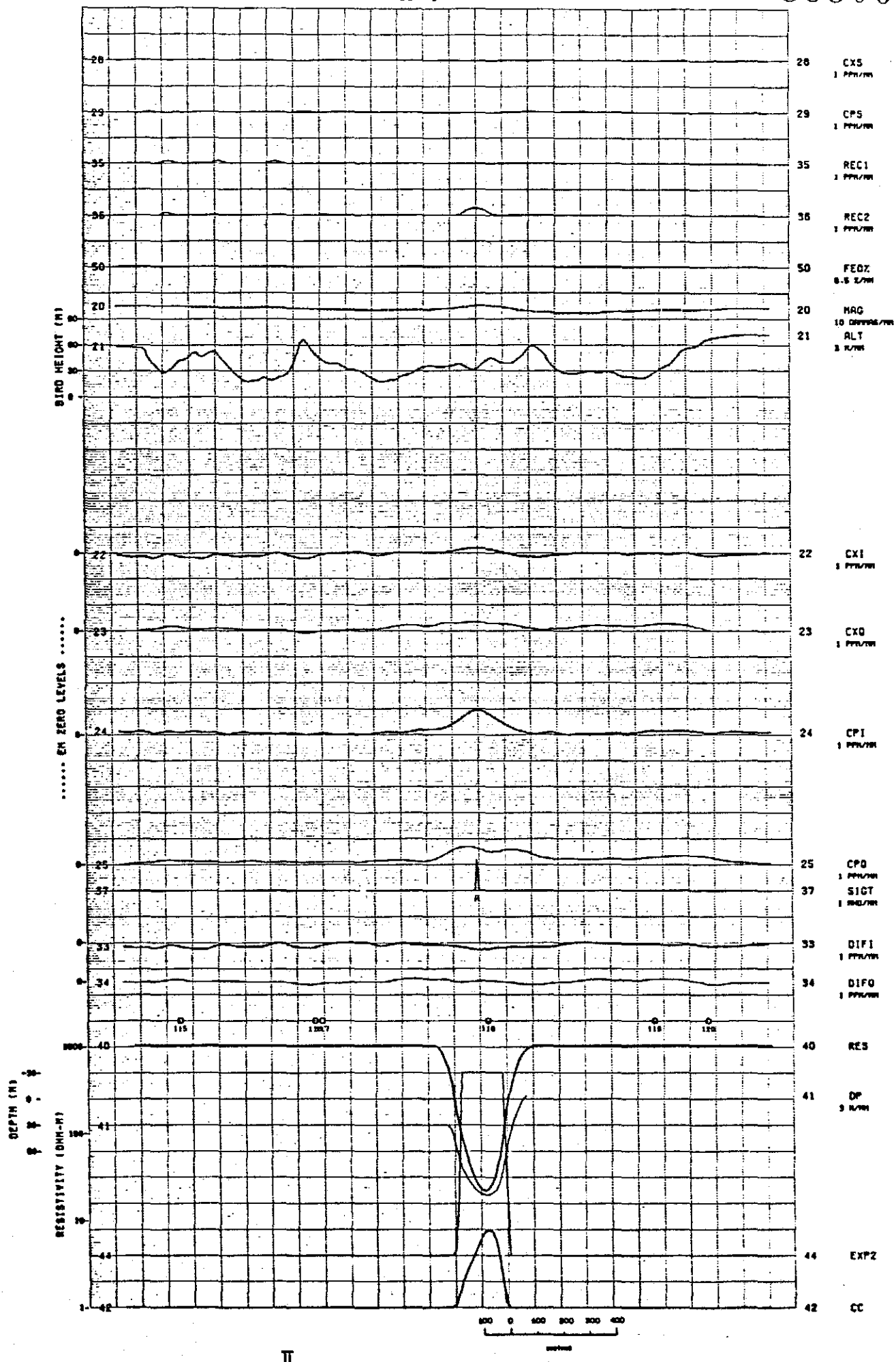

Fig. A1 DIGHEM^{II} digital profile.

5 cm

equivalent to the standard coil-pair of all inphase-quadrature airborne EM systems. Channels 24 and 25 are the inphase and quadrature of the additional coplanar coil-pair.

Channels 33 and 34 are inphase and quadrature difference functions of the coaxial and coplanar channels. The difference channels tend to be free from the response of conductive overburden. Channel 37 is the conductance. The conductance channel essentially is an automatic anomaly picker calibrated in conductance units of mhos; it is triggered by the anomaly recognition functions shown as channels 35, 36, and 42.

Channel 40 is the resistivity, which is derived from the coplanar channels 24 and 25. The resistivity channel 40 yields data which can be contoured, and so the DIGHEM^{II} system yields a resistivity contour map in addition to an electromagnetic map, a magnetic contour map, and an enhanced magnetic contour map. The enhanced magnetic contour map is similar to the filtered magnetic map discussed by Fraser.*

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*Cdn. Inst. Mng., Bull., April 1974.

Channel 41 is the depth channel. A depth estimate which is negative will occur when conductive overburden exists. A negative depth estimate implies that the conductive material occurs above the daylight surface. This false estimate shows that the EM system has responded to the conductive surface material and had also sensed the underlying resistive rock. In Fig. A1, the positive depth estimate of about 100 m is close to the true depth for this bedrock conductor.

Channel 42 is the conductivity contrast which highlights resistivity lows. Channel 43 is the depth contrast, which usually is not plotted. Both channels 42 and 43 tend to yield positive responses over bedrock conductors at depth. Channel 44 is the multiple of channels 42*43. Consequently, channel 44 tends to yield large positive responses over bedrock conductors at depth. The interpretation of channels 42 and 44 has to be done with care, however, because they may also respond in a similar fashion to a local thickening in conductive cover, e.g., over a buried river channel.

Channel 50 provides an estimate of the percent by weight of magnetite. This computation is made whenever

the coplanar inphase channel 24 is negative. The negative response shows that magnetic permeability exists.

Dual-frequency surveying

For surveys flown primarily for resistivity mapping, as opposed to EM surveying, the two transmitter coils may be energized at two well-separated frequencies (e.g., 900 and 3600 Hz). Apparent resistivity maps can be made independently for each frequency. The interpretation procedure involves comparing the apparent resistivity and apparent depth parameters at the two frequencies.

The use of two different coil-pair orientations (i.e., coaxial and coplanar) for dual-frequency resistivity mapping is an unorthodox procedure. However, as long as the current flow patterns are primarily horizontal, the different coil orientations do not influence the results. Wire fences and other cultural features will produce local deviations, because they usually respond preferentially to one or the other of the coil-pairs.

The difference channels 33 and 34, and the anomaly recognition channel 35, are not produced for dual frequence surveys. This is because the divergent frequencies of the two coil-pairs render them meaningless.

APPENDIX IV

COMMENTS ON THE HOWARDS ROAD 1979 DRAINAGE SAMPLING

(from Macnamara, 1980)

Note : Not all samples referred to come from the relinquished area

8. HOWARDS ROAD AREA ANOMALIES

8.1 Samples 602675M-676P

8.1.1 These samples occur north of Howards Road and just south of the dolerite mass of Mt. Dundas, near an eastern corner of the E.L.

Sieved sample 602675M is weakly to moderately anomalous with (in ppm) 360 Zn and 185 Pb.

8.1.2 Chemical analysis of panned concentrate sample 602676P shows unremarkable Zn and Pb values but carries 3.8% Cr and 13.6% Fe.

Binocular microscopy indicated black and yellow subangular to angular grains, very good sorting. The heavy minerals comprise major (+5%) hypersthene, minor (1-5%) magnetite rubble, limonitic pebbles, leucoxene and zircon, garnet, rutile, tourmaline and specularite.

8.1.3 The anomaly appears to be third order only.

8.2 Samples 602702M-703P and 602710M-711P

8.2.1 Sieved sample 602702M and 602710M each with 5 ppm Ag, and slightly elevated Zn-Pb values are weakly anomalous compared with other sieved drainage samples in the Howards Road area.

8.2.2 Sample 602564P (Figure 2) collected in 1978 (Macnamara, 1979) in the main creek downstream of 602702M and 602710M contained 20 ppm Ag.

8.2.3 Panned concentrate sample 602703P contains 3 ppm Ag, 18.7% Cr, 9.6% Fe.

071

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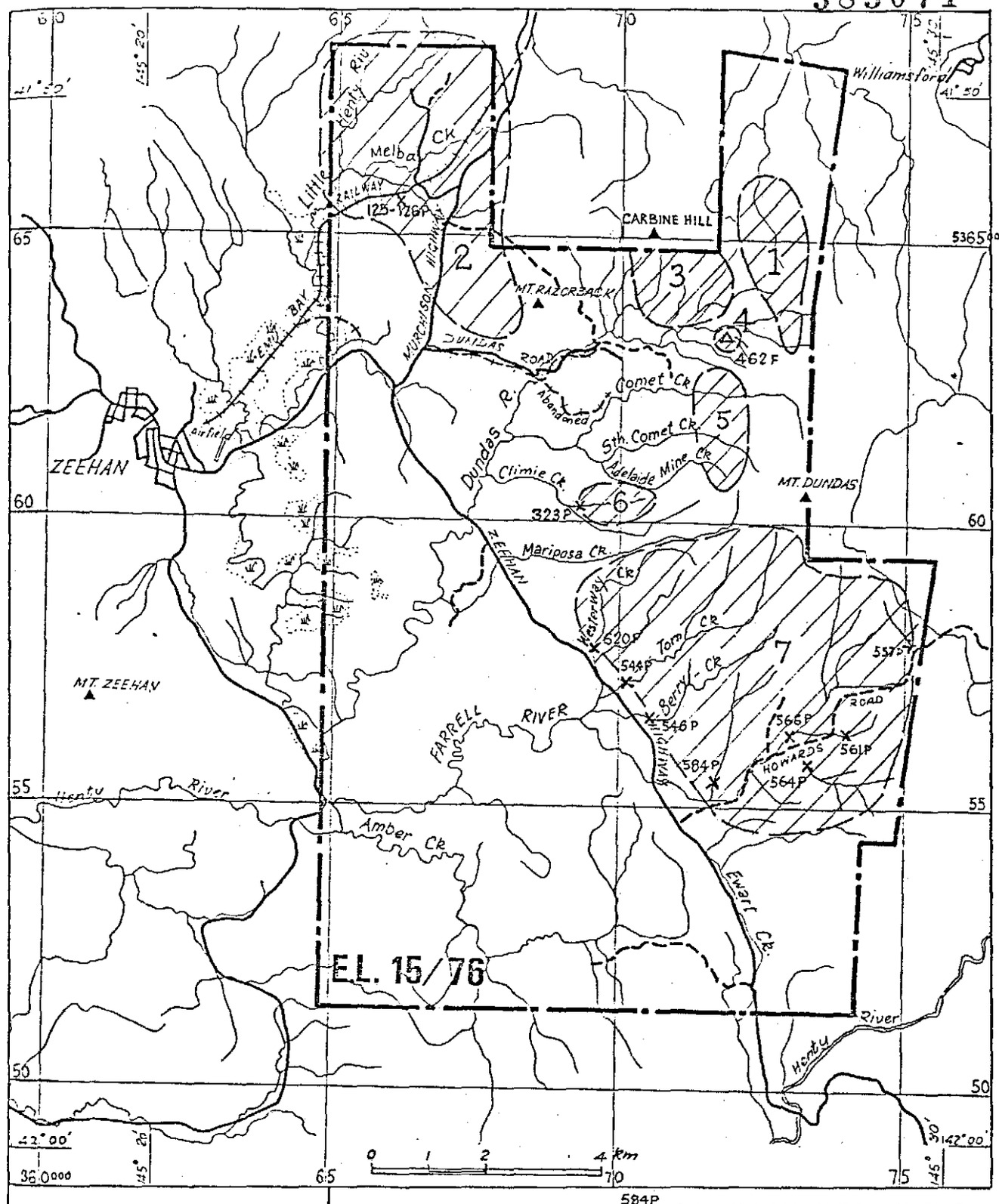

ANOMALOUS DRAINAGE AREAS AND SAMPLE LOCATIONS: 1977-1978 SURVEY

FIG. 2

5 cm

E.L. 15/76 DUNDAS TASMANIA

E.M.R. 60/80

AS

R. 60/80

Microscopic description (see Table 2) indicated brown and yellow h.m., euhedral and angular grains, good sorting. It consists by volume of 40% chromite plus major (+5%) ilmenite and leucoxene, minor (1-5%) limonitised garnet schist and trace (< 1%) magnetite rock aggregates, epidote, garnet, rutile and zircon.

Chemical analyses of sample 602711P indicated less than 1 ppm Ag, 0.47% Cr and 4.8% Fe. Microscopic description (Table 2) indicated green angular poorly sorted h.m. with major epidote pebbles, epidote and actinolite and trace chromite and magnetite rubble.

8.2.4 While the chromium was probably derived from an ultrabasic rock, the garnet schist and actinolite grains were unexpected in this section of the E.L.

8.2.5 Except for the 1978 value of 20 ppm, the above samples are weakly anomalous only. However, they gain added significance by their proximity to the more highly anomalous samples discussed in the following section (8.3).

8.3 Panned Concentrate Samples 602682-721P

8.3.1 Panned concentrate samples 602682P to 721P (Table 1) all contain anomalous gold values, associated with moderately high Cr values. In addition nearby samples 602701P, 709P and 719P from the Howards Road area are also weakly anomalous with 0.1 ppm Au (see Appendix III).

8.3.2 The samples were collected in the SE corner of E.L. 15/76 from streams draining morainal material through which Dundas Group rocks crop out along some valleys. Other valleys and the ridges have been mapped as Pleistocene Moraine (Blissett, 1962).

PART TABLE 1 (Macnamara 1980) — MAIN ANOMALOUS DRAINAGE SAMPLES

Sample No	Sample Type	Easting	Northing	Sn	Cu	Zn	Pb	Bi	Ag	Au	Ni	Co	Cr	Mo	W	Fe
602675	Mud	372·8	5358·8	<1	25	360	185	5	1	<3	150	195	<20	<3	5	–
602676	Panned	"	"	1.5	15	440	150	30	<1	<0.1	85	80	3·83%	–	1.5	13·6%
602681	Mud	373·8	5357·1	5	10	60	25	5	<1	<3	55	15	<20	<3	<5	–
602682	Panned	"	"	15	2	60	80	45	<1	1·3	100	145	12·0%	–	15	7·20%
602691	Mud	372·5	5355·5	<1	5	20	20	5	<1	<3	15	<5	20	<3	<5	–
602692	Panned	"	"	1.5	20	1000	90	55	4	114	155	190	20·6%	–	1.5	10·4%
602693	Mud	371·7	5353·3	<1	10	35	30	<5	1	<3	25	10	<20	<3	5	–
602694	Panned	"	"	15	5	820	110	46	6	3·7	85	160	16·7%	–	15	6·40%
602695	Mud	372·2	5353·4	<1	15	95	30	10	1	<3	25	15	<20	<3	<5	–
602696	Panned	"	"	15	5	370	105	20	<1	1·0	35	50	5·29%	–	<10	4·00%
602702	Mud	373·8	5355·6	<1	20	160	70	10	5	<3	110	30	<20	<3	5	–
602706	Mud	373·8	5355·3	5	10	105	40	5	1	<3	75	20	<20	<3	<5	–
602707	Panned	"	"	45	2	800	50	5	1	4·8	195	170	21·6%	–	<10	8·00%
602710	Mud	373·8	5355·2	5	55	150	60	15	5	<3	145	45	<20	<3	<5	–
602711	Panned	372·0	5353·6	20	5	155	115	20	5	0·2	25	20	1·97%	–	<10	4·00%
602721	Panned	373·2	5351·3	25	10	420	60	35	<1	6·3	150	95	12·0%	–	<10	6·40%

TABLE 2 : HEAVY MINERAL SUITES, HOWARDS ROAD AREA, BINOCULAR MICROSCOPE STUDY

Sample No.	Colour	Shape	Sorting	Major (+5%)	Minor (1-5%)	Trace (1%)
602682P	Black and grey	Subangular to angular	Good	Chromite (15%) Epidote Ilmenite	Tourmaline Zircon	Anatase Biotite Diopside Garnet Leucoxene Magnetite Brookite
602692P (= 691P)	-	-	-	Ilmenite Leucoxene	Rutile Zircon	Magnetite rubble Limonitic pebbles Beryl* Gold* Epidote Garnet Monazite Sphene Tourmaline
602694P	Yellow, black	Angular to subangular	Excellent	Ilmenite Leucoxene Zircon	Chromite (2%) Magnetite Rutile	Epidote Garnet (orange, pink) Tourmaline
602696P	Yellow, black	Angular, subangular	Excellent	Epidote Ilmenite Leucoxene	Magnetite	Chromite Corundum* Zircon
602703P	Brown, yellow	Euhedral, angular	Good	Chromite (40%) Ilmenite Leucoxene	Limonitised garnet schist*	Magnetite rock aggregates Epidote Garnet Rutile Zircon
602707P	Black, yellow	Fragmented angular	Moderate	Chromite (40%) Tremolite schist Epidote Leucoxene	Talc	Rutile Zircon Magnetite rubble
602711P	Green	Angular	Poor	Epidote pebbles Epidote Actinolite	- -	Chromite Magnetite rubble
602717P	Brown, green	Subangular, some angular	Moderate	Epidote Ilmenite Leucoxene	Epidote pebbles Magnetite rubble Actinolite Zircon	Chromite Rutile Tourmaline
602721P		Subangular, some angular	Poor	Epidote pebbles Epidote Chromite Ilmenite	Zircon	Rutile Garnet (pink and orange)

8.3.3 In order of decreasing gold content, the panned concentrate analyses are set out below. Each sample represents four to six 35 cm (15") pans of material - approximately 0.02 m^3.

Sample No:	Au (ppm)	Ag (ppm)	Cr (%)	Fe (%)	Weight (g)
602692P	114	4	20.6	10.4	?
602707P	48	1	21.6	8.0	44.6
602721P	6.3	<1	12.0	6.4	55.3
602694P	3.7	6	14.7	6.4	9.0
602682P	1.3	<1	12.0	7.2	9.0
602696P	1.0	<1	5.3	4.0	50.4

8.3.4 Results indicate strong gold anomalies are reporting in panned concentrates associated with elevated Ag and Cr values. Cr and Fe possibly vary proportionately with gold when it does occur in the h.m.

8.3.5 Table 2 outlines a description of the heavy mineral suites of the anomalous gold samples. It is an abstract from Appendix IV.

The presence of beryl, biotite, corundum, tremolite schist, garnet schist, etc. in the concentrates may indicate a combination of source provenances or a granite/schist source. This aspect has yet to be checked.

8.3.6 Follow-up work starting with the strongest anomalies will involve further panning aimed at closing off the anomalous area and at checking the source of the gold. Both the morainal material and bedrock need to be checked as potential host rocks.

The work deserves a high priority.

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PART OF MACNAMARA 1980 APPENDIX IV

and Macnamara 1994 (Appendix III)

MINPET SERVICES

REPORT NO. 23/79

MINERALOGICAL EXAMINATION OF HEAVY MINERAL DRAINAGE SAMPLES FROM E.L. 15/76, DUNDAS, TASMANIA

(For P.M. Macnamara, Regional Geologist, CSR Limited
Exploration Group)

5TH DECEMBER, 1979

INTRODUCTION

Forty one panned heavy mineral samples were received from the Dundas CSR Exploration office for further concentration over tetrabromoethane and determination of heavy minerals present.

Heavy minerals were tabulated as major (more than 10.0 percent), minor (1.0% to 10.0%) and trace (less than 1.0%).

SUMMARY

Other than an abundance of chromite and ilmenite (including leucoxene) in many samples and major zircon and rutile in several there is little of interest or significance in these concentrates. There are however, traces of gold, beryl and monazite in sample 691. (= 692P)

Chromite is present as non-magnetic opaque octahedra having a bluish reflectance was checked out by Central Mineralogic Services, Adelaide and was confirmed to be a magnesian variety of the mineral.

Chromite was found in large quantities in the drainage samples from streams draining the extensive serpentine outcrop of Mount Razorback (metamorphosed pyroxenite sills) and its extension. Chromite also appears to be eroding from the Cambrian gabbro/norite in the south-east sector of the lease, and from an unknown source occupying high country on the east side of the lease.

The problem of chromite from ultrabasic intrusives having a close association with gabbro/norite dykes is exemplified in The Lizard occurrence where a metamorphosed serpentine magma has been intruded by gabbro and norite. The chromite there is in fluxion bands in fine grained serpentinite which is converted to anthophyllite, tremolite and talc in shear/crush zones. The serpentinite described has a ratio of 4:1 chrome to nickel (i.e., 0.28% Cr_2O_3 and 0.07% NiO). It is interesting to note the Cr_2O_3:NiO contents of other serpentinite present :

	W/W Percent	
	Cr_2O_3	NiO
Durite serpentinite	0.28	0.15
Tremolite serpentinite	0.25	0.17
Bastite serpentinite (Lherzolite)	0.20	0.16
Chromite serpentinite	0.28	0.07

The tremolite serpentinite therefore has a close chrome: nickel relationship.

East (1) (5357 m N to 5358 m N/373m E to 374 m E). Samples 678, 682:

Largely ilmenite and epidote, but traces of chromite occur in 678 and the mineral is in abundance (10 percent) in 682. Otherwise magnetite, zircon and tourmaline and contact metamorphic (?) garnet and tremolite are present.

Origin of chromite unlikely to be from Mt. Dundas the only basic igneous intrusive in the catchment ?

East (2) (5356 m N to 5357 m N/373 m E to 374 m E). Samples 684, 686 and 688 :

A major abundance of chromite occurs in all three samples.

The only source of basic rock derived minerals is gabbro or norite which occupies high ground to the east and just west of the lease boundary. An abundance of leucoxenised ilmenite also occurs and epidote from catchment metamorphosed serpentinite or metasediments. Contact metamorphic garnet and andalusite are present. The freshness of chromite probably indicates an adjoining source.

East (4) (5355 m N to 5356 m N/372 m E to 373 m E). Samples 690 and 692 :

Leucoxene and ilmenite are very abundant (70 and 90 volume percent, respectively), and chromite (4 percent) in 690 which also contains a trace of hypersthene. A gabbroic

source in the east is the likely source). An abundance of zircon (20 percent) in Sample 690 and a trace of gold with monazite, tourmaline and beryl in 691. A possible granite/basic rock contact may be responsible for the trace of gold present (where is the granite ?).

East (5) (5355 m N to 5356 m N/373 m E to 374 m E). Samples 701, 703, 705, 707 and 709 :

From samples 701 to 707 inclusive all contain major chromite (35, 40, 48 and 40 volume percent respectively). All samples are from streams draining the gabbro near the eastern border of the lease. Sample 709 contains only 3 percent of chromite and is from the southernmost stream. Ilmenite and leucoxene are also dominant minerals in the above concentrates. Towards 707 and 709 calc-silicate minerals, epidote, actinolite and tremolite (from altered serpentinite and basic intrusives?) become dominant and most of sample 709 is epidote. The minerals are fresh and largely angular fragmented grains but are well sorted. Talc appears as an impurity in 707 (from metamorphosed gabbro ?). From whence the garnet schist in 703 ?

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5/12/79

DUNDAS H.M., STREAM SEDIMENT EXPLORATION PROGRAMME 1979

LEGEND

Rock Particles

Actinolite, Tremolite, Schist	TS
Banded ferruginous shale	BF
Chlorite Schist	CS
Epidote rock fragments	ED
Ferruginous Pebbles	FP
Ferruginous Siltstones	FS
Garnetiferous Schist	GS
Goethite Pebbles	GP
Graphite Schist	G
Limonitised Garnet Schist	LGS
Limonitic Pebbles	LP
Limonitic Schist	LS
Magnetite Rubble	MR
Mica Schist	MS
Magnetite Rock Aggregates	MA

Colours

BL Black; BR Brown; BLU Blue; BU Buff;
DBR Dark Brown; GR Grey; GN Green;
W White; VT Vitreous; Y Yellow;

Grain Shapes

Euhedral, crystalline	1
Aggregated laths	2
Subangular	3
Angular	4
Fragmented	5
Rounded	6
Pitted	7

Sorting

Excellent	1
Very Good	2
Good	3
Mainly Good	4
Moderate	5
Poor	6

Mineral, Rock Fragments Abundance

1 Major 5 ⟶ 2 Minor 1 ⟶ <5 3 Trace 0 ⟶ <1

DUNDAS STREAM SEDIMENT HEAVY MINERAL SAMPLING PROGRAMME - 1979

Sample No.s	Rock Fragments / Resistance	Mineral Abundance: Actinolite	Anatase	Andalusite	Augite/Hypersthene	Beryl	Biotite	Cassiterite	Corundum	Diopside	Epidote	Garnet	Gold	Hornblende	Ilmenite	Kyanite	Leucoxene	Magnetite	Melebenite	Monazite	Rutile	Sphene	Spinel	Talc	Tourmaline	Vesuvianite	Zircon	Grain Colours	Grain Shapes	Grain Size Limits mm: Minimum	Maximum	Median	Sorting	Comments	Concentrate Weight (g)
649 AR	LP1							1											2		3				2		3	CL, BR, BL	4-6	.05	4.0	1.2	6	Many grains show crystalline	12.1
OOR P	TS1																														0.1		forms. Clinozoisite 2%	
	CS2																																		
602 654 P	LP1										2								2		3	2	3		2		2	b. BR	6-3, 7	.06	5.0	0.90	6		38.7
(CE 069)	MS1																														0.11			
602 657 P	LPI						3				3						1	2	3		2		3				3	BR, BL, W	3	.05	6.0	1.3	5		16.6
(CE 072)	CS1																														0.1			
	GS1																																	
602 650 P	GP1		3								2	2			1		1	3			1		2		2	3	1	BR, BL, Y	4-3	.04	3.0	0.1	4	Good concentrate for basic	8.0
(RG 100)																																	demonstration purposes	
602 651	LP2							1				3					1	3			2	3			3		1	BL,	1-6	.05	6.0	0.50	4	Chromite 790% concentrate.	12.3
																															0.22		Zircon, rutile are rounded	
602 661	EP1																														0.90		Epidote rock fragments	
	CS2						3				3	3			2			3			3				3	3	BU, BL,	5, 2	.06	10.0	0.10	4	790% concentrate	26.0
	LP3																																	
602 664	BF1										2				1		3	3			1				3		1	Y, BL, GR	5, 4, 6	.05	10.0	0.10	4	Zircon rounded	9.0
602 666	MR1														1		3				3						2	BU, WH	4					Zircon / Rutile } round	28.1
	EP1																																	Epidote - subangular
602 668								2							1			3		3	3				3			BL	6 > 3	.05	1.2	0.14	3	Ilmenite > 70%	6.0
																																	Chromite 2%	
602 670	MR1							2			2	3			1		3				3					3	2	BR	4 > 3	.05	2.0	0.20	3	Chromite 8%	16.4
602 672								1							1		3	3			3		3				3	BL	1	.05	1.6	0.30	2	chromite > 80% present	115.1
602 674	FP2							1			3	3			1		3				3				3		2	BL	1 > 6	.20	2.9	0.40	3	chromite 60%	38.8
602 676	MR2																											Y, BL						Specularite, trace	5.8
	LP2							3			3	3			1		2				3				3		2		3 > 4	.06	2.9	0.10	2		
602 / 678	EP1							3		2		8			1		3	3			3				3	3	3	Y, BR	3 > 4	.14	2.9	0.10	3		3.9
602 / 682			3				3	1		3	1	3			1		3	3							2		2	BL, GR	3 = 4	.05	1.1	0.10	3	Brookite - trace	9.0
																																	chromite - 1%	
602 / 684	FS1							1		3	2	3			1		3				2				3			D.BL,	4-3	.08	7.5	0.14	3	Brookite trace	6.2
	EP1																																	
	MR3																																	
602 / 686	EP1			3				1			2	3			1		3	3							3		2	BL, Y	4 > 3, 1	.06	4.5	0.14	3	Clinozoisite 3%	6.3
	FP1																																chromite 3%	

REGIONAL STREAM SEDIMENT HEAVY MINERAL SAMPLING PROGRAMME - 1979.

SAMPLE No.	Rock Fragments Abundance	Mineral Abundance: Actinolite	Andalusite	Anthophyllite	Augite/Hypersthene	Beryl	Biotite	Chromite	Corundum	Diopside	Epidote	Garnet	Gold	Hornblende	Ilmenite	Kyanite	Leucoxene	Magnetite	Molybdenite	Monazite	Rutile	Sphene	Spinel	Talc	Tourmaline	Xenotime	Zircon	Grain Colours	Grain Shapes	Grain Size Limits mm: Minimum	Maximum	Median	Scoring	Comments	Concentrate Weight g
602 ✓ 688	FP1		3					1	3		1				1		1	3			3				3		2	Y, BL	3>4	·02	1·0	0·11	5	Chromite 20%	5·8
	CG 3																																		
602 ✓ 690	LS 2							2	3		3			3	1						3				2		1	Y, BL	3>4	·06	0·8	0·10	3	Zircon elecs, pink Chromite 4%	5·8
602 694								2			3	3			1		1	2			2				3		1	Y, BL	4>3	·08	4·5	0·16	1	Garnet, orange, pink Chromite 2%	9·0
602 696								3	3		1				1		1	2									3	Y, BL	4>3	·10	1·8	0·20	1		50·4
602 699	LP 3	3						3			1				1		1				3						3	BR, Y	3>4	·08	4·5	0·21	3		204·5
602 ✓ 701	TS 2							1			1						1	3										BL, Y	1, 4	·07	1·8	0·40 0·14	3	Chromite 35%	31·6
602 ✓ 703	LGS2														1																				
	MR 3							1			3	3			1		1				3						3	BR, Y	1, 4	·05	3·2	0·14	3	Chromite 40%	5·0
602 ✓ 705		3						1			2	3			2		1	3			3				3		1	BL, W	1, 4, 3, 6	·04	1·1	0·08	3	Chromite 48%	6·3
602 ✓ 707	TS 1																														0·80				
	MR 3							1			1						1				3			2			3	BL, Y	5, 4	·09	6·1	0·17	5	Chromite 40%	44·6
602 ✓ 709	EP1																																	Chromite 8%	21·3
	MR 3	2						2			1	2			2												2	GN	4>3	·10	4·0	0·10	1	Garnet orange	
602 711	EP 1																																		
	MR 3	1						3			1																	GN	4	·08	5·5	0·17	6		62·7
602 713	FS 3							1			3				2			3							2		1	BL, GR	6>3	·05	2·5	0·11	3	Chromite 70% Magnetite, fine euhedral	8·4
602 715	EP 1	2					3	1			2	3			2			3			3				2		1	BL, Y	3>4>6	·05	4·5	0·07	6	Chromite 49%	6·6
602 717	EP2	2						3			1				1		1				3				3		2	BR, GN	3>4	·03	2·5	0·07	5		26·3
	MR 2																																		
602 719	EP 1							1			2				2			3			3						2	BL, Y	4>3	·04	4·5	0·10	6	Chromite 30%	61·8
602 721	EP 1																																	Chromite 15%	55·3
	MR 3							1			1	3			1						3						2	BL, GN	4>3	·04	3·0	0·11	6	Garnet, pink and orange	
602 723	EP1																																		
	TS 2							2				3			2						3				3		2	BR	6>4	·02	6·0	0·11	5	Chromite 3%	8·6
	MR 3																																		

DUNCANS STREAM SEDIMENT HEAVY MINERAL SAMPLING PROGRAMME 1979

SAMPLE No.'s	ROCK FRAGMENTS ABUNDANCE	MINERAL ABUNDANCE: HORNBLENDE	ANDRADITE	ANDALUSITE	ANDALUSITE/STAUROLITE	BERYL	CASSITERITE	CHROMITE	CORUNDUM	DIOPSIDE	EPIDOTE	GARNET	GOLD	HYPERSTHENE	ILMENITE	KYANITE	LEUCOXENE	MAGNETITE	METAMORPHIC	MONAZITE	RUTILE	SPINEL	STAUROLITE	TALC	TOURMALINE	TREMOLITE	ZIRCON	GRAIN COLOURS	GRAIN SHAPES	GRAIN SIZE LIMITS mm: MINIMUM	MAXIMUM	MEDIAN	SEDIMENT	COMMENTS	CONCENTRATE WEIGHT g
602 725								1			3	3						3			3							YT, BU	4, 1, 5	·07	1·1	0·18	1	Chromite > 95%	212·7
602 726	FP 2							1			3	2			2		2	3			1	2					1	CR, BL	6 → 3	·06	6·0	0·0	3	Chromite 7%	10·4
602 732	EP 1							1			2							3			1						1	CH, BL	4 → 6	·05	5·5	0·14	6	Chromite 2%	5·2
	FP 2																																	
602 734	FP 1							1			3				1			3			3					3	3	BL	3 → 4	·05	5·5	0·17	3	Chromite 30%	313·0
	EP 3																																	
602 739	EP 1							1			1	3			2		3	3			1		3	1			1	CR, BL	6 → 3	·05	4·5	0·10	3	Chromite 15%	3·9
	FP 2																																	
602 740	EP 2							1	3		1	2			1	3		3			1			2			1	Y, BL	6 → 3	·05	1·6	0·07	1	Chromite 10%	3·8
	FP 3																																	
602 691 / 692	MR 3					3					3	3	3		1		1		3	2	3			3			2								
	LP 3																																	

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APPENDIX V

GEOCHEMICAL ANALYSES OF THE 1979 DRAINAGE SAMPLING

(Part of Macnamara, 1980)

Note : Not all samples referred to come from the relinquished area

PACMINEX [illegible]Y. LTD. — SAMPLE DATA SHEET

AREA EL 15/76, Dundas — PROSPECT NUMBER 602 — DATE SAMPLED April '79 — LABORATORY REPORT NO. ____

STATE TAS — LOCATION ____ — 1:100,000 SHEET 7914 Pieman — SAMPLER P.M.M. — ANALYTICAL METHOD -80: AAS + XRF (Sn, W)

NOTATIONS: SAMPLE TYPE – M - Creekmud ✓, S - Soil, SA - Soil Auger, RC - Drill Core, RP - Percussion Chips, R - Rock

ANALYSES: Please state element

ADDITIONAL P = panned Concentrate for Cr...

	SAMPLE NUMBER	SAMPLE TYPE	APERTURE SIZE (SIEVE/MICRONS)	Sn	Cu	Zn	Pb	Bi	Ag	Au	Ni	Co	Cr	V	Ti	Zr	P	B	Mn	Ca	Ba	Weight g	LOCATION E/W	LOCATION N/S
	602 650	P		I/S	40	940	270	35	<1	<0.1	140	10	11.1%						1400			8.0		
	651	P		I/S	10	1200	580	60	2	I/S	220	240	27.0%						880			12.3		
IE	652	M	-20	<1	10	80	100	<20	<2	<3	30	<5	20						30					
			-80	5	15	80	130	10	1		25	10												
	653	M	-20																				=602CE065	
			-80	5	30	710	160	<5	1		105	40											M	
	654	P		10	145	1700	230	45	3	<0.1	120	90	2.4%						0.78%			38.7		
	655	M	-20																				=602CE070	
			-80	5	170	2100	1500	15	2		360	155											M	
	656	M	-20																				=602CE071	
			-80	<5	15	220	130	<5	1		80	50											M	
	657	P		I/S	115	1600	240	40	1	<0.1	110	85	0.61%						3000			16.6		
	658	M	-20																				=602CE073	
			-80	<5	35	320	500	5	1		170	45											M	
	659	M	-20																				=602CE074	
			-80	<5	15	175	130	5	1		70	20											M	
	659A	M	-20																				=602CE075	
			-80	<5	25	310	180	5	<1		100	55											M	
IE	602 660	M	-20	<1	20	130	100	<20	<2	<3	40	20	<20						100					
			-80	5	10	130	95	10	1		30	35												
	661	P		20	10	145	55	15	<1	<0.1	45	20	3000						520			26.0		
E	662	R		1	<2	150	20	<20	<2	<3	30	10	300						100					
E	663	M	-20	<1	20	130	120	<20	<2	<3	50	60	20						100					
			-80	<5	30	185	185	15	1		70	100												
	664	P		I/S	30	540	260	35	<1	<0.1	115	80	7.60%						600			9.0		
A/E	665	M	-20	<1	20	210	80	<20	<2	<3	120	50	<20						100					
			-80	<5	30	290	105	10	2		155	105												
	666	P		20	10	165	180	20	<1	<0.1	50	35	2000						2000			23.1		
IE	667	M	-20	3	<2	20	20	<20	<2	<3	30	<5	100						30					
			-80	<5	2	10	5	<5	<1		5	<5												
	668	P		2600	20	1700	95	40	4	<0.1	290	300	37.5%						1300			16.0		
E	669	M	-20	(a) 1,000	<2	50	<20	<2	5	<3	20	10	300						30					
			-80	385	<2	70	20	<5	<1		20	10												
	670	P		560	20	270	135	5	2	<0.1	60	65	3.54%						1200			16.4		

-20: A/E = AAS for Cu, Zn, Pb, Bi, Ag, Ni, Co. Emission: Sn, W etc.

I/S. = insufficient sample (est. heavy minerals)

(a) -20/602669 = 270 ppm Sn by XRF.

PACMINEX( )TY. LTD. — SAMPLE DATA SHEET

088

AREA EL 15/76, Dundas | PROSPECT NUMBER 602 | 1:100,000 SHEET 7914 | DATE SAMPLED | SAMPLER | LABORATORY REPORT NO. | ANALYTICAL METHOD

STATE TAS LOCATION DRAINAGE SAMPLING

NOTATIONS: SAMPLE TYPE – M - Creekmud, S - Soil, SA - Soil Auger, RC - Drill Core, RP - Percussion Chips, R - Rock | ANALYSES: Please state element | ADDITIONAL

SAMPLE NUMBER	SAMPLE TYPE	APERTURE (MESH / MICRONS)	CHEMICAL ANALYSES (ppm) Sb	Mo	W	F	In	Cd	Nb	As	Fe	SUMMARY DESCRIPTION	LOCATION E/W	LOCATION N/S
602650	P				1.5			4			13.6%	Razorback Grid line 3480N : 3485N/7990E : o/c. qtz-chert breccia h.m. sparse and v.f.g. (602650P = 602RG100P)		
651	P							6			10.4%	Razorback Grid line 3480N/7180E : ck flows SSW over muddy t.-tree. Alluvial flat.		
652	M	-20	<30	<3	<50					<50				
		-80			5									
653	M	-20										=602CE065M : Geophoto Grid CARBINE East line 70'N (CSR line (6472mN/1293mE) : 2m gulley flows to 145°M		
		-80			10									
654	P				<10			8			34.4%	= 602CE069P · As for 602653		
655	M	-20										CARBINE EAST : 70'N Line (6472mN/1350mE) 0.2m gulley = 602CE070M		
		-80			30									
656	M	-20										CARBINE East Grid : 70'N line (6472.0mN/1474mE) = 602CE071M. 1.5m ck flows to 260°M.		
		-80			10									
657	P				1.5			7			35.2%	= 602CE072P As for 602656M.		
658	M	-20										=602CE073M · Geophoto line 1931E/65'N, CARBINE East ? hornfelsed qtzite - grey sh.		
		-80			5									
659	M	-20										=602CE074M : CARBINE EAST : 60'N/1050'E		
		-80			<5									
659A	M	-20										= 602CE075M : CARBINE East 60'N/850'E		
		-80			5									
602660	M	-20	<30	<3	<50					<50		Howards Road area (N°4) on Geophoto (?McIntyre) grid at 00'N/1125'N : 3m major Ck · o/c. dk. grey slate. coc/60°W dip		
		-80			5									
661	P							2			4.0%	Cobble mainly slate, some dolerite + qtz veined (?) gneissic rk (tuff?)		
662	R		<30	<3						<50		Location 660M : Cobble of 1mm felspar-FeMg dioritic or dolerite ± qtz-veins : limonitic : tuff?		
663	M	-20	<30	<3	<50					<50		Nth of Howards Rd : 00/00N grid 1.5m ck just above junction slate o/c - c30/90° - blue grey sl. cobbles of slate, dk. green chloritic granular rk ± qtz frags (= tuff?)		
		-80			5									
664	P							4			15.2%			
665	M	-20	<30	<3	<50					<50		Small ck above 602663 (not a tributary) at 00'N line/750'E		
		-80			10									
666	P							4			8.8%			
667	M	-20	<30	<3	<50					<50		CUNI area : site 602123M, 124P. 3m SE of railway : 4x -2omesh pans → plentiful black h.m (heavy mineral).		
		-80			<5									
668	P							6			10.0%			
669	M	-20	<30	<3	<50					<50		CUNI : above site of 602121M 122P at 3m SE of railway 3 pans of -2omesh → plentiful h.m.		
		-80			5									
602670	P							3			12.4%			

PACMINEX (PTY. LTD. — SAMPLE DATA SHEET

089

AREA EL 15/76, Dundas | PROSPECT NUMBER 602 | 1:100,000 SHEET 7914 | DATE SAMPLED April 79 | SAMPLER P.M.M. | LABORATORY REPORT NO. | ANALYTICAL METHOD -80: AAS + XRF(Sn, W)

STATE TAS | LOCATION | DRAINAGE SAMPLING

NOTATIONS: SAMPLE TYPE – M - Creekmud, S - Soil, SA - Soil Auger, RC - Drill Core, RP - Percussion Chips, R - Rock | ANALYSES: Please state element | ADDITIONAL Preferred elements

	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE PREPARATION (-20 MESH / -80 MESH)	CHEMICAL ANALYSES (ppm) Sn	Cu	Zn	Pb	Bi	Ag	Au	Ni	Co	Cr	V	Te	Zr	P	B	Mn	Cu	Ba	Weight g	LOCATION E/W	N/S
																			Sc					
I/E	602 671	M	-20	1	10	80	60	<20	<2	<3	40	10	100											
			-80	5	10	75	55	<5	<1		20	20												
	672	P		2200	2	1200	50	85	1	<0.1	200	350	38.3%						1200			115.1		
A/E	673	M	-20	<1	20	160	160	<20	<2	<3	50	30	<20						50					
			-80	<5	20	185	175	5	<1		35	35												
	674	P		1.000	5	1200	175	60	<1	2.0	210	260	30.5%						1100			33.8		
I/E	675	M	-20	<1	40	370	240	<20	<2	<3	170	200	<20						100					
			-80	<5	25	360	185	5	1		150	195												
	676	P		1./S.	15	440	150	30	<1	<0.1	85	80	3.83%						3400			5.8		
A/E	677	M	-20	<1	20	100	80	<20	<2	<3	70	30	<20						50					
			-80	<5	10	90	75	5	<1		45	20												
	678	P		1./S.	50	340	130	20	<1	1./S.	65	40	1.20%						1300			3.4		
A/E	679	M	-20	<1	30	100	60	<20	<2	<3	70	20	<20						30					
			-80	<5	15	115	65	10	1		60	15												
	602 680	M	-20	<1	20	90	40	<20	<2	<3	50	10	<20						30					
			-80	5	15	90	55	10	<1		40	10												
	681	M	-20	<1	10	70	40	<20	<2	<3	70	10	<20						100					
			-80	5	10	60	25	5	<1		55	15												
	682	P		1./S.	2	600	80	45	<1	1.3	100	145	12.0%						1200			9.0		
	683	M	-20	<1	20	100	40	<20	<2	<3	60	20	<20						100					
			-80	<5	15	105	65	10	1		45	20												
	684	P		1./S.	55	880	350	40	1	<0.1	120	125	4.8%						1600			6.2		
	685	M	-20	<1	20	100	60	<20	<2	<3	70	40	20						100					
			-80	<5	20	150	70	10	1		105	50												
	686	P		1./S.	15	1100	85	60	1	<0.1	160	220	27.4%						1300			6.3		
	687	M	-20	<1	20	90	60	<20	<2	<3	80	20	<20						30					
			-80	<5	10	85	45	5	1		50	15												
	688	P		1./S.	25	1200	160	50	2	<0.1	165	180	16.5%						1300			5.8		
	689	M	-20	<1	10	70	40	<20	<2	<3	60	<5	<20						10					
			-80	<5	15	75	45	5	1		40	10												
	602 690	P		1./S.	35	1100	175	30	2	<0.1	65	85	6.30%						880			5.8		
	691	M	-20	<1	20	20	40	<20	<2	<3	40	<5	20						30					
			-80	<5	5	20	20	5	<1		15	<5												
	602 692	P		1./S.	20	1000	90	55	4	114	155	190	20.6%						800					

-20 : A/E = AAS for Cu, Zn, Pb, Bi, Ag, Co, Ni ; Emission : Sn, W etc

1./S. = insufficient sample (heavy minerals, generally)

3830896

PACMINEX (PTY. LTD. — SAMPLE DATA SHEET

AREA EL 15/76 Dundas | PROSPECT NUMBER 602 | 1:100,000 SHEET 7914 | DATE SAMPLED April 79 | LABORATORY REPORT NO. | ANALYTICAL METHOD

STATE TAS | LOCATION DRAINAGE SAMPLING | SAMPLER

NOTATIONS: SAMPLE TYPE – M - Creekmud, S - Soil, SA - Soil Auger, RC - Drill Core, RP - Percussion Chips, R - Rock | ANALYSES: Please state element | ADDITIONAL

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE FRACTION	CHEMICAL ANALYSES (ppm) Sb	Mo	W	F	In	Cd	Nb	As	Fe	SUMMARY DESCRIPTION	LOCATION E/W	LOCATION N/S
602671	M	-20	<30	<3	<50					<50		Below Eh/Era contact (1:63360 Geology Sheet) at 5365·3N/366mE : 3 pans (-20 mesh) 3cm above junction.		
		-80			5									
672	P				<10			6			12.0%			
673	M	-20	<30	<3	<50					<50		Dundas road E of highway near 602602M (5363·2N/367·2E) 5cm above CK junction. (5 pans of -20 mesh)		
		-80			<5									
674	P				<10			6			12.0%			
675	M	-20	<30	<3	<50					<50		Howards Road - Nth near 602 662. 7 pans (-20 mesh) 372 800E / 5358 800mN approx. (End of road branch		
		-80			5									
676	P				1/S.			4			13.6%	banded slate 150°/70°E)		
677	M	-20	<30	<3	<50					<50		Nth of Howards Rd and E of main branch: 100m from junction 7 pans (-20 mesh) · Ref 5357 200N / 373 600E.		
		-80			<5									
678	P				1/S.			<3			8·80%			
679	M	-20	<30	<3	<50					<50		V. minor ck east of 602 680 (5357 200N / 373 850E)		
		-80			5									
602 680	M	-20	<30	<3	<50					<50		Minor ck E of 602 681		
		-80			<5									
681	M	-20	<30	<3	<50					<50		Howards Rd : 3cm above junction 6 pans. 5357 150N / 373 800E.		
		-80			<5									
682	P				1/S.			4			7.20%			
683	M	-20	<30	<3	<50					<50		East of Howards road : 20m above junction approx 5356 300N / 373 900E		
		-80			5									
684	P				1/S.			5			25.6%			
685	M	-20	<30	<3	<50					<50		Other branch near 602 683.		
		-80			5									
686	P				1/S.			5			9.60%			
687	M	-20	<30	<3	<50					<50		North of Howards Rd below 602 683 near 5356 350N / 373 250E · 3cm above junction of main ck.		
		-80			5									
688	P				1/S.			6			10.4%	6 pan (-20 mesh).		
689	M	-20	<30	<3	<50					<50		South of Howards Road : 5355 600N / 372 500E 15m above junction		
		-80			<5									
602 690	P				1/S.			6			11.2%			
691	M	-20	<30	<3	<50					<50		On old track near 602689M. (5355·5N / 372·5E) 5 pans (-20 mesh)		
		-80			<5									
692	P				1/S.			5			10.4%			

0600800

PACMINEX PTY. LTD. — SAMPLE DATA SHEET

AREA: EL15/76, Dundas — PROSPECT NUMBER: 602 — DATE SAMPLED: April 79 — LABORATORY REPORT NO.: — NOTATIONS: SAMPLE TYPE – M - Creekmud, S - Soil, SA - Soil Auger, RC - Drill Core, RP - Percussion Chips, R - Rock — ADDITIONAL: Panned concentrate

STATE: TAS — LOCATION: Drainage Sampling — 1:100,000 SHEET: 7914 — SAMPLER: — ANALYTICAL METHOD: -80: A.A.S/XRF (Sn, W) — ANALYSES: Please state element

	SAMPLE NUMBER	SAMPLE TYPE	APERTURE SIZE (SIEVE) (MICRONS)	Sn	Cu	Zn	Pb	Bi	Ag	Au	Ni	Co	Cr	V	Te	Zr	P	B	Mn	Ca	Ba	Weight g	LOCATION E/W	LOCATION N/S
E	602-693	M	-20	<1	10	40	40	<20	<2	<3	40	<5	<20						30					
			-80	<5	10	35	30	<5	1		25	10												
	694	P		I/S.	15	820	110	40	6	3.1	85	160	14.7%						1200			9.0		
E	695	M	-20	<1	20	70	20	<20	<2	<3	30	10	<20						10					
			-80	<5	15	95	30	10	1		25	15												
	696	P		10	5	370	105	20	<1	1.0	35	50	5.28%						960			50.4		
	697	M	-20	<1	20	40	20	<20	<2	<3	30	10	<20						10					
			-80	<5	15	40	35	5	1		10	10												
	698	M	-20	<1	30	110	40	<20	<2	<3	40	20	<20						30					
			-80	5	30	145	45	5	1		30	20												
	699	P		10	2	145	70	20	1	<0.1	10	20	1.8%						740			204.5		
	602 700	M	-20	<1	10	90	40	<20	<2	<3	90	20	100						30					
			-80	<5	10	115	45	5	1		70	20												
	701	P		<5	5	780	65	50	<1	0.1	160	155	18.7%						880			31.6		
E	702	M	-20	<1	30	120	60	<20	5	<3	100	20	<20						30					
			-80	<5	20	160	70	10	1		110	30												
	703	P		I/S.	15	1200	115	50	3	I/S.	125	220	18.7%						920			5.0		
	704	M	-20	<1	10	60	40	<20	<2	<3	50	20	<20						30					
			-80	10	10	80	45	5	1		55	15												
	705	P		I/S.	5	1400	80	60	5	<0.1	240	250	24.5%						1100			6.3		
	706	M	-20	<1	10	70	40	<20	<2	<3	80	20	<20						30					
			-80	5	10	105	40	5	1		75	20												
	707	P		<5	2	800	50	50	1	48	195	170	21.6%						840			44.6		
	708	M	-20	<1	40	160	40	<20	<2	<3	60	20	<20						10					
			-80	<5	35	190	60	10	1		25	20												
	709	P		5	5	185	80	25	<1	0.1	50	40	3.83%						620			21.3		
	602 710	M	-20	<1	60	120	60	<20	5	<3	170	30	<20						30					
			-80	5	55	150	60	15	2		185	45												
	711	P		<5	15	75	75	20	<1	<0.1	50	25	0.47%						600			52.7		
	712	M	-20	<1	10	10	60	<20	<2	<3	30	<5	<20						5					
			-80	<5	5	10	10	<5	<1		10	<5												
	713	P		I/S.	80	2200	105	55	<1	<0.1	160	260	27.0%						1700			8.4		

-20: A/E : AAS - Cu, Zn, Pb, Bi, Ag, Ni, Co ; E = Emission = Sn, W etc. I/S. insufficient sample.

PACMINEX (PTY. LTD. — SAMPLE DATA SHEET

092

AREA EL15/76 Dundas | PROSPECT NUMBER 602 | 1:100,000 SHEET 7914 Pieman | DATE SAMPLED April 79 | SAMPLER J. Down | LABORATORY REPORT NO. | ANALYTICAL METHOD

STATE TAS | LOCATION | DRAINAGE Sampling

NOTATIONS: SAMPLE TYPE – M - Creekmud, S - Soil, SA - Soil Auger, RC - Drill Core, RP - Percussion Chips, R - Rock | ANALYSES: Please state element | ADDITIONAL

	SAMPLE NUMBER	SAMPLE TYPE	APERTURE SIZE (MICRONS)	CHEMICAL ANALYSES (ppm) Sb	Mo	W	F	In	Cd	Nb	As	Fe	SUMMARY DESCRIPTION	LOCATION E/W	N/S
E	602693	M	-20	<30	<3	<50					<50		Near Queenstown Highway South of Howards Road 2com NE of hwy (5353 300N/ 3717 00E) 5 pans (-20 mesh)		
			-80			5									
	694	P				1.1S			4			6.40%			
E	695	M	-20	<30	<3	<50					<50		South of 60 693M (5353 400mN/ 3722 00E) 4 pans		
			-80			<5									
	696	P				<10			2			4.00%			
	697	M	-20	<30	<3	<50					<50		Small ck 2com S of 602695M. (5353150N/ 3722 00E)		
			-80			<5									
	698	M	-20	<30	<3	<50					<50		South of 697M. 4 pans. (5353 900N/ 3724 00E)		
			-80			5									
	699	P				<10			2			4.00%			
	602 700	M	-20	<30	<3	<50					<50		Above third tram crossing of ck approx 500m SE of Howards Road. 5 pans (5355 700N/ 3733 00E)		
			-80			<5									
	701	P				<10			5			8.00%			
	702	M	-20	<30	<3	<50					<50		East of Howards Rd near 5355 600N/ 3738 00E. 5 pans.		
			-80			5									
	703	P				1.1S.			5			9.60%			
	704	M	-20	<30	<3	<50					<50		Near 602702M : 4 pans (-20 mesh)		
			-80			<5									
	705	P				1.1S.			6			10.4%			
	706	M	-20	<30	<3	<50					<50		South of 602702M : Main Ck nr. 5355 300N/ 3738 50E 5 pans (-20 mesh)		
			-80			<5									
	707	P				<10			5			8.00%			
	708	M	-20	<30	<3	<50					<50		East branch of ck nr. 602706 5 pans (-20 mesh)		
			-80			<5									
	709	P				<10			4			5.60%			
	602 710	M	-20	<30	<3	<50					<50		West branch of ck nr. 602706. 5 pans.		
			-80			<5									
	711	P				<10			3			4.80%			
N	712	M	-20	<30	<3	<50					<50		1.6 km South of Dundas Ck. Along Queenstown Highway and 5cm to E. 5358 500N/ 3684 00E (6 pans)		
			-80			5									
	713	P				1.1S.			6			8.80%			

38309

PACMINEX (PTY. LTD.) — SAMPLE DATA SHEET

093

AREA EL 15/76, Dundas — PROSPECT NUMBER 602 — DATE SAMPLED April 79 — LABORATORY REPORT NO. — NOTATIONS: SAMPLE TYPE – M - Creekmud, S - Soil, SA - Soil Auger, RC - Drill Core, RP - Percussion Chips, R - Rock, Please state element — ADDITIONAL P: Panned concent.

STATE TAS — LOCATION — 1:100,000 SHEET 7914 — SAMPLER P.M / J.D — ANALYTICAL METHOD A.A.S / XRF (Sn, W) = -80 Mesh — ANALYSES:

DRAINAGE SAMPLING

SAMPLE NUMBER	SAMPLE TYPE	FRACTION (MESH)	CHEMICAL ANALYSES (ppm) Sn	Cu	Zn	Pb	Bi	Ag	Au	Ni	Co	Cr	V	Te	Zr	P	B	Mn	Ca	Ba	Weight g	LOCATION E/W	N/S
602 714	M	-20	<1	<2	10	<20	<20	<2	<3	20	20	<20						<5					
		-80	5	5	10	10	<5	<1		5	<5												
715	P		1/S.	30	1200	390	30	2	<0·1	115	110	10·5%						620			6·6		
716	M	-20	<1	30	100	40	<20	<2	<3	50	10	<20						30					
		-80	<5	20	125	45	10	1		45	20												
717	P		20	5	155	115	20	5	0·2	25	20	1·87%						960			26·3		
718	M	-20	<1	20	30	<20	<20	<2	<3	40	10	20						100					
		-80	<5	10	35	20	<5	<1		25	10												
719	P		25	5	600	65	40	1	0·1	190	120	18·0%						820			61·8		
720																							
721	P		25	10	420	60	35	<1	6·3	150	95	12·0%						720			55·3		
722	M	-20	<1	80	180	280	<20	5	<3	70	50	<20						100					
		-80	<5	70	210	290	10	2		45	45												
723	P		1/S.	75	1,000	2,000	30	2	<0·1	70	60	3.05%						360			8·6		
724	M	-20	<1	10	50	<20	<20	<2	<3	20	10	<20						100					
		-80	5	10	55	30	<5	1		20	10												
725	P		10,700	5	1200	70	80	1	<0·1	150	330	42%						1300			312·7		
726	M	-20	1	10	30	40	<20	<2	<3	10	10	<20						30					
		-80	5	5	25	45	<5	<1		5	10												
727	M	-20	<1	10	20	<20	<20	<2	<3	10	<5	<20						5					
		-80	5	2	10	10	<5	<1		5	<5												
728	P		1/S.	2	540	95	40	<1	<0·1	160	125	14·4%						460			10·4		
729	M	-20	<1	10	30	160	<20	<2	<3	10	<5	<20						<5					
		-80	5	10	40	195	5	1		5	<5												
602 730	M	-20	<1	10	20	120	<20	<2	<3	20	<5	<20						100					
		-80	<5	5	10	120	<5	1		5	<5												
731	M	-20	10	20	130	100	<20	<2	<3	40	10	100						100					
		-80	<5	30	230	195	10	1		35	30												
732	P		1/S.	10	1100	440	45	1	<0·1	180	140	13·5%						720			5·2		
733	M	-20	<1	20	180	80	20	<2	<3	90	20	<20						10					
		-80	<5	15	220	70	<5	1		95	35												
734	P		50	5	880	130	40	<1	<0·1	115	120	13·5%						720			313·0		

-2c : A/E = AAS for Cu, Zn, Pb, Bi, Ag, Ni, Co ; Emmission Spec = E for Sn, W etc. 1/S = insufficient sample (heavy minerals)

383093

PACMINEX (PTY. LTD.) — SAMPLE DATA SHEET

094

AREA EL15/76 Dundas | PROSPECT NUMBER 602 | 1:100,000 SHEET 7914 | DATE SAMPLED MAY 79 | SAMPLER J.Dunn / P.A.M. | LABORATORY REPORT NO. | ANALYTICAL METHOD

STATE TAS | LOCATION DRAINAGE SAMPLING

NOTATIONS: SAMPLE TYPE – M - Creekmud, S - Soil, SA - Soil Auger, RC - Drill Core, RP - Percussion Chips, R - Rock | ANALYSES: Please state element | ADDITIONAL P = panned concentrate

SAMPLE NUMBER	SAMPLE TYPE	APERTURE (MESH)	CHEMICAL ANALYSES (ppm) Sb	Mo	W	F	In	Cd	Nb	As	Fe	SUMMARY DESCRIPTION	LOCATION E/W	N/S
602 714	M	-20	<30	<3	<50					<50		Mariposa Creek 200m E of Queenstown Highway. 6 pans (-20 mesh. (5357 300N/ 368 000E)		
		-80			<5									
715	P				1.1/5.			5			8.0%			
716	M	-20	<30	<3	<50					<50		Tributary of Ewart Ck south of Howards Road E of highway 5 pans (-20mesh ck sediment). Approx. 5353 600N/ 372 400E		
		-80			<5									
717	P				<10			2			4.60%			
718	M	-20	<30	<3	<50					<50		800m N of highway bridge over Ewart Ck. 3 pans (-20 mesh) 5352 400N/ 372 600E		
		-80			<5									
719	P				<10			4			7.20%			
720												Not Sampled.		
721	P				<10			3			6.40%	Ewart Ck tributary Sedge of EL15/76. Very braided ck. near track. 5351 300N/ 373 200E		
602 722	M	-20	<30	<3	<50					<50		Along Razorback Grid (R.G.) baseline (B/L) at 294mN Minor ck. 6 pans (-20mesh sieved ck sediment).		
		-80			<5									
723	P				1.1/5.			7			28%			
724	M	-20	<30	<3	<50					<50		Razorback B/L 3123N. 6 pans.		
		-80			<5									
725	P				220			6			10.4%			
726	M	-20	<30	<3	<50					<50		Razorback B/L 3167N		
		-80			<5									
727	M	-20	<30	<3	<50					<50		Razorback B/L 3235N 6 pans.		
		-80			5									
728	P				1.1/5.			3			6.4%			
729	M	-20	<30	<3	<50					<50		R.G. B/L 3500N		
		-80			<5									
602 730	M	-20	<30	<3	<50					<50		R.G. B/L 3547mN		
		-80			<5									
731	M	-20	<30	<3	<50							R.G. B/L 3840mN. 6 pans (-20mesh)		
		-80			5									
732	P				1.1/5.			5			10.4%			
733	M	-20	<30	<3	<50					<50		R.G. B/L 4472mN. 5 pans - very narrow gulley (0.3m).		
		-80			10									
734	P				<10			4			19.2%			

3830941

PACMINEX [illegible]Y. LTD. — SAMPLE DATA SHEET

383095

095

AREA EL 15/76, Dundas STATE TAS LOCATION DRAINAGE SAMPLING

PROSPECT NUMBER 602 1:100,000 SHEET 7914

DATE SAMPLED May '79 SAMPLER J. Dunn / P.M.M.

LABORATORY REPORT NO. ANALYTICAL METHOD -80: A.A.S / XRF (Sn, W)

NOTATIONS: SAMPLE TYPE – M - Creekmud ✓ S - Soil, SA - Soil Auger, RC - Drill Core, RP - Percussion Chips, R - Rock

ANALYSES: Please state element

ADDITIONAL P = Panned concentrate

SAMPLE NUMBER	SAMPLE TYPE	APERTURE SIZE (SIEVE/MICRONS)	Sn	Cu	Zn	Pb	Bi	Ag	Au	Ni	Co	Cr	V	Ti	Zr	P	B	Mn	Ca	Ba	Weight g.	LOCATION E/W	LOCATION N/S
																		10					
/E 602 735	M	-20	⊕ 30	30	30	40	<20	<2	<3		<5	20											
		-80	5	15	35	20	<5	<1		15	5												
602 736	M	-20	<1	20	90	160	<20	<2	<3	90	<5	<20						<5					
		-80	135	20	135	175	5	1		40	10												
737	M	-20	<1	10	10	<20	<20	<2	<3	<5	<5	<20						<5					
		-80	<5	2	10	10	<5	<1		5	<5												
738	P		I/S.	25	740	800	35	>25	I/S.	125	95	9.03%						460			3.9		
739	M	-20	<1	<2	10	<20	<20	<2	<3	20	<5	<20						10					
		-80	<5	<2	<2	5	<5	<1		<5	<5												
740	P		I/S.	15	310	140	20	18	I/S.	75	50	4.35%						260			3.8		
602 741	M	-20	<1	<2	20	<20	<20	<2	<3	<5	<5	300						100					
		-80	<5	2	10	15	<5	<1		5	<5												
602 742	M	-20																					
		-80																					
743		-20	15	32	120	90	<10	<1		35	30	50								x			
		-80	4	32	120	100	<10	<1		35	40	40								x			
744		-20	3	28	290	130	<10	<1		380	25	220								x			
		-80	<1	32	320	140	<10	1		430	25	90								x			
745		-20	8	25	210	160	<10	<1		730	150	1400								x			
		-80	5	20	210	160	<10	<1		780	160	530								x			
746		-20	15	10	170	100	<10	<1		560	90	1.1%								x			
		-80	2	10	150	110	<10	<1		610	100	3960								x			
747		-20	<1	10	250	70	<10	<1		2000	240	1.3%								x			
		-80	<1	8	240	65	<10	<1		2000	270	8500								x			
748		-20	1	15	140	40	<10	<1		970	100	5000								x			
		-80	<1	15	130	50	<10	<1		1000	110	2100								x			
602 749		-20	<1	40	100	95	<10	<1		50	40	100								x			
		-80	<1	40	110	90	<10	<1		50	40	70								200			

CHEMICAL ANALYSES (ppm)

-20 = A/E = AAS (Cu, Zn, Pb, Bi, Ag, Ni, Co), Emission Spec (Sn, W etc)   I/S. Insufficient Sample (heavy mineral)

⊕ [illegible] <2 ppm Sn by XRF

383095

PACMINEX (PTY. LTD. — SAMPLE DATA SHEET

096

AREA EL15/76 Dundas | PROSPECT NUMBER 602 | 1:100,000 SHEET 7914 | DATE SAMPLED | SAMPLER | LABORATORY REPORT NO. | ANALYTICAL METHOD

STATE TAS | LOCATION | DRAINAGE SAMPLING

NOTATIONS: SAMPLE TYPE – M - Creekmud, S - Soil, SA - Soil Auger, RC - Drill Core, RP - Percussion Chips, R - Rock | ANALYSES: Please state element | ADDITIONAL Planned Cover

	SAMPLE NUMBER	SAMPLE TYPE	APERTURE SIZE (MICRONS)	CHEMICAL ANALYSES (ppm) Sb	Mo	W	F	In	Cd	Nb	As	Fe	SUMMARY DESCRIPTION	LOCATION E/W	N/S
E	602 735	M	-20	<30	<3	<50					<50		Razorback Grid (R.G.) baseline (B/L) at 4570mN		
			-80			<5									
E	736	M	-20	<30	<3	<50					<50		R.G. B/L 4800N.		
			-80			10									
	737	M	-20	<30	<3	<50					<50		Cuni Grid: line 8341mN along northern boundary and west of 6200E baseline at 4865mE. 6 tons of		
			-80			<5									
	738	P				1.1/S.			4			10.4%	Sieved -20 mesh ck sediment.		
	739	M	-20	<30	<3	<50					<50		Cuni Grid (C.G) 5400mE on line 8341N		
			-80			<5									
	602 740	P				1.1/S.			2			4.00%			
	602 741	M	-20	<30	<3	<50					<50		CG 8341N/6130E (geographic gnd: 5368.3N/366.1E.		
			-80			<5									
	742														
	743		-20								<20		Razorback Mine Area: 5363.8N/369.1E (geographic grid)		
			-80								<20				
	744		-20								<20		ditto 5364.1N/369.0E		
			-80								<20				
	745		-20								<20		Razorback 5364.2N/368.9E		
			-80								<20				
	746		-20								<20		Razorback : 5364.3N/368.8E		
			-80								<20				
	747		-20								<20		Razorback : 5364.4N/368.7E		
			-80								<20				
	748		-20								<20		Razorback 5364.4N/368.7E		
			-80								<20				
	602 749		-20								<20		Razorback 5364.5N/368.3E		
			-80								<20				

See pages 13 and 14 for full results also.

E = Emission Spec.

PACMINEX (O) Y. LTD. — SAMPLE DATA SHEET

097

AREA E.L. 15/76 Dundas | PROSPECT NUMBER 602 | 1:100,000 SHEET 7914 | DATE SAMPLED | SAMPLER | LABORATORY REPORT NO. | ANALYTICAL METHOD

NOTATIONS: SAMPLE TYPE – M - Creekmud, S - Soil, SA - Soil Auger, RC - Drill Core, RP - Percussion Chips, R - Rock | ANALYSES: Please state element | ADDITIONAL

STATE TAS | LOCATION

SAMPLE NUMBER	SAMPLE TYPE	FRACTIONATION (MESH SIZE)	CHEMICAL ANALYSES (ppm) Sn E	Cu	Zn	Pb	Bi	Ag	Au	Ni	Co	Cr	V	Tl	Zr	P	B	Mn	Ca E	Ba	Weight	LOCATION LAT	LONG
602 750	M	-20	5	10	110	45	<10	<1		1450	250	8800							X				
		-80	<1	5	110	40	<10	<1		1650	310	3800							X				
751	M	-20	10	12	160	65	<10	<1		390	65	8000							X				
		-80	250	12	150	70	<10	<1		420	60	3200							X				
752	M	-20	15	10	310	25	<10	<1		960	160	4·3%							X				
		-80	<1	10	300	30	<10	<1		800	150	3·5							X				
753	M	-20	48	8	90	50	<10	<1	<0·05	20	10	2700							X				
		-80	150	10	95	70	<10	<1	<0·05	20	10	830							X				
754	M	-20	520	10	80	40	<10	<1	<0·05	20	20	1900							X				
		-80	2000	10	80	50	<10	<1	<0·05	20	20	370							X				
755	M	-20	34	2	15	5	<10	<1	<0·05	<5	<5	460							X				
		-80	2	<2	15	<5	<10	<1	<0·05	<5	<5	230							X				
602 756	M	-20	155	12	70	40	<10	<1	<0·05	15	40	1000							X				
		-80	20	12	70	40	<10	<1	<0·05	15	30	280							X				

E = Emission Spectrograph

X = below limit of detection

3830697

PACMINEX (80) LTD. — SAMPLE DATA SHEET

098

AREA _____ PROSPECT NUMBER _____ 1:100,000 SHEET _____ DATE SAMPLED _____ SAMPLER _____ LABORATORY REPORT NO. _____ ANALYTICAL METHOD _____

NOTATIONS: SAMPLE TYPE – M - Creekmud, S - Soil, SA - Soil Auger, RC - Drill Core, RP - Percussion Chips, R - Rock. ANALYSES: Please state element. ADDITIONAL _____

STATE _____ LOCATION _____

SAMPLE NUMBER	SAMPLE TYPE	APERTURE (SIEVE) (MICRONS)	CHEMICAL ANALYSES (ppm) Sb	Mo E	W	F	In	Cd	Nb	As	Ce	SUMMARY DESCRIPTION	LOCATION E/W	LOCATION N/S
602 750		-20		X	<50					<20		Location : 5364.7N / 368.4E Razorback		
		-80		X	<50					<20				
751		-20		X	<50					<20		Razorback 5364.8N / 368.3E		
		-80		X	<50					<20				
752		-20		X	<50					<20		Razorback area 5364.8N / 368.2E		
		-80		X	<50					<20				
753		-20		X	<10					<20	50	5365.1N / 366.0E NEVADA GRID		
		-80		X						<20				
754		-20		X	<10					<20	60	5365.2N / 365.9E NEVADA GRID		
										<20				
755		-20		X	<10					<20	20	5364.9N / 366.1E Nevada Grid		
										<20				
602 756		-20		X	<10					<20	90	Nevada Grid area 5365.1N / 366.3E		
										<20				

X = below limit of detection (emission Spec)

CSR LIMITED—SAMPLE DATA SHEET

DRAINAGE : ROCK SAMPLES

AREA EL 15/76 — PROSPECT NUMBER 602 — DATE SAMPLED — LABORATORY REPORT NO.

STATE TAS — LOCATION Dundas. — 1:100,000 SHEET 7419 — SAMPLER — ANALYTICAL METHOD

NOTATIONS: SAMPLE TYPE — M - Creekmud, S - Soil, SA - Soil Auger, RC - Drill Core, RP - Percussion Chips, R - Rock

ANALYSES: Please state element

ADDITIONAL

SAMPLE NUMBER	SAMPLE TYPE	APERTURE SIZE (SIEVE/MICRONS)	Sn	Cu	Zn	Pb	Bi	Ag	Au	Ni	Co	Cr	Sb	Mo	W	As	Mn	Ba	Ca	Ti	LOCATION E/W	LOCATION N/S
602733		-20	10	40	280	100	<20	5	<3	120	30	740	<30	<3	<50	<50	300					
		-80	<5	20	280	75	10	1		120	50	2100			10							
		-20							<0.01													
602743		-20		32	120	90	<10	<1		35	30	50		<3	<50	<20		<200				
		-80		32	120	100	<10	<1		35	40	40		<3		<20		<200				
		-20	15		80		<1	0.3					<30			<50						
		-80	4		100		<1	0.4					<30			<50						
744		-20		28	290	130	<10	<1		380	25	220		<3	<50	<20		<200				
		-80		32	320	140	<10	<1		430	25	90		<3		<20		<200				
		-20	3		200		<1	0.5					<30			<50						
		-80	<1		200		<1	0.5					<30			<50						
745		-20		25	210	160	<10	<1		730	150	1400		<3	<50	<20		<200				
		-80		20	210	160	<10	<1		780	160	530		<3		<20		<200				
		-20	8		180		<1	0.5					<30			<50						
		-80	5		200		<1	0.4					<30			<50						
746		-20		10	170	100	<10	<1		560	90	11 000		<3	<50	<20		<200				
		-80		10	150	110	<10	<1		610	100	3'900		<3		<20		<200				
		-20	15		200		<1	0.4					<30			<50						
		-80	2		200		<1	0.3					<30			<50						
747		-20		10	250	70	<10	<1		2000	240	13,000		<3	<50	<20		<200				
		-80		8	240	65	<10	<1		2000	270	8'500		<3		<20		<200				
		-20	<1		150		<1	0.2					<30			<50						
		-80	<1		200		<1	0.2					<30			<50						
748		-20		15	140	40	<10	<1		970	100	5000		<3	<50	<20		<200				
		-80		15	130	50	<10	<1		1,000	110	2'100		<3		<20		<200				
		-20	1		100		<1	0.3					<30			<50						
		-80	<1		100		<1	0.3					<30			<50						
749		-20		40	100	95	<10	<1		50	40	100		<3	<50	<20		<200				
		-80		40	110	90	<10	<1		50	40	70		<3		<20		200				
		-20	<1		30		<1	0.3					<30			<50						
		-80	<1		50		<1	0.3					<30			<50						
602750		-20		10	110	45	<10	<1		1450	250	8800		<3	<50	<20		<200				
		-80		5	110	40	<10	<1		1650	310	3500		<3		<20		<200				
		-20	5		100		<1	0.2					<30			<50						
		-80	<1		150		<1	0.2					<30			<50						
751		-20		12	160	65	<10	<1		390	65	8,000		<3	<50	<20		<200				
		-80		12	150	70	<10	<1		420	60	3'200		<3		<20		<200				
		-20	10		200		<1	0.4					<30			<50						
		-80	250		200		<1	0.4					<30			<50						
752		-20		10	310	25	<10	<1		960	160	43,000		<3	<50	<20		<200				
		-80		10	300	30	<10	<1		800	150	35,000		<3		<20		<200				
		-20	15		300		<1	0.3					<30			<50						
		-80	<1		500		<1	<0.1					<30			<50						

A/E = AAS for Cu, Zn, Pb, Bi, Ag, Ni, Co, Cr ; Emission for Sn, W, (Cr), Mn, Sb, Au, As, Ba
A/X = AAS + XRF.

383099

CSR LIMITED—SAMPLE DATA SHEET

CSR

100

AREA EL 15/76 PROSPECT NUMBER 602 1:100,000 SHEET

STATE TAS LOCATION Dundas

DATE SAMPLED

SAMPLER

LABORATORY REPORT NO.

ANALYTICAL METHOD

NOTATIONS: SAMPLE TYPE – M - Creekmud, S - Soil, SA - Soil Augur, RC - Drill Core, RP - Percussion Chips, R - Rock

ANALYSES: Please state element

ADDITIONAL

SAMPLE NUMBER	SAMPLE TYPE	APERTURE SIZE (MICRONS)	CHEMICAL ANALYSES (ppm) Sn	Cu	Zn	Pb	Bi	Ag	Au	Ni	Co	Cr	Sb	Mo	W	As	Mn	Br	Ca	Ti	Ce	LOCATION E/W	LOCATION N/S
															<10								
602753		-20	48	8	90	50	<10	<1	<0.05	20	10			<3		<20		<200			50		
		-80		10	95	70	<10	<1		20	10	830		10		<20		<200					
		-20	30		100		<1	0·3					<30			<50							
		-80	150		100		<1	0·3					<30			<50							
754		-20	520	10	80	40	<10	<1	<0.05	20	20			<3	<10	<20		<200			60		
		-80		10	80	50	<10	<1		20	20	370		<3		<20		<200					
		-20	600		100		<1	0·3					<30			<50							
		-80	2000		100		<1	0·4					<30			<50							
755		-20	34	2	15	5	<10	<1	<0.05	<5	<5			<3	<10	<20		<200			20		
		-80		<2	15	<5	<10	<1		<5	<5	230		<3		<20		<200					
		-20	5		20		<1	0·2					<30			<50							
		-80	2		30		<1	0·3					<30			<50							
602756	M	-20	155	12	70	40	<10	<1	<0.05	15	40			<3	<10	<20		<200			90		
		-80		12	70	40	<10	<1		15	30	280		<3		<20		<200					
		-20	60		80		<1	0·3					<30			<50							
		-80	20		70		<1	0·3					<30			<50							

A = A.A.S.

PAGE 1 OF 11

383100

101

383101

Australian Laboratory Services PTY. LTD.

CONSULTING CHEMISTS & ANALYSTS

OFFICE & LABORATORY
44 BALACLAVA ST., WOOLLOONGABBA 4102
Phone (07) 391 6988 A/H 355 0776
TELEX ALSEV 42344

LABORATORY REPORT

R. W. YERBURY
DIRECTOR

BATCH No.: 20 E CLIENT PACMINEX PTY.LTD.
ORDER No.: 18254 AREA: DUNDAS - TAS. DATE RECEIVED: 3-5-
SAMPLE TYPE: SOIL(-80#) & ROCKS No.: 85 DATE COMPLETED: 16-5
ATTENTION: Mr. P. MACNAMARA

SAMPLE No.	Cu ppm	Pb ppm	Zn ppm	Ag ppm	Ni ppm	Co ppm	Bi ppm	Sn ppm	W ppm
stream ~~Soil~~ Sediments 602652M	15	130	80	1	25	10	10	5	5
660	10	95	130	1	30	35	10	5	5
63	30	185	185	1	70	100	15	<5	5
65	30	105	290	2	155	105	10	<5	10
67	2	5	10	<1	5	<5	<5	<5	<5
69	<2	20	70	<1	20	10	<5	385	5
671	10	55	75	<1	20	20	<5	5	5
73	20	175	185	<1	35	35	5	<5	<5
75	25	185	360	1	150	195	5	<5	5
77	10	75	90	<1	45	20	5	<5	<5
79	15	65	115	1	60	15	10	<5	5
680	15	55	90	<1	40	10	10	5	<5
81	10	25	60	<1	55	15	5	5	<5
83	15	65	105	1	45	20	10	<5	5
85	20	70	150	1	105	50	10	<5	5
87	10	45	85	1	50	15	5	<5	5
89	15	45	75	1	40	10	5	<5	<5
91	5	20	20	<1	15	<5	5	<5	<5
93	10	30	35	1	25	10	<5	<5	5
95	15	30	95	1	25	15	10	<5	<5
97	15	35	40	1	10	10	5	<5	<5
98	30	45	145	1	30	20	5	5	5
700	10	45	115	1	70	20	5	<5	<5
02	20	70	160	1	110	30	10	<5	5
04	10	45	80	1	55	15	5	10	<5 *
06	10	40	105	1	75	20	5	5	<5
08	35	60	190	1	25	20	10	<5	<5
710	55	60	150	2	185	45	15	5	<5
12	5	10	10	<1	10	<5	<5	<5	5
602714M	5	10	10	<1	5	<5	<5	5	<5

NATA

This Laboratory is registered by the National Association of Testing Authorities, Australia. The tests reported herein have been performed in accordance with its

METHODS: Cu Pb Zn Ag Ni Co Bi by method 1 ; Au by method 12C
Sn W by method 9 A (XRF)

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383102

Australian Laboratory Services PTY. LTD.

CONSULTING CHEMISTS & ANALYSTS

OFFICE & LABORATORY
44 BALACLAVA ST., WOOLLOONGABBA 4102
Phone (07) 391 6986 A/H 355 0776
TELEX ALSEV 42344

LABORATORY REPORT

R. W. YERBURY
DIRECTOR

BATCH No.: 20 E CLIENT PACMINEX PTY.LTD.
ORDER No.: AREA: DATE RECEIVED:
SAMPLE TYPE: No.: DATE COMPLETED:
ATTENTION:

SAMPLE No.	Cu ppm	Pb ppm	Zn ppm	Ag ppm	Ni ppm	Co ppm	Bi ppm	Sn ppm	W ppm
602716M	20	45	125	1	45	20	10	<5	<5
18	10	20	35	<1	25	10	<5	<5	<5
22	70	290	210	2	45	45	10	<5	<5
24	10	30	55	1	20	10	<5	5	<5
26	5	45	25	<1	5	10	<5	5	<5
27	2	10	10	<1	5	<5	<5	5	5
29	10	195	40	1	5	<5	5	5	<5
730	5	120	10	1	5	<5	<5	<5	<5
31	30	195	230	1	35	30	10	<5	5
33	15	70	220	1	95	35	<5	<5	10
35	15	20	35	<1	15	5	<5	5	<5
36	20	175	135	1	40	10	5	135	10
37	2	10	10	<1	5	<5	<5	<5	<5
39	<2	5	<2	<1	<5	<5	<5	<5	<5
741M	2	15	10	<1	5	<5	<5	<5	<5
602CG164	5	80	220	1	540	140	10	<5	10
202	35	270	650	1	160	80	5	10	5
209	70	170	370	2	110	45	15	10	5
270	35	500	0.27%	2	230	230	5	5	20
649AR001	5	5	5	<1	10	<5	<5	<5	<5
02	2	5	5	<1	5	<5	<5	<5	<5
04	10	10	30	<1	20	10	<5	<5	5
05	<2	10	10	<1	5	<5	<5	<5	<5
06	<2	5	15	<1	10	5	<5	<5	<5
07	2	5	2	<1	5	<5	<5	<5	<5
08	<2	5	2	<1	5	<5	<5	<5	<5
09	5	10	10	<1	10	10	<5	<5	<5
602CE002	30	80	90	1	20	20	5	5	5
012	25	145	20	1	5	20	5	5	5
035	70	0.13%	630	8	95	45	5	5	15

METHODS:

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383103

ADELAIDE
Tel.: 272 5733

~~SYDNEY~~
Tel.: 977 6495

A.C.S. Laboratories Pty. Ltd.
~~68 ALEXANDER STREET~~
~~CROWS NEST, N.S.W. 2065~~
50 Mary Street,
UNLEY. 5061.
(P.O. Box 3)

ANALYTICAL RESULTS

Samples from: Pacminex Pty.Ltd.
Area: Zeehan, Tas.
Samples of: Soil and rock.
Preparation: Crush, pulverize and sieve. Sheet No.: 6.
Batch No.: A 2905. Date: 28/5/79.

SAMPLES WILL BE DISPOSED OF AFTER TWO MONTHS UNLESS WE ARE OTHERWISE ADVISED

Sample Description	Cu ppm	Pb ppm	Zn ppm	Ag ppm	Ni ppm	Co ppm	Bi ppm
602NEV 115	120	40	40	<2	40	<5	<20
6	120	<20	20	<2	40	10	<20
7	130	220	50	<2	60	10	<20
8	30	400	10	5	30	10	<20
9	30	40	30	<2	20	<5	<20
20	10	40	20	<2	10	<5	<20
1	90	60	50	5	60	<5	<20
602NEV 122	30	420	20	<2	30	<5	<20
602NEV 001 R	50	60	170	<2	90	20	<20
022 R	420	80	650	<2	950	90	<20
024 R	20	<20	390	<2	50	10	<20
051 R	10	40	50	<2	50	10	<20
052 R	50	80	170	<2	110	30	<20
081 R	10	40	290	<2	80	40	<20
086 R	250	20	210	<2	100	<5	<20
602 662 R	<2	20	150	<2	30	10	<20
602 CE 013 R	50	200	30	<2	60	50	<20
602 652 M	10	100	80	<2	30	<5	<20
660	20	100	130	<2	40	20	<20
663	20	120	130	<2	50	60	<20
665	20	80	210	<2	120	50	<20
667	<2	20	20	<2	30	<5	<20
669	<2	<20	50	5	20	10	<20
671	10	60	80	<2	40	10	<20
673	20	160	160	<2	50	30	<20
675	40	240	370	<2	170	200	<20
677	20	80	100	<2	70	30	<20
679	30	60	100	<2	70	20	<20
680	20	40	90	<2	50	10	<20
681	10	40	70	<2	70	10	<20
683	20	40	100	<2	60	20	<20
685	20	60	100	<2	70	40	<20
687	20	60	90	<2	80	20	<20
689	10	40	70	<2	60	<5	<20
691	20	40	20	<2	40	<5	<20
693	10	40	40	<2	40	<5	<20
695	20	20	70	<2	30	10	<20
697	20	20	40	<2	30	10	<20
698	30	40	110	<2	40	20	<20
700	10	40	90	<2	90	20	<20
702	30	60	120	5	100	20	<20
704	10	40	60	<2	50	20	<20
706	10	40	70	<2	80	20	<20
708	40	40	160	<2	60	20	<20
710	60	60	120	5	170	30	<20
712	10	60	10	<2	30	<5	<20
714	<2	<20	10	<2	20	20	<20
716	30	40	100	<2	50	10	<20
718	20	<20	30	<2	40	10	<20
602 722	80	280	180	5	70	50	<20

ANALYTICAL METHODS: Cu, Pb, Zn, Ag, Ni, Co, Bi by AAS.

DISTRIBUTION: Pacminex Pty.Ltd.

Signed .....

★47131

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383104

ADELAIDE
Tel.: 272 5733

SYDNEY
Tel.: 977-6495

A.C.S. Laboratories Pty. Ltd.
ALEXANDER STREET
MANLY, N.S.W. 2095
50 Mary Street,
UNLEY. 5061.
(P.O. Box 3).

ANALYTICAL RESULTS

Samples from: Pacminex Pty.Ltd.

Area: Zeehan, Tas.

Samples of: Soil and rock.

Preparation: Crush, pulverize and sieve.

Sheet No.: 7.

Batch No.: S A 2905

Date: 28/5/79.

SAMPLES WILL BE DISPOSED OF AFTER TWO MONTHS UNLESS WE ARE OTHERWISE ADVISED

Sample Description	Cu ppm	Pb ppm	Zn ppm	Ag ppm	Ni ppm	Co ppm	Bi ppm
602 724	10	<20	50	<2	20	10	<20
726	10	40	30	<2	10	10	<20
727	10	<20	20	<2	10	<5	<20
729	10	160	30	<2	10	<5	<20
730	10	120	20	<2	20	<5	<20
731	20	100	130	<2	40	10	<20
733	20	80	180	<2	90	20	20
735	30	40	30	<2	30	<5	<20
736	20	160	90	<2	90	<5	<20
737	10	<20	10	<2	<5	<5	<20
739	<2	<20	10	<2	20	<5	<20
741	<2	<20	20	<2	<5	<5	<20
602 CG 164 M	10	40	150	<2	450	100	<20
202	30	240	1500	<2	130	60	<20
209	40	280	500	<2	100	40	<20
270	20	<20	20	<2	20	<5	<20
649 AR 001	10	<20	30	<2	30	<5	<20
2	10	<20	30	<2	10	10	<20
4	10	<20	30	<2	20	10	<20
5	<2	<20	20	<2	10	<5	<20
6	20	<20	20	<2	30	<5	<20
7	<2	<20	10	<2	20	<5	<20
8	10	<20	10	<2	20	<5	<20
9	10	<20	20	<2	20	20	<20
602 RG 069 M	<2	<20	20	<2	10	<5	<20
183	10	80	50	<2	10	10	<20
602 CE 002 M	30	60	80	<2	30	20	<20
012	80	1140	500	10	80	20	<20
035	70	900	450	10	70	20	<20
057	30	60	30	<2	20	10	<20
065	20	280	170	<2	70	10	<20
067	30	100	30	<2	20	10	<20
068	50	100	200	<2	70	50	<20
070	130	960	1150	<2	230	80	<20
071	20	100	170	<2	80	30	<20
073	30	340	220	<2	130	20	<20
074	20	140	190	<2	80	20	<20
075	30	140	220	<2	60	40	<20
Repeat and check -							
602 CG 494	10	60	160	<2	600	70	<20
509	50	20	120	<2	80	20	<20
602 CE 029	30	40	20	<2	30	10	<20
046	<2	20	10	<2	10	10	<20
602 NEV 015	60	40	70	<2	70	10	<20
032	<2	<20	20	<2	20	10	<20
068	10	40	80	<2	40	<5	<20
084	60	60	100	<2	380	20	<20
117	120	200	50	<2	80	10	<20
602 652 M	10	100	70	<2	30	10	<20
722	70	280	170	<2	70	40	<20
602 CG 209	30	140	250	<2	100	40	<20
602 CG 299	60	140	250	<2	110	40	<20

ANALYTICAL METHODS:

Cu, Pb, Zn, Ag, Ni, Co, Bi by AAS.

Emission Spec. to Follow.

DISTRIBUTION: Pacminex Pty.Ltd.

Signed: [signature]

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383105

A.C.S. Laboratories Pty. Ltd.
50 MARY STREET
UNLEY, S.A. 5061
P.O. BOX 3
UNLEY, S.A. 5061
PHONE: 272 5733

ANALYTICAL RESULTS

Samples from: Pacminex Pty.Ltd. O/No.18253.
Area: Zeehan, Tas.
Samples of: Soil, sediment and rock.
Preparation: Sieve, crush and pulverize. Sheet No.: 5.
Batch No.: A 2905. Date: 28/6/79.

SAMPLES WILL BE DISPOSED OF AFTER TWO MONTHS UNLESS WE ARE OTHERWISE ADVISED

Sample Description	Cr ppm	W ppm	Mo ppm	Mn ppm	Sn ppm	As ppm	Sb ppm	Au ppm
602NEV 116	<20	<50	3	5	<1	<50	<30	<3
7	20	<50	<3	30	<1	<50	<30	<3
8	20	<50	<3	10	1	<50	<30	<3
9	20	<50	<3	10	<1	<50	<30	<3
20	20	<50	<3	30	<1	<50	<30	<3
1	30	<50	<3	30	<1	<50	<30	<3
602NEV 122	20	<50	<3	10	1	<50	<30	<3
602NEV 001 R	20	<50	<3	30	10	<50	<30	<3
022 R	300	<50	<3	300	<1	<50	<30	<3
024 R	3000	1000	<3	100	<1	<50	<30	<3
051 R	100	<50	<3	30	30	<50	<30	<3
052 R	100	<50	<3	30	30	<50	<30	<3
081 R	20	<50	<3	100	<1	<50	<30	<3
086 R	1000	<50	<3	30	<1	<50	<30	<3
602 662 R	300	<50	<3	100	1	<50	<30	<3
602CE 013 R	30	<50	<3	100	3	<50	<30	<3
602 562 M	20	<50	<3	30	<1	<50	<30	<3
660	<20	<50	<3	100	<1	<50	<30	<3
663	20	<50	<3	100	<1	<50	<30	<3
665	<20	<50	<3	100	<1	<50	<30	<3
667	100	<50	<3	30	3	<50	<30	<3
669	300	<50	<3	30	1000	<50	<30	<3
671	100	<50	<3	50	1	<50	<30	<3
673	<20	<50	<3	50	<1	<50	<30	<3
675	<20	<50	<3	100	<1	<50	<30	<3
677	<20	<50	<3	50	<1	<50	<30	<3
679	<20	<50	<3	30	<1	<50	<30	<3
680	<20	<50	<3	30	<1	<50	<30	<3
681	<20	<50	<3	100	<1	<50	<30	<3
683	<20	<50	<3	100	<1	<50	<30	<3
685	<20	<50	<3	100	<1	<50	<30	<3
687	<20	<50	<3	30	<1	<50	<30	<3
689	<20	<50	<3	10	<1	<50	<30	<3
691	20	<50	<3	30	<1	<50	<30	<3
693	<20	<50	<3	30	<1	<50	<30	<3
695	<20	<50	<3	10	<1	<50	<30	<3
697	<20	<50	<3	10	<1	<50	<30	<3
698	<20	<50	<3	30	<1	<50	<30	<3
700	100	<50	<3	30	<1	<50	<30	<3
702	<20	<50	<3	30	<1	<50	<30	<3
704	<20	<50	<3	30	<1	<50	<30	<3
706	<20	<50	<3	30	<1	<50	<30	<3
708	<20	<50	<3	10	<1	<50	<30	<3
710	<20	<50	<3	30	<1	<50	<30	<3
712	<20	<50	<3	5	<1	<50	<30	<3
714	<20	<50	<3	<5	<1	<50	<30	<3
716	<20	<50	<3	30	<1	<50	<30	<3
718	20	<50	<3	100	<1	<50	<30	<3
722	<20	<50	<3	100	<1	<50	<30	<3
602 724	<20	<50	<3	100	<1	<50	<30	<3

ANALYTICAL METHODS: Cr, W, Mo, Mn by Esl; Sn, Sb, As, Au by ES2.

DISTRIBUTION: Pacminex Pty.Ltd., Zeehan.

Signed P.M. Thomas for J.R. Burns

NATA

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383106

A.C.S. Laboratories Pty. Ltd.
50 MARY STREET
UNLEY, S.A. 5061
P.O. BOX 3
UNLEY, S.A. 5061
PHONE: 272 5733

ANALYTICAL RESULTS

Samples from: Pacminex Pty.Ltd. O/No.18253.
Area: Zeehan, Tas.
Samples of: Soil, sediment and rock.
Preparation: Sieve, crush and pulverize. Sheet No.: 6.
Batch No.: A 2905. Date: 28/6/79.

SAMPLES WILL BE DISPOSED OF AFTER TWO MONTHS UNLESS WE ARE OTHERWISE ADVISED

Sample Description	Cr ppm	W ppm	Mo ppm	Mn ppm	Sn ppm	As ppm	Sb ppm	Au ppm
602 726	<20	<50	<3	30	1	<50	<30	<3
727	<20	<50	<3	5	<1	<50	<30	<3
729	<20	<50	<3	<5	<1	<50	<30	<3
730	<20	<50	<3	100	<1	<50	<30	<3
731	100	<50	<3	100	10	<50	<30	<3
733	<20	<50	<3	10	<1	<50	<30	<3
735	20	<50	<3	10	30	<50	<30	<3
736	<20	<50	<3	<5	<1	<50	<30	<3
737	<20	<50	<3	<5	<1	<50	<30	<3
739	<20	<50	<3	10	<1	<50	<30	<3
741	300	<50	<3	100	<1	<50	<30	<3
602 CG 164 M	<20	<50	<3	5	10	<50	<30	<3
202	<20	<50	<3	10	<1	<50	<30	<3
209	30	<50	<3	50	1	<50	<30	<3
270	20	<50	<3	30	1	<50	<30	<3
649 AR 001	20	<50	<3	30	1	<50	<30	<3
002	<20	<50	<3	30	<1	<50	<30	<3
004	<20	<50	<3	5	1	<50	<30	<3
005	<20	<50	<3	<5	<1	<50	<30	<3
006	<20	<50	<3	10	<1	<50	<30	<3
007	<20	<50	<3	5	<1	<50	<30	<3
008	<20	<50	<3	10	<1	<50	<30	<3
009	<20	<50	<3	10	1	<50	<30	<3
602RG 069 M	<20	<50	<3	10	3	<50	<30	<3
183	20	<50	<3	<5	1	<50	<30	<3
602 CE 002 M	30	<50	<3	10	<1	<50	<30	<3
012	<20	<50	<3	30	<1	<50	<30	<3
035	<20	<50	<3	100	<1	<50	<30	<3
057	<20	<50	<3	100	<1	<50	<30	<3
065	<20	<50	<3	100	<1	<50	<30	<3
067	<20	<50	<3	100	<1	<50	<30	<3
068	<20	<50	<3	100	<1	<50	<30	<3
070	<20	<50	<3	300	<1	<50	<30	<3
071	20	<50	<3	300	<1	<50	<30	<3
073	<20	<50	<3	100	<1	<50	<30	<3
074	<20	<50	<3	100	<1	<50	<30	<3
602CE 075	30	<50	<3	300	<1	<50	<30	<3

ANALYTICAL METHODS: Cr, ~~W, Mo,~~ Mn by ES1; Sn, Sb, As, Au by ES2.

NATA

DISTRIBUTION: Pacminex Pty.Ltd., Zeehan.
Sydney.

Signed E.M. Thomas for J.R. ...

Ao/3924

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383107

FORM 6 JOB 5043/79 — AMDEL ANALYTICAL SERVICE — *Results in ppm unless otherwise stated* — BATCH NO. 1/2 .A

TT	Sample No.		Cu.	Pb	Zn	Co	Ni	Cr.
1	602 7L43M	-20#	32	90	120	30	35	50
2	"		28	130	290	25	380	220
3	5		25	160	210	150	730	1400
4	6		10	100	170	90	560	1.1%
5	7 "		10	70	250	240	2000	1.3%
6	8		15	40	140	100	970	5000
7	9		40	95	100	40	50	100
8	50		10	45	110	250	1450	8800
9	1		12	65	160	65	390	8000
10	2		10	25	310	160	960	4.3%
11	3		8	50	90	10	20	2700
12	4		10	40	80	20	20	1900
13	5"		2	5	15	<5	<5	460
14	602 756M		12	40	70	40	15	1000
15	602 NEV 123 S	-20#	5	15	410	40	40	2.5%
16	STD							
17	602 7L43M	-80#	32	100	120	40	35	40
18	"		32	140	320	25	430	90
19	602 7L45M	-80#	20	160	210	160	780	530
20	7 "							

FORM 6 JOB 5043/79 — AMDEL ANALYTICAL SERVICE — *Results in ppm unless otherwise stated* — BATCH NO. 2. A

TT	Sample No.		Cu	Pb	Zn	Co	Ni.	Cr
1	602 7L46M	-80#	10	110	150	100	610	3900
2	7	"	8	65	240	270	2000	8500
3	8	"	15	50	130	110	1000	2100
4	9	"	40	90	110	40	50	70
5	STD							
6	50	"	5	40	110	310	1650	3800
7	1	"	12	70	150	60	420	3200
8	2	"	10	30	300	150	800	3.5%
9	3	"	10	70	95	10	20	830
10	4	"	10	50	80	20	20	270
11	5 "	"	<2	<5	15	<5	<5	230
12	602 756M	"	12	40	70	30	15	280
13	602 NEV 123S	-80#	5	10	470	30	25	2.2%
14	602 NEV 121R		90	45	540	60	720	2800
15	125		15	50	460	30	60	7000
16	126		670	180	1700	190	1700	5300
17	602 NEV 127R		10	15	240	15	45	4200
18	55 "							
19	CODE		C1	C1	C1	C1	C1	C1
20			% Cr	CODE	F1			

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FORM 6 JOB 50A3/79

AMDEL ANALYTICAL SERVICE

Results in ppm unless otherwise stated

383108

BATCH NO. 1/2 B

TT	Sample No.		Ag	Bi	As	Au			
1	602743M	-20#	<1	<10	<20	—			
2	〃		<1	<10	<20	—			
3	5		<1	<10	<20	—			
4	6		<1	<10	<20	—			
5	7 x		<1	<10	<20	—			
6	8		<1	<10	<20	—			
7	9		<1	<10	<20	—			
8	50		<1	<10	<20	—			
9	1		<1	<10	<20	—			
10	2		<1	<10	<20	—			
11	3		<1	<10	<20	<0.05			
12	4		<1	<10	<20	<0.05			
13	5		<1	<10	<20	<0.05			
14	602756M		<1	<10	<20	<0.05			
15	602NEV123S	-20#	<1	<10	<20	<0.05			
16	STD.								
17	602743M	-80#	<1	<10	<20	—			
18	〃		<1	<10	<20	—			
19	602745M	-80#	<1	<10	<20	—			
20	7 x								

FORM 6 JOB 50A3/79

AMDEL ANALYTICAL SERVICE

Results in ppm unless otherwise stated

BATCH NO. 2. B

TT	Sample No.		Ag.	Bi.	As.	Au			
1	602746M	-80#	<1	<10	<20	—			
2	7	"	<1	<10	<20	—			
3	8	"	<1	<10	<20	—			
4	9	"	<1	<10	<20	—			
5	STD.								
6	50	"	<1	<10	<20	—			
7	1	"	<1	<10	<20	—			
8	2	"	<1	<10	<20	—			
9	3	"	<1	<10	<20	—			
10	4	"	<1	<10	<20	—			
11	5 x	"	<1	<10	<20	—			
12	602756M	"	<1	<10	<20	—			
13	602NEV123S	-80#	<1	<10	<20	<0.05			
14	602NEV124R		<1	<10	<20	<0.05			
15	125	"	<1	<10	<20	<0.05			
16	126		<1	<10	<20	<0.05			
17	602NEV127R		<1	<10	<20	<0.05			
18	55 x								
19	— CODE		C_2	C_1	C_1	C_3			
20									

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383109

The Australian
Mineral Development
Laboratories

emington Street, Frewville,
South Australia 5063
Phone Adelaide 79 1662
Telex AA 82520

Please address all
correspondence to
P.O. Box 114 Eastwood
SA 5063
In reply quote:

amdel

AC 3/8/9/0 - 5043/

NATA CERTIFICATE

30 July 1979,

REPORT COMPLETE

Mr. P. Macnamera,
CSR Exploration,
G.P.O. Box 483,
SYDNEY N.S.W. 2001

REPORT AC 5043/79

YOUR REFERENCE: Order No 18264. Prospect No 602.
Application dated 5 June 1979.

IDENTIFICATION: As listed.

DATE RECEIVED: 13 June 1979.

ANALYSIS
ppm

SAMPLE MARK		TIN Sn	TUNGSTEN W	NIOBIUM Nb	TANTALUM Ta	CERIUM Ce
~~602NEV 124~~		~~<4~~	~~<10~~	~~<4~~	~~<10~~	~~<20~~
~~602NEV 125~~		~~<4~~	~~<10~~	~~<4~~	~~<10~~	~~30~~
~~602NEV 126~~		~~<4~~	~~<10~~	~~<4~~	~~<10~~	~~80~~
~~602NEV 127~~		~~<4~~	~~<10~~	~~<4~~	~~<10~~	~~40~~
602	753	48	<10	<4	<10	50
602	754	520	<10	<4	<10	60
602	755	34	<10	<4	<10	20
602	756	155	<10	<4	10	90

METHOD: B1

(-20)
✓
✓
✓

Enquiries quoting AC 5043/79 to the Manager please

D. K. Rowley
Manager
Analytical Chemistry Division

for R L Bruce

for Norton Jackson
Managing Director

dg

Pilot Plant: Osman Place
Thebarton S.A.
Telephone 43 8053
Branch Laboratory: Perth

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THE AUSTRALIAN MINERAL DEVELOPMENT LABORATORIES 383110

REPORT AC 5043/79

x = not detected at the limits quoted

Results in ppm unless otherwise stated. Detection limits in brackets.

Sample No.	Ba (500)	Ta (100)	V (10)	Yb (1)	Be (1)	Mo (3)	W (50)	Ce (300)	La (50)	N (2
-20# 02743	x	x	1510	3	4	x	x	x	x	
4	x	x	2010	2	2	x	y	x	x	
5	x	x	1510	2	1	x	y	x	x	
6	x	x	1010	1	x	x	y	x	x	
7	x	x	1010	x	x	x	y	x	x	
8	x	x	1010	2	1	x	x	x	x	
9	x	x	1810	1	2	x	x	x	x	
50	x	x	1710	1	x	x	x	x	x	
1	x	x	3010	4	2	x	x	x	x	
2	x	x	3010	2	x	x	x	x	x	
3	x	x	1710	x	y	x	x	x	x	
4	x	x	1810	4	x	x	x	x	x	
5	x	x	1510	2	x	x	x	x	x	
02756	x	x	1810	2	x	x	x	x	x	
5 2NEW123	x	x	2010	1	x	x	x	x	x	
-80# 02743	x	x	1510	3	3	x	x	x	100	
4	x	x	1510	2	2	x	x	x	x	
5	x	x	1510	2	2	x	x	x	x	
6	x	x	1010	2	1	x	x	x	x	
7	x	x	1810	1	x	x	x	x	x	
8	x	x	1010	2	2	x	x	x	x	
9	2010	x	1810	1	2	x	x	x	x	
50	x	x	1710	x	x	x	x	x	x	
1	y	x	2010	5	2	x	x	x	x	
2	x	x	5010	3	2	10	x	x	x	
3	x	x	2010	2	1	x	x	x	x	
02754	x	x	1010	3	1	x	x	x	x	

Results are semi-quantitative. Elements apparently present in concentrations of econom

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THE NORTHERN MINERAL EXPLORATION LABORATORIES 383111

REPORT AC 5043/79

x = not detected at the limits quoted

Results in ppm unless otherwise stated. Detection limits in brackets.

Sample No.	Ag (0.1)	Cd (3)	Ge (1)	Sb (30)	As (50)	In (10)	Sn (1)	Bi (1)	Ga (1)	Zn (2)
-20 # 02743	0.3	x	x	x	x	x	15	x	20	
4	0.5	x	x	x	x	x	3	x	20	
5	0.3	x	x	x	x	x	8	x	10	
6	0.4	x	x	x	x	x	15	x	7	
7	0.2	x	x	x	x	x	x	x	x	
8	0.3	x	x	x	x	x	1	x	7	
9	0.3	x	x	x	x	x	x	x	5	
50	0.2	x	x	x	x	x	5	x	3	
1	0.4	x	x	x	x	x	10	x	18	
2	0.3	x	x	x	x	10	15	x	8	
3	0.3	x	x	x	x	x	30	x	8	
4	0.3	x	x	x	x	x	600	x	10	
5	0.2	x	1	x	x	x	5	x	1	
02756	0.3	x	x	x	x	x	60	x	5	
1235 ONEY -80 # 02743	0.4	x	1	x	x	20	1	x	3	
4	0.5	x	x	x	x	x	4	x	15	
5	0.4	x	x	x	x	x	5	x	15	
6	0.3	x	x	x	x	x	2	x	8	
7	0.2	x	x	x	x	20	x	x	1	
8	0.3	x	x	x	x	x	x	x	7	
9	0.3	x	x	x	x	x	x	x	5	
50	0.2	x	x	x	x	10	x	x	12	
1	0.4	x	x	x	x	x	250	x	25	
2	0.1	x	x	x	x	20	x	x	15	
3	0.3	x	x	x	x	x	150	x	10	
02754	0.4	x	1	x	x	x	2000	x	10	

Results in ppm [illegible]

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383112

REPORT AC 5243/79

x = not detected at the limits quoted

Results in ppm unless otherwise stated. Detection limits in brackets

ple	Ba (500)	Ta (100)	V (10)	Yb (1)	Be (1)	Mo (3)	W (50)	G (300)	La (50)	Nb (20
22755	x	x	710	2	x	x	x	x	x	
56	x	x	710	2	1	x	x	x	x	
1235 2NEV	x	x	1010	1	1	x	x	x	x	
124	x	x	510	1	3	x	x	x	x	
25	x	x	1010	1	x	x	x	x	x	
26	x	x	710	2	5	x	x	x	x	
27	x	x	810	1	x	x	x	x	x	

ple o.	Ag (0.1)	Cd (3)	Ge (1)	Sb (30)	As (50)	In (1)	Sn (1)	Bi (1)	Ga (1)	Zn (20)
22755	0.3	x	1	x	x	x	2	x	1	3
56	0.3	x	x	x	x	x	20	x	3	7
1235 2NEV	0.5	x	x	x	x	x	2	x	3	10
124	0.4	x	x	x	x	x	x	x	x	6
25	0.3	x	x	x	x	x	x	x	3	5
26	0.3	x	x	x	x	x	x	x	x	5
27	0.3	x	1	x	x	x	x	x	1	7

Results are semi-quantitative

THE AUSTRALIAN MINERAL DEVELOPMENT LABORATORIES

REPORT AN...5043/79.....

QUALITATIVE SPECTROGRAPHIC ANALYSIS

Sample No.	Major	Minor	Heavy Trace (0.1—1%)	Trace (0.01—0.1%)	Faint Trace (0.001—0.01%)	Very Faint Trace (0.0001—0.001%)
	Fe	Cr	Mn	Ni Zn Ti Na	Zr Co Y	Sc Be
602 NEV 124	Si		Al	Cu K	V Li	
			Mg	P Ca	Pb	
	Fe	Cr	Mn Ni	Cu K Ti	Co Y	Be Li Y
602 NEV 126	Si		Zn Al	P Zr	V Na	Sc
			Mg	Ca Pb		

Elements not sought: Hg, Hf, U, Re

Other elements not detected at limits quoted in attached sheet:

SPECTROGRAPHIC ANALYSIS

Detection-Limit Concentrations of Elements
DC Arc Excitation

Element	%	ppm	Element	%	ppm
Ag	0.00001	0.1	Na	0.005	50
Al	0.02	200	Nb	0.02	20
As	0.005	50	Nd	0.03	300
Au	0.0003	3	Ni	0.0005	5
B	0.001	10	Os	0.001	10
Ba	0.005	50	P	0.01	100
Be	0.0001	1	Pb	0.0001	1
Bi	0.0001	1	Pd	0.001	10
Ca	0.002	20	Pr	0.01	100
Cd	0.003	3	Pt	0.001	10
Ce	0.03	300	Rb	0.001	10
Co	0.0005	5	Re	0.001	10
Cr	0.002	20	Rh	0.0002	2
Cs	0.003	30	Ru	0.0002	2
Cu	0.00005	0.5	Sb	0.003	30
Dy	0.01	100	Sc	0.005	50
Er	0.01	100	Si	0.02	200
Eu	0.005	50	Sm	0.03	300
Fe	0.005	50	Sn	0.0001	1
Ga	0.0001	1	Sr	0.001	10
Gd	0.03	300	Ta	0.01	100
Ge	0.0001	1	Tb	0.01	100
Hf	0.02	200	Te	0.002	20
Hg	0.01	100	Th	0.01	100
Ho	0.01	100	Ti	0.01	100
In	0.001	10	Tl	0.0001	1
Ir	0.0002	2	Tm	0.01	100
K	0.0005	5	U	0.1	1000
La	0.01	100	V	0.001	10
Li	0.0001	1	W	0.005	50
Lu	0.03	300	Y	0.001	10
Mg	0.01	100	Yb	0.005	50
Mn	0.001	10	Zn	0.002	20
Mo	0.0003	3	Zr	0.02	200

SPECTROGRAPHIC ANALYSIS

Detection-Limit Concentrations of Elements
DC Arc Excitation

Element	%	ppm	Element	%	ppm
Ag	0.00001	0.1	Na	0.005	50
Al	0.02	200	Nb	0.02	20
As	0.005	50	Nd	0.03	300
Au	0.0003	3	Ni	0.0005	5
B	0.001	10	Os	0.001	10
Ba	0.005	50	P	0.01	100
Be	0.0001	1	Pb	0.0001	1
Bi	0.0001	1	Pd	0.001	10
Ca	0.002	20	Pr	0.01	100
Cd	0.003	3	Pt	0.001	10
Ce	0.03	300	Rb	0.001	10
Co	0.0005	5	Re	0.001	10
Cr	0.002	20	Rh	0.0002	2
Cs	0.003	30	Ru	0.0002	2
Cu	0.00005	0.5	Sb	0.003	30
Dy	0.01	100	Sc	0.005	50
Er	0.01	100	Si	0.02	200
Eu	0.005	50	Sm	0.03	300
Fe	0.005	50	Sn	0.0001	1
Ga	0.0001	1	Sr	0.001	10
Gd	0.03	300	Ta	0.01	100
Ge	0.0001	1	Tb	0.01	100
Hf	0.02	200	Te	0.002	20
Hg	0.01	100	Th	0.01	100
Ho	0.01	100	Ti	0.01	100
In	0.001	10	Tl	0.0001	1
Ir	0.0002	2	Tm	0.01	100
K	0.0005	5	U	0.1	1000
La	0.01	100	V	0.001	10
Li	0.0001	1	W	0.005	50
Lu	0.03	300	Y	0.001	10
Mg	0.01	100	Yb	0.005	50
Mn	0.001	10	Zn	0.002	20
Mo	0.0003	3	Zr	0.02	200

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CONSULTING CHEMISTS & ANALYSTS

OFFICE & LABORATORY
44 BALACLAVA ST., WOOLLOONGABBA 4102
Phone (07) 391 6986 A/H 355 0776
TELEX ALSEV 42344

LABORATORY REPORT

R. W. YERBURY
DIRECTOR

BATCH No.: M038 CLIENT C.S.R. LTD. - MINERALS & CHEMICALS DIVISION
ORDER No.: 20130 AREA: DATE RECEIVED: 5.1.
SAMPLE TYPE: CONCENTRATES No.: 41 DATE COMPLETED: 24.1.
ATTENTION: P. MACNAMARA

SAMPLE No.	Cu ppm	Pb ppm	Zn ppm	Ag ppm	Bi ppm	Co ppm	Ni ppm
602651P	10	580	0.12%	2	60	240	220
61	10	55	145	<1	15	20	45
64	30	260	540	<1	35	80	115
66	10	180	165	<1	20	35	50
68	20	95	0.17%	4	40	300	290
70P	20	135	270	2	5	65	60
72	2	50	0.12%	1	85	350	200
74	5	175	0.12%	<1	60	260	210
76	15	150	440	<1	30	80	85
78	50	130	340	<1	20	40	65
82	2	80	600	<1	45	145	100
84	55	350	880	1	40	125	120
86	15	85	0.11%	1	60	220	160
88	25	160	0.12%	2	50	180	165
90P	35	175	0.11%	2	30	85	65
91 92	20	90	0.10%	4	55	190	155
94	15	110	820	6	40	160	85
96	5	105	370	<1	20	50	35
99	2	70	145	1	20	20	10
602701P	5	65	780	<1	50	155	160
03	15	115	0.12%	3	50	220	125
05	5	80	0.14%	5	60	250	240
07	2	50	800	1	50	170	195
09	5	80	185	<1	25	40	50
11P	15	75	75	<1	20	25	50
13	80	105	0.22%	<1	55	260	160
15	30	390	0.12%	2	30	110	115
17	5	115	155	5	20	20	25
19	5	65	600	1	40	120	190
602721P	10	60	420	<1	35	95	150

This Laboratory is registered by the National Association of Testing Authorities, Australia. The tests reported herein have been performed in accordance with

METHODS: Cu Pb Zn Ag Bi Co Ni Cd Cr Fe Mn METHOD 1
Sn W METHOD 9-A Au METHOD 120

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44 BALACLAVA ST., WOOLLOONGABBA 4102
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TELEX ALSEV 42344

LABORATORY REPORT

R. W. YERBURY
DIRECTOR

BATCH No.: M038 CLIENT C.S.R. LTD

ORDER No.: AREA: DATE RECEIVED:

SAMPLE TYPE: No.: DATE COMPLETED:

ATTENTION:

SAMPLE No.	Cd ppm	Cr %	Fe %	Mn ppm	Au ppm	Sn ppm	W ppm			
602651P	6	27.0	10.4	880	Insufficient Sample					
61	2	0.30	4.00	520	<0.1	20	<10			
64	4	7.60	15.2	600	<0.1	Insufficient Sample				
66	4	0.20	8.80	0.20%	<0.1	20	<10			
68	6	37.5	10.0	0.13%	<0.1	0.26%	<10			
602670P	3	3.54	12.4	0.12%	<0.1	560	<10			
72	6	38.3	12.0	0.12%	<0.1	0.22%	<10			
74	6	30.5	12.0	0.11%	2.0	0.10%	<10			
76	4	3.83	13.6	0.34%	<0.1	Insufficient Sample				
78	3	1.20	8.80	0.13%	Insufficient Sample					
82	4	12.0	7.20	0.12%	1.3	Insufficient Sample				
84	5	4.80	25.6	0.16%	<0.1	"	"			
86	5	22.4	9.60	0.13%	<0.1	"	"			
88	6	16.5	10.4	0.13%	<0.1	"	"			
90P	6	6.30	11.2	880	<0.1	"	"			
91 92	5	20.6	10.4	800	114	"	"			
94	4	14.7	6.40	0.12%	3.7	"	"			
96	2	5.28	4.00	960	1.0	10	<10			
99	2	1.80	4.00	740	<0.1	10	<10			
602701P	5	18.7	8.00	880	0.1	<5	<10			
03	5	18.7	9.60	920	Insufficient Sample					
05	6	24.5	10.4	0.11%	<0.1	"	"			
07	5	21.6	8.00	840	48.0	<5	<10			
09	4	3.83	5.60	620	0.1	5	<10			
11P	3	0.47	4.80	600	<0.1	<5	<10			
13	6	27.0	8.80	0.17%	<0.1	Insufficient Sample				
15	5	10.5	8.00	620	<0.1	"	"			
17	2	1.87	4.00	960	0.2	20	<10			
19	4	18.0	7.20	820	0.1	25	<10			
602721P	3	12.0	6.40	720	6.3	25	<10			

METHODS:

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CONSULTING CHEMISTS & ANALYSTS

OFFICE & LABORATORY
44 BALACLAVA ST., WOOLLOONGABBA 4102
Phone (07) 391 6986 A/H 355 0776
TELEX ALSEV 42344

LABORATORY REPORT

R. W. YERBURY
DIRECTOR

BATCH No.: M038 CLIENT C.S.R. LIMITED
ORDER No.: AREA: DATE RECEIVED:
SAMPLE TYPE: No.: DATE COMPLETED:
ATTENTION:

SAMPLE No.	Cu ppm	Pb ppm	Zn ppm	Ag ppm	Bi ppm	Co ppm	Ni ppm	
602723P	75	0.20%	0.10%	2	30	60	70	
25	5	70	0.12%	1	80	330	150	
28	2	95	540	<1	40	125	160	
32P	10	440	0.11%	1	45	140	180	
34	5	130	880	<1	40	120	115	
38	25	800	740	>25	35	95	125	
602740P	15	140	310	18	20	50	75	
602654P 602CE 069P	145	230	0.17%	3	45	90	120	
657P 072P	115	240	0.16%	1	40	85	110	
650P 602RG 100P	40	270	940	<1	35	10	140	
~~649AR 003P~~	~~35~~	~~50~~	~~270~~	~~<1~~	~~30~~	~~65~~	~~60~~	← Sher area.

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METHODS:

APPENDIX VI

GEOCHEMICAL ANALYSES OF THE 1981-83 DRAINAGE SAMPLING

(Part of Macnamara, 1984)

Drainage (-20 mesh) : suffix "A" following sample number

Sample Nos. : 602594A-916A
A140001-367A

Laboratory :

(i) ACS Batch A2905 28/5/79
(ii) ALS Batch B204 12/3/81
(iii) ALS Batch K082, K082/1, K082/2 18/10/82 (O/N 33271)
(iv) Comlabs Job COM 821156 14/7/82 (O/N 30661)

Method :

(1) AAS : Cu, Zn, Pb, Bi, Ag, Ni, Co, Cr, Fe, Mn, Cd
Au1 (ppb), Au2 (ppb)

(2) Emission Spec : Cr2, Sn2

(3) XRF : Cr1, Sn, Sn1

Note : Cr2 and Sn are emission spectrograph results

Cr1 is an XRF value. Sn1 values are checks on analyses labelled "Sn"

All values are in ppm, except Au (ppb)

Detection Limit : Values below the limit of detection are assigned a value equal to half the limit of detection, e.g. Ag (0.5), Bi (2), (Co (1), Cd (0.5), Au (2), Sn (2)

```
VAX/VMS  DATA        RELINQ  4-JUL-1984 10:38   TTDO:  4-JUL-1984 10:38   USER_1:[DATA.DUNDAS]RELINQ.1;3   VAX/VMS
VAX/VMS  DATA        RELINQ  4-JUL-1984 10:38   TTDO:  4-JUL-1984 10:38   USER_1:[DATA.DUNDAS]RELINQ.1;3   VAX/VMS
VAX/VMS  DATA        RELINQ  4-JUL-1984 10:38   TTDO:  4-JUL-1984 10:38   USER_1:[DATA.DUNDAS]RELINQ.1;3   VAX/VMS
```

```
DDDD    AAA   TTTTT   AAA
D   D  A   A    T    A   A
D   D  A   A    T    A   A
D   D  A   A    T    A   A
D   D  AAAAA    T    AAAAA
D   D  A   A    T    A   A
DDDD   A   A    T    A   A
```

```
RRRRRRRR    EEEEEEEEEE  LL            IIIIII    NN       NN    QQQQQQ
RRRRRRRR    EEEEEEEEEE  LL            IIIIII    NN       NN    QQQQQQ
RR      RR  EE          LL              II      NN       NN  QQ      QQ
RR      RR  EE          LL              II      NN       NN  QQ      QQ
RR      RR  EE          LL              II      NNNN     NN  QQ      QQ
RR      RR  EE          LL              II      NNNN     NN  QQ      QQ
RRRRRRRR    EEEEEEEE    LL              II      NN NN    NN  QQ      QQ
RRRRRRRR    EEEEEEEE    LL              II      NN NN    NN  QQ      QQ
RR  RR      EE          LL              II      NN   NNNN  QQ  QQ  QQ
RR  RR      EE          LL              II      NN   NNNN  QQ  QQ  QQ
RR    RR    EE          LL              II      NN     NN  QQ    QQ      ....
RR    RR    EE          LL              II      NN     NN  QQ    QQ      ....
RR      RR  EEEEEEEEEE  LLLLLLLLLL    IIIIII    NN     NN    QQQQ  QQ  ....
RR      RR  EEEEEEEEEE  LLLLLLLLLL    IIIIII    NN     NN    QQQQ  QQ  ....
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111111      ;;        333333
111111      ;;        333333
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DDDD    AAA   TTTTT   AAA
D   D  A   A    T    A   A
D   D  A   A    T    A   A
D   D  A   A    T    A   A
D   D  AAAAA    T    AAAAA
D   D  A   A    T    A   A
DDDD   A   A    T    A   A
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VAX/VMS  DATA        RELINQ  4-JUL-1984 10:38   TTDO:  4-JUL-1984 10:38   USER_1:[DATA.DUNDAS]RELINQ.1;3   VAX/VMS
VAX/VMS  DATA        RELINQ  4-JUL-1984 10:38   TTDO:  4-JUL-1984 10:38   USER_1:[DATA.DUNDAS]RELINQ.1;3   VAX/VMS
VAX/VMS  DATA        RELINQ  4-JUL-1984 10:38   TTDO:  4-JUL-1984 10:38   USER_1:[DATA.DUNDAS]RELINQ.1;3   VAX/VMS
```

SAMPLE	AMGE	AMGN	N NO	SN	SN1	SN2	CU	ZN	PB	BI	AG	AU1	AU2	NI	CO	CR	CR1	CR2	FE	MN	CD
A140005	37404.	535431.	005A	2.	0.	0.	35.	150.	50.	0.	2.0	2.	0.	70.	35.	65.	0.	0.	39700.	840.	0.0
A140006	37394.	535426.	006A	4.	0.	0.	25.	160.	50.	0.	2.0	2.	0.	25.	20.	20.	0.	0.	40500.	500.	0.0
A140008	37401.	535330.	008A	4.	0.	0.	35.	200.	55.	0.	2.0	2.	0.	40.	25.	30.	0.	0.	45100.	890.	0.0
A140011	37453.	535448.	011A	6.	0.	0.	40.	165.	65.	0.	2.0	2.	0.	105.	35.	130.	0.	0.	49800.	910.	0.0
A140012	37411.	535446.	012A	2.	0.	0.	50.	400.	105.	0.	4.0	2.	0.	90.	35.	50.	0.	0.	56500.	1800.	0.0
A140013	37357.	535447.	013A	4.	0.	0.	40.	185.	55.	0.	2.0	2.	2.	110.	35.	65.	0.	0.	43000.	320.	0.0
A140014	37347.	535460.	014A	2.	0.	0.	40.	200.	50.	0.	2.0	2.	3.	135.	40.	70.	0.	0.	46400.	820.	0.0
A140016	37319.	535447.	016A	6.	0.	0.	30.	250.	55.	0.	2.0	2.	3.	115.	40.	60.	0.	0.	47000.	1100.	0.0
A140018	37384.	535501.	018A	8.	0.	0.	40.	170.	80.	0.	2.0	2.	3.	25.	55.	25.	0.	0.	42600.	2200.	0.0
A140019	37369.	535502.	019A	2.	0.	0.	100.	160.	30.	0.	2.0	20.	20.	270.	65.	225.	0.	0.	68900.	1300.	0.0
A140020	37275.	535501.	020A	12.	0.	0.	10.	50.	20.	0.	1.0	2.	3.	45.	10.	20.	0.	0.	22100.	125.	0.0
A140021	37459.	535548.	021A	2.	0.	0.	10.	80.	35.	0.	1.0	2.	0.	75.	25.	220.	0.	0.	23100.	990.	0.0
A140023	37451.	535543.	023A	4.	0.	0.	5.	65.	15.	0.	2.0	2.	0.	65.	15.	1500.	0.	0.	17600.	500.	0.0
A140024	37359.	535548.	024A	2.	0.	0.	15.	130.	35.	0.	6.0	2.	0.	95.	25.	195.	0.	0.	26400.	420.	0.0
A140026	37365.	535539.	026A	6.	0.	0.	10.	105.	15.	0.	2.0	2.	2.	90.	20.	260.	0.	0.	24900.	510.	0.0
A140027	37350.	535541.	027A	6.	0.	0.	40.	170.	90.	0.	2.0	2.	0.	95.	40.	40.	0.	0.	42800.	1100.	0.0
A140028	37341.	535549.	028A	10.	0.	0.	30.	140.	50.	0.	2.0	2.	0.	85.	25.	25.	0.	0.	36300.	340.	0.0
A140029	37325.	535546.	029A	16.	0.	0.	50.	90.	50.	0.	2.0	2.	0.	80.	45.	35.	0.	0.	50300.	1400.	0.0
A140030	37326.	535541.	030A	12.	0.	0.	55.	100.	50.	0.	2.0	2.	0.	85.	55.	40.	0.	0.	52500.	2100.	0.0
A140031	37269.	535542.	031A	10.	0.	0.	5.	20.	20.	0.	1.0	2.	3.	10.	5.	35.	0.	0.	10100.	90.	0.0
A140032	37256.	535540.	032A	12.	0.	0.	15.	80.	30.	0.	1.0	2.	3.	50.	10.	30.	0.	0.	26200.	200.	0.0
A140034	37492.	535551.	034A	2.	0.	0.	10.	80.	40.	0.	1.0	2.	0.	105.	25.	140.	0.	0.	28800.	600.	0.0
A140035	37238.	535545.	035A	2.	0.	0.	5.	35.	15.	0.	0.5	2.	0.	20.	5.	130.	0.	0.	13700.	115.	0.0
A140038	37436.	535504.	038A	4.	0.	0.	10.	135.	35.	0.	2.0	2.	0.	135.	30.	245.	0.	0.	36500.	890.	0.0
A140039	37449.	535507.	039A	6.	0.	0.	10.	75.	25.	0.	2.0	2.	0.	90.	20.	185.	0.	0.	35700.	480.	0.0
A140040	37461.	535508.	040A	2.	0.	0.	5.	90.	30.	0.	2.0	2.	0.	130.	20.	145.	0.	0.	34300.	580.	0.0
A140145	37261.	535883.	145A	4.	0.	0.	30.	270.	110.	0.	1.0	2.	0.	115.	105.	20.	0.	0.	45100.	10000.	0.0
A140146	37119.	535797.	146A	6.	2.	0.	15.	45.	70.	0.	1.0	2.	0.	15.	10.	10.	0.	0.	23500.	530.	0.0
A140171	37256.	535554.	171A	8.	0.	0.	5.	25.	25.	0.	0.5	2.	0.	15.	5.	65.	0.	0.	11300.	100.	0.0
A140180	37147.	535979.	180A	4.	0.	0.	20.	160.	170.	0.	0.5	2.	0.	25.	35.	20.	0.	0.	33700.	3700.	0.0
A140181	37153.	535817.	181A	14.	0.	0.	25.	110.	65.	0.	0.5	2.	0.	30.	15.	25.	0.	0.	29100.	860.	0.0
A140192	37256.	535899.	192A	6.	0.	0.	20.	150.	90.	0.	1.0	2.	10.	30.	30.	30.	0.	0.	29000.	2100.	0.0
A140193	37255.	535554.	193A	16.	0.	0.	10.	25.	20.	0.	0.5	2.	0.	15.	5.	65.	0.	0.	10800.	110.	0.0
A140196	37364.	535717.	196A	6.	0.	0.	20.	110.	75.	0.	1.0	2.	0.	55.	25.	30.	0.	0.	36600.	1600.	0.0
A140307	37400.	535811.	307A	12.	0.	0.	30.	245.	90.	0.	1.0	2.	0.	100.	60.	25.	0.	0.	37600.	5900.	0.0
A140308	37400.	535772.	308A	6.	0.	0.	35.	195.	135.	0.	1.0	2.	0.	70.	70.	25.	0.	0.	39400.	4000.	0.0
A140309	37401.	535730.	309A	10.	0.	0.	15.	100.	40.	0.	1.0	2.	0.	45.	10.	15.	0.	0.	23300.	430.	0.0
A140310	37397.	535719.	310A	8.	0.	0.	15.	85.	35.	0.	1.0	2.	0.	70.	15.	40.	0.	0.	27200.	630.	0.0
A140311	37402.	535716.	311A	10.	0.	0.	10.	50.	30.	0.	1.0	2.	0.	25.	5.	25.	0.	0.	17400.	230.	0.0
A140312	37255.	535554.	312A	4.	0.	0.	10.	30.	25.	0.	1.0	2.	5.	20.	5.	50.	0.	0.	12300.	105.	0.0
A140342	37256.	535554.	342A	18.	0.	0.	5.	30.	25.	0.	0.5	2.	0.	15.	5.	100.	0.	0.	12000.	140.	0.0
A140347	37255.	535555.	347A	6.	0.	0.	10.	25.	25.	0.	0.5	2.	0.	15.	5.	160.	0.	0.	10600.	100.	0.0
602660	37256.	535899.	660A	0.	0.	1.	20.	130.	100.	10.	0.5	0.	0.	40.	20.	0.	0.	10.	0.	0.	0.0
602663	37276.	535890.	663A	0.	0.	1.	20.	130.	120.	10.	0.5	0.	0.	50.	60.	0.	0.	20.	0.	0.	0.0
602665	37289.	535894.	665A	0.	0.	1.	20.	210.	80.	10.	0.5	0.	0.	120.	50.	0.	0.	10.	0.	0.	0.0
602675	37274.	535883.	675A	0.	0.	1.	40.	370.	240.	10.	0.5	0.	0.	170.	200.	0.	0.	10.	0.	0.	0.0
602677	37364.	535717.	677A	0.	0.	1.	20.	100.	80.	10.	0.5	0.	0.	70.	30.	0.	0.	10.	0.	0.	0.0
602679	37382.	535719.	679A	0.	0.	1.	30.	100.	60.	10.	0.5	0.	0.	70.	20.	0.	0.	10.	0.	0.	0.0
602680	37376.	535722.	680A	0.	0.	1.	20.	90.	40.	10.	0.5	0.	0.	50.	10.	0.	0.	10.	0.	0.	0.0
602681	37379.	535714.	681A	0.	0.	1.	10.	70.	40.	10.	0.5	0.	0.	70.	10.	0.	0.	10.	0.	0.	0.0
602683	37390.	535626.	683A	0.	0.	1.	20.	100.	40.	10.	0.5	0.	0.	60.	20.	0.	0.	10.	0.	0.	0.0
602685	37392.	535630.	685A	0.	0.	1.	20.	100.	60.	10.	0.5	0.	0.	70.	40.	0.	0.	20.	0.	0.	0.0
602687	37322.	535635.	687A	0.	0.	1.	20.	90.	60.	10.	0.5	0.	0.	80.	20.	0.	0.	10.	0.	0.	0.0
602689	37252.	535551.	689A	0.	0.	1.	10.	70.	40.	10.	0.5	0.	0.	60.	2.	0.	0.	10.	0.	0.	0.0
602691	37252.	535555.	691A	0.	0.	1.	20.	20.	40.	10.	0.5	0.	0.	40.	2.	0.	0.	20.	0.	0.	0.0
602700	37332.	535568.	700A	0.	0.	1.	10.	90.	40.	10.	0.5	0.	0.	90.	20.	0.	0.	100.	0.	0.	0.0
602702	37378.	535567.	702A	0.	0.	1.	30.	120.	60.	10.	5.0	0.	0.	100.	20.	0.	0.	10.	0.	0.	0.0
602704	37383.	535561.	704A	0.	0.	1.	10.	60.	40.	10.	0.5	0.	0.	50.	20.	0.	0.	10.	0.	0.	0.0
602706	37384.	535528.	706A	0.	0.	1.	10.	70.	40.	10.	0.5	0.	0.	80.	20.	0.	0.	10.	0.	0.	0.0
602708	37380.	535518.	708A	0.	0.	1.	40.	160.	40.	10.	0.5	0.	0.	60.	20.	0.	0.	10.	0.	0.	0.0

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602710	37372.	535517.	710A	0.	0.	1.	60.	120.	60.	10.	5.0	0.	0.	170.	30.	0.	0.	10.	0.	0.	0.0
602774	37274.	535557.	774A	10.	0.	0.	10.	20.	15.	15.	0.5	10.	0.	20.	5.	270.	850.	0.	0.	0.	0.5
602776	37262.	535547.	776A	15.	0.	0.	15.	35.	20.	35.	0.5	10.	0.	20.	10.	220.	440.	0.	0.	0.	0.5
602778	37254.	535544.	778A	2.	0.	0.	20.	70.	35.	30.	1.0	10.	0.	60.	15.	115.	830.	0.	0.	0.	1.0
602782	37525.	535794.	782A	10.	0.	0.	20.	70.	70.	20.	1.0	15.	0.	120.	80.	230.	540.	0.	0.	0.	2.0
602784	37519.	535791.	784A	5.	0.	0.	25.	70.	40.	30.	1.0	15.	0.	120.	20.	130.	670.	0.	0.	0.	2.0
602786	37508.	535798.	786A	5.	0.	0.	20.	60.	40.	20.	1.0	10.	0.	75.	30.	185.	550.	0.	0.	0.	1.0
602788	37504.	535781.	788A	5.	0.	0.	15.	90.	45.	20.	1.0	10.	0.	105.	30.	260.	740.	0.	0.	0.	1.0
602790	37518.	535773.	790A	2.	0.	0.	10.	25.	30.	20.	1.0	15.	0.	35.	10.	230.	580.	0.	0.	0.	1.0
602791	37509.	535707.	791A	2.	0.	0.	10.	25.	30.	5.	1.0	5.	0.	45.	15.	320.	1000.	0.	0.	0.	0.5
602793	37479.	535697.	793A	5.	0.	0.	25.	100.	70.	5.	1.0	20.	0.	100.	50.	250.	400.	0.	0.	0.	2.0
602794	37385.	535666.	794A	5.	0.	0.	20.	60.	40.	5.	1.0	10.	0.	60.	20.	280.	680.	0.	0.	0.	1.0
602796	37402.	535629.	796A	2.	0.	0.	20.	100.	50.	25.	1.0	15.	0.	70.	30.	185.	490.	0.	0.	0.	2.0
602798	37394.	535620.	798A	10.	0.	0.	20.	100.	55.	20.	1.0	10.	0.	50.	25.	90.	280.	0.	0.	0.	2.0
602800	37240.	535530.	800A	2.	0.	0.	15.	40.	20.	5.	1.0	5.	0.	25.	10.	140.	520.	0.	0.	0.	0.5
602802	37225.	535510.	802A	5.	0.	0.	20.	40.	60.	15.	1.0	10.	0.	20.	20.	80.	560.	0.	0.	0.	1.0
602803	37213.	535506.	803A	10.	0.	0.	15.	50.	35.	10.	1.0	5.	0.	20.	15.	150.	300.	0.	0.	0.	1.0
602878	37286.	535596.	878A	2.	0.	0.	20.	95.	35.	20.	1.0	5.	0.	70.	10.	1400.	3300.	0.	0.	0.	1.0

Drainage panned concentrates : bromoform separated heavy minerals (h.m.)

Sample Nos. : 602651C-602740C
602811C-602917C
A140007C-A140371C

(Note : 602761C-602809C were not chemically analysed)

Laboratory : Comlabs Job COM 830248, 7/3/83 (O/N 33326)
ALS Batch No. MO 38, 24/1/80 (O/N 20130)

Method

AAS : Cu, Zn, Pb, Bi, Ag, Au, Ni, Co, Cr, Fe, Mn
XRF : Sn, W, As, Sb, Mo

Detection Limit : all results in ppm (including Au). Values of less than the limit of detection are arbitrarily assigned a value of half the limit of detection. Limits of detection relevant are:
Cu (1), Ag (0.5), Au (0.02), W (5), Sb (2)

HMG : The column headed "HMG" gives the weight of bromoform-separated heavy mineral (h.m.), in grams, i.e. HMG. This refers to an original volume of about 0.02 m^3 pebbly sand creek sample of about 6 kg weight.

NNo : New (sample) Number, indicates the -20 mesh sample number at the site of the panned concentrate sample, e.g. panned concentrate sample 602811C at -20 mesh sample site 602810A has a new number (NNo) 810C.

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VAX/VMS  DATA        RELINQ  4-JUL-1984 10:38   TTDO:  4-JUL-1984 10:39   USER_1:[DATA.DUNDAS]RELINQ.2;3   VAX/VMS
VAX/VMS  DATA        RELINQ  4-JUL-1984 10:38   TTDO:  4-JUL-1984 10:39   USER_1:[DATA.DUNDAS]RELINQ.2;3   VAX/VMS
VAX/VMS  DATA        RELINQ  4-JUL-1984 10:38   TTDO:  4-JUL-1984 10:39   USER_1:[DATA.DUNDAS]RELINQ.2;3   VAX/VMS
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DDDD     AAA    TTTTT   AAA
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D   D   A   A     T    A   A
D   D   A   A     T    A   A
D   D   AAAAA     T    AAAAA
D   D   A   A     T    A   A
DDDD    A   A     T    A   A
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RRRRRRRR    EEEEEEEEEE  LL            IIIIII    NN       NN    QQQQQQ
RRRRRRRR    EEEEEEEEEE  LL            IIIIII    NN       NN    QQQQQQ
RR      RR  EE          LL              II      NN       NN  QQ      QQ
RR      RR  EE          LL              II      NN       NN  QQ      QQ
RR      RR  EE          LL              II      NNNN     NN  QQ      QQ
RR      RR  EE          LL              II      NNNN     NN  QQ      QQ
RRRRRRRR    EEEEEEEE    LL              II      NN  NN   NN  QQ      QQ
RRRRRRRR    EEEEEEEE    LL              II      NN  NN   NN  QQ      QQ
RR  RR      EE          LL              II      NN    NNNN  QQ  QQ  QQ
RR  RR      EE          LL              II      NN    NNNN  QQ  QQ  QQ
RR    RR    EE          LL              II      NN      NN  QQ    QQ        ....
RR    RR    EE          LL              II      NN      NN  QQ    QQ        ....
RR      RR  EEEEEEEEEE  LLLLLLLLLL    IIIIII    NN      NN    QQQQ  QQ    ....
RR      RR  EEEEEEEEEE  LLLLLLLLLL    IIIIII    NN      NN    QQQQ  QQ    ....
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  222222        ;;;;      333333
22      22      ;;;;    33      33
22      22      ;;;;    33      33
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    22          ;;;;            33
  22              ;;    33      33
  22              ;;    33      33
2222222222      ;;        333333
2222222222      ;;        333333
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DDDD     AAA    TTTTT   AAA
D   D   A   A     T    A   A
D   D   A   A     T    A   A
D   D   A   A     T    A   A
D   D   AAAAA     T    AAAAA
D   D   A   A     T    A   A
DDDD    A   A     T    A   A
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VAX/VMS  DATA        RELINQ  4-JUL-1984 10:38   TTDO:  4-JUL-1984 10:39   USER_1:[DATA.DUNDAS]RELINQ.2;3   VAX/VMS
VAX/VMS  DATA        RELINQ  4-JUL-1984 10:38   TTDO:  4-JUL-1984 10:39   USER_1:[DATA.DUNDAS]RELINQ.2;3   VAX/VMS
VAX/VMS  DATA        RELINQ  4-JUL-1984 10:38   TTDO:  4-JUL-1984 10:39   USER_1:[DATA.DUNDAS]RELINQ.2;3   VAX/VMS
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SAMPLE	AMGE	AMGN	N NO	SN	CU	ZN	PB	BI	AG	AU	NI	CO	CR	FE	MN	CD	W	AS	SB	MO	HMG
A140007	37400.	535424.	006C	105.	18.	120.	110.	22.	2.0	0.02	34.	18.	1900.	96000.	1500.	0.	5.	0.	0.	0.	9.8
A140009	37405.	535331.	008C	150.	18.	270.	80.	28.	1.0	0.02	55.	26.	44000.	83000.	1700.	0.	45.	0.	0.	0.	17.7
A140015	37352.	535457.	014C	26.	18.	180.	60.	24.	1.0	0.15	70.	22.	10000.	78000.	750.	0.	15.	0.	0.	0.	19.2
A140017	37314.	535443.	016C	32.	10.	90.	70.	16.	2.0	0.70	36.	10.	2100.	87000.	2600.	0.	5.	12.	14.	2.	0.0
A140022	37453.	535544.	021C	14.	10.	160.	26.	12.	2.0	0.02	42.	20.	290000.	43000.	700.	0.	5.	0.	0.	0.	13.9
A140025	37361.	535543.	024C	40.	12.	180.	42.	24.	1.0	0.02	65.	22.	95000.	57000.	1200.	0.	5.	0.	0.	0.	16.8
A140033	37258.	535538.	032C	0.	0.	0.	0.	0.	0.0	0.00	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	4.5
602661	37256.	535894.	660C	20.	10.	145.	55.	15.	0.5	0.02	45.	20.	3000.	40000.	520.	2.	0.	0.	0.	0.	26.0
602664	37272.	535887.	663C	0.	30.	540.	240.	35.	0.5	0.02	115.	80.	76000.	152000.	600.	4.	5.	0.	0.	0.	9.0
602666	37282.	535890.	665C	20.	10.	165.	180.	20.	0.5	0.02	50.	35.	2000.	88000.	2000.	4.	5.	0.	0.	0.	23.1
602676C	37278.	535881.	675C	0.	15.	440.	150.	30.	0.5	0.02	85.	80.	38300.	136000.	3400.	4.	0.	0.	0.	0.	5.8
602678	37370.	535713.	677C	0.	50.	340.	130.	20.	0.5	0.00	65.	40.	12000.	88000.	1300.	3.	0.	0.	0.	0.	3.9
602682	37375.	535711.	681C	0.	2.	600.	80.	45.	0.5	1.30	100.	145.	120000.	72000.	1200.	4.	0.	0.	0.	0.	9.0
602684	37392.	535623.	683C	0.	55.	880.	350.	40.	1.0	0.02	120.	125.	48000.	256000.	1600.	5.	0.	0.	0.	0.	6.2
602686	37397.	535630.	685C	0.	15.	1100.	85.	60.	1.0	0.02	160.	220.	224000.	96000.	1300.	5.	0.	0.	0.	0.	6.3
602688	37326.	535634.	687C	0.	25.	1200.	160.	50.	2.0	0.02	165.	180.	165000.	104000.	1300.	6.	0.	0.	0.	0.	5.8
602690	37252.	535551.	689C	0.	35.	1100.	175.	30.	2.0	0.02	65.	85.	63000.	112000.	880.	6.	0.	0.	0.	0.	5.8
602692	37258.	535554.	691C	0.	20.	1000.	90.	55.	4.0	114.00	155.	190.	206000.	104000.	800.	5.	0.	0.	0.	0.	0.0
602701	37337.	535569.	700C	2.	5.	780.	65.	50.	0.5	0.10	160.	155.	187000.	80000.	880.	5.	5.	0.	0.	0.	31.6
602703	37376.	535561.	702C	0.	15.	1200.	115.	50.	3.0	0.00	125.	220.	187000.	96000.	920.	5.	0.	0.	0.	0.	5.0
602705	37388.	535561.	704C	0.	5.	1400.	80.	60.	5.0	0.02	240.	250.	245000.	104000.	1100.	6.	0.	0.	0.	0.	6.3
602707	37391.	535531.	706C	2.	2.	800.	50.	50.	1.0	48.00	195.	170.	216000.	80000.	840.	5.	5.	0.	0.	0.	44.6
602709	37381.	535514.	708C	5.	5.	185.	80.	25.	0.5	0.02	50.	40.	38300.	56000.	620.	4.	5.	0.	0.	0.	21.3
602711	37370.	535513.	710C	2.	15.	75.	75.	20.	0.5	0.02	50.	25.	4700.	48000.	600.	3.	5.	0.	0.	0.	82.7
602879	37292.	535596.	878C	38.	8.	850.	70.	42.	2.0	1.05	220.	125.	178000.	63000.	1200.	0.	15.	0.	0.	0.	31.6

APPENDIX VII

COMMENTS ON HOWARDS ROAD 1981-1983 DRAINAGE SAMPLING

9. HOWARDS ROAD AREA

9.1 Geology and Target Type

In contrast with panned concentrates elsewhere on the E.L., panning has indicated widespread detrital gold in the SE sector of E.L. 15/76. This area is mainly underlain by Cambrian Dundas Group volcanoclastics and tuffs plus minor ultramafic and basic bodies. Possibly 25% of the area is concealed by Quaternary morainal cover, which tends to be distributed on flat areas at changes of slope. While the moraine has probably been instrumental in redistributing gold from bedrock sources, the divide on the eastern edge of the E.L. may mark the eastern edge of any gold bedrock source stripped by the eroding action of the moraine.

Serpentinites occur along the eastern edge of the E.L. Carbonate-bearing, fine-grained siltstones and volcanoclastics have been recognised by previous workers. The target mineralisation is epithermal replacement type akin to Carlin-style, such as occur in acid volcanic-carbonate-serpentinite sequences. An alternative target is the exhalite type similar to the siliceous pyrite gold deposits of Bousquet Mine, Abitibi Belt, Quebec. These occur in altered mafic tuffs associated with hydrothermal pyrite, kyanite, andalusite, pyrophyllite, diaspore and chloritoids. Kyanite, andalusite, pyrite and other hydrothermal minerals have been identified in h.m. at Howards Road (see Appendices III, IV and V).

NOTE: Appendix III is Mineral Services Report No 23/79 included in Appendix IV of Relinquishment Report
Appendix IV is Mineral Services Report No 15/81 in this Appendix
Appendix V is Mineral Services Report No 45/82 in this Appendix

9.2 Grid and Drainage Sampling

Following drainage sampling reported in Macnamara (1980b), Appendix IV of this Relinquishment Report four cross-lines (5354.5N, 5355.05N, 5355.5N and 5356.5N) were cut across a baseline at 375E (Figure 1). These were soil sampled and magnetic and VLF-EM surveys conducted. Results were reported in Macnamara (1983a).

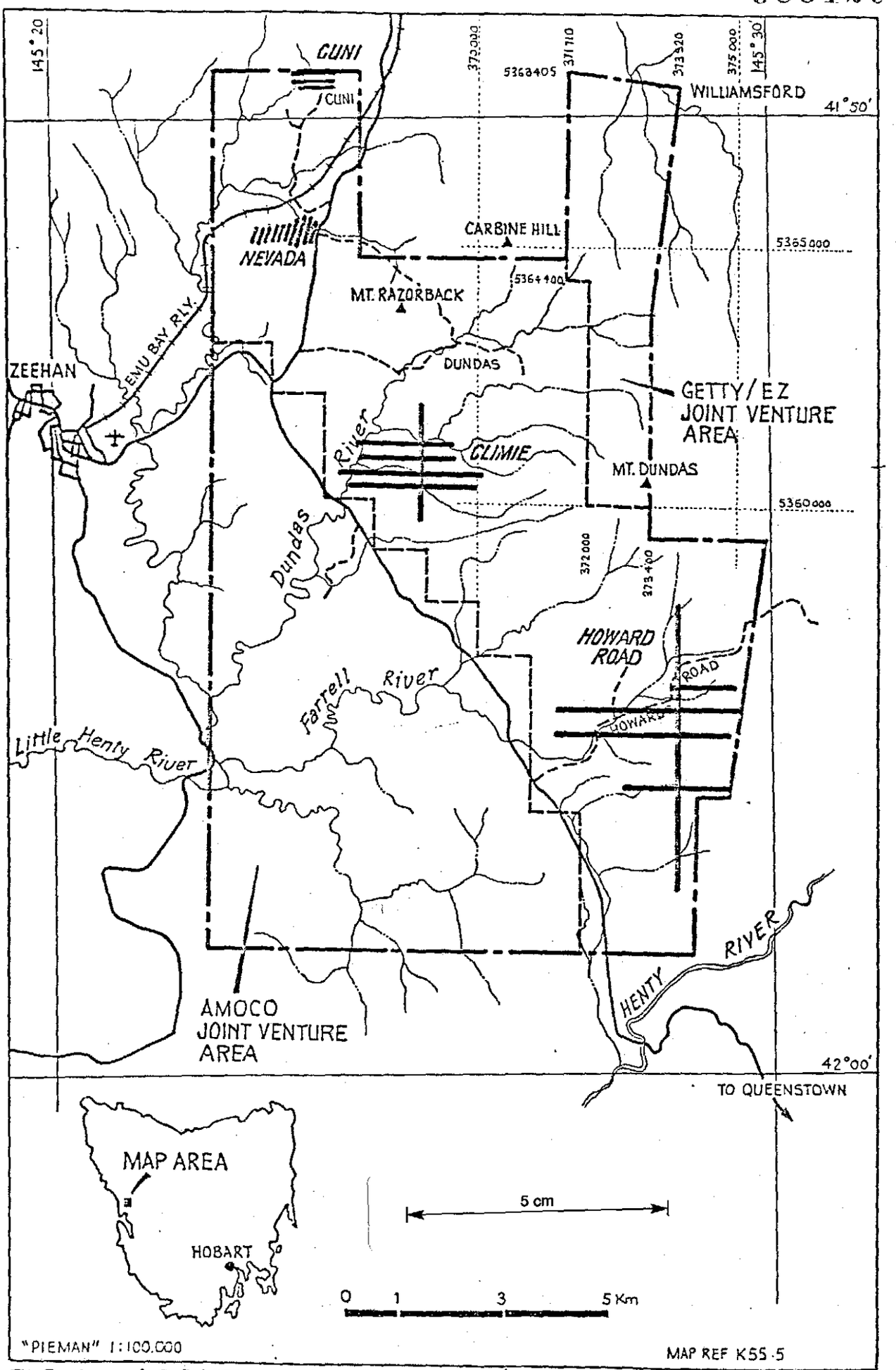

FIG. 1. LOCATION MAP E.L. 15/76 DUNDAS, TASMANIA
SHOWING JOINT VENTURE AREAS & CSR 1982 GRIDS

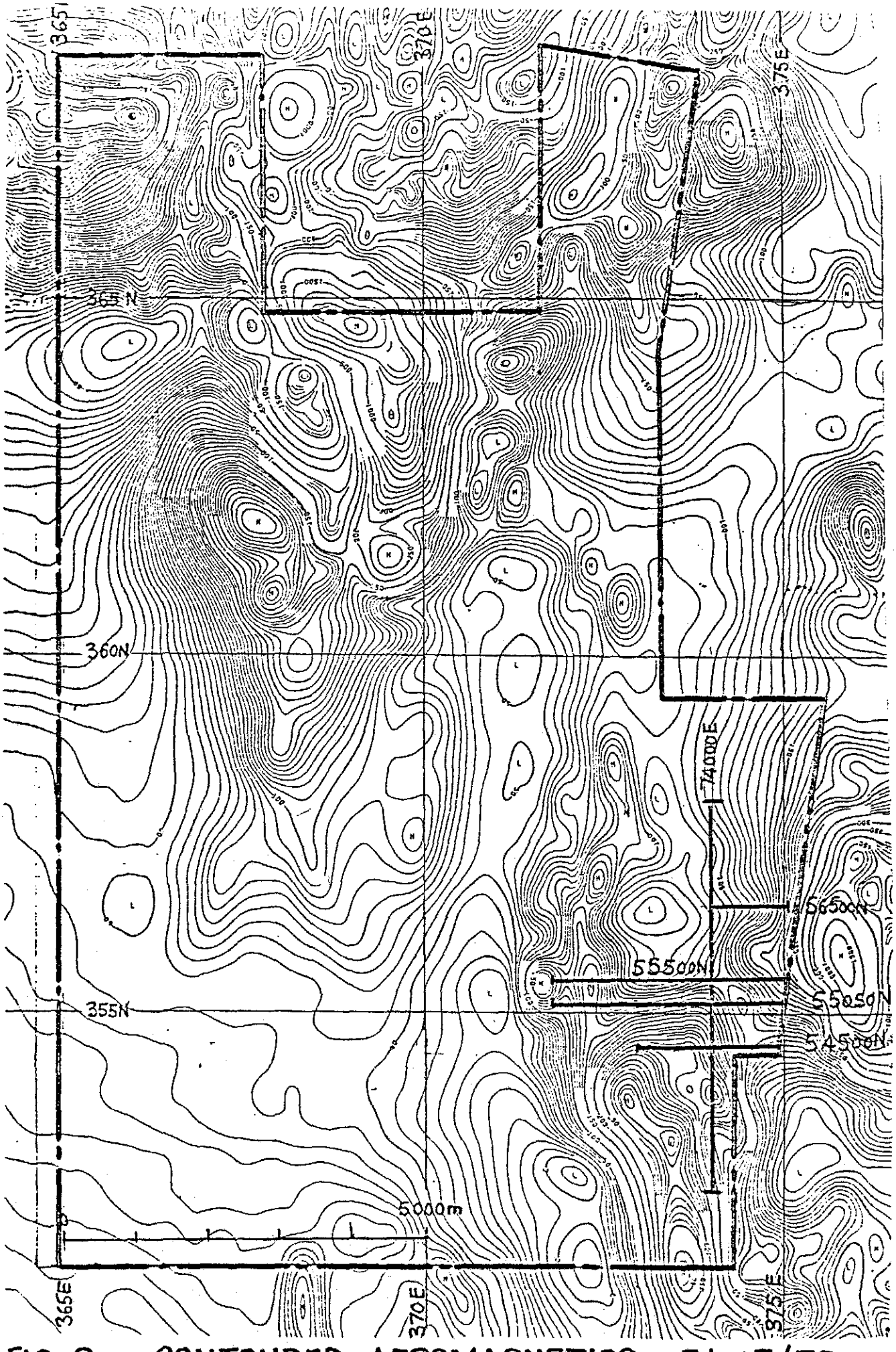

FIG. 2 CONTOURED AEROMAGNETICS E.L.15/76
DUNDAS, TASMANIA

TABLE 1

HOWARDS ROAD PANNED CONCENTRATE ANALYSES

SAMPLE NO.	Ag (ppm)	Au (ppm)	VISIBLE Au PARTICLES	OTHER (ppm)
602877C	6.0	1.9	-	220 Sn, 1250 Pb, 140 W
682C	0.5	1.3	-	
707C	1.0	48	-	
879C	2.0	1.05	-	
775C	-	-	0.3 mm	
692C	4.0	114		
779C	-	-	1.5 mm	
801C	-	-	1.5 mm	
807C	-	-	2.9, 0.7 mm	
869C	4.0	23.5	-	115 Sn
829C	4.0	3.35	-	200 Sn
694C	6.0	3.7	-	
827C	2.0	14.2	-	40 Mo
A140017C	2.0	0.7	-	
602831C	3.0	5.0	-	65 W, 10 Mo
696C	0.5	1.0	-	
833C	1.0	4.5	-	
837C	1.0	0.30	-	1350 Cu, 85 W
867	3.0	0.02	0.1, 0.2 mm	1350 Cu (contam.?)
721C	0.5	6.3	-	
903C	1.0	0.8	-	
875C	1.0	0.02	1 mm	

Figure 2 shows the aeromagnetic trends in the general area, including a magnetic high possibly related to an intrusion at the west end of lines 55500N and 55050N.

The soil sampling did not indicate the position of any strongly mineralised bedrock source. If much of the gold located by panning is coarser gold associated with the moraine and the finer gold has been flushed out, a technique involving selective digestion of fine gold may be useful for locating fine gold bedrock sources. Rock geochemistry, involving As, Sb, Mo, etc. may also be applicable.

Visual study and/or chemical analyses of panned concentrates have confirmed anomalous gold values in creeks adjacent to Howards Road, draining westwards towards the highway between Howards Road and the southern E.L. border, and in drainages in the SE corner of the E.L. Gold noted visually in panned concentrates does not always report in subsequent chemical analyses of these samples.

9.3 The Main Gold Anomalies

Table 1 lists anomalous samples in order of occurrence from east to west adjacent to Howards Road, then southwards adjacent to the highway and then eastwards near the southern E.L. border.

Sample 602869 (4 ppm Ag, 23.5 ppm Au) contains a moderate h.m. content (21.5 g) and was taken from Farrell Rivulet just east of the highway. Other strong values occur to the east and southeast, e.g. 602707C (48 ppm Au), 602692C (114 ppm Au), 602829C (3.35 ppm Au), 602694C (3.7 ppm Au), 602827C (14.2 ppm Au) and 602831C (5.0 ppm Au). This general area is at the western extremity of the soil sampled lines, near an aeromagnetic high (Figure 2) and adjacent to a base metal anomaly located in the early 1970s (see Macnamara, 1983c). A fairly strong result is also recorded on the

eastern margin of the E.L. near Howards Road by 602877C (6 ppm Ag, 1.9 ppm Au, 140 ppm W, 220 ppm Sn, 1300 ppm Zn and 1250 ppm Pb).

9.4 Hydrothermal Heavy Minerals

Apart from the usual suite of rock-forming heavy minerals (i.e. ilmenite, zircon, rutile, chromite, etc.), a number of "hydrothermal", skarn and "alteration" heavy minerals were also noted. These tend to be fairly widespread and do not indicate any particular zone as being a "hydrothermal" centre. The minerals include vesuvianite, biotite, sillimanite, garnet, andalusite, staurolite, ubiquitous tourmaline, fluorite, topaz, carbonate (siderite, dolomite, etc.), beryl, anhydrite, pyrite, (?)gadolinite, etc. Tourmaline, biotite and garnet are fairly widespread.

Most occur as "trace" minerals but some occur in greater concentrations as "minor" elements in the concentrate (while chromite, ilmenite, zircon, etc.) usually form the "major" mineral concentrations in the h.m. samples.

Vesuvianite is widespread as a trace mineral, but increases to minor quantities in the SE in 602903C (0.8 ppm Au), with trace pyritic hornfels, biotite, tourmaline, etc. In nearby 602875C, gold particles were noted during panning (but Au does not report in chemical analyses), garnet occurs as a minor mineral associated with trace tremolite, fluorite and tourmaline. These creeks drain an area of Quaternary gravels near gabbro and basalt. The higher-than-usual vesuvianite content may indicate a skarn zone. Sample 602865C carries trace vesuvianite, garnet and tourmaline.

Near Howards Road, 602801C, with a 1.5 mm Au particle, is associated with trace scheelite, dolomite and tourmaline. Nearby, 602779C, with a 1.5 mm Au particle, contains trace siderite, topaz, tremolite and biotite. Nearby, 602777C carries trace baryte, biotite, cordierite and andalusite,

602775C carries 0.3 mm Au particle and trace perouskite and tremolite, and 602692C, with 114 ppm Au, contained trace gold, beryl, garnet and tourmaline. To the south, 602872C (14.2 ppm Au and 40 ppm Mo) carries trace staurolite, garnet, biotite, beryl, topaz. The siderite, dolomite and baryte in the above samples (777C, 779C, 801C) may have been derived locally as the minerals are fairly soft. Baryte occurs also to the east in 602795C, near Howards Road.

Beryl reports in samples 602692C, 827C and 829C near the Howards Road/Queenstown Highway junction.

Blue fluorite was noted in 602877C on the eastern edge of the E.L. near Howards Road. This sample is also anomalous in Au (1.9 ppm), Ag (6 ppm), Sn (220 ppm), Pb (1250 ppm) and W (140 ppm). It contains minor vesuvianite, and trace fluorite, sillimanite, biotite, pyritic fragments and tourmaline. (It may be similar to 602903C in the SE corner of the E.L.).

9.5 Conclusions

In conclusion, the vesuvianite-rich drainages indicated by 602877C, 602903C and the zone near the Howards Road/ Queenstown Highway junction, appear to have the best gold and indicator heavy mineral concentrates, possibly adjacent to local bedrock gold sources. It may be possible to check such areas by soil and rock geochemical methods, using Au, Ag, Mo, W, etc. If studies (including geomorphological) indicate the gold in panned concentrates, which is fairly coarse, is derived from morainal material, rock geochemical and selective fine-grained-gold dissolution techniques on drainage samples may be appropriate. Fine gold is unlikely to have concentrated in the morainal gravels. Reference is also made to the recommendations in Macnamara (1983a).

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MINPET SERVICES

REPORT NO. 15/81

DUNDAS HEAVY MINERAL CONCENTRATES FOR MINERARAPHIC DETERMINATION

(for P.M. Macnmara, CSR Limited)

Part of Appendix IV from Macnamara 1984

NOTE Not all samples referred to are from the relinquished area

March 1981

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CONTENTS

1. INTRODUCTION

This current work is a follow-on from previous heavy mineral analysis of stream sediments completed in Pacminex Pty. Ltd. report PMR 88/78 entitled "A Mineralogical/Geochemical Appraisal of Heavy Mineral Concentrates, E.L. 15/76, Dundas, Tasmania". In that exercise, chemical analyses and a map were provided. In the current project discussion will necessarily have to be confined to the interesting details of mineralogy.

One specimen, 602825 was missing from the series; one sample 602796 was also missing but was replaced by 602896 - unlisted.

2. SUMMARY

(a) Gold traces were seen in 602761, 602775, 602779, 602801 and 602811 with association of arsenopyrite, and appreciable tourmaline in the latter.

(b) Cassiterite traces occur in 602809, 602812, 602851, 602859 and 602901, and with topaz in 602851 and 602859.

(c) Scheelite determined (optically) occurs in 602801; and possibly in several other specimens containing skarn minerals (idocrase, diopside) and other hydrothermal/ pneumatolytic minerals (tourmaline, topaz, beryl, fluorite, etc.). This scheelite was not tabulated.

(d) Ilmenite and a splendent fractured chromite features largely in many of the concentrates, otherwise there is an abundance of zircon and in several specimens, epidote.

(e) High grade pelitic metamorphic minerals (sillimanite, andalusite and staurolite) are present but rare.

Footnote

Sample No. 602875

'Spinel' mineral in abundance, somewhat fractured octahedra with a splendent lustre. Black to brown colour with some translucent grain margins, sent to a laboratory for confirmation of spinel type.

Determined by :-

XRD - Spinel? = chromite

Probe - Major - Mg, Fe, Al, Cr.
Minor - Ti.

Identification confirmed - chromite (JFR 24/3/61).

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3. DISCUSSION

3.1 Common Minerals

Several common mineral species (zircon, tourmaline and ilmenite for example) are present in most samples. These show fresh crystalline forms to variable attrition depending on number of sedimentary cycles and/or energy states of stream environment. Colour variations (tourmaline and zircon) and crystal form variations (rutile, cassiterite) are seen.

Ilmenite is very dominant in a number of samples - 602775, 602777, 602783, 602789, 602801, 602809. 602813, 602817, 602819, 602894, 602907, 602913, 602915 and 602917. Very dominant in 414AH 001P and 002P with magnetite. Apart from magnetite minerals such as an angular, splintery or crystalline splendent spinel (microprobed and identified as chromite) ilmenite is commonly an associate as are much smaller amounts of rutile of variable colouring, and crystal forms, sometimes anatase, brookite and various other minerals.

High grade metamorphics, particularly sillimanite are seen from time to time but only in trace amounts. Cordierite is present is there by accident having an S.G. of 2.6 to 2.7 (TBE is 2.96). Andalusite is rarely seen (602807, 602871, 602839). Staurolite (602827 only) with beryl.

The common calc silicate minerals are represented mainly by epidote, very much less actinolite and an 'abundance' of idocrase)602798, 602843, 602865 only). Epidote and idocrase are commonly associated and with diopside (602843) probably indicate proximity of skarn conditions - but seen below.

3.2 Economic Minerals and Associations

(a) Gold. This was seen many times, as solitary grains up to 1 mm size and occasionally as two grains in one sample. Without panning each concentrate individually (as

was done last year for CBC, Perth), gold could easily be missed. In the current batch of samples, gold was spotted either during heavy mineral separation (by E. Sky) and then confirmed during mineragraphy, or where missed during the heavy media separation then in the +60 mesh and once only in -60 mesh samples during the mineralogical determinations.

Where gold was seen specimens showed a fair abundance of tourmaline (602761, 602775, 602779, 602801); with cassiterite and arsenopyrite (602811); with arsenopyrite and CO_3 (602807P); with scheelite (602801); with no specific indicator minerals (602873, 602907).

(b) Cassiterite. In every case where cassiterite is reported it was confirmed by zinc test,as some rugged looking blotchy brown/yellow rutile looks remarkably like cassiterite.

Cassiterite occurs with traces of tourmaline in 602809, 602813, 602851, 602859 and 602901. The mineral occurs also with topaz in 602851, 602859,

(c) Scheelite. Observed optically only once as a trace in 602801.

3.3 Indicator Minerals

(a) Topaz is more common here than previously reported for the Dundas area generally occurring as trace amounts as angular low B.R. fragments - confirmed by 2V = (50-65^{o}), +ve optical sign and high R.I.'s (1.61 to 1.64) compared with quartz which it superficially resembles.

The mineral is associated with a high grade metamorphic mineral; sillimanite (602771); with fluorite (602773); with gold (602779); garnet and chromite (602785);

/....

chromite only (602817, 602855, 602879, 602885); with cassiterite and sillimanite (602851); beryl, fluorite, phlogopite (zinnwaldite?) (602859); with cassiterite, sillimanite (602901). So like tourmaline its pneumatolytic 'rival', topaz, has a fairly even spread in this specimen suite.

(b) Tourmaline. A widespread distribution, always very variable in colour and preservation state. Described above. Where it is more abundant, gold, topaz or fluorite may be present, e.g. 602761, 602773, 602785 and 602801.

(c) Beryl. With topaz 602773, 602827, 602847, 602859 (and with fluorite and cassiterite).

(d) Fluorite. Traces only of cleavage fragments and grains 602773 (with beryl and topaz); 602843 (with a trace of gadolinite?); 602859 (with topaz and beryl); 602875, 602887 (with tourmaline only).

As seen the associations of hydrothermal/pneumatolytic vein minerals are fairly normal.

3.4 Scheelite by Fluorescence

Concentrates with abundant tourmaline, some topaz, scheelite or other pneumatolytic/hydrothermal minerals and concentrates containing skarn minerals - all samples were examined under S/W, U/V light. From this exercise it was noted that several specimens contain faint traces of yellow, less commonly bluish fluoresence. This includes 602843, 602896, 602883, 602879, 602811, 602909, 602877, 602855, 602801, 602795, 602773 and 602763. Scheelite was determined optically only in 602801.

N.B. Marked fluorescence in underlined (801).

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SAMPLES FOR HEAVY MINERAL SEPARATION o/n 23271

Sample No.	H/Mineral gms.
602761 P	32.6
63	1.0
67	4.4
69	5.2
71	8.2
73	6.9
75	28.2
77	7.9
79	6.6
81	4.3
83	2.1
85	1.8
87	6.4
89	13.4
92	21.4
95	12.2
96	214.8
97	3.7
98	9.0
602801	17.9
4	13.2
7	7.6
9	92.6
11	31.5
13	58.3
15	90.6
17	325.9
19	200.3
21	225.6
23	68.0
25	no sample
27	7.2
29	8.8
31	9.6
602833 P	53.2
35	2.3
37	4.3
39	43.7
41	141.1

Sample No.	H/Mineral gms.
602843 P	169.5
45	8.4
47	0.6
49	88.8
51	13.9
53	3.6
55	11.4
57	38.3
59	17.9
62	23.1
65	68.9
67	11.5
69	21.5
71	51.9
73	309.1
75	95.9
77	7.1
79	31.6
81	47.4
83	150.3
85	22.5
87	45.9
89	39.3
94	363.8
98	8.5
602901	18.6
3	10.3
5	74.2
7	226.5
9	13.3
11	536.3
13	699.3
15	346.1
17	29.1
807 P	1.4
414PH001 P	346.4
002 P	258.7

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Results of Tetrabromethane / Bromoform seperation.

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TABLE 1 : BADJAC, HEAVY MINERAL ANALYSIS, MARCH, 1981

CSR NO.	HS NO.	MINERAL ABUNDANCE AND ROUNDNESS			GRAIN SIZE RANGE (mm)			CONCT. WEIGHT (g)	MISC. COMMENTS
		Major	Minor	Trace	Max.	Min.	Med.		
602761	1545	Limonitised amphibole 3 Ilmenite 3	Chromite 1>5 Zircon 1>5 Tourmaline 2>4	Rutile 1 Gold 4 Corundum 2 Epidote 4 Biotite 4	7.5	0.03	0.5 0.06	32.6	Limonitised amphibole grains - several mm. Gold 0.7 mm. Minor fresh purple zircon.
602762	1546	Zircon 5>1 Tourmaline 4 Ilmenite 4>1	Actinolite 3 Biotite 4	Magnetite 3>1 Idocrase 3 Chromite 2 Epidote 3 Sillimanite 4	1.5	0.04	0.2 0.06	1.0	
602767	1547	Zircon 5>1 Tourmaline 4 Ilmenite 3>1	Biotite 3	Corundum 3 Magnetite 1 Actinolite 4>1 Epidote 3 Tourmaline 5 Rutile 4 Sillimanite 4 Chromite 1	1.8	0.05	0.3 0.05	4.4	
602769	1548	Ilmenite 4 Zircon 5>1 Tourmaline 4>1	Ferruginised amphibole(?) 4	Biotite 3 Actinolite 3 Rutile 4 Sillimanite 5	7.5	0.02	0.9 0.06	5.2	Ilmenite, browish pitted grains.
602771	1549	Ilmenite 4>3 Zircon 3>1 Tourmaline 4>1	Limonitic pebbles 3 Chromite 2>1 Epidote 3 Leucoxene	Biotite 3 Magnetite 3>1 Sillimanite 4 Garnet 3 Topaz 2 Rutile 3	1.5	0.03	0.3 0.07	6.2	
602773	1550	Limonitic pebbles 3 Ilmenite 1>3 Zircon 3>2	Ferruginised amphibole 3 Chromite 2>1 Tourmaline 2>3 Leucoxene	Fluorite 1 Magnetite 4>1 Garnet 3 Anatase 1 Biotite 4 Sillimanite 4 Epidote 3 Idocrase 4 Topaz 2 Beryl 1 Tremolite 4	2.8	0.03	0.4 0.04	6.9	
602775	1551	Ilmenite 4	Magnetite 4 Leucoxene Rutile 4 Tourmaline 4>2 Zircon 2>3	Gold 2 Epidote 2>4 Perovskite 1 Tremolite 3	6.2	0.02	0.9 0.14	28.2	~60 vol.% coarse worn ilmenite crystals. Gold 0.3 mm.
602777	1552	Magnetite 4>1 Ilmenite 3>1 Zircon 1>4	Chromite 1>2 Leucoxene	Andalusite 1 Biotite 3 Tourmaline 1 Anatase 1 Rutile 2 Baryte 2 Cordierite 3	0.8	0.04	0.3 0.14	7.9	+60# 95 vol.% magnetite + ilmenite.
602779	1553	Ilmenite 3>1 Zircon 3>1	Magnetite 3>4 Leucoxene Biotite 4 Tourmaline 4>1	Gold 4 Siderite 1 Tremolite 3 Actinolite 3 Topaz 2	5.0	0.02	0.3 0.07	6.6	Magnetite very pitted. Gold 1.5 mm. Ilmenite, badly pitted, leucoxenised.
602781	1554	Limonitic pebbles 3 Ilmenite 3 Leucoxene	Tremolite schist 4 Tremolite 3 Chromite 2	Magnetite 4>1 Biotite 3 Zircon 5 Epidote 3 Tourmaline 1 Rutile 4>3 Idocrase 2	1.2	0.03	0.3 0.14	4.3	

CSR NO.	HS NO.	MINERAL ABUNDANCE AND ROUNDNESS			GRAIN SIZE RANGE (mm)			CONCT. WEIGHT (g)	MISC. COMMENTS
		Major	Minor	Trace	Max.	Min.	Mnd.		
602783	1555	Ilmenite 3>1	Magnetite 3>1 Chromite 2>1	Tremolite 3 Biotite 3 Epidote 4>2 Rutile 4 Tourmaline 1	3.5	0.04	0.3 0.10	2.1	Concentrate >70 vol.% ilmenite.
602785	1556	Ilmenite 3>1	Chromite 2>1 Tremolite schist 3 Tourmaline 1	Magnetite 3 Rutile 1 Zircon 1>5 Garnet 3 Topaz 3	1.2	0.04	0.3 0.10	1.8	
602787	1557	Ilmenite 1>4	Leucoxene Limonitic pebbles 4 Tourmaline 1 Zircon 1>4 Chromite 2	Magnetite 3>1 Anatase 1 Garnet 4 Ferruginised amphibole 3 Rutile 2>4 Biotite 3 Epidote 3 Topaz 2	6.0	0.04	0.4 0.06	6.4	
602789	1558	Ilmenite 3>1	Leucoxene Magnetite 2>3 Zircon 1>4 Tourmaline 1 Chromite 2	Tremolite schist 4 Rutile 4 Actinolite 4 Sillimanite 3 Biotite 4 Anatase 2	1.1	0.02	0.3 0.11	13.4	Concentrate is very largely ilmenite.
602792	1559	Ilmenite 3>1 Chromite 3>1	Leucoxene Rutile 4>5 Tourmaline 1 Zoisite 2	Magnetite 3>1 Biotite 3 Anatase 3 Epidote 4 Zircon 1	1.8	0.04	0.3 0.11	21.4	
602795	1560	Ilmenite 3>1 Chromite 3>2	Leucoxene Zoisite 1 Epidote 3 Zircon 4>1	Magnetite 4 Rutile 4 Biotite 4 Epidote 3 Tourmaline 1 Baryte 1 Diopside 3	1.9	0.03	0.4 0.11	12.2	
602896 (796)	1561	Ilmenite 3>1 Limonitic, banded pebbles		Magnetite 1>4 Biotite 3 Rutile 3>1 Tourmaline 3 Zircon 5>1 Tremolite 4 Garnet 5 Epidote 3 Topaz 2>1	9.0	0.02	0.3 0.14	214.8	
602797	1562	Ilmenite 3>1 Chromite 2>1	Limonitic pebbles 4 Zircon 4>1 Epidote 3	Biotite 3 Magnetite 4>1 Garnet 3 Leucoxene Tourmaline 1>4 Actinolite 3	6.5	0.02	0.3 0.10	3.7	
602798	1563	Limonitic coarse pebbles 4 Ilmenite 1 Zircon 1>3	Idocrase 1	Tourmaline 3 Magnetite 1 Rutile 4 Garnet (orange) 4 Epidote 3 Leucoxene 1 Biotite 4 Actinolite 4	3.5	0.03	0.4 0.07	9.0	
602801	1564	Ilmenite 3	Leucoxene Zircon 1 Tourmaline 1 Antase 1 Chromite 4	Dolomite 4 Leucoxene Gold 4 Rutile 4 Epidote 1 Scheelite 3	4.5	0.04	0.4 0.11	17.9	Ilmenite, coarse, pitted. Gold 1.5 mm. Coarse anatase to crystal intergrowths. Spinel - red or yellow translucent crystal edges.

CSR NO.	HS NO.	MINERAL ABUNDANCE AND RANKNESS					GRAIN SIZE RANGE (mm)			CONCT. WEIGHT (g)	MISC. COMMENTS
		Major	Minor	Trace			Max.	Min.	Med.		
602804	1565	Magnetite 3>1 Ilmenite 3>1	Leucoxene Zircon 1>3	Garnet 2 Chromite 2 Chlorite 4			3.5	0.06	0.5 0.08	13.2	Magnetite, ilmenite + leucoxene with >95 vol.% conct. Trace of zircon orange (fresh).
602807	1566	Zircon 1>5 Ilmenite 4	Epidote 3	Garnet 4 Chromite 3 Leucoxene Biotite 3 Tourmaline 1>4 Actinolite 3 Anatase 1 Andalusite 4 Rutile 3			3.0	0.06	0.2 0.10	7.6	
602809	1567	Ilmenite 4>5 Zircon 4>1	Limonitic particles, coarse 4	Magnetite 4 Cassiterite 4 Rutile 4 Tourmaline 4>1 Actinolite			3.8	0.04	0.4 0.17	92.6	Conct. > 95 vol.% ilmenite. Red-amber cassiterite - several coarse grains.
602811	1568	Ilmenite 4>1	Limonitic particles, coarse 4 Zircon 4 1	Tourmaline 4>1 Magnetite 4>2 Gold 4>2 Pyrite 1 Arsenopyrite 1 Rutile 5 Biotite 4 Epidote 4 Cassiterite 3			2.2	0.04	0.4 0.10	31.5	Gold 1.4 mm. Arsenopyrite, fresh, twinned. Conct. 95 vol.% ilmenite.
602813	1569	Ilmenite 4>1 Zircon 5>1		Magnetite 4 Rutile 4 Tourmaline 5>1 Cassiterite 3			2.5	0.04	0.4 0.11	58.3	Conct.> 95 vol.% ilmenite. Some coarse bright red/ brown cassiterite - large and small grains.
602815	1570	Ilmenite 5>1 Zircon 5>1		Magnetite 4>3 Rutile 5 Biotite 4 Sillimanite 4 Tourmaline 5 Epidote 4 Garnet 3			2.8	0.04	0.2 0.14	90.6	Possible prismatic tantalite trace, prismatic black, vitreous lustre.
602817	1571	Ilmenite 5>3>1	Limonitic pebbles 4 Zircon 5>1	Magnetite 5>3 Chromite 2 Rutile 4 Garnet 4 Topaz 3 Tourmaline 4			3.5	0.06	0.3 0.21	323.9	Conc. >98 vol.% ilmenite.
602819	1572	Ilmenite 1>5>2 Limonitic pebbles	Spinel 2>3	Magnetite 3>2 Limonitised amphibole 3 Zircon 5>1 Tourmaline 5 Rutile 4 Biotite 3			3.5	0.06	0.4 0.21	200.3	Conc. >95 vol.% ilmenite.
602821	1573	Limonitised metamorphics Ilmenite 1>4	Leucoxene	Magnetite 1>3 Biotite 2 Zircon 4>1 Rutile 3 Tourmaline 4 Clinozoisite 4			7.5	0.02	1.2 0.10	225.6	
602823	1574	Limonitic pebbles 5>3 Ilmenite 2	Magnetite 2>1	Tourmaline 3 Epidote 3 Garnet 4 Rutile 2			5.1	0.02	0.2 0.21	69.0	
602825		MISSING									

DSR NO.	MS NO.	MINERAL ABUNDANCE AND ROUNDNESS						GRAIN SIZE RANGE (mm)			CONCT. WEIGHT (g)	MISC. COMMENTS
		Major		Minor		Trace		Max.	Min.	Med.		
602827	1576	Ilmenite Zircon	1>3 1>5	Magnetite Leucoxene Topaz	1 2	Staurolite Chromite Actinolite Anatase Garnet Epidote Biotite Rutile Beryl	4 4 3 1 4 1 1 3 1	4.0	0.01	0.4 0.07	7.2	Spinel - black, vitreous lustre = chromite. Beryl - slightly kaolinised.
602829	1577	Limonitic pebbles Ilmenite	4 4>1	Magnetite Topaz	1>4 2	Biotite Rutile Actinolite Zircon Beryl	3 4 1 1>5 1	4.1	0.01	0.3 0.14	8.8	Beryl - slightly kaolinised.
602831	1578	Ilmenite Limonitic pebbles Zircon	3>1 3 4>1	Magnetite	1>4	Epidote Rutile Garnet Leucoxene Biotite Tourmaline Antase	2 4 4 2 2 1	4.0	0.04	0.4 0.10	9.6	Rounded zircon - purple.
602833	1579	Magnetite Epidote Ilmenite Zircon	1>3 3>1 3>1 1>5			Chromite Leucoxene Garnet Tourmaline Rutile	1 5 2 3	1.5	0.03	0.4 0.06	53.2	
602835	1580	Magnetite Epidote Ilmenite	1>3 1>3 3>1	Leucoxene Zircon	 1	Garnet (orange) Biotite Rutile	4 3 4	0.8	0.01	0.4 0.11	2.3	Abundance of leucoxenised ilmenite present.
602837	1581	Epidote Ilmenite Leucoxene	3>1 1	Magnetite Topaz	1>3 2	Rutile Biotite Staurolite Tourmaline Garnet Actinolite Diopside	4 3 3 4 4 4>2 3	3.5	0.02	0.3 0.10	4.3	
602839	1582	Ilmenite Limonitic pebbles Epidote	3>1 3 3>1	Magnetite Leucoxene Zircon	2>1 1	Chromite Rutile Actinolite Andalusite	1 4 1 5	4.9	0.05	0.3 0.14	43.7	
602841	1583	Epidote Chromite	3 3>1>2			Magnetite Garnet Zircon Rutile Sillimanite Idocrase	4>2 3 5 4 5 3	4.0	0.01	0.3 0.14	141.1	Spinel - vitreous lustre, black = chromite.
602843	1584	Ilmenite	1>3	Magnetite Chromite Leucoxene Epidote Idocrase Zircon	1>4 3>2 3 3 1	Biotite Rutile Gadolinite Diopside Fluorite Tremolite	2 4 1 2 1 3	5.5	0.03	0.14 0.10	160.5	Spinel - red internal reflection.
602845	1585	Chromite Zircon	2>1 5>4	Ilmenite Leucoxene Tourmaline	2 3 4	Magnetite Biotite Rutile Anthophyllite	1>4 3 4 3	2.0	0.03	0.2 0.04	8.4	50 vol.% worn zircon grains. Purple zircon, rare.
602847	1586	Zircon Chromite	5>4>1 2>3	Magnetite Rutile Topaz	2>1 4>3 2	Biotite Tourmaline Beryl Sphene	2 3 4 4	4.2	0.01	0.15 0.04	0.6	Magnetite is largely rubble from rock bands.
602849	1587	Chromite Ilmenite	1 5>4	Magnetite Rutile Zircon	5>3 4 4>1	Garnet Epidote Tourmaline	2 3 4	3.1	0.04	0.2	83.8	

CSR NO.	MS NO.	MINERAL ABUNDANCE AND ROUNDESS						GRAIN SIZE RANGE (mm)			CONCT. WEIGHT (g)	MISC. COMMENTS
		Major		Minor		Trace		Max.	Min.	Med.		
602851	1588	Ilmenite Chromite Zircon	3>1 1 1>5	Magnetite Rutile Ilmenite Leucoxene	3>1 4 3 4	Tourmaline Sillimanite Cassiterite Topaz Biotite	4>1 4 3 3 3	3.9	0.03	0.2 0.04	13.9	>40 vol.% conct. is zircon.
602853	1589	Magnetite Chromite	1>3 1>5	Zircon	1	Phlogopite Tourmaline Siderite Epidote Rutile Actinolite Sillimanite	3 4 1 3 5 1 5	5.0	0.04	0.4 0.1	3.6	Spinel - vitreous lustre, conchoidal fracture. octahedra = chromite >70 vol.% chromite. Brown-red tourmaline.
602855	1590	Ilmenite	4>1	Chromite Rutile Zircon	1>5 5>4 5>1	Biotite Magnetite Tourmaline Tremolite Topaz	3 5 3 3 2	3.2	0.04	0.2 0.1	11.4	
602857	1591	Ilmenite Zircon	5>1 5>1	Magnetite Chromite Rutile	5>1 1>5 4	Biotite Garnet Rutile Tourmaline Leucoxene	2 2 4 1 4	1.2	0.02	0.2 0.11	38.3	
602859	1592	Ilmenite Chromite	3>1 1>2	Rutile	4>1	Biotite Garnet Tourmaline Cassiterite Phlogopite Topaz Beryl Fluorite	2 1 4 2 3 2 1 2	3.5	0.03	0.3 0.14	17.9	
602862	1593	Ilmenite Zircon	3>2 4>1	Chromite Garnet Rutile Leucoxene	3 2>3 4 4	Magnetite Biotite Tourmaline Tremolite	4>1 3 4 3	1.1	0.03	0.3 0.06	23.1	
602865	1594	Epidote Spinel Ilmenite	3 3 1	Magnetite Idocrase	3>1 1	Zircon Garnet Tourmaline	1 3 3	6.2	0.05	0.3 0.10	68.9	
602867	1595	Ilmenite	1>4	Magnetite Epidote Chromite Leucoxene Zircon	1>3 3 1>2 5>1	Anhydrite Rutile Spinel (red) Siderite Gold Biotite	3 4>6 2 1 3 2	4.5	0.03	0.3 0.14	11.5	Gold, several grains 0.1 to 0.2 mm.
602869	1596	Chromite Ilmenite Limonitic pebbles	3>1 1 3	Magnetite Topaz	3>1 2	Chlorite Epidote Actinolite Tourmaline Sillimanite Garnet Zircon Clinozoisite	3 3 3 1 3 4 4 3	4.0	0.03	0.5 0.10	21.5	
602871	1597	Chromite Ilmenite	1>3 1>2	Limonitic pebbles Zircon	5 5	Garnet Rutile Tourmaline Biotite Andalusite	3 5>1 2 4 4	3.5	0.04	0.3 0.2	51.9	
602873	1598	Ilmenite Dolomite	3>1 1>2	Magnetite Chromite	3>4 3	Gold Rutile Sillimanite Epidote Zircon Garnet	3 3 3 2 3 4	3.2	0.02	0.4 0.18	309.1	Gold 0.15 mm. More than 60 vol.% carbonate.

ESR NO.	MS NO.	MINERAL ABUNDANCE AND ROUNDNESS			GRAIN SIZE RANGE (mm)			CONCT. WEIGHT (g)	MISC. COMMENTS
		Major	Minor	Trace	Max.	Min.	Med.		
602875	1599	Pebbles MnO_2/ limonitic rock 1>3 Chromite 2>1	Ilmenite 1 Garnet 4 Spinel 2>1	Epidote 3 Tremolite 3 Specularite 4 Tourmaline 4 Rutile 4 Zircon 3>1 Spinel (red) 2 Fluorite 1	11.5	0.01	0.3 0.10	95.9	Spinel - red transparent margins, occasionally all over - bright red/ colourless.
602877	1600	Chromite 2>1	Ilmenite 1>3 Pebbles, MnO_2/ lim. 3 Idocrase 1>3 Leucoxene Zircon 5>1	Sillimenite 1 Biotite 2 Pyrite 1 Pyrite - specked rock frags. 3 Fluorite - blue 1 Rutile 4 Tourmaline 3 1	2.8	0.03	0.4 0.10	7.1	
602879	1601	Chromite 2>1	Magnetite 1>3 Ilmenite 3>1 Epidote 1>3 Zircon 1>3	Topaz 2 Idocrase 3>1 Actinolite 3 Biotite 3 Rutile 4 Tourmaline 3	2.9	0.03	0.2 0.08	31.6	Purple and colourless zircon in equal quantities. Brown epidote.
602881	1602	Ilmenite 3>1 Limonitic pebbles 4>2	Chromite 1 2	Magnetite 1 Rutile 4 Biotite 3 Zircon 4 Phlogopite 3 Topaz 2 Clinozoisite 2	9.5	0.01	0.3 0.08	47.4	
602883	1603	Magnetite 2 Ilmenite 4>1	Dolomite 1 Epidote 3 Chromite 3 Rutile 3>4	Zircon 3 Brucite 3 Topaz 2	8.0	0.01	0.3 0.10	150.3	Magnetite apparently altered amphibole or hedenbergite. Orange rutile.
602885	1604	Limonitised amphibole, pebble size 3 Limonitised fine grain (epidote, hematite, etc.)	Magnetite 2>1 Chromite 2>1 Ilmenite 1 Zircon 4	Carbonate 1 Rutile 2 Epidote 4 Garnet 3 Tourmaline 2 Biotite 3 Topaz 2	5.2	0.04	0.3 0.10	22.5	Some magnetite pseudo-morphing amphibole. More limonitised bundles fibrous amphibole - pebble size. Yellow-orange rutile common.
602887	1605	Ilmenite 3>1	Chromite 2 Zircon 4>1>2 Rutile 3	Magnetite 3 Biotite 2 Epidote 3 Garnet 2 Tourmaline 4 Sillimanite 2 Fluorite 1 Topaz 2 Idocrase 1	4.5	0.03	0.3 0.14	45.9	Low B.R., moderate R.I., 2V 55° - ve. Prismatic cleavage, 1. slow. Mineral present as trace - not identified.
602889	1606	Ilmenite 1>3	Chromite 2 Rutile 4>3 Zircon 4>1 Garnet 3	Magnetite 1>4 Tourmaline 4	1.8	0.03	0.3 0.10	39.3	More than 90 vol.% ilmenite.
602894	1607	Ilmenite 1>4>3		Cassiterite 4 Zircon 4>1 Rutile 4>1 Spinel 1 Garnet 3 Tourmaline 3	2.9	0.03	0.6 0.10	363.8	More than 90 vol.% coarse ilmenite. Large volume of ilmenite has trapped an abundance (~5 vol.%) quartz. Large (~1 mm) cassiterite grain.
602898	1608	Limonitic pebbles 4>3 Ilmenite 4	Epidote 3	Beryl 3 Biotite 4 Chromite 3 Tourmaline 4 Zircon 4 Rutile 1 Epidote 4 Topaz 2	3.5	0.01	0.2 0.14	8.5	

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CSR NO.	MS NO.	MINERAL ABUNDANCE AND RANKNESS			GRAIN SIZE RANGE (mm)			LOAD, WEIGHT (g)	MISC. COMMENTS
		Major	Minor	Trace	Max.	Mod.	Min.		
602901	1609	Ilmenite 1>4 Limonitised amphibole coarse frgs. 3	Rutile 3 Zircon 1>4	Actinolite 3 Magnetite 1>4 Spinel 3>1 Garnet 3 Tourmaline 4>1 Biotite 3 Sillimanite 3 Cassiterite 4 Topaz 3 Epidote 3	6.5	0.03	0.3 0.10	18.6	Spinel fairly bluish at edges, one grain. Largely brown or red on margin. Cassiterite, coarse (+1 mm) grain.
602903	1610	Epidote 3>1 Chromite 3>1 Idocrase 1	Magnetite 3>1 Ilmenite 3 Pyritic hornfels 4 Zircon 4>1	Biotite 3 Leucoxene Rutile 4 Tourmaline 5	7.2	0.04	0.3 0.10	10.3	
602905	1611	Ilmenite 3>1	Ferruginised coarse amphibole/ pyroxene 1 Rutile 3>4 Chromite 2>3	Zircon 4 Tremolite 3 Epidote 3	3.5	0.02	0.3 0.10	74.2	Rutile - orange.
602907	1612	Ilmenite pebbles 4 Limonitic pebbles 2	Epidote 3 Tremolite rock fragments 4	Gold 4 Rutile 4 Zircon 4 Actinolite 3 Tourmaline 4 Magnetite - rubbly 3 - crystals 4	4.5	0.01	1.0 0.14	226.5	Gold, 1.0 mm. Ilmenite > 90 vol.%. concentrate.
602909	1613	Limonitic pebbles 4>3 Ilmenite 4>3>1	Magnetite 1>3 Chromite 3>2 Zircon 4>3>1	Garnet 3 Tourmaline 4 Rutile 3 Biotite 2 Epidote 3 Topaz 3	5.8	0.01	0.3 0.10	13.3	
602911	1614	Limonitic pebbles 4>3 Spinel 2>1		Magnetite - ferruginised amphibole 2 Magnetite 4 Zircon 4 Garnet 3	5.5	0.01	0.4 0.14	536.3	Chromite >95% of sample concentrate. Very splinter splendent lustre. Zircon purple
602913	1615	Ilmenite 1>3 Chromite 2>1	Limonitic pebbles 3 4	Magnetite = ferruginised amphibole 2 Garnet 4>2 Zircon 1>5 Anatase 4 Sillimanite 3	6.2	0.02	0.4 0.14	699.3	Chromite> ilmenite, more than 99 vol.% of concn.
602915	1616	Ilmenite 1>3 Limonitic pebbles 3	Magnetite 3>2 Chromite 2>1	Limonitised amphibole 4 Garnet 3 Zircon 4 Epidote 3 Tremolite 3	5.0	0.01	0.3 0.21	346.1	Limonitic magnetite - several mms. Concentrate > 90 vol.% ilmenite.
602917	1617	Ilmenite 1>3 Zircon 4>5	Limonitic magnetite - platey several mms.	Rutile 3 Tourmaline 1>4	6.0	0.01	0.2 0.10	29.1	Ilmenite > 90 vol.% of concentrate.
602807P	1618	Ilmenite 4>1 Zircon 1>4	Leucoxene Chromite 2	Gold 4 Pyrite 2 Carbonate 2 Rutile 4 Biotite 3 Arsenopyrite 4 Garnet 4 Tourmaline 3	2.5	0.01	1.0 0.05	1.4	Gold 2.9 mm, 0.7 mm. Zircon colourless > 80 vol.%. -60# fraction.

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DSR NO.	HS NO.	MINERAL ABUNDANCE AND ABUNDANCE						GRAIN SIZE RANGE (mm)			DUPLICATE WEIGHT (g)	MISC. COMMENTS
		Major		Minor		Trace		Max.	Med.	Min.		
602414 AH 001F	1619	Magnetite Ilmenite	2>3 1>3			Epidote Rutile Zircon. Tremolite	3 4 1 4	5.0	0.06	0.3 0.14	346.4	Magnetite about 30 vol.% concentrate. Ilmenite about 65 vol.% concn. Mineral pitted.
602414 AH 002P	1620	Magnetite Ilmenite	4>1>2 1>3	Epidote Rutile Zircon	4 4 1>4	Garnet Tourmaline	4 4	6.5	0.02	0.4 0.14	258.4	Magnetite > 60 vol.% of concentrate. Ilmenite ~ 30 vol.% of concentrate. Zircon murky with limonite attachments.

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MINPET SERVICES

REPORT NO. 45/82

MINERALOGICAL EXAMINATION OF HEAVY MINERAL DRAINAGE SAMPLES FROM E.L. 15/76, DUNDAS, TASMANIA

(prepared for Mr. P.M. Macnamara, CSR Limited)

Part of Appendix V from Macnamara 1980

December 1982

1. INTRODUCTION

Thirty-four panned mineral concentrates obtained from the Dundas E.L. were dried and further concentrated over tetrabromoethane. Magnetic minerals were then separated by a heavy, switch on/off hand magnet. Fractions were examined semi-quantitatively by the low power stereomicroscope followed by more detailed examination of the -60 mesh fractions under R.I. oils, using the petrological microscope. Results are presented as on previous occasions, using a 'Bangka style' table, which though giving information on grain sorting, expresses in detail the general state of all grains in the same concentrate.

Discussion was limited in view of CSR's budget expenditure restrictions. Two specimens were submitted for XRD. Diffractometry of pyroxene and amphiboles (A090) and XRD powder pattern - identification of yellow pleochroic prisms (A256).

A routine examination for fluorescent minerals was made.

2. SUMMARY

The sampled area consists of much faulted serpentine intrusives, metamorphosed calc-silicate sediments, slates, etc. and also gabbro of Cambrian age and in one location Jurassic dolerites. If grains of the same mineral show in one sample, varied crystal forms, colours and wear, this may indicate grains present are derived from more than one rock suite or more likely from more than one sedimentary erosion period and many grains may have little relevance to existing catchment stratigraphy. However an abundance of chromite in varied states of erosion, much of it fresh euhedral grains but to fragmentary slivers is noted particularly in the northwest sector and Nevada Grid. In Cambrian Serpentine rocks and sediments, crocoite (lead chromate) occurs as traces commonly where pyrite occurs, also present with baryte once. Crocoite occurs in the central southern sector adjoining the location where lead sulphides occur in the M.F. Phelan and West Comet Mine neighbourhoods (hydrothermal mineralisation - or mine dumps?) and where chromite is shedding from the serpentine masses at Serpentine and Razorback Hills. Cassiterite seen is very sparse and grains which are mottled brown-red are small and rather worn. These are present north and south within the sampled area, Morain (A007), Crimson Creek Formation (A042), Silurian Amber Slate (A189), Dundas Group Unassigned (A062).

Pascoite [H_2Ca_2 $(VO_3)_6$ 10 H_2O] identified by optical properties only occurs in the presence of crocoite and pyrite at A214P and is a likely hydrothermal galena associate mineral; also occurs in A256 with goethite. Fresh galena occurs with pyrite curiously in heavily oxidised A060, so presumably as for pyrite, comes from an adjoining exposure.

Fresh pyrite (often accompanied by pale, near white marcasite) is seen in A056, A216, A241, A333, A336, A339, A368, A369, A370 and A371. Its mineral associates are galena in A056, marcasite (A216), crocoite, pascoite and marcastite (A241), baryte, marcasite and shceelite (A339) and marcasite (A371).

Two concentrates from neighbouring streamlets on the west/ south side of the sector on alluvium of the Climie Creek overlying Dundas Group unassigned rocks (A069P and A067P):-

.. A069P. Mainly limonite pebbles, epidote and zircon, minor chromite, ilmenite and magnetite. Traces of staurolite, garnet and tourmaline. Mixed subangular and freshly crystalline forms.

.. A067P. Largely limonite pebbles, tremolite schist fragments, ilmenite, tremolite crystals and zircon; minor magnetite and rutile; traces of crocoite, actinolite, hornblende, staurolite corundum, chromite, sillimanite and tourmaline. Largely worn, some good crystal forms - ilmenite, zircon and chromite.

Apart from chromite there is little of significance here. Orange prisms = crocoite, trace present.

.. A056P. Adelaide Mine Creek - Dundas Group - unassigned. Mainly limonitic pebbles, actinolite schist fragments, tremolite. Minor - nil samples; traces of magnetite rubble, staurolite, chromite, garnet, ilmenite, magnetite, rutile, tourmaline, zircon, pyrite, galena. Largely worn grains except pyrite, galena, tourmaline and magnetite. Unusual to find galena fragments as fresh as these in a stream sediment so there is likely to be adjoining freshly exposed sulphide veins.

(d) Central Southern Sector (just WSW of A090P)

.. A046P (WSW of A090P, approx. ½ mile). (Alluvium). Heavy concentrate is largely (?70 vol.% ilmenite as worn grains) with a further 10 vol.% zircon of fresh and worn grains, minor chromite, rutile and tremolite, traces of enstatite, hornblende, staurolite, epidote, leucoxene, cordierite, spinel and tourmaline. Rock fragments of minor tremolite schist, traces of garnetiferous schist and epidote aggregates. Most grains are worn but include fresh ilmenite, tourmaline and zircon and some rounded, pitted and fragmented grains. Grains are of varied origin, with fresh ilmenite (basic intrusive), chromite (ultramafic) and zircon (granitic).

/....

chromite and ilmenite (t0 90 vol.%) associated with plentiful zircon.

.. A025P. Just (0.6 mile) east of A033P, SE of part of Southern Sector on unassigned Dundas Group/Moraine.
Largely tremolite schist, hornblende, ilmenite, tremolite crystal grains. Minor epidote, leucoxene, carbonate and traces of limonite pebbles, epidote, aggregates, actinolite, topaz, hypersthene, rutile and hematite - calc-silicate sedimentary and basic intrusive origin (gabbros, dolerites to west) with fresh topaz, hornblende and some ilmenite).

.. A022P. Southeast within Southern Sector (nearest A025P to the west, approx. (½ mile). Sediments rest on Cambrian gabbros, norite, dolerite.
Largely chromite, ilmenite and tremolite. Minor enstatite, tremolite schist, epidote, leucoxene, and carbonate. Traces of epidote rock, actinolite, topaz, hornblende, garnet, sillimanite, hypersthene, rutile, enstatite, apatite and zircon. Mainly fragmented and finely crystalline with some rounded grains. The bulk of minerals present are chromite, magnetite and ilmenite from basic and ultrabasic(?) sources.

.. A017P. Southeast within Southern Sector (south of A025P) on Moraine.
Largely epidote, magnetite and ilmenite. Traces of limonite pebbles, epidote rock and minor tremolite schist, topaz, hornblende, chromite, diopside, sillimanite, leucoxene and zircon. Mainly subangular grains, some fresh crystals (zircon, chromite, magnetite, ilmenite and sillimanite). Ilmenite varies 50:50, magnetic and feebly magnetic fractions. Varied origin mainly calc-silicate sedimentary and basic intrusives.

.. A015P. Close to A017P - just to the east and also on Moraine.
Largely epidote, minor hornblende, diopside, ilmenite, magnetite; traces of chromite, actinolite, topaz, cordierite, rutile, tourmaline, tremolite and zircon. Similar origin to A017P witn greater emphasis on sedimentary calc silicate rather than basic intrusives. Diopside fresh, fragmentary.

.. A009P. Just over 1 mile SSE of A017P and resting on Moraine. Largely diopside, epidote and magnetite. Minor epidote rock, ilmenite, leucoxene, zircon and tourmaline. Traces, actinolite chromite, idocrase, garnet, sillimanite and tourmaline.

Mainly of calc-silicate metamorphic origin with some granitic influence.

.. A007P. Approximately ½ mile SE of A015P and ESE of A017P, southeast Southern Sector, on Moraine.
Largely chromite, epidote, ilmenite, magnetite and zircon. Chromite is >10 vol.%. Minor epidote rock, epidote >70 vol.%.

Traces of tremolite schist, actinolite, topaz, diopside, garnet, rutile and cassiterite (worn) and tourmaline. Grains are subangular and rounded - worn, but evenly crystalline - some ilmenite, zircon and tourmaline. Well-sorted. Mixed metamorphic calc-silicate and ultramafic/basic intrusive sources - fairly fresh.

Remaining specimens are shown separately and consist of A341, A368, A369, A370 and A371, Nevada Grid, NW of NW Sector. Situated on Hodge Slate and Razorback Conglomerate of the Dundas Group.

All contain abundant fragmentary chromite including brown/yellow transparent thin slivers of the mineral. Chromite is major in all concentrates except A371 where there is a minor presence. Magnetite is fresh and also worn, rubbly - the latter most notable in A368 and A371 but with a major presence only in A341 and A371. Ilmenite is major in all concentrates but is pitted and worn in most. Traces of limonite:garnet schist, limonitic(?) schist, actinolite schist in A371 indicates a metamorphic (calc-silicate?) catchment. Similarly for minor tremolite schists (A370). Trace actinolite (except A368), trace hornblende (except A369 and A370), trace epidote (except A368), trace tremolite (except A368). One other trace metamorphic mineral present is sillimanite (A369). Most interesting is major pyrite (A371) - commonly associated with marcasite (altered pyrite?).

/....

4. REFERENCES

PACMINEX PTY. LIMITED

PMR 215/72 - A Mineralogical Examination of Heavy Mineral Concentrates, etc., E.L. 15/76, Dundas, Tasmania.

PACMINEX PTY. LIMITED.

PMR 88/78 - A Mineralogical/Geochemical Appraisal of Heavy Mineral Concentrates, E.L. 15/76, Dundas, Tasmania.

MINPET SERVICES

MPS 23/79 - Mineralogical Examination of Heavy Mineral Drainage Samples from E.L. 15/76, Dundas, Tasmania.

December 1982

TABLE 1 : LEGEND

Rock Aggregates

TS - tremolite schist
AS - actinolite
BF - banded ferruginous shale
CS - chlorite schist
ED - epidote rock fragments
FP - ferruginous hematite/limonite pebbles
FS - ferruginous siltstone
GS - garnetiferous schist
LGS - garnetiferous schist, limonitised
GP - goethite pebbles
OcL - ochreous limonite particles
MS - mica schist
MA - magnetite rock aggregates
MR - magnetite rubble

Minerals

Ap - apatite
Ah - anhydrite
Ba - baryte
Br - brookite
Cl - chlorite
Cr - crocoite
Ch - chrysotile
Cs - cassiterite
En - enstatite
Fo - forsterite
Gt - goethite
Ga - galena
Hm - hematite
Mh - maghemite
Mc - marcasite
Ps - pascoite
Sp - specularite
Sh - scheelite

Abundance (minerals and rock fragments)

1 - major >5 vol.%
2 - minor 1-5 vol.%
3 - trace <1 vol.%

Grain Shapes

1 - euhedral, crystalline
2 - aggregated laths
3 - subangular
4 - angular
5 - fragmented
6 - rounded
7 - pitted

Sorting

1 - excellent
2 - very good
3 - good
4 - mainly good
5 - moderate
6 - poor

TABLE 1 : STREAM SEDIMENT HEAVVY MINERAL DETERMINATIONS, DUNDAS (Part 2)

SAMPLE NUMBER	ROCK FRAGMENTS ABUNDANCE	Actinolite	[illegible]	Hornblende	Staurolite	Andalusite	[illegible]	Corundum	Chromite	Diopside	Epidote/Cli	Garnet	Sillimanite	Hypersthene	Ilmenite	Leucoxene	Magnetite	Carbonate	Cordierite	Rutile	Spinel	Tourmaline	Tremolite	Zircon	Additional Minerals	GRAIN COLOURS	GRAIN SHAPES	GRAIN SIZE LIMITS (mm) MIN.	MAX.	MED.	SORTING	COMMENTS	CONC. WEIGHT (g)
A140007	TS3, ED2, FP1	3	3						1	3	1	3			1	3	1			3		3		1	Cs3	Green, black, brown	3>1>4	0.07	2.2	0.4 0.22	3	Chromite >10 v%. Epidote >70 v%. Cassiterite - trace.	9.8
A140009	ED2, FP3	3							3	1	1	3	3		2	2	1					3		2	Id3	Black, green, brown	3>1>4>5	0.03	1.8	0.3 0.11	2	Diopside, very fragmentary, fresh.	17.7
A140015	AcS3, LP3	1	3	2					3	2	1				2		2		3	3		3	3	3	Mh3	Green, brown,	3>1>5>6>7	0.03	1.4	0.4 0.12	3	Mainly epidote - crystalline. Ilmenite, both dull and splendent. Hornblende, brown.	19.2
A140017	ED2, TS2, LP3		3	3					3	3	1		3		1	3	1							3		Black, brown, yellow.	3>1>5>6	0.01	2.2	0.3 0.16	5	Ilmenite 50:50, mag:non mag. fraction.	21.1
A140022	ED3, TS2	3	3	3		2			1		2	3	3	3	1	2	1	2		3			1	3	Ap3	Black, yellow, white	5>1>3	0.05	2.0	0.4 0.16	4	Largely ilmenite + chromite? zircon pink (4)	13.9
A140025	TS1, LP3, ED3	3	3	1					1		2			3	2		1			3			1		Ilm3	Yellow, brown, green	3>1>4	0.02	1.6	0.4 0.11	4	Much pale amphibole present.	16.8
A140033	LS3	2	3	1	3			3	2	3	3	3		3	1	2	1	3	3	3		3	1	2		Black, brown, white	3>1>4	0.03	1.3	0.5 0.08	4	Several generations of ilmenite present. Mauve zircon.	4.5
A140036	AcS3	3	3		3				2		3	3			1	2	2			3		3	1	2	Ah3	Black, white	3>6>1>7	0.03	1.2	0.3 0.10	3	Mauve zircon.	4.4
A140042	Ts3, AcS3 OcL3	3	3	3	3				3	3		2	3		1		3			2		3		1	Ap3 Cs3	Black, white	3>1>7>6	0.03	1.0	0.4 0.06	3	Ilmenite >70 v%. Brown-red mottled angular cassiterite.	39.7
A140046	TS2, GS3, ED3			3	3	3			2		3	2			1	3	3		3	2		3	2	1		Black, white	3>1>7>6>5	0.02	0.8	0.3 0.07	2	Ilmenite >70 v%. Zircon >10 v%. Spinel, black/ green.	23.2
A140056	MR3, LP1, TS3, AcS1				3				3			3			3		3			3		3	1	3	Py3 Ga3	Brown, yellow	3>6>1	0.01	2.0	0.3 0.08	5	Largely ferruginous rubble.	5.4
A140060	MR3, LP1, OcL3, AcS2	3			3				3		3	3			2		3			3		2	1	2		Brown, yellow	3>5>1>7	0.03	2.4	0.3 0.08	5	Purple zircon. Fibrous magnetite - abundant.	4.1
A140062*	MR1, LP3	2							2		3	2			1		1	1		2		3	2	3	Cr3 Ap3 Ba3 Cs3 Sp3	Brown, black	3>5>1>7	0.01	2.0	0.4 0.16	6	Ilmenite, pitted. Mainly rubbly ferruginous carbonate.	63.1
A140067*	LP1, TS1 AcS1	1		1	1		3	1	3		3		3		1	3	2			2		3	1	1	Cr3	Black, yellow	3>1>6	0.02	2.9	0.3 0.05	5	Abundant ilmenite - splendent.	7.0
A14006[illegible]	LP1				3				2		1	1			2		2			3		3		1		Black, white	3>1>7>6>7	0.02	2.2	0.4 0.08	5	Mauve (worn) zircon. Fragmental chromite.	3.8

* Orange prisms (XRD) trace.

SAMPLE NUMBER	ROCK FRAGMENTS PRESENT	[illegible]	[illegible]	Hornblende	[illegible]	[illegible]	Biotite	[illegible]	Chromite	Diopside	Enstatite/Cli	Garnet	Sillimanite	Hypersthene	Ilmenite	Leucoxene	Magnetite	Carbonate	Cordierite	Rutile	Spinel	Tourmaline	Tremolite	Zircon	Additional Minerals	GRAIN COLOURS	GRAIN SHAPES	GRAIN SIZE LIMITS (mm) MIN.	MAX.	MED.	SORTING	COMMENTS	CONCT. WEIGHT (g)
A140090	MR3, LP1 EP1	3				1			2	1					1	2	3		3	2				2		Brown, yellow	3>2>6>7	0.05	3.0	0.3 0.16	6	Diffractometer test+.	5.1
A140092	LP1, TS2	3	3	3	3		3		2		3	3	3		2	2	3			3		3		1	Fo3	Brown, yellow	3>1>6>7	0.02	3.2	0.3 0.07	5	Zircon, tourmaline, variable wear, coloration.	3.8
A140187	LP3, TS2 OcL3	3	3		3				1		3	3			1	1	3			2		3	2	1		Black, yellow	3>1>6	0.02	1.0	0.4 0.11	3	Concentrate >90 vol.% chromite + ilmenite, multi-coloured zircon. Purple, worn garnet.	10.6
A140189	LP3, OcL3	1							1	3	3	3			1	1	3			2		2	3	1	Ap3 Cs3	Black, yellow	3>1>6>7	0.01	0.8	0.3 0.07	3	Concentrate >90 vol.% ilmenite + chromite. Zircon colourless and mauve. Both 1 = 6, superabundant.	22.8
A140205	MR3			3	3				1			3			1		3			3		3		3		Black	1>3>7	0.01	1.0	0.3 0.20	2	Concentrate >98 vol.% chromite> ilmenite. Rutile main minor component.	304.2
A140216	MR3	3							3			3					3	1		3			3		Py2 Mc3 Hm1	Brown, yellow	3>5>1	<0.01	1.5	0.6 0.12	3	Ferruginous carbonate and calcite.	53.0
A140218	TS1	3		1					1	3					1		2							1		Black, brown, yellow	3>1>2>7	<0.01	1.7	0.3 0.08	3	Brown < green hornblende.	84.0
A140241	MA1, LP2	3							1		3	3	3		1		2	1		2		3	2	3	Cr3 Py3 Ps3 Mc3	Brown, yellow, white	3>5>2>1	<0.01	2.2	0.3 0.10	4	Abundance of coarse ferruginous carbonate and calcite fragments. Crocoite, monolinic yellow/orange pleochroic Z∧C 7°.	27.1
A140256	MA3		1						3						1	3		2		3			2	3	Ps3 Cl3 Cr2 Gt1	Brown, orange, white	3>5>2>1	0.01	1.8	0.5 0.16	5	Yellow/orange pleochroic prisms of crocoite.	80.1
A140268	MR2, TS1	3		3						3	3			2	2	3	3			3		3		3	Sp3	Brown, yellow	3>2>5>1	0.02	1.4	0.4 0.11	5	Rutile as squat prisms.	9.7
A140296	LP1	1		1		1					2			1	1	3	3							3		Black, green, yellow	3>7>6	0.02	2.6	0.3 0.08	2	Coarse pale hypersthene and ilmenite. Fines hypersthene enstatite, hornblende mix.	66.0
A140313	MR1, TS1, AS3 DeL1, [illegible] EP1	3		3		3		3			3	3			2			3		3		2		3	Py3	Brown, yellow	3>4>6>1	0.03	4.0	0.3 0.2	5	Rutile - squat red prisms.	12.9
A140336	MR3, GP1 EP1, TS1			1	3			3	2		3				2		3	2		3	3	3	3	3	Sp3 Py3	Black, yellow	3>6>1>5>6	<0.01	2.2	0.3 0.11	4	Largely goethite pebbles. Dull grey manganese oxides fragments. Spinel - red.	16.9

+ Enstatite, diopside, chromite.

383160

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Additional Minerals	GRAIN COLOURS	GRAIN SHAPES	GRAIN SIZE LIMITS (mm) MIN.	MAX.	MED.	SORTING	COMMENTS	[illegible] WEIGHT (g)
A140339	MR3, GP1 TS3, Ac53			3							3	3		1			3				3	3	Br3 Py3 Mc3	Black, brown, yellow.	3>6>5	<0.01	2.8	1.2 0.12	4	90 vol.% (+60 mesh) component of worn ilmenite pebbles; purple zircon - worn; colourless, fresh.	72.1
A140341	MA1, GP2	3		3				1		3				1		1				3		3	3		Black, brown	1>2>3>7	0.02	1.4	0.3 0.16	3	Magnetite fresh euhedra - splendent lustre or aggregate laths. Abundant chromite and ilmenite - fresh and less so pitted. Black tourmaline.	57.3
A140168	MA3			3				1						1		3							Py2 Mc3	Black	1>5>7>2	0.03	0.8	0.3 0.08	3	Ilmenite - pitted. Chromite fragmented, splendent, bluish reflectance. Mainly opaque, slivers + crystals, amber, transparent.	23.9
A140369	MS3			3				1		3		3		1		3					3	2	Py3	Black, white	1>5>3>6	0.02	1.4	0.3 0.08	2	Mainly chromite - mostly fragmentary and transparent; otherwise rounded ilmenite and fragmentary > euhedral zircon.	45.3
A140370	TS2	3						1		3				1		3				3	3	3	Py1 Mc3 Sp3	Black, yellow	1>3>5	0.02	1.2	0.3 0.09	2	Chromite:tremolite growths: pyrite. Zircon - orange, euhedral, also mauve, worn.	41.9
A140371	MP1, LS1 GP1, Ac51 LS53	1		3				2		3				1		1				3	3	3	Py3 Mc3	Brown, yellow, black	3>5>1	0.01	1.3	0.4 0.12	2	Magnetite - aggregate laths. Marcasite - near white, fine granular.	34.8

TABLE 2 : SAMPLE WEIGHTS, E.L. 15/76

Sample No.	Head Weight	Heavies
A140007	85.2	9.8
A140009	85.0	17.7
A140015	85.2	19.2
A140022	56.3	13.9
A140025	56.0	16.8
A140033	49.5	4.5
A140036	49.5	4.4
A140042	277.3	39.7
A140046	170.0	23.2
A140056	56.7	5.4
A140060	56.5	4.1
A140062	170.3	63.1
A140067	56.7	7.8
A140069	49.5	3.8
A140090	99.5	5.1
A140092	49.5	3.8
A140187	70.9	10.6
A140189	99.2	22.8
A140205	509.7	304.2
A140216	170.6	53.0
A140218	227.1	84.0
A140241	85.0	27.1
A140256	142.2	80.1
A140268	57.1	9.7
A140296	99.2	66.0
A140333	99.3	12.9
A140336	113.0	16.9
A140339	198.0	72.1
A140341	99.2	57.3
A140368	49.5	23.9
A140369	170.0	45.3
A140370	49.5	11.9
A140371	56.2	34.8

MAP SHEET ZEEHAN 1:15840

PROJECT PIEMAN

MAP SHEET ZEEHAN 1:15840

LINE 1 S.E.

LINE 2 E

LINE 3.5 W.

LINE 4 N.E.

179·17 181·16 182·24 183·04 183·96 184·78 185·97 187·35 189·25 191·56 192·37 194·16 195·75 197·97 198·62 205·83 205·85 MH206·00 EM206·45 EM207·30 207·35 207·93

Brickfields

Fault

Monterey Fault

Lake Edgar Fault

Emerald Fault

Qrs Qrg Qpm Qa Qt Qd Db Dm Df Dqp Dp Dg Ed Edv Eb Es Ec Ef Eq Eqa Eqb Eqd Eqe Eqf Eqg Eqh Eqi Eqj Eqk Eqm Eqn Eqo Eqp Eqq Eqr Eqs Eqt Equ Eqv Eqw Eqx Eqy Eqz Ec Ed Pc Pb Puo Jd Tb Tc Tg Tm Tp Tr Ts Tt Tu Tv Tw Tx Ty Tz

EL 7/68 EL 15/76

343 000mE 345 000mE

5370000 5365000 5360000N 5360m 5355m 5350m

850yds 845yds 840yds 835yds 830yds

REFERENCE

EL 15/76

EL 7/68

207·93 GEOTERREX Airborne E.M.

5 cm

SCALE 1:25,000

0 1 2km

383163

CSR LIMITED-MCD

E.L. 15/76 DUNDAS TAS.

GEOLOGY & E.M. TEST LINES

84-2175 001

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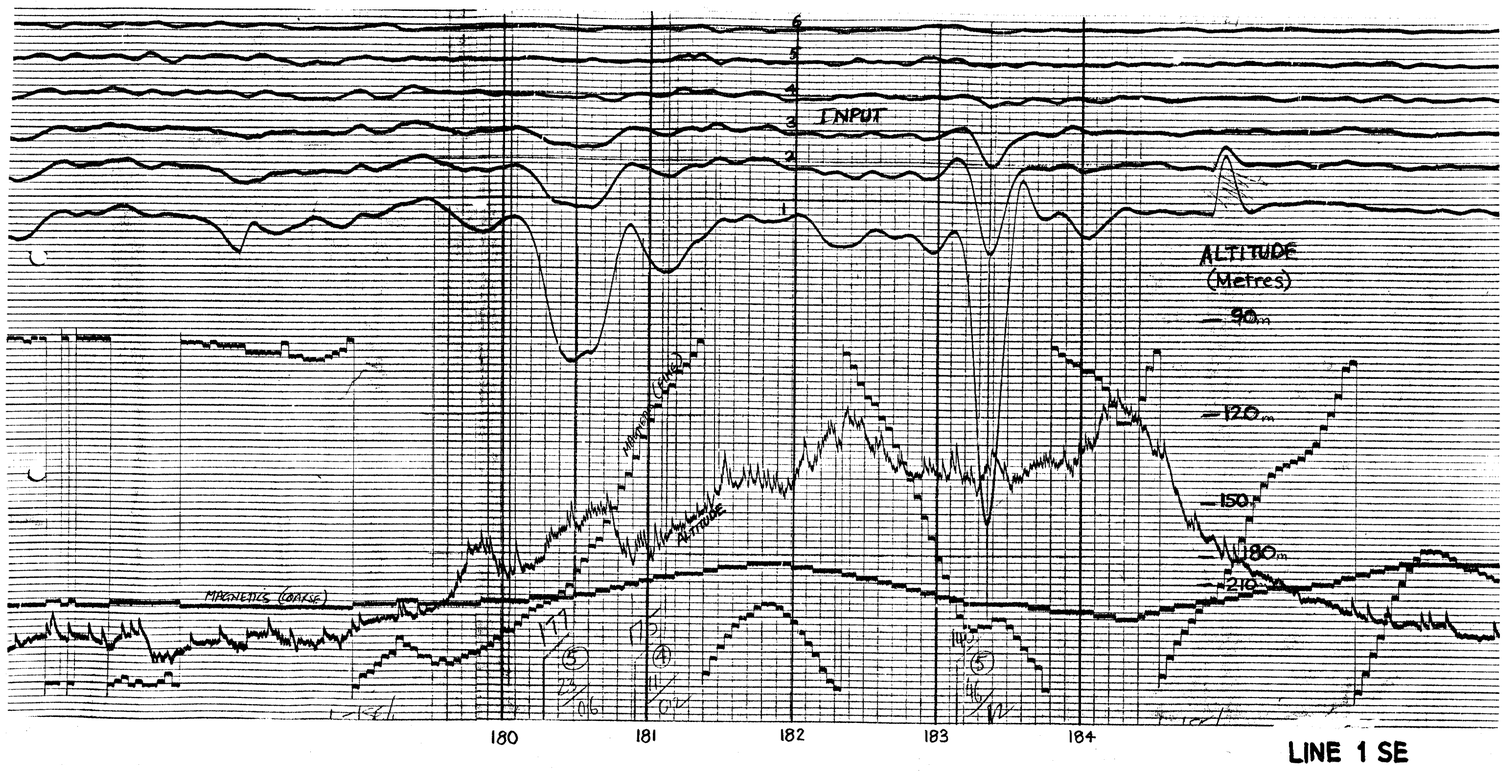
DRAWN : P.M.M.	
DATE : May '81	
REVISED :	



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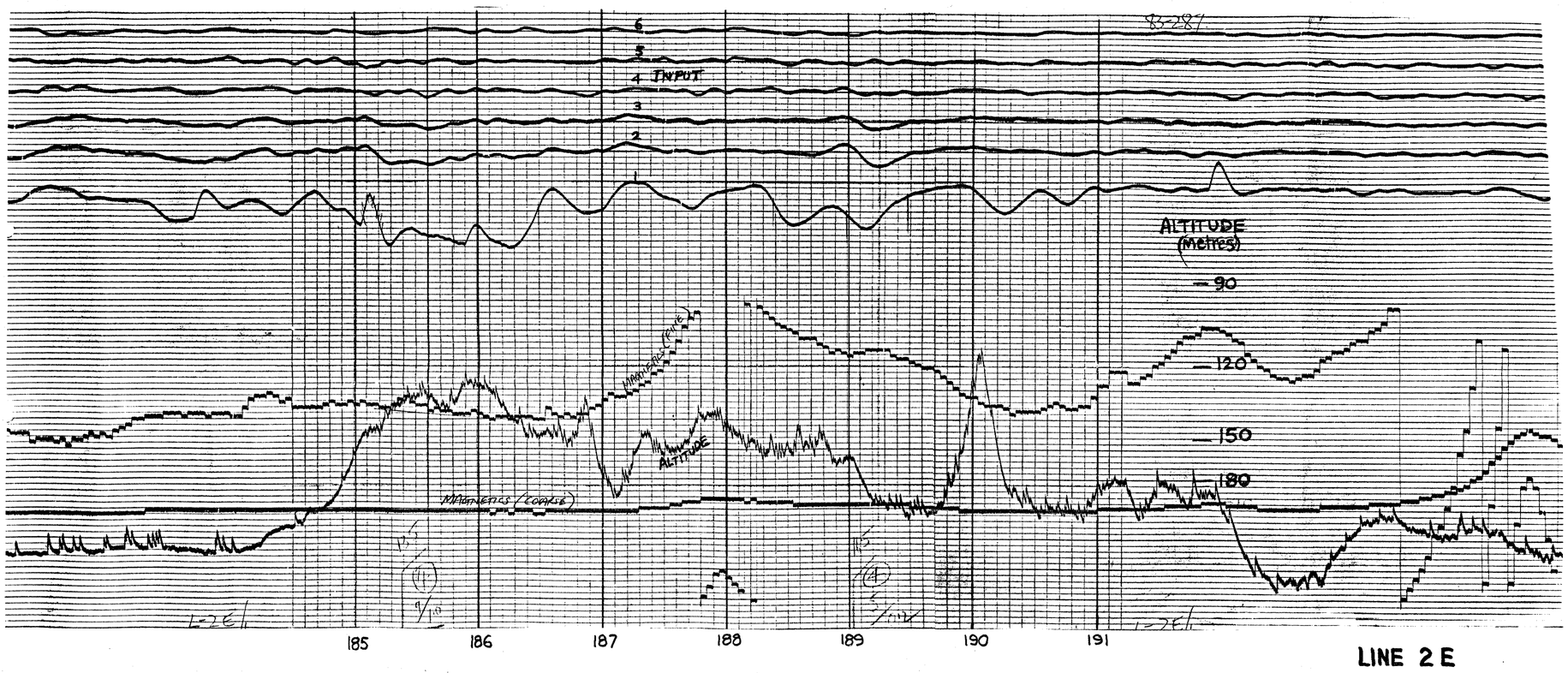

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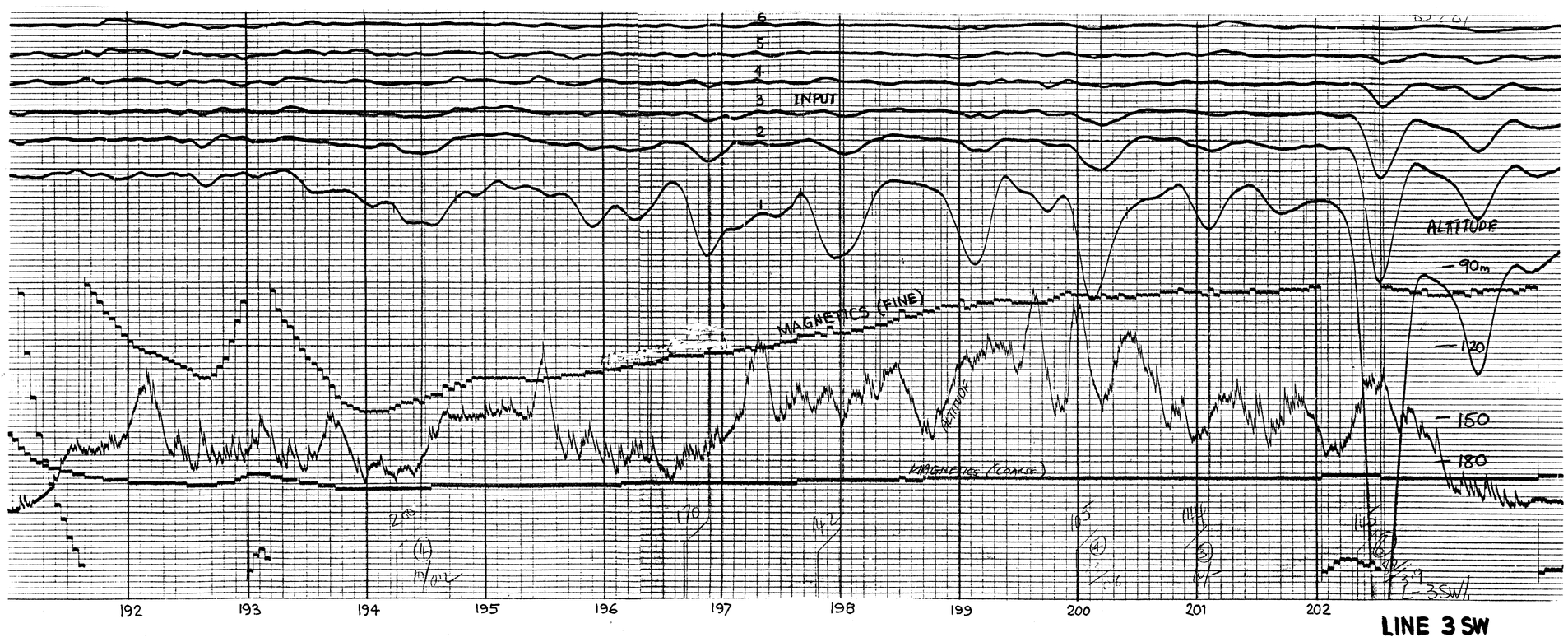

LINE 3 SW

LINE 4 NE

383164

FOR EMR 46/81

CSR LIMITED-MCD

AIRBORNE INPUT E.M.
AND MAGNETIC RECORDS
TEST FLIGHTS OF 002

EL. 15/76 DUNDAS TAS.

84-2175

SCALE	K555-22
DRAWN	
DATE MAY 1981	
REVISED	

370 000 m E
372 000 m E
374 000 m E
376 000 m E
5 360 000 m N
5 358 000 m N
5 356 000 m N
5 354 000 m N
5 352 000 m N

RELINQUISHMENT BOUNDARY

A140180
A140181
A140146
A140307
A140308
A140309
A140310
A140311
A140196, 602677
602678
602679
602680
602681
602682
A140192, 602660
602661
602663
602664
602665
602666
602675
A140145
602676
602784
602782
602783P
602785P
602786
602787P
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602789P
602790
602791
602793
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602794M
602795P
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602688
602689
602696
602797P
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602683
602684
602798
602799P
SL1
602678
602679
SL2
SL3
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A140193
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602774
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602777P
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A140035
602778
602779P
A140032
A140033
SL4
602800
602801P
SL5
602803
602804P
SL6
602802
A140020
P5.1
P5.2
602701
602700
602702
602703
602705
602704
P5.5
P5.4
A140028
A140029
A140030
A140024
A140021
A140025
A140026
P5.3
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602706
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A140038
A140039
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A140014
A140015
A140016
A140017
A140013
A140012
A140011
A140005
A140006
A140007
A140008
A140009
602864M
602865P

RELINQUISHMENT BOUNDARY

E.L. 15/76 BOUNDARY

N

REFERENCE

- DRAINAGE SAMPLE LOCATIONS
- SOIL SAMPLE LOCATIONS
- PIT SAMPLE LOCATIONS

383165

5 cm

0 1 km

CSR LIMITED - AMCD

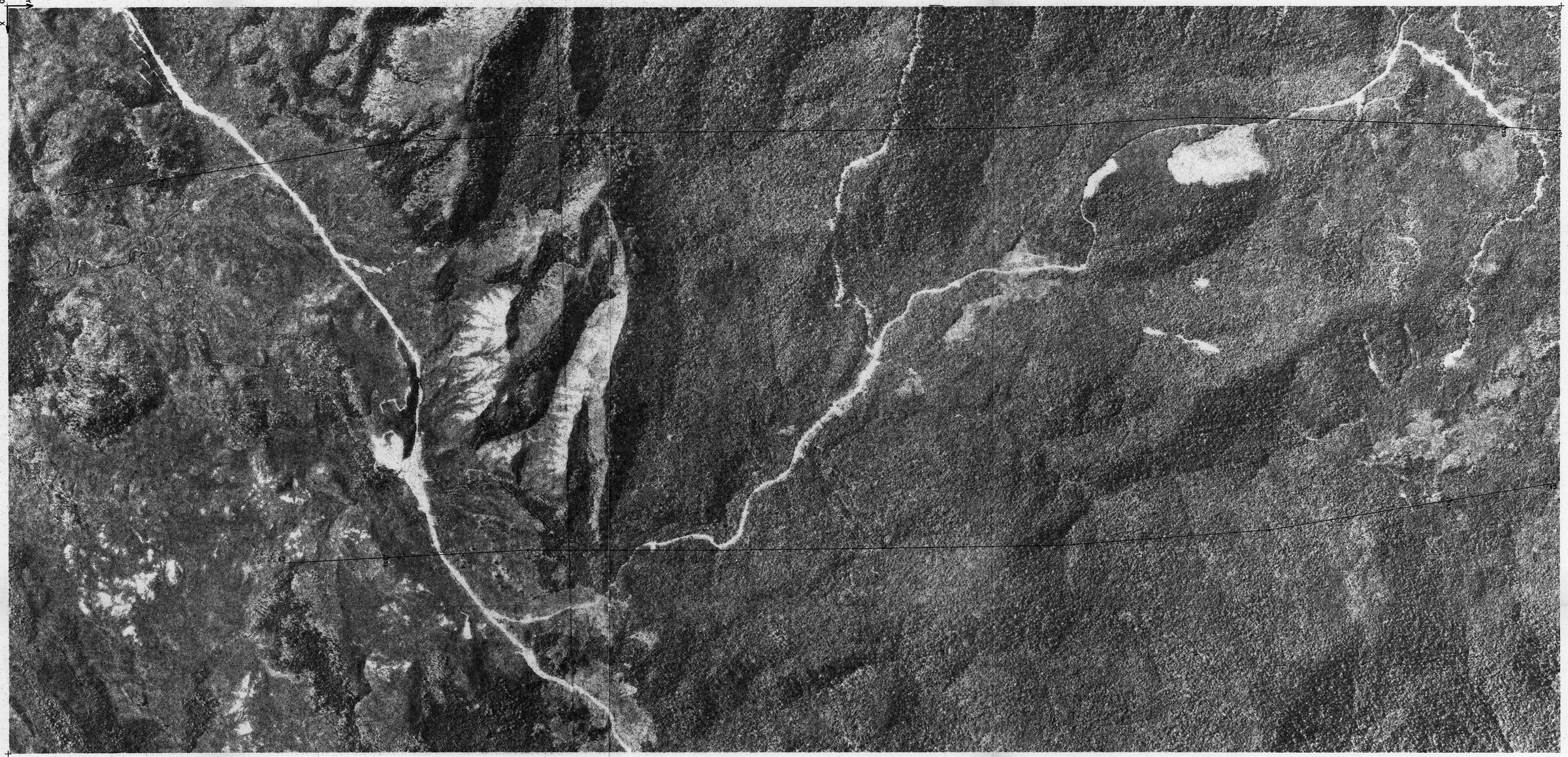
E.L.15/76 DUNDAS, TASMANIA
RELINQUISHMENT AREA

DRAINAGE SAMPLES

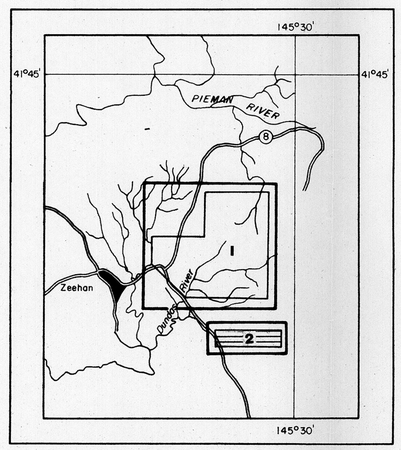
84-2175

SCALE	: 1 : 10,000	DRG. No.
DRAWN	: P.D.E./	K555 - 47
DATE	: July '84	
REVISED	:	

003



LOCATION MAP



Scale 1:250,000

383166

DIGHEM II SURVEY

ZEEHAN REGION, TASMANIA

ELECTROMAGNETICS

FOR

5 cm

C.S.R. LIMITED

84-2175

SCALE 1:10,000

1/2 0 1/2 1 Kilometres

1/4 0 1/4 1/2 Miles

SHEET 2

004

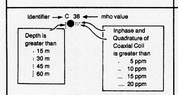
REGISTERED PROFESSIONAL ENGINEER
D. C. FRASER
PROVINCE OF ONTARIO

Flight line

Fiducials and numbers

ANOMALY GRADE	EM GRADE SYMBOL	MHO RANGE
6	●	⩾ 100
5	✱	50 — 99
4	●	20 — 49
3	⊙	10 — 19
2	○	5 — 9
1	○	⩽ 4
	×	Possible conductor

DIGHEM anomalies are divided into six grades of conductivity — thickness product. This product in mhos is the reciprocal of resistance in ohms. The mho is a measure of conductance, and is a geologic parameter. Most swamps yield grade 1 anomalies but highly conducting clays can give grade 2 anomalies. The multi-coil anomaly shapes often allow surface conductors to be recognized, and these are indicated by the letter S on this map. The remaining grade 1 and 2 anomalies could be weak bedrock conductors. The higher grades indicate increasingly higher conductances. Examples: The ore bodies of the Magusi River camp (Quebec, Canada) yield grade 4 anomalies, while Mattabi and Whistle (Ontario, Canada) give grade 5. Graphite and sulphides can span all grades but, in this survey area, field work may show that the different grades indicate different types of conductors.



Refer to list of anomalies in survey report for the actual ppm values for all coils, and for conductor depths.

The actual mho value is plotted beside the EM grade symbol. The letter is the anomaly identifier. The horizontal rows of dots indicate anomaly amplitude on the flight record, and the vertical column gives the estimated depth. This depth may be unreliable because the stronger part of the conductor may be deeper or to one side of the flight line, or because of a shallow dip or conductive overburden effects.

	Conductor axis
S	Surface response (usually conductive overburden, but includes conductive response from broad expanse of weathered and unweathered rocks, and from culture which gathers current from conductive ground).
S?	Possible surface response
L	Culture (usually a line such as a fence, power or telephone line, but also includes buildings, etc.).
L?	Possible culture
?	Questionable anomaly
	Apparent thickness > 10m
	Dip direction
100↕	Direct magnetic correlation of 100 gammas

DIGHEM maps are designed to provide a correct impression of conductor quality by means of the conductance grade symbols. The symbols can stand alone with geology when planning a followup program. The actual mho values are plotted for those who wish quantitative data. The anomaly ppm and depth are indicated by inconspicuous dots which should not distract from the conductor patterns, while being helpful to those who wish this information. The map provides an interpretation of all conductors in terms of length, strike direction, conductance and depth. The accuracy is comparable to an interpretation from a ground EM survey having the same line spacing.

DWG. No. K555-48

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355	APRIL 82		