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Location of Tenement and Summary of Geology

Location of tenement and access

EL 11/96, comprising an area of 6 square kilometers, is located approximately 3 km NE of Pioneer, as illustrated in figure 1.

Access is provided by 4-wheel-drive track from Garibaldi Rd., approximately 1.5 km W of the junction with the Gladstone main road.

Summary of the geology of the area

All the outcropping rocks in the area are Devonian coarse-grained granite/adamellites, with some small fine-grained granite/adamellite areas. In the western half of the lease the areas of exposed granite are separated by deeply greisenised (mostly kaolinised) regions. Most of these greisenised areas show lines of surface quartz fragments with a trend of 340° (T). In at least three cases these lines of surface quartz fragments indicate quartz veins still in place within the greisenised granite. Silcrete is usually encountered near the indicated quartz veins.

Figure 2 shows the area of the lease. Also shown are the six sample lines and other spot sample locations. The areas where native metals were found are marked, and are each assigned a number to enable the native metals and alloys listed in Table 1 to be correlated with sites.

Previous Exploration of the Area

Except for the old tin-mining excavations in the SW corner of the lease (Nolan's old mine), and Mr. McCormack's mining lease adjoining the N end of the lease, there are no records of any previous exploration activity in the area. Nevertheless some limited activity has occurred, and is evidenced by some surface clearing and test pits, but this activity is very old. One area occurs just west of line 6 near where there is also evidence of an old camp and an old fence. A number of test pits occur in an area about 100 m east of line 1, close to the track. About 50 m to the S of location 11 (line 5) on Figure 2, some of the loose surface granite rocks have been pushed up into quite a large mound, although no other evidence of excavation (e.g. a pit) is obvious. At about 60 m east on line 4 there is an old test pit, and there are other pits, apparently randomly located, around this area. Location 16 is within an excavation known as "Nolan's old workings".

Interest in the area, which led to the present exploration lease, commenced with the discovery of native metal particles in the ground immediately to the S of the lagoon on Mr. McCormack's mining lease. This was followed by the marking-out of two prospecting claims in 1995, which contained the two most obvious quartz veins in the hills immediately to the S of Mr. McCormack's mining lease. The continuing discovery of native metals and alloys on these claims, and the apparent association of these native metals with the indicated quartz veins, led to an application for the present exploration lease.

During 1996/1997 and 1997/1998 geochemical sampling was carried out along the indicated lines in Figure 2. Each sample location was also examined for the presence of native metals and for chromites and Mg-ilmenites. This allowed mapping of occurrences for these particles, and showed that they were spatially associated with the quartz veins. At the same time the geochemical sampling and analysis did not indicate the presence of significant mineralisation, but did produce a correlation between quartz veins, native metals, chromite and Mg-ilmenite, and small geochemical "highs". One of the more significant geochemical highs occurred at 75 east and 100 east on line 4, where copper assayed at around 120 ppm. As it was thought that this value could be due to some error, the area was re-sampled, but the new samples were destroyed by fire before they were analysed.

Analysis of quartz from the line 5 samples suggested that the geochemical highs, at least along line 5, were of a secondary nature, and were probably not associated with the granite in the area.

The results obtained during 1996/1997 and 1997/1998 were not encouraging for the discovery of an economic mineral deposit, but were geologically and geochemically puzzling.

Exploration Philosophy

While one of the main reasons for exploring the area is simply to shed light on the geological and geochemical puzzle posed by the presence of the native metals, chromites and Mg-ilmenites, and their association with the quartz veins, there is also the consideration that the presence of the native metals may be indicating some hidden deposit of economic value. The nature (or existence) of any such deposit can not be determined by the presence of the native metals alone, and for this reason it has not been possible to state the type of deposit being sought.

Exploration of the area is therefore based primarily on geological problem solving rather than on an economically driven programme.

Summary of Exploration Work Carried Out from May 1996 to May 1997

Details of this work are given in the 1996/1997 report on exploration activities. A brief summary is given below.

Five separate lines, totalling approximately 1.5 km in length were pegged out and sampled at 25 m intervals. Approximately 2 kg samples were taken at each site. About a quarter of each sample was used for chemical analysis by neutron activation and AAS. The remainder of each sample was panned to a heavy mineral concentrate and examined for native metals, chromites and Mg-ilmenites. These were then subjected to electron microprobe analysis, and many of the native metals were later photographed.

Magnetic field measurements and radiation measurements were made at 5 m intervals along each pegged line. Self-potential and electromagnetic measurements were also made.

The results of all the above measurements and analyses were given in the previous report.

Summary of Exploration Work Carried Out from May 1997 to May 1998

Samples from line 5 (containing locations 11 to 14 on Figure 2) were re-analysed using the method developed by Dr. Jan van Moort. In this method acid-insoluble residues are analysed. After preparation the samples consist mainly of quartz with minor feldspar and sericite. Most of the secondary mineralisation is removed, leaving only that mineralisation which occurred with the formation of the quartz. Samples were analysed at Lucas Heights in Sydney, by PIXE/PIGME (Proton Induced X-ray Emission, and Proton Induced Gamma ray Emission). The aim of this analysis was to look for evidence of any mineralisation associated with the emplacement of the quartz veins themselves.

It had been intended to analyse the acid insoluble residues also by EPR at the Central Science Laboratory, university of Tasmania, but the samples were destroyed by fire before this could be done. Some previous PIXE/PIGME analysis had been carried out on samples from line 1 (containing locations 4 to 6 on Figure 2), but this did not use acid insoluble residues. The planned re-analysis of line 1, using neutron activation rather than PIXE/PIGME, was not carried out because all the samples were destroyed by fire before being sent for analysis.

Vegetation samples were taken along line 5, and prepared for AA analysis. These were to have been analysed using the Techtron-Varian AAS at the geology dept. of the university of Tasmania, However this machine was disposed of by the university, and is now set up at our new workshop at Exton. It was not operational before May 1998.

Line 2 (which includes location 7 and 8 on Figure 2) was examined further for chromites and Mg-ilmenites.

Exploration Work Carried Out from May 1998 to May 1999

The quartz veins indicates on lines 2 and 5 (at locations 7 and 14 respectively) were examined in more detail by back-hoe excavation, in the company of Dr. Van Moort and Dr. Ang Pwa (university of Tasmania), to make sure that they were in situ, as previously thought. Quartz from these veins was also re-analysed by PIXE/PIGME at Lucas Heights in Sydney.

A new E-W line, line 6 on figure 2, was marked out. Geochemical samples were taken, at 25 m intervals from within the clay horizon, and analysed for Cu, Ni, Pb, Zn and Mg. Radiation measurements every 5 m were also taken. For each geochemical sample location, the quartz within the sample was isolated and analysed by PIXE/PIGME at Lucas Heights. These samples were prepared as described for the line 5 quartz analyses in the previous report.

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Water samples were taken from most stream and water-filled test holes on the lease. These samples were evaporated to one tenth their volume, and then analysed by AA for the elements listed above.

The anomalous copper values previously obtained on line 4 were further examined by re-sampling the previous holes and extending the sampling area 50 m to the north and 25 m to the south, using a 25 m grid.

An anomalous copper value obtained on line 6 (at 25 m west) was also further examined by extending the sample area around this location, on a 25 m grid.

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Results

Geochemical

Previous samples have been analysed by neutron activation and AAS (the latter for Cu, Pb, Ni, Zn) by Becquerel Laboratories in Sydney. Samples taken over the past six months have been analysed by myself, at Exton, using an older Varian-Techtron Model AA-6 spectrometer (with some technical advice and help from Mr. John Lethborg of Westbury). A portion of the sample is dried, and the minus 53 μ m fraction is taken for analysis. It is hoped that this size fraction will minimise the possibility of including a native metal grain in the analysis. At 100 μ m, an elongated copper or brass grain could change a Cu analysis figure by more than 20 ppm.

Analysis data for lines 1 to 5 have been given in previous annual reports.

A Cu anomaly (reported as 121 ppm) was indicated for line 4 in the 1996/97 annual report. Except for a Cu value of 18 ppm for 25W on line 5, all other Cu analyses have given values less than 10 ppm, and typically around 5 ppm. When the area was held as a prospecting claim, Cu values of 41 ppm were obtained for two sites between locations 3 and 5 (figure 2). The results from a further examination of the area around the line 4 anomaly are shown in figures 3 to 5, and are given in appendix A. The presence of a meaningful Cu anomaly is confirmed, but the maximum value obtained in these later analyses was only 52 ppm instead of the original 121 ppm. A further high Cu value (37 ppm) was obtained about 100m to the NW (figure 3). A high Zn value also occurs in the area, 25m N of the Cu anomaly.

Using particle sizes up to 0.8 mm, and grinding them in a ring mill before analysis, gave generally lower analysis values, but the same distribution patterns as shown in figures 3 to 5 persisted.

The analysis results from line 6 are given in appendix B, and the results for the eastern section are illustrated in figures 6 to 8. The Cu values (with a maximum value of 40 ppm) show a definite NE-SW trend, but this trend is not obvious for the Pb and Zn values. PIXE/PIGME analysis of the quartz along line 6 (appendix C) did not show up any mineralisation in the quartz.

Water samples

Water samples were taken from most lagoons, creeks and water-filled sample holes on the lease, as indicated in figure 9. These were evaporated to 1/10th their volume, and analysed. The analysis results are given in appendix D. In most cases the water contained very little of interest, but two locations gave higher than usual values. The first of these was water collected from a small pit beside the lagoon shown at the top right in figure 2. This contained relatively high Pb and Ni, with Cu and Zn also being higher than average. The second location was on line 5, spanning 35W and 100W (location 14 on figure 2), where water was found in sample pits at both locations (but not elsewhere on line 5). The highest Cu value was obtained

from water in the main lagoon at top centre in figure 2, but this water contained no significant Pb, Ni or Zn.

The high Cu value for the main lagoon is interesting because this was the area where native metals (native brass) were first identified. The high Pb content in the small top right lagoon may be associated with the high Pb obtained near line 6 (see figure 7), because the western branch of the feeding creek originates near the E end of line 6.

The high Cu, Pb, Zn and Ni values from 100W on line 5 (location 14 on figure 2) are interesting because they coincide with a local change of granite type (see below).

Quartz veins

PIXE/PIGME analyses of the vein quartz from veins at locations 7 and 14 are given in appendix C. The analyses were carried out by Dr. Ang Pwa from the university of Tas. Most of the values are at or below the detection limit, and indicate a very barren quartz.

The quartz veins indicated crossing lines 1 and 2 (figure 2) have previously been reported with a strike of 340° (T) and a dip approximately vertical. The quartz vein crossing line 5 was initially assumed to have a similar strike, but a deeper (1.5m) excavation, exposing less disturbed ground, now indicates a strike of 315° (T), with a dip of approximately 45° to the SW. This line 5 "vein" actually consists of a number of parallel veins of variable thicknesses from less than 1 cm up to more than 5 cm.

The quartz vein crossing line 6 has a strike of approximately 358° (T) and a dip of approximately 80° to the east. This is a more substantial vein, with a thickness between 10 and 15 cm.

Granite variation and location

At 35W on line 5, excavation revealed a muscovite granite which had been heavily weathered but not greisenised. This appears to be a different granite to the adamellite found elsewhere (for example around the quartz vein on line 2).

Granite locations were sketched in figure 2 of the 1997/98 report, but have not been given in this report because in many locations (for example line 4 and the E end of line 6) the "exposed" granite turned out to be surface rocks and boulders embedded within the upper sections of clay layers. For both lines 4 and 6, no clear granite "textures" were visible in the clay, and the depth of the clay is unknown.

Native metals

Unfortunately electron microprobe analysis of native metal particles is no longer available, and identification of any native metals is now by visual microscope observation. Particles of Fe, Cu, Zn and brass are reasonably easy to recognise, but the presence of Ni or Cr in any iron, or

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the amount of Zn and Sn in a brass or bronze particle can not be determined. Particles of Sn or Pb were originally found only by accident because they could not be easily identified, and were therefore mounted for analysis. These particles tend to be small (mostly < 50µm) and tabular to flaky, with rounded edges. They have a dull grey surface. They are similar to many other particles which were not identified with any of the microprobe labels used for analysis.

Cu was identified at locations 17 (by Ralph Bottrill) and 18 (figure 2) on line 6, and Zn and brass were observed for location 18 (at six of the sample sites).

Chromites

As for the native metals, no further microprobe analyses are routinely available. Unless the chromite particles are octahedral, they are not easy to tell from many ilmenite particles. Placing the particles in a strong rotating magnetic field can remove most of the ilmenite by rolling it out of the sample, as was reported in previous annual reports, but the equipment previously used for this was destroyed by fire.

No chromites could be identified with any certainty in the new samples from line 4. All that can be said is that some of the particles did look suspiciously like chromites.

Two chromites were identified in the line 6 samples. One of these was found by Ralph Bottrill on a grain mount made up for microprobe analysis; the particle location was at 150W on line 6. Another was recognised from its octahedral shape, and came from 0W, 50S on line 6.

Mg-ilmenites

As for chromite, no further microprobe analyses are available on a routine basis, and no rotating field equipment now exists to assist with identification.

No further Mg-ilmenite (or picroilmenite) particles were recognised.

Cassiterite

In most cases cassiterite particles are easily identifiable under a microscope, although some previously analysed cassiterite particles have been black and similar in appearance and magnetism to some ilmenites or chromites, and some other analysed cassiterite particles have been almost colourless.

Figures 10 and 11 map the occurrence of cassiterite in the lines 4 and 6 samples. "Significant" cassiterite (figure 11) means that more than 20 grains were found in the panned concentrate

from a 2 kg clay sample. In both of figures 10 and 11 the cassiterite distribution pattern appears to be oriented between N-S and NE-SW.

Site 16 observations

This location is within Nolans's old tin workings, where the creek bed has been excavated to a depth of approximately 3m. A hand auger was used to penetrate a further 1.5m. At a depth of approximately 4m there is a coarse sand with orange clay. Above this there is approximately a 1m layer of fairly pure kaolinite clay, similar to that found further north at Corduroy Creek (where it is about the same thickness) and at the old South Mt. Cameron Mine. The kaolinite clay forms the bottom of Nolan's workings. Above this (exposed by Nolan's excavation) is a coarse sand and clay between large granite boulders. Both heavily weathered (right through) and un-weathered large boulders exist side-by-side. For the weathered boulders, it is obvious that the weathering took place at some other location, and that the boulders were not on the surface at the time. While the un-weathered boulders could easily have rolled down from the present hills either to the north or the east, the placement of the heavily weathered boulders is not so easily explained; they would probably have had to be exposed very quickly and transported down to their present positions almost immediately afterwards.

Discussion

A possible fault line

Figure 12 is a portion of a Landsat image (band 4) of the NE of Tasmania. The lease area is marked out approximately by the white rectangle. Lineations can be seen, particularly to the SE of the lease area, which have the same orientation as many of the observed quartz veins in the lease area (bearing approximately 340°). Other lineations, not so obvious, and with a bearing of approximately 40° , can be seen to the NE of the lease area. One of these, if projected to the SW, as shown by the diagonal white line, cuts across the lease area approximately through the two known copper anomalies. The projected lineation is also roughly parallel to the Ringarooma River to the west and, if projected further to the SW, encounters the Ringarooma River south of Pioneer. The location of this projected lineation across the lease area is shown in figure 13, where it passes between the two hills on the lease and is roughly parallel to one side of the large hill to the east.

Figure 13 also shows two locations where rounded quartz pebbles were found, at a depth of approximately 50 cm in both cases, in clay just above deeper clay with a granite texture. It is possible that these pebbles mark an old river bed. Any accompanying dolerite pebbles could have decomposed, as have most in the Tertiary sediments exposed in the lagoon at the top centre of the lease. However it does seem a little odd, if the pebbles do mark an old river bed, that more water-worn quartz pebbles have not been found.

The evidence could suggest that the projected lineation marked on figure 12 locates an ancient fracture line which was later faulted, with the eastern side moving upwards. The boulders at

location 16 would suggest that this faulting occurred after the formation of the kaolinite layer, which would place the faulting sometime after the late Tertiary, and associate it with the basalt intrusions further to the west.

Timing of the native metal occurrences

The native metals were initially found within the Tertiary gravels around the lagoon at top centre of figure 2, so the mechanism which led to their formation was active at least later than the Tertiary.

Conclusions

The origins of the chromites and Mg-ilmenites has not yet been solved. They could remain from an ancient river which flowed NW across the lease area, but I think that their distribution pattern, and their association with disturbed regions in the granite and with the quartz veins, still argues against this. In the light of the possible Tertiary faulting, they probably are associated with the Tertiary basalts, as suggested by Prof. Wys Yim (see 1997/98 report).

The 1997/98 report also suggested several (perhaps 3) episodes of geochemical activity. It now seems that one of these (involving Cu and perhaps Zn) may be associated with late Tertiary faulting.

Future Exploration

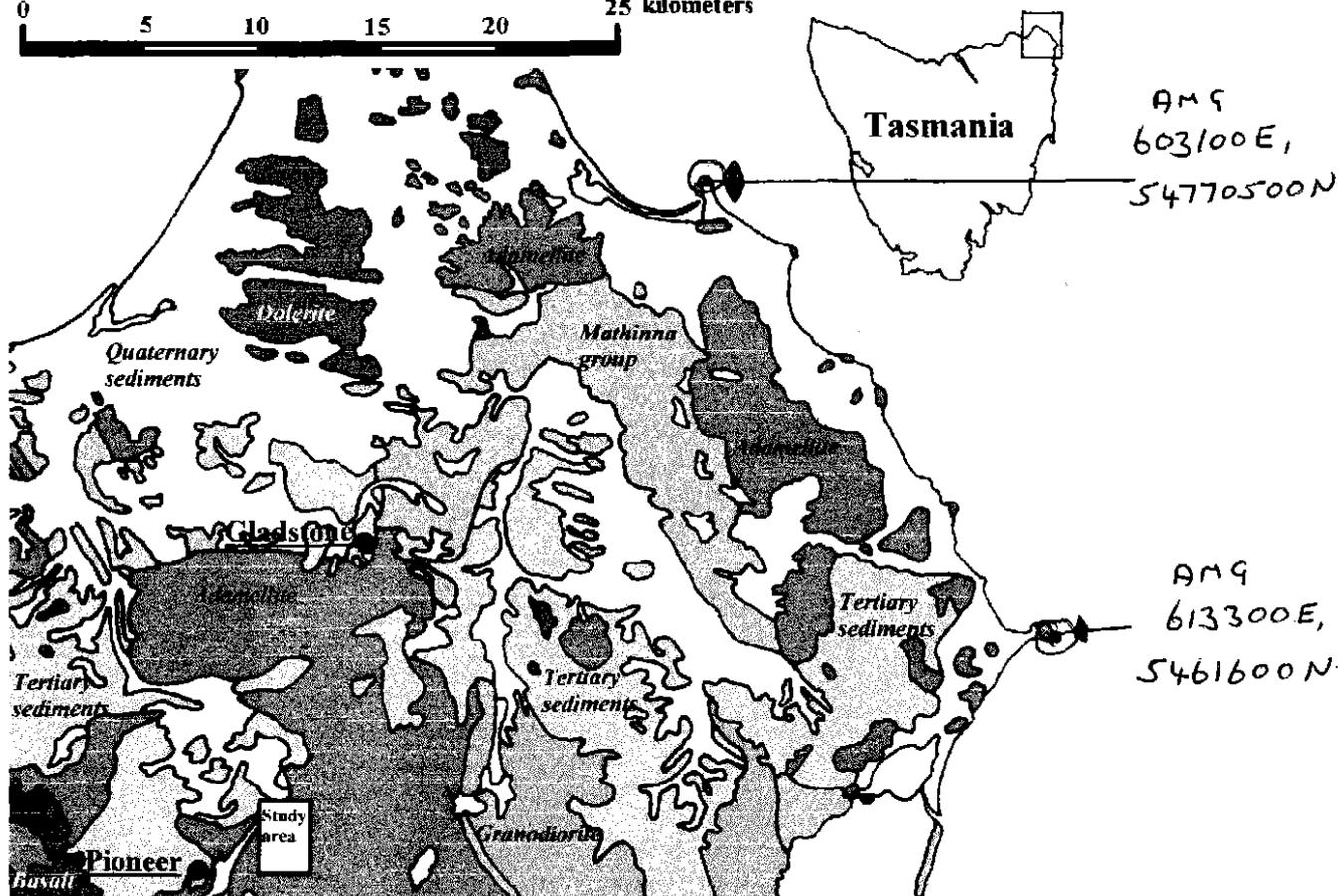
Exploration during the following year will concentrate on extending the geochemical sampling. In particular the eastern end of line 6 will be extended further east and north, and tied in with line 1. Line 1 will be re-sampled because the only previous analyses on this line were by PIXE/PIGME (without acid treatment of samples). The line 1 sampling will also be extended to the north of the line. Line 5 will be re-sampled, and the area around the eastern end of line 5 will be examined in more detail (on a 25m grid). The analysis of line 5 samples was not completed before the samples were destroyed. Sampling will now be done by hand auger rather than by hand-dug pits.

Figure 1

Location of EL 11/96

5 cm

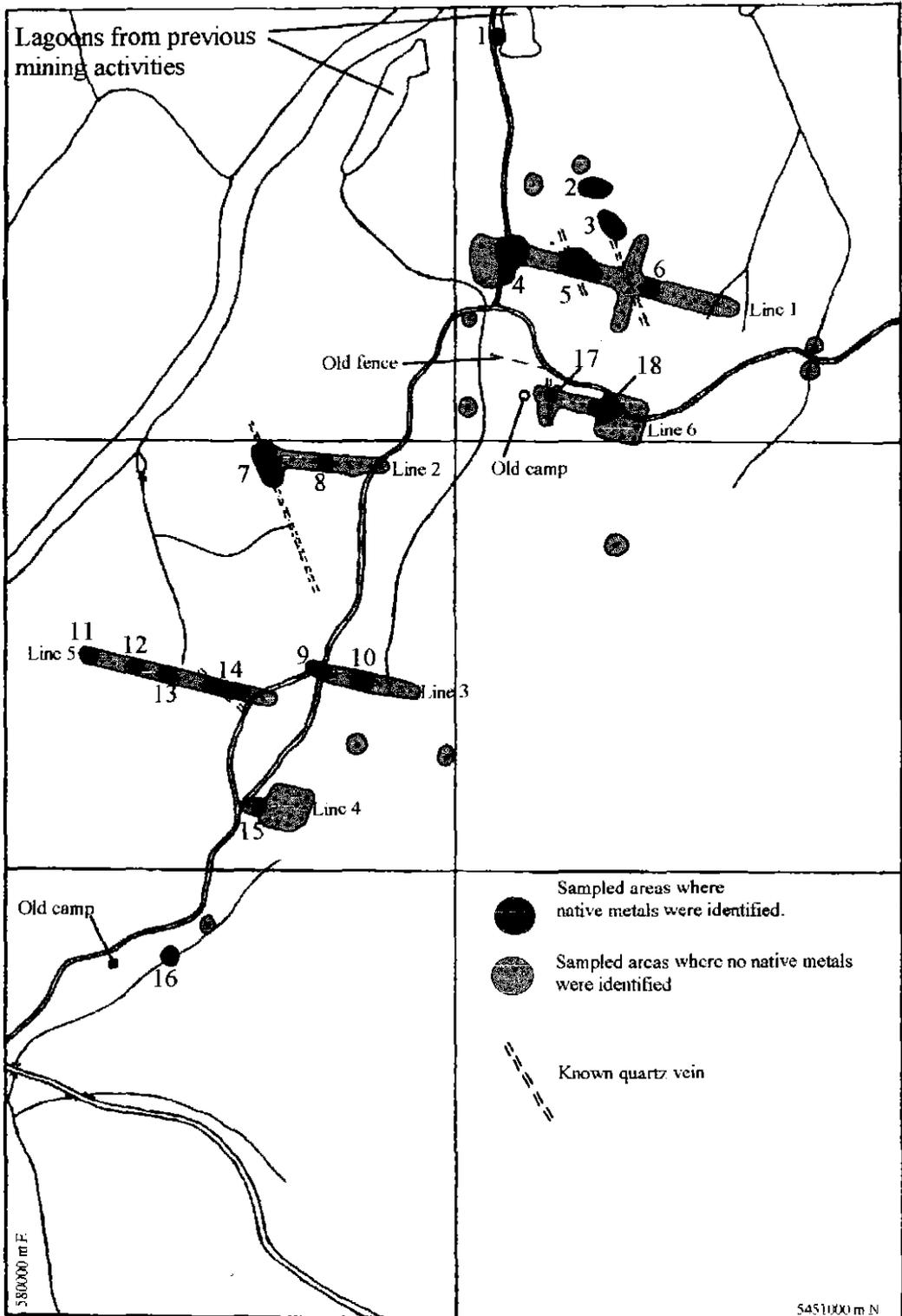
0 5 10 15 20 25 kilometers



AMG REFERENCE POINTS ADDED

Figure 2**The lease area, showing sample lines and native metal occurrences**

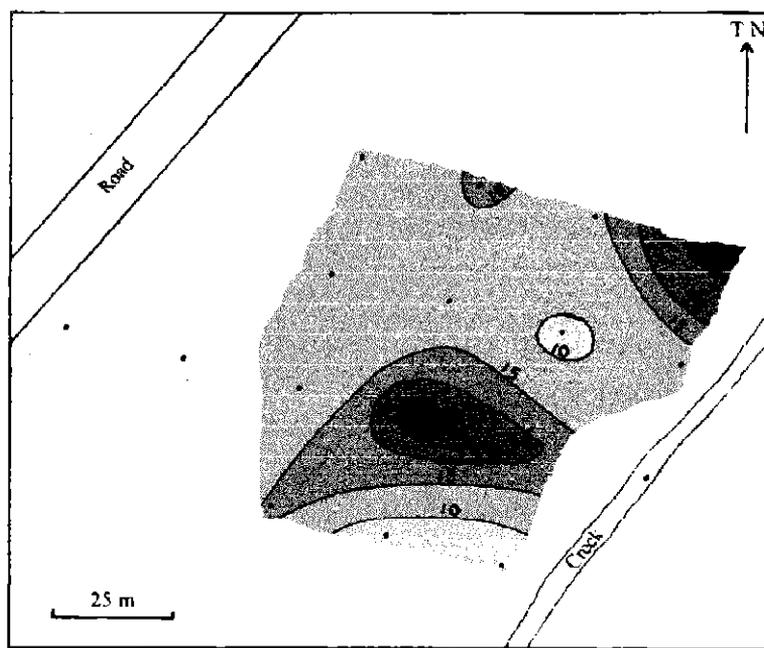
Note: grid spacing is 1 km.



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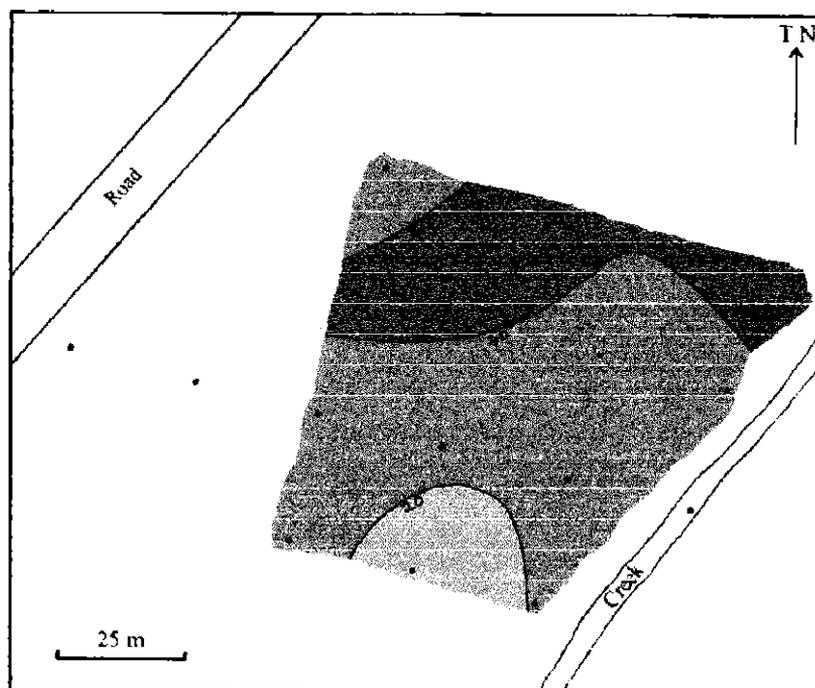
Figure 3

Line 4 Cu distribution

**Figure 4**

Line 4 Pb distribution

5 cm



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Figure 5
Line 4 Zn distribution

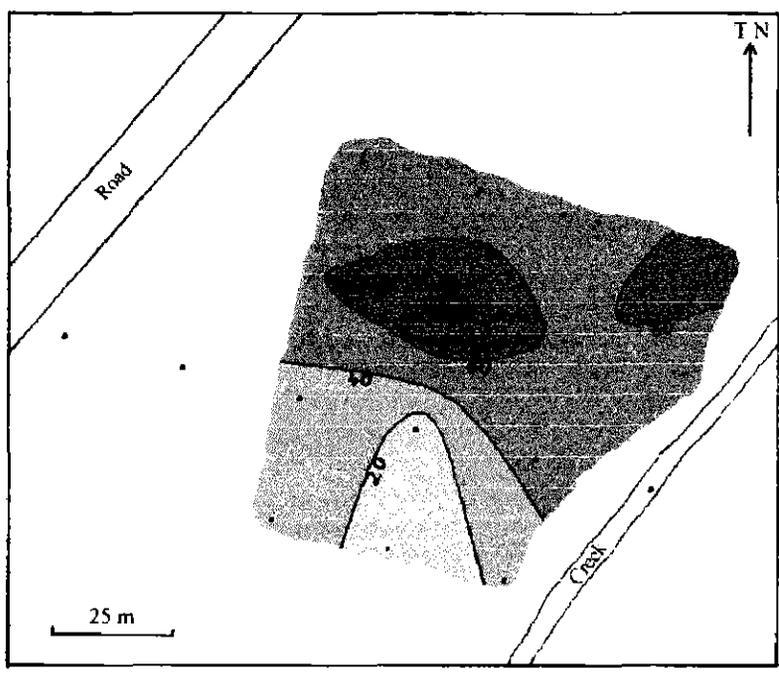
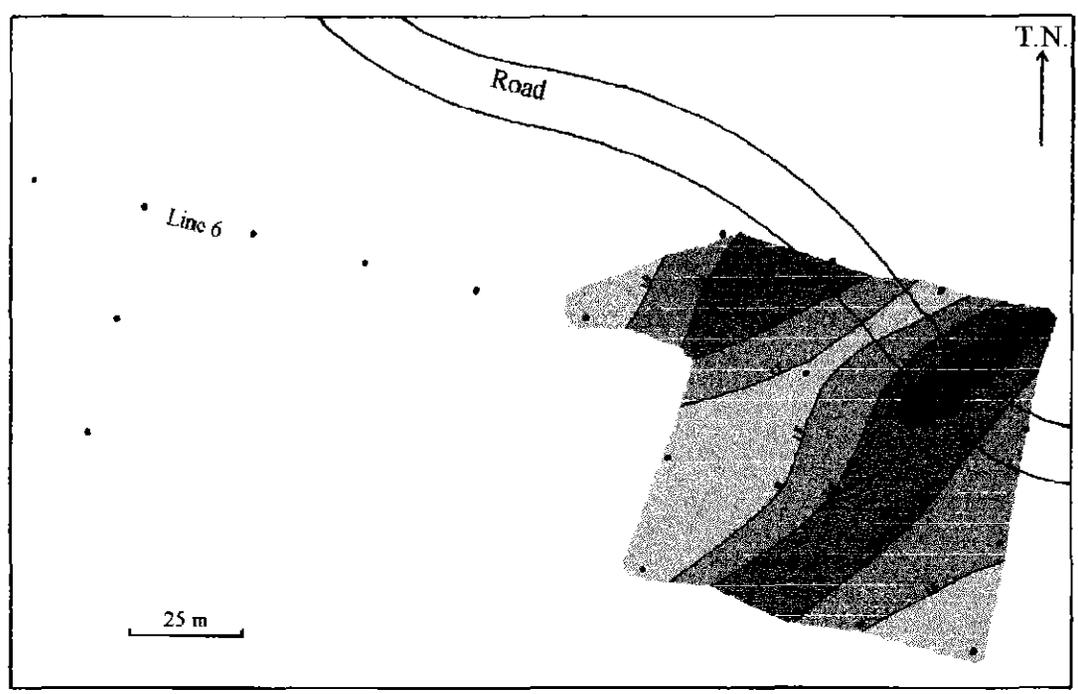


Figure 6
Line 6 Cu distribution

5 cm



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Figure 7
Line 6 Pb distribution

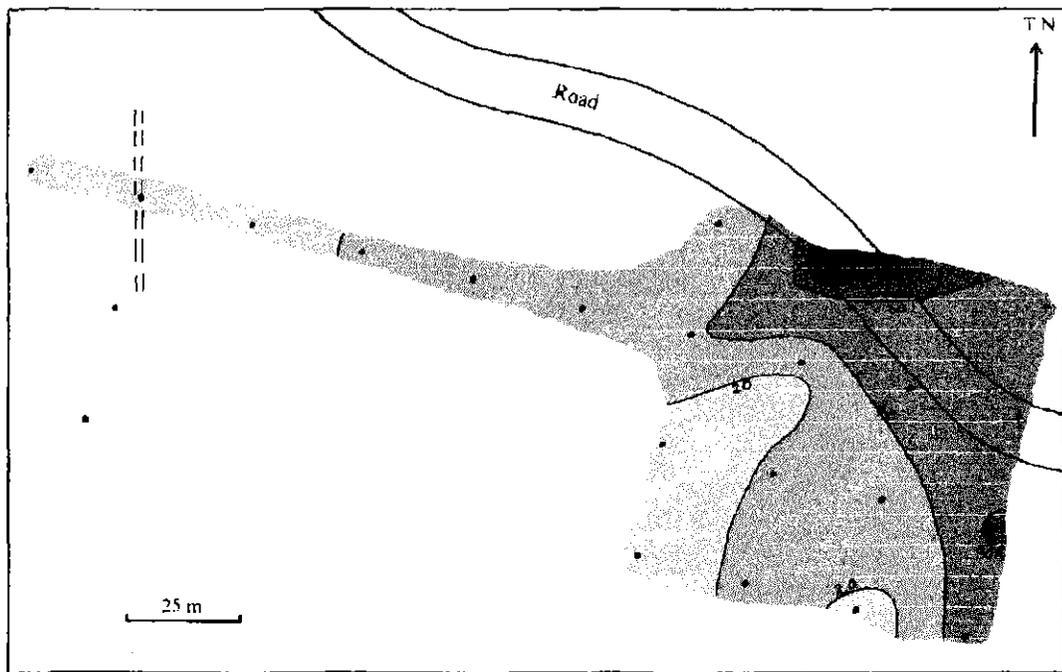


Figure 8
Line 6 Zn distribution

5 cm

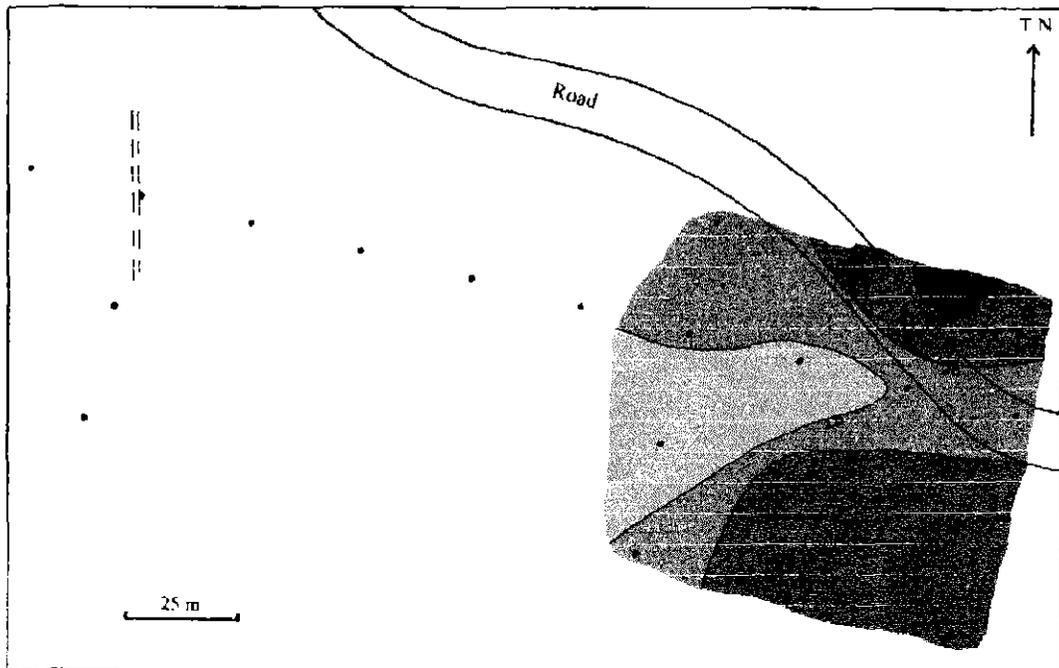
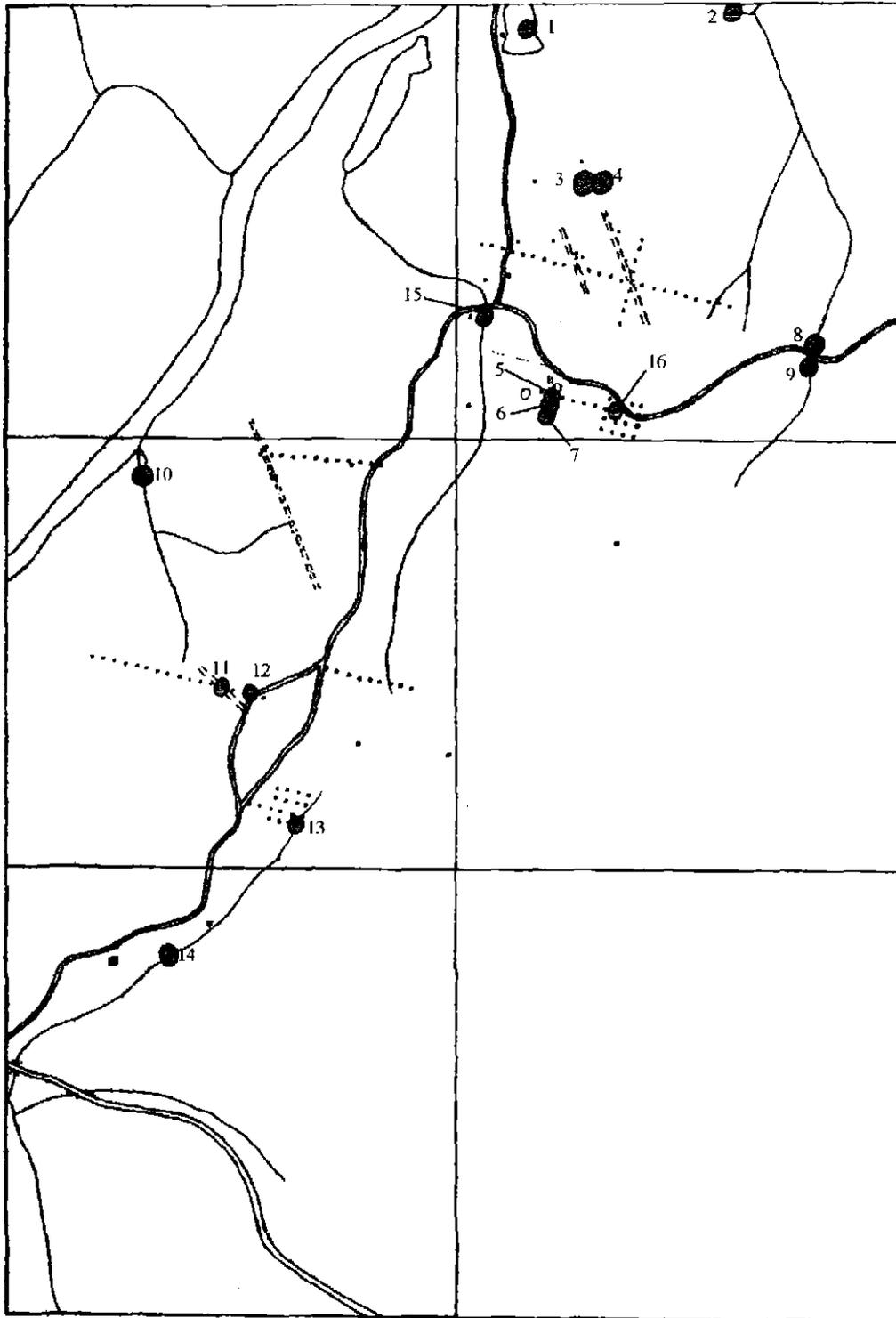


Figure 9
Water sample locations



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Figure 10

Cassiterite distribution at line 4

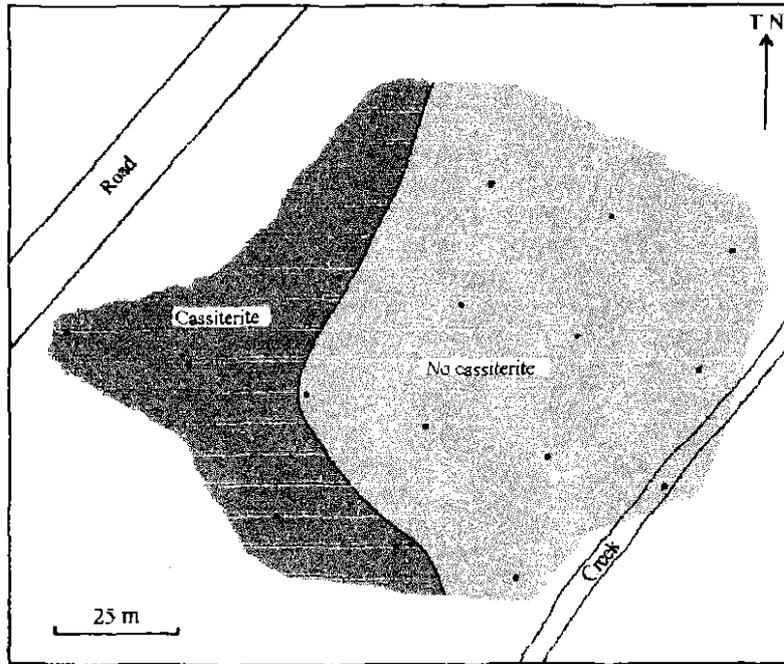
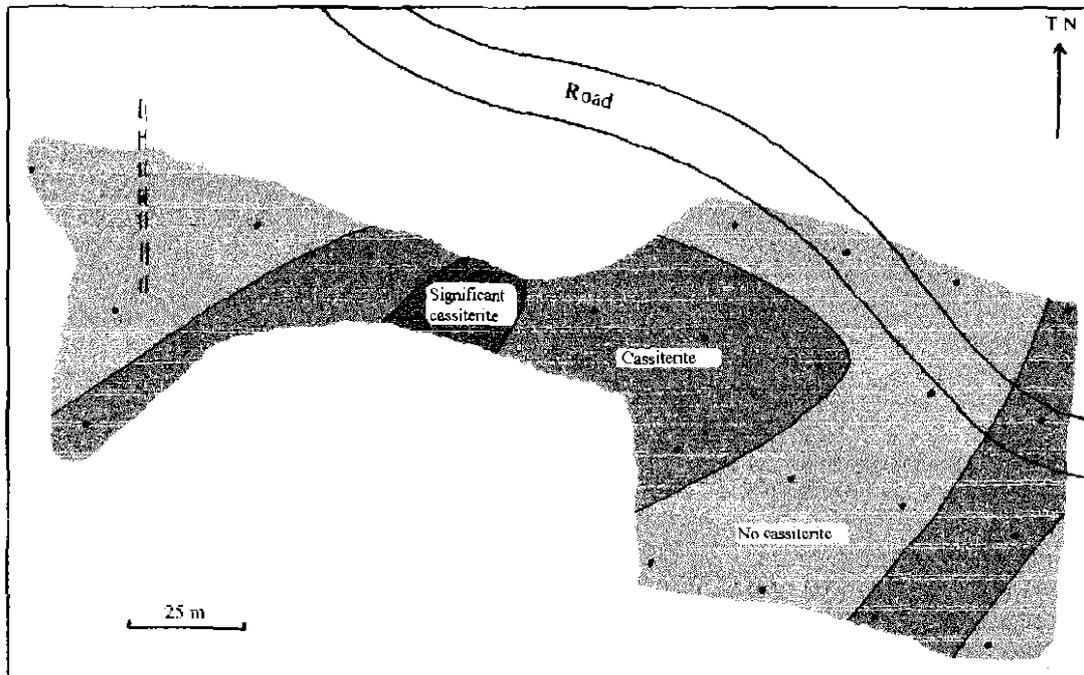


Figure 11

Cassiterite distribution at line 6

5 cm



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Figure 12

Landsat image of NE Tasmania showing
extension of a lineation across the lease

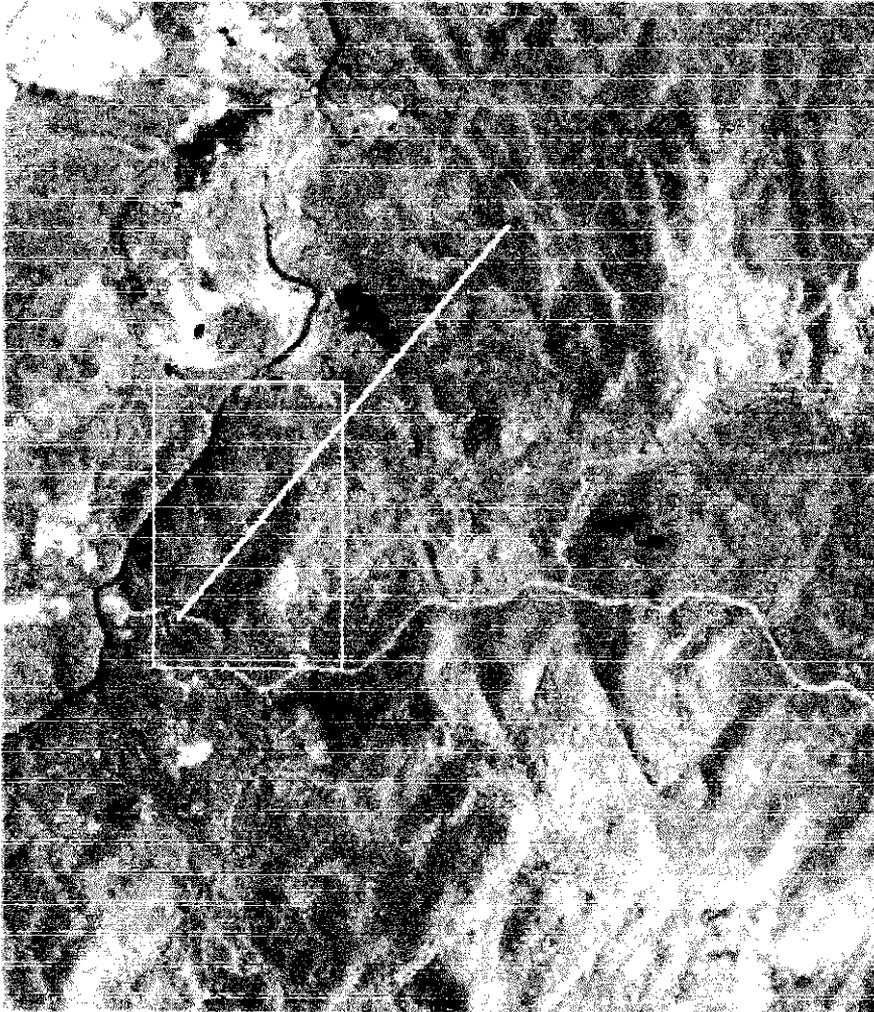
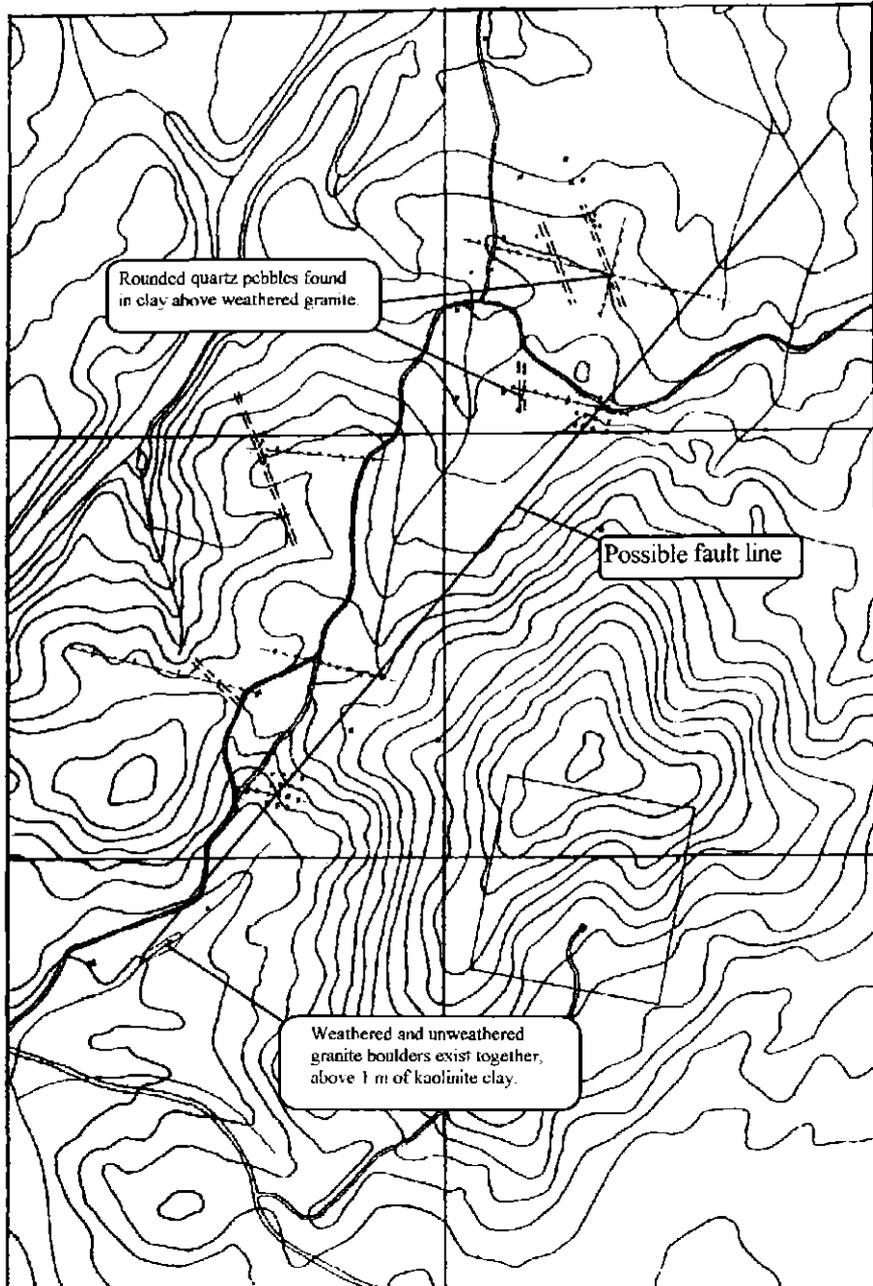


Figure 13

Possible fault line across the lease



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Appendix A
New analysis results for line 4

<u>Location</u>	<u>ppm</u>			
	<u>Cu</u>	<u>Zn</u>	<u>Ni</u>	<u>Pb</u>
4-50E-25S	15	40	5	35
4-50E-0S	10	30	3	23
4-50E-25N	10	63	6	43
4-50E-50N	10	48	5	35
4-75E-25S	7.5	13	1	8
4-75E-0S	53	18	3	23
4-75E-25N	10	83	8	40
4-75E-50N	15	50	8	45
4-100E-25S	7.5	25	8	20
4-100E-0S	23	45	8	33
4-100E-25N	8.7	53	6	35
4-100E-50N	13	45	5	40
4-125E-25N	10	43	6	33
4-125E-50N	38	78	9	48

Appendix B
Analysis results for line 6

<u>Location</u>	<u>ppm</u>			
	<u>Cu</u>	<u>Zn</u>	<u>Ni</u>	<u>Pb</u>
6-0W-25N	25	43	8	45
6-0W-0S	16	20	10	53
6-0W-25S	18	33	10	60
6-0W-50S	10	33	5	50
6-25W-25N	11	60	10	65
6-25W-0S	40	20	5	50
6-25W-25S	23	33	8	35
6-25W-50S	15	33	8	15
6-50W-25N	23	33	10	115
6-50W-0S	14	19	15	23
6-50W-25S	14	31	11	23
6-50W-50S	23	36	13	33
6-75W-25N	19	25	10	23
6-75W-0S	20	24	25	38
6-75W-25S	8	3	<2	5
6-75W-50S	13	21	9	28
6-100W-0S	10	20	15	28
6-125W-0S	5	13	5	25
6-150W-0S	5	18	3	25
6-175W-0S	10	58	3	5
6-200W-0S	<3	8	3	3
6-200W-25S	3	43	2	45
6-200W-50S	3	35	3	50
6-225W-0S	3	30	2	80

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Appendix C Quartz analysis results

<u>Location</u>	<u>ppm</u>				
	<u>Cu</u>	<u>Zn</u>	<u>Ni</u>	<u>Pb</u>	<u>As</u>
Vein-location 7	2	2	2	2	0
Vein-location 14	1	2	1	1	0
6-0W-0S	0.3	1.3	2	2	0.7
6-25W-0S	0.7	1.3	2.3	1.7	0.3
6-50W-0S	1.7	1.3	2.3	3	0.3
6-75W-0S	3	1.3	2.3	2.7	0.3
6-100W-0S	2	3	2	1	1
6-125W-0S	1.3	1.7	2.3	2.7	0.3
6-150W-0S	2	1.3	2.3	0.7	1.3
6-175W-0S	1.3	2	2	1.3	0
6-200W-0S	0.3	1.3	1.3	2	0.3

The values given for the line 6 samples are the averages of three quartz analyses. The mean detection limit varies for each sample and each element, but most of the above values are close to the limit or below it.

Appendix D Water sample analysis results Concentration in the original sample

<u>Location on</u> <u>Figure 9</u>	<u>Cu</u>	<u>Zn</u>	<u>Ni</u>	<u>Pb</u>
2	0.027	0.023	0.024	0.110
1	0.036	0.013	0.000	0.020
4	0.008	0.000	0.000	0.000
3	0.013	0.014	0.000	0.050
16	0.008	0.012	0.005	0.020
5	0.017	0.017	0.006	0.050
5	0.009	0.022	0.011	0.040
6	0.000	0.009	0.000	0.000
7	0.000	0.013	0.000	0.000
12	0.012	0.034	0.006	0.060
11	0.020	0.049	0.023	0.130
15	0.002	0.006	0.000	0.000
10	0.006	0.000	0.000	0.000
14	0.004	0.014	0.000	0.000
8	0.020	0.014	0.000	0.040
9	0.006	0.005	0.000	0.000
13	0.002	0.002	0.000	0.020

Measurements were made on samples which had been evaporated to 1/10th their original volume.

Figure 2**The lease area, showing sample lines and native metal occurrences**

Note: grid spacing is 1 km.

