Final Report of Exploration Activities May 1996 to May 2001

EL 11/96

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Abstract

Exploration activities have been confined mainly to small hand-dug sample pits to depths of approximately 1m and to soil auger sampling to depths of 12 m. Self-potential and radiation measurements were also made along the soil-sample lines. The hand-dug samples were taken along approximately E-W lines at 25 m intervals, and also on 25 m grids in some areas of interest. Auger sampling was carried out at 10 m intervals in an E-W direction across several identified or suspected quartz veins.

The exploration activities have identified the presence and mapped the occurrence of native metals and alloys of iron, lead, zinc, copper and tin. Chromium and nickel have also been found, but only in alloys. The native metals are associated with chrome spinels and with magnesium ilmenites, in the close vicinity of NNW-trending barren quartz veins within weathered granites. Where data is available from auger drilling through the weathered granites, the presence of a particular native metal coincides with locally higher geochemical values for that element. However, the origin of the native metals remains unexplained.

The chrome spinels are found at all depths through the weathered granite in the vicinity of the quartz veins, and have compositions consistent with at least two quite different sources. One source being mid ocean ridge peridotite and the other being suprasubduction zone peridotite. In one area of the lease these two spinel types are each restricted to separate and distinct locations, but at other places they occur together.

The NNE-trending quartz veins appear to define passages of significant underground water flow and coincide with higher radiation and positive SP values. In most cases the quartz veins have been extensively fractured by subsequent movement, and now exist as walls of randomly oriented quartz fragments with weathered granites to either side. The exception to this is the vein associated only with suprasubduction peridotite spinels, where the vein is fractured but the quartz fragments are still mostly in their original orientations. Although auger drilling brought up some vein quartz fragments, no basic or ultramafic rock fragments were found. In locations where the auger encountered vein quartz, the depth of the weathered rock was greater than 12m and the auger was unable to reach solid rock. Thus, decisive evidence for the source of the chrome spinel was not obtained.

Soil analysis was carried out initially by neutron activation on crushed whole sample, and later by AAS after aqua regia digestion of the minus 50 µm fraction. For one sample line, analysis was also done by PIXE/PIGME analysis of the acid-insoluble residue, revealing some differences between the spatial distribution of primary and secondary zinc and lead values.

Soil geochemistry revealed no economically interesting anomalies, but, especially from the auger drilling samples, did identify several anomalous regions of higher values for copper, lead, zinc and magnesium surrounding known or suspected quartz veins.

The exploration has not located evidence of any economic mineralisation near to the surface. However, the geochemical highs, the native metals and the presence of minerals such as chrome spinels in a granite area may indicate possible economic mineralisation at depth or at

some distance. The exploration has revealed some geochemical and geological puzzles, in the form of the native metals, the chrome spinels and the magnesium ilmenites, and further examination of these occurrences could provide useful data on the geology of NE Tasmania.

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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 340^0 (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 seven sample lines and other spot sample locations. The areas where native metals were found are marked, and are each assigned a number for reference.

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.

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

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 appear to be no written records of previous exploration in the area. Nevertheless there has been considerable past activity, and this is evidenced by surface clearings and test pits. Some of this activity is very old, but some appears to have been within the last 50 years. One area occurs just west of line 6 near where there is evidence of an old camp, several small rubbish dumps and an old fence, and another is the valley to the north of 0W on line 6. A number of test pits occur in an area about 100 m east of the end of line 1, close to the track. About 50 m to the S of the western end of 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.

Interest in the area commenced with the discovery of native metal particles in the ground immediately to the S of the lagoon within 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. Mcormack'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.

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, totaling 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 measurements were made on line 5, and electromagnetic measurements were made on line 4.

Native metal photographs and electron microprobe analyses have been provided on CD, with the photographs in .jpg format.

For line 1 the geochemistry revealed no significant anomalies, but Cr in particular tended to show higher values in the vicinity of the known quartz veins. Radiation measurements showed quite high values at either end of this line, but these did not appear to be associated with the known quartz veins.

For line 2 Cr was again higher in the vicinity of the known quartz vein at the W end of the line, but other elements showed nothing of significance. Radiation also increased towards the W end of the line.

For line 3 Cr was again high in the vicinity of surface quartz fragments, while other elements and radiation measurements showed nothing significant.

For line 4, where no quartz vein was evident, Cr remained at a very low level. However, radiation, magnetics and E/M dip measurements all showed similar patterns, increasing towards the W of the line, and high Cu values were also obtained at the W end of this line.

For line 5, higher Cu occurred at the E end of the line in the vicinity of the known quartz vein, but Cr showed higher values only near the centre of the line where no vein was obvious. Radiation and SP measurements gave similar patterns, with magnetics showing a significant and sudden increase to the W end of the line at the same point where the SP values show a significant negative.

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

Details of this work are given in the 1997/1998 report on exploration activities. A brief summary is given below.

Acid-insoluble residues from line 5 samples were analysed using the method developed by Dr. Jan van Moort. In this method most of the secondary mineralisation is removed, leaving only that mineralisation which occurred with the formation of the quartz. The aim of this analysis was to look for evidence of any mineralisation associated with the emplacement of the quartz veins themselves. There appear to be three distinct element patterns:

1. Cu, Mn, Zn and Ba (secondary?) with peak values at only 25W.
   Rb, Na and K (primary?) with peak values at only 25W.
2. As, Cr and Fe (secondary?) with peak values at 150W and 275W.
3. Pb, Ce, Sm and La (secondary?) with peak values at 100W, 200W and 275W.

Summary of Exploration Work Carried Out from May 1998 to May 1999

Details of this work are given in the 1998/1999 report on exploration activities. A brief summary is given below.

The quartz veins indicated on lines 2 and 5 were examined in more detail. Quartz from these veins was re-analysed by PIXE/PIGME at Lucas Heights in Sydney for Cu, Zn, Ni, Pb and As. All values were close to the detection limit or below it. 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. The samples were re-analysed by AAS, using only the –53μm fraction, and confirmed the "anomalous" copper value, but now gave the value as 53 ppm, raising the possibility that the higher previous value had been due to a particle of native copper.

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 analysed by PIXE/PIGME at Lucas Heights. A high copper value (40 ppm) 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.

Water samples were taken from most stream and water-filled test holes on the lease and evaporated to one tenth volume. These samples were analysed by AA for Cu, Pb, Zn and Pb. Cu was highest in the two lagoons on J. McCormack's mining lease. Zn, Pb and Ni were highest in rain water collected in a test pit at 50W on line 5. Ni and Pb were also high in the western lagoon on J. McCormack's lease.

Exploration Work Carried Out from May 1999 to May 2000

Work during 1999-2000 is detailed in the 1999/2000 annual report, and concentrated on the NE portion of the lease, with some theoretical re-examination of spinel (chromite) compositions and their significance in the light of a paper by Kamenetsky et al (1999).

When the analysed chromite compositions are plotted by TiO_2 and Al_2O_3 content, as suggested by Kamenetsky et al (1999), the results indicate that the EL 11/96 chromites come from two different sources; SSZ (supra subduction zone) and MORB (mid ocean ridge) peridotites. This is further emphasised by the fact that there is a distinct compositional difference for line 2 between chromites from the eastern end (MORB peridotite) and the western end (SSZ peridotite).

Area 6 was extended 150 metres further to the east and 125 metres to the north, and a further 18 samples taken on a 25 metre grid by hand auger from within the clay horizon. This revealed no significantly high values.

A motorised soil auger drill capable of drilling to depths of 12 metres with a 65mm diameter auger was obtained. A series of four initial holes was drilled along line 6 as a learning exercise, commencing at 40W and stepping west at 10m intervals. The first of these holes did pick up the W edge of the Cu high revealed by shallow sampling, and appears to have shown the W edge of a Zn high at 6m depth.

A further series of ten auger holes were drilled along a new line 7 where the highest values for zinc and lead were obtained in previous sampling. Samples from these holes were analysed by AA for Cu, Pb, Ni, Zn, Mg, and Ca. This series of holes allowed a geochemical section to be constructed for line 7, revealing significant patterns of the highest values yet obtained for Zn and Pb at depths closer to the solid granite basement, but nothing of significance for Cu or Ni.

Of particular interest was the fact that the high Zn values on line 7 coincide with the location where native zinc was first found. Galena was also found in panned samples from the high Pb area. No direct evidence of a quartz vein was found, but projections from a vein further to the south indicate that it should pass through line 7 somewhere in the vicinity of the high Zn and

Pb values. Although cassiterite is only found near the surface in most places, at one place on line 7, where considerable pyrite also occurs, it is found at all depths down to the granite basement.

Exploration Work Carried Out from May 2000 to May 2001

Work during 2000/2001 has again concentrated on the NE section of the lease, and has aimed at the determination of the line 7 anomaly trends.

A series of eleven holes (line 8) was drilled by motorised soil auger at approximately 10 m spacing along an E-W line approximately 130 m south of line 7. A further line of 5 holes (line 9) was drilled in an E-W direction a further 40 m to the south of line 8. A north-south line of four holes was drilled from line 8 40W towards the south. The locations of these auger holes are shown on figure 3.

Radiation measurements and SP measurements were made along lines 7 and 8, and SP measurements were also made along the old line 1.

Discussion of results

Auger drilling and geochemistry

Early shallow sampling, at depths of around 1 m, over chosen areas on the lease (lines 1 to 6 in figure 2) did reveal some geochemical patterns associated with the observed or inferred quartz veins, but in general the analysis values were not far above background level and the patterns were not well defined.

Motorised soil auger drilling down to the unweathered granite basement was considerably more revealing (lines 7 to 10 on figure 3). Of particular interest was the revelation that the top metre of the soil profile was relatively geochemically barren, and the previous near-surface sampling was unlikely to show up any real anomalies.

The geochemical sections or profiles derived from the auger drilling programme are shown in figures 4 to 8. The sections from nickel analyses are not shown here. Pollution from some stainless steel welding on the auger bit made these values unreliable.

For line 7 the water table was almost at ground level, but for lines 8 to 10 the water table varied between 3m and 4m. Higher copper values tended to occur at or above the water table, high lead values tended to span the water table, but high zinc and magnesium values always occurred below the water table. Thus higher copper values are not significant in the line 7 section where the water table is high, while high zinc values do not occur for lines 8 and 10 where the water table is low compared to the depth to basement. Note that the auger did not reach basement for most of line 9.

No surface quartz was visible along lines 7 and 10. No coherent quartz vein was found under either set of surface quartz fragments shown as surface "veins" on lines 8 and 9. These "veins" appear to exist now as 50 to 80 cm wide "walls" of scattered and randomly-oriented quartz fragments within the weathered granite. The veins just above basement were identified from fragments of vein quartz brought up by the auger.

The quartz vein detected by the central auger hole on line 9 has an interesting relationship to geochemical values. Higher in the profile the zinc, magnesium and lead tend to form lobes to either side of the vein, while near the basement the zinc and magnesium values tend towards the vein location. This pattern is not so clear for the vein just above basement on line 8. The line 9 vein may form a high underground water flow channel because only 100 m to the north along the expected vein trend, water flows quite freely from the ground after rain and flows down across line 7 about 15 m east of the indicated "location 1".

Basement of the weathered granite

The auger drilling reveals a weathered granite basement with considerable relief compared to the present surface. Approximate contours of the basement are shown in figure 3. It is emphasised that this basement is not an old surface that has subsequently been covered over by sediments. The granite has weathered in situ. For example, the south-western quartz vein in figure 3 exists as a wall of fractured quartz vein within a weathered (kaolinised) granite. The surface quartz veins across the eastern end of line 8 and the western end of line 9 are different. Here the fragments of vein quartz appear to be randomly distributed within a NNW trend between 50 cm and 80 cm wide, within the weathered granite. This is interpreted to indicate considerable disturbance of the original vein by faulting.

The indicated basement trends are between 335^0 and 340^0, which is roughly the same as that for the quartz veins.

Entirely hidden under the surface contours appears to be a weathering trend of between 60^0 and 70^0, so that line 8 is placed along a ridge, with a basement valley to the south. This appears to be a similar situation to that existing under the lagoon on Mr. M^cCormack's mining lease further to the north, and revealed by percussion drilling in 1974. It is suspected that a further example of this trend may be located just to the south of line 6.

SP and radiation measurements

Radiation and SP measurements for lines 1, 6, 7 and 8 are shown in figures 9 and 10 (no measurements have yet been made for lines 9 and 10). Both radiation and SP measurements give similar patterns, - where radiation is higher, the SP is more positive. A similar relationship between radiation and SP is also shown for line 5 (1996/1997 report) in the SW quarter of the lease.

In figure 11 the radiation highs for each of the above lines are marked in green, and appear to define trends of approximately 335^0. This trend is approximately the same as previously identified for the quartz veins in the area, and also matches with the contour trends in the weathered granite basement shown in figure 3. The eastern trend of radiation highs roughly coincides with several quartz veins, a line of high underground water flow and native metal occurrences, but no quartz veins or high water flows are observed along the other two trend lines and native metals do not always occur. The northern part of the central trend is near a granite exposure, but this is not the case elsewhere. No radiation highs are associated with the two western veins shown in figure 3.

Where geochemical profiles are available (lines 6, 7, 8 and 9), the radiation trends coincide roughly with high values for Pb, Zn, Cu and Mg.

Oxidised and reduced zoning in the weathered granite profiles.

The weathered granite profiles for lines 7 to 10 are shown in figure 12. There appears to be only a very vague relationship between colour and geochemistry, with the geochemical highs, particularly for lines 7 and 8, being loosely associated with the brown oxidised regions.

Native metals and sulphides

Native metal and sulphide occurrences have not yet been completed for lines 9 and 10, but are given for lines 7 and 8 in figure 13. Microprobe analyses for these particles are not available, so all native metals and sulphides have been grouped together in figure 13. The auger holes have been numbered from east to west. There appears to be a tendency for the native metals and sulphides to avoid the brown oxidised regions shown in figure 12, and therefore to be found more around the perimeter of the geochemical high areas.

During initial sampling on the lease, native zinc was first identified between holes 5 and 6 on line 7, and native copper was found in three sample pits between holes 2 and 3 on line 8. It is interesting that the native metal in each case is closely associated with a geochemical high for that element. No native copper was originally found at the line 7 location (but a copper-zinc alloy was found), and no native zinc was originally found at the line 8 sample sites.

So far, native copper has also been observed from the first two holes on line 9. For hole 1, at 1 m depth, and for hole 2 at 8 m and 12 m depths.

No other original native metal locations have yet been examined by auger holes.

Chrome spinels, magnesium ilmenites and pyrope garnets

Without electron microprobe facilities, the identification of these particles is very uncertain, and was not routinely been carried out for the auger samples. However, some octahedral, probably chrome spinel (weakly to very weakly magnetic), particles were observed for line 8; at 6 m depth in hole 1, 7 m depth in hole 9, and 8 m depth in hole 11. It is noteworthy, in the light of past experience, that hole 1 is close to surface vein quartz, and hole 11 intercepted vein quartz at 12 m. No evidence of a quartz vein has been found near line 9, but geochemistry hints at something in this area.

A particle that appears to be a purple (G10?) pyrope garnet was found at 1 m depth for hole 1 of line 9. Three G10 pyrope garnets were found in 1996 at the western end of line 2. In that case they were found by an accurate ellutriator-type specific gravity separation of a sample taken at about 80 cm depth. They were analysed by electron microprobe, but were dismissed as probable pollution. The separation equipment had some time previously been used to recover G10 pyropes from a "seeded" test sample provided by CRA Exploration, but had been cleaned thoroughly afterwards. The CRA separation recovered all the pyropes that CRA "seeded" into the sample, and CRA vehemently denied that their sample could have contained any other pyropes. The possible line 9 pyrope indicates that the dismissal of the line 2 pyropes may have been a little hasty. Normally any pyrope garnets would be lost during sample panning, and no attempt has been made to systematically search for them over the past 5 years. Incremental specific gravity separations were not used on subsequent samples (too complex and slow).

Vein and fault trends on the lease

Where quartz vein trends can be determined, most trend NNW (around 335^0). One vein (W end of line 5) trends at almost 360^0, while another (E end of line 5) has a trend about 310^0. Native metal occurrences and radiation and SP anomalies in the north of the lease follow the 335^0 trend.

An apparent fault line (see 1999/2000 report) has a NE trend (40^0), and has left-handedly displaced the above quartz vein trend by about 50 m.

There may also be a further trend, shown in the solid rock basement contours to the south of line 8, of between 60^0 and 70^0. A similar trend is also shown in the granite basement under the lagoon in the north of the lease.

Summary and Conclusions

No evidence for economic mineralisation has been found during the time of the exploration lease, but the evidence does indicate mineralisation, probably sub-economic, below the shallow depths examined in the exploration programme. The programme has examined only the weathered granite profile above the solid granite. This weathered profile contains intact quartz veins, indicating that it has weathered in situ.

The exploration programme was commenced because of the discovery of native metals. The native metals included copper, zinc, lead, tin, iron and alloys of these metals. It also included iron/chromium/nickel alloys. Chrome spinel and magnesium ilmenites were later found. The significance of these finds was not established by the exploration programme, and they remain as questions to be answered. The main achievement of the exploration programme has been to show that these particles are not pollution or surface remnants. Rather, together with geochemical anomalies and structural features, they are pointing to as yet undefined geological events and possible hydrothermal activity.

Dr. van Moort (University of Tas., pers. com) considers that the native metals were formed at depth, and their decomposition near the surface has led to the geochemical high values. This fits with most of the evidence, but not with the initial detection of native brasses in the quaternary "tin wash" sediments on Mr. McCormack's mineral lease. That was the unexpected discovery that began the whole investigation and led to the exploration lease. Native metals, other than gold, silver and copper, have been reported from other area in Tasmania (e.g. Lisle, near Scottsdale), and it may be that their occurrence is more common-place than thought. Few people seem to have actually sought them, and their presence would normally be put down to pollution from excavating or processing machinery.

The chrome spinel, in an exclusively granite, area was initially suggested to be remnants of old river deposits or from whatever rocks once lay above the granite, but this can not be the case. The chrome spinel (also the magnesium ilmenites) appears to be spatially associated with the quartz vein system, and consequently also with the native metal locations and geochemical highs. In addition, chrome spinel is found close to quartz veins at all depths, not only near the surface. The spinel probably indicates the existence of thin dykes formed along zones of weakness in the granites defined by the quartz veins. Weathering is deepest in the vicinity of the quartz veins, and it is assumed that the possible dykes would be more deeply weathered than the granites to either side. So far no direct evidence, in the form of rock particles, has been obtained for such dykes. Chrome spinel compositions suggest at least two episodes of intrusion.

Although the exploration programme has now ceased, and the existence of an economic mineral deposit is unlikely, it is considered that an expanded soil auger drilling programme could be at least academically rewarding. If this could be supplemented by several shallow diamond drill holes, the question of the chrome spinel origins may be answered. The discovery of native metals in unweathered rock would also settle some questions about the native metal origins.

Environmental Disturbance

Previous activities

There is quite widespread evidence of past exploration of the area, much of which has been mentioned above. Past activities have varied from small 30 cm square test holes, to shallow excavations up to 5 m or more in diameter, and to larger mounds of excavated earth and rock. Much of this work could have been associated with past tin mining exploration, as it occurs in valleys leading to old tin mines either in the north or south of the lease. An old water race that once carried water to the old tin mining areas on Mr. McCormack's mineral lease, follows the contours up the western side of the lease and terminates on the hill just to the south of the lagoon, about 25 to 30 m above the lagoon.

The area is used for cattle grazing, and has been popular for wood-gathering. Unfortunately the re-opening and improvement of pre-existing tracks through the area, necessary for equipment access to Mr. McCormack's mineral lease, also made the area more popular with wood-gatherers.

Although no burning has taken place in the past seven years, much of the area had been burnt in the early 1990's, and burning has apparently taken place quite frequently in the past. A burn had been planned by Forestry for 1999, but was not carried out.

The current exploration programme

The exploration programme has not required the construction of any roads or tracks. Existing tracks were used when available and when suitable for two-wheel-drive vehicles, but most access to the sampled areas on lines 1 to 6 was on foot.

The bush in the area is open. Thus sample lines could be pegged out with only a little cutting of low scrub to enable sighting. Due to subsequent vegetation growth, most of the sample lines and locations are now quite difficult to find without some accurate navigation. Line markers have been removed.

The first three years of the programme involved the gathering of information about native metals, and for this it was critical to control sources of sample pollution. Sampling holes for lines 1 to 6 were dug always (and only) by the same pre-cleaned shovel and crow-bar, both of which had been analysed. The sample hole depths were between 60 cm and 1 m, with surface dimensions about 30 cm by 60 cm. Many of these holes later collapsed, and others have now been filled in.

A back-hoe was used to examine several quartz veins more comprehensively, particularly on lines 5 and 6, and just to the north of line 1. The latter has been filled, and the others will be filled before the lease expires.

The motorised soil auger consisted of a trailer-mounted auger, towed by a tractor. No clearing of drill-pads was required, with the holes easily being sited to avoid significant vegetation. All the drill holes have been plugged.

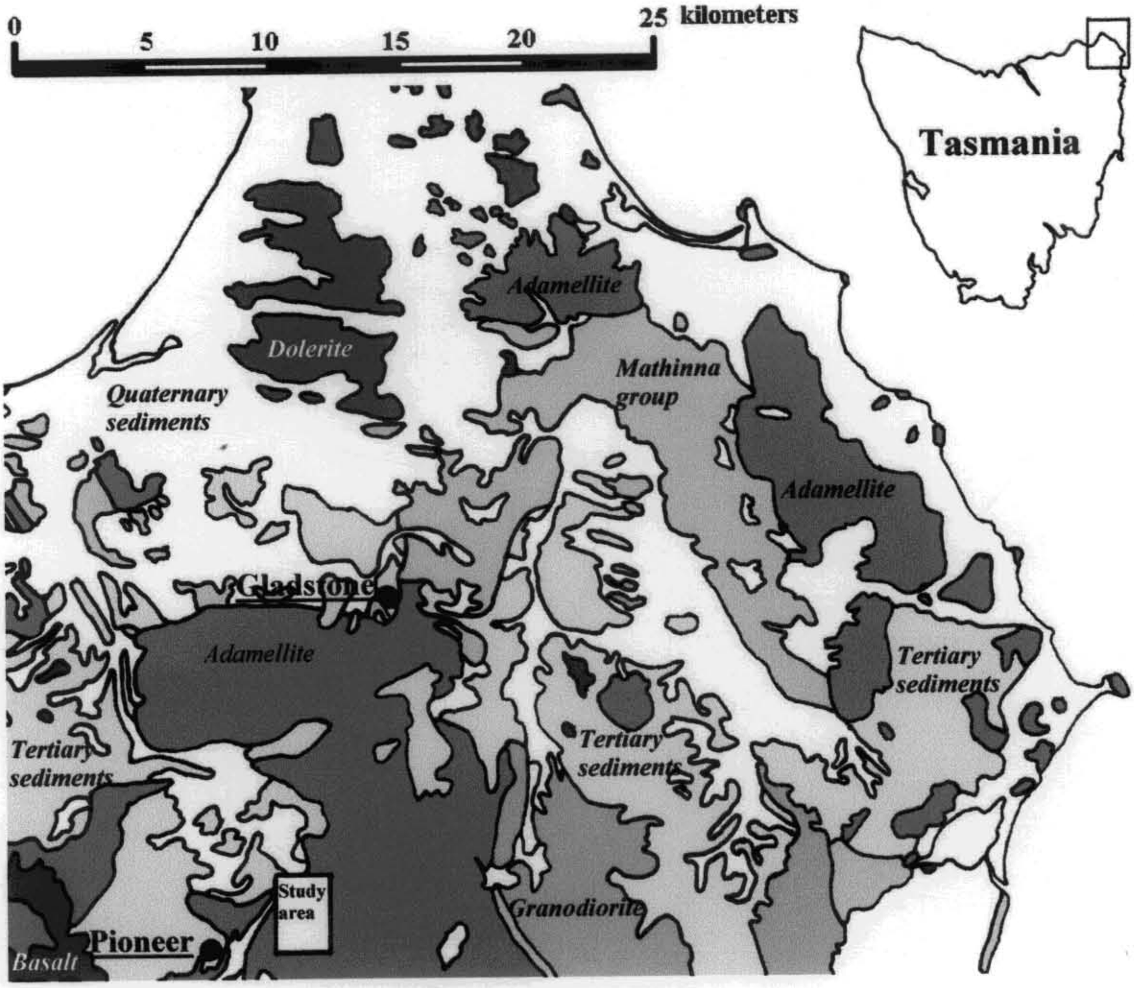
Expenditure

1996/1997	$13 640.00
1997/1998	$5 750.00
1998/1999	$10 630.00
1999/2000	$14 700.00
2000/30th March 2001	$18 050.00
30th March 2001/30th April 2001	$3 770.00
Total expenditure to 30th April 2001	$66 540.00

Keywords

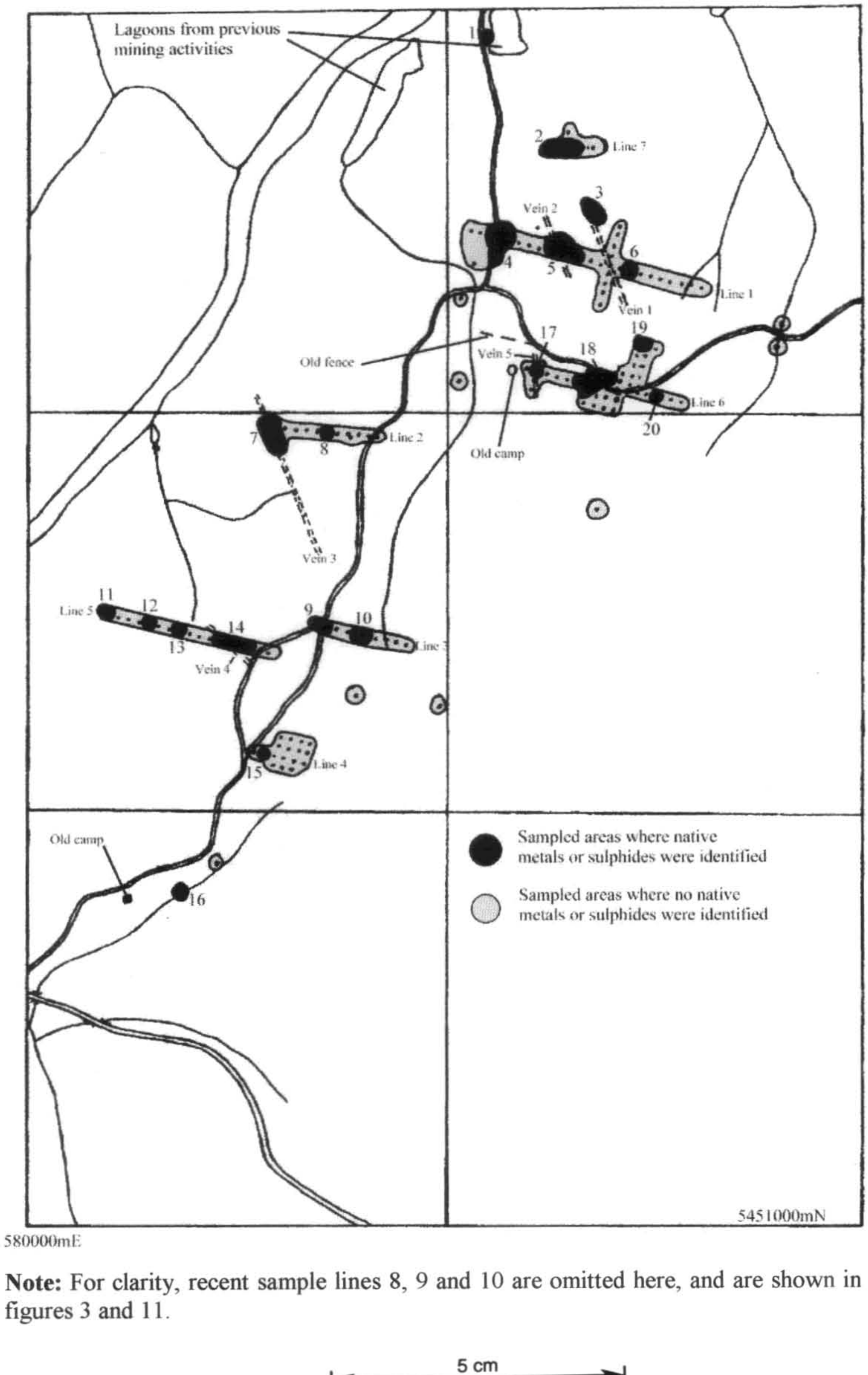
EL11/96, native metals, chrome spinel, magnesian ilmenites.

Figure 1
Location of EL 11/96 in NE Tasmania



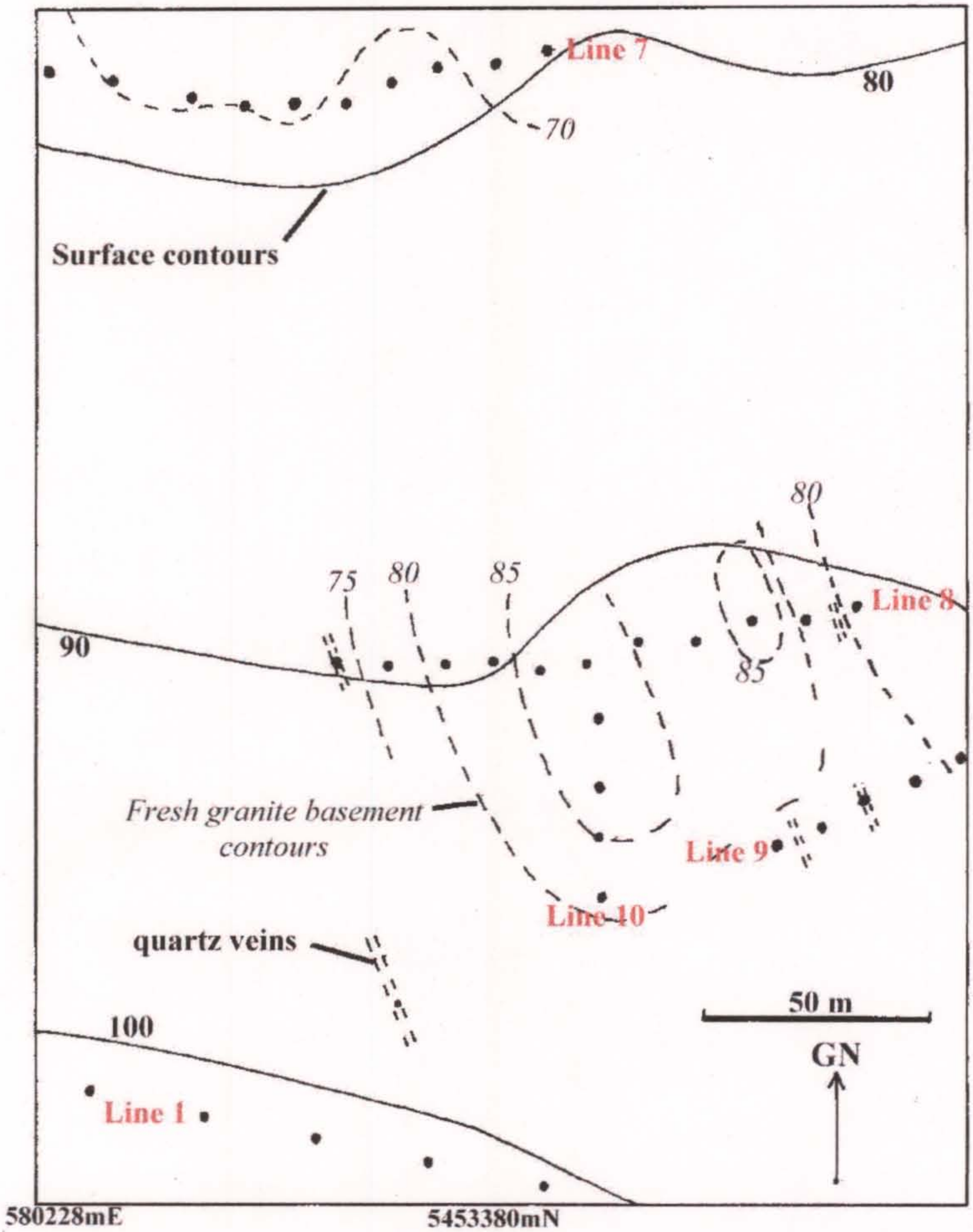
5 cm

Figure 2
Location of sample lines on the lease



Note: For clarity, recent sample lines 8, 9 and 10 are omitted here, and are shown in figures 3 and 11.

Figure 3
Auger hole locations and weathered granite basement contours



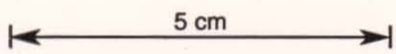
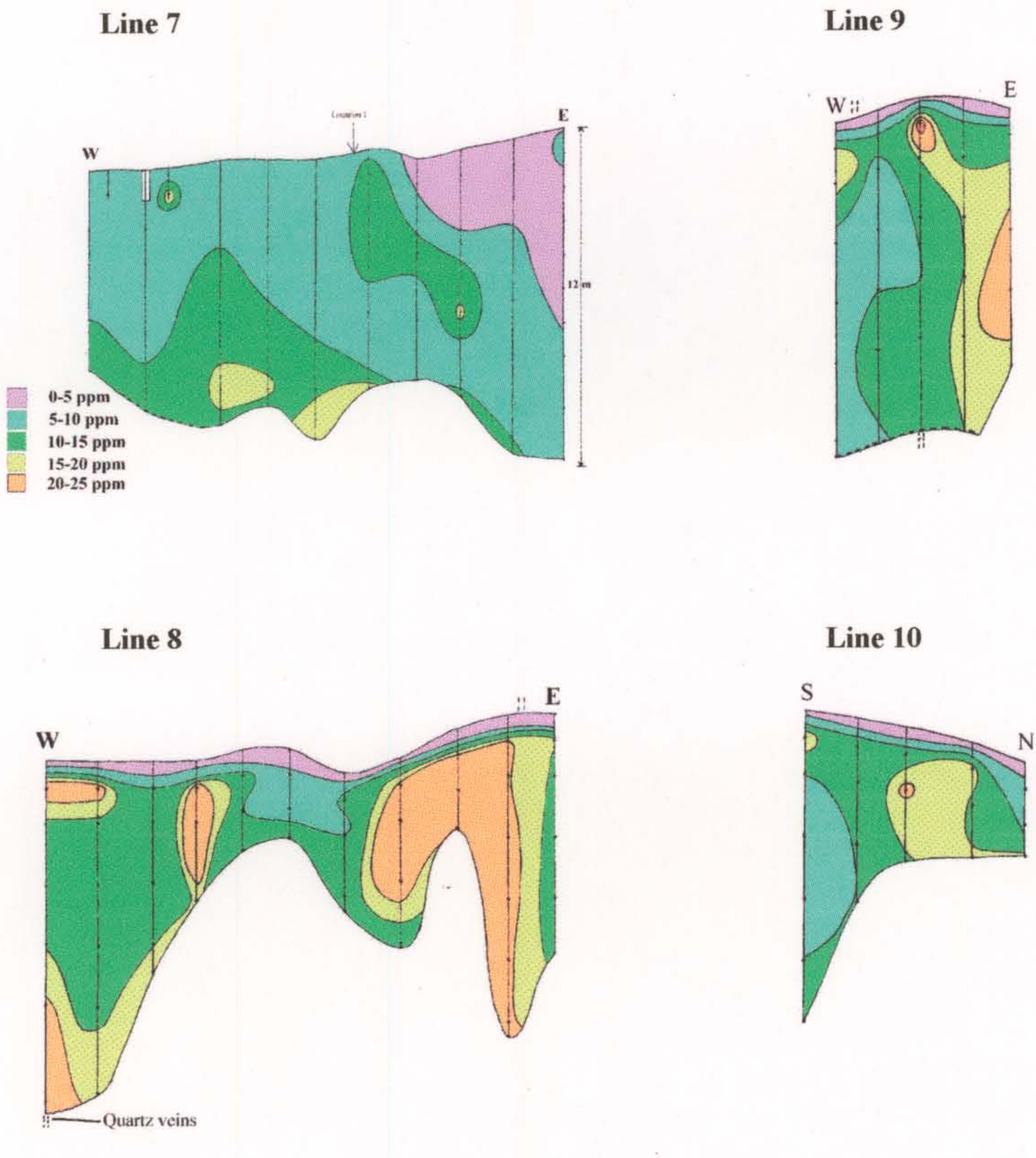


Figure 4
Lines 7 to 10 Copper values



Refer to figure 3 for hole locations.

Figure 5
Lines 7 to 10 Zinc values

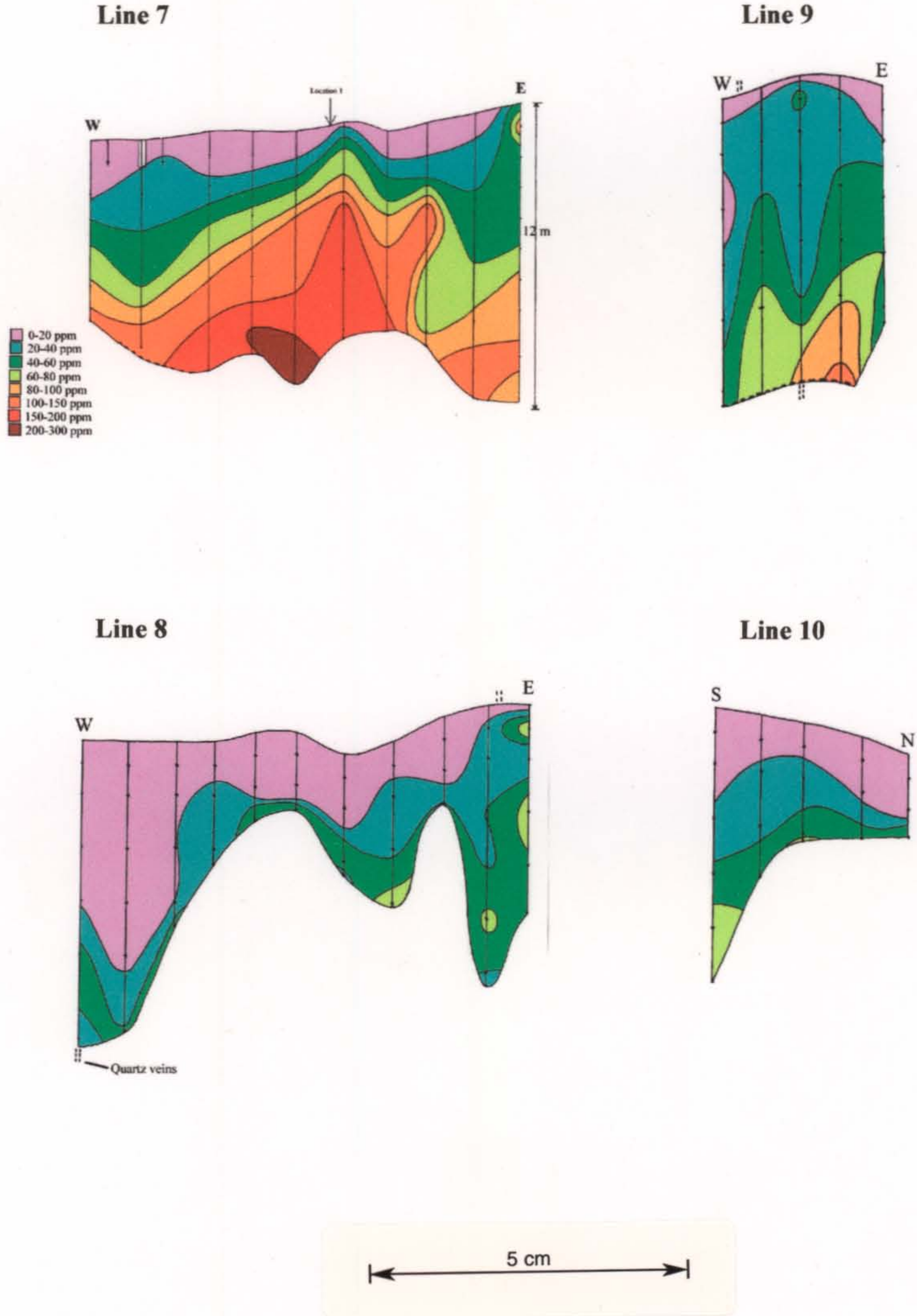


Figure 6
Lines 7 to 10 Lead values

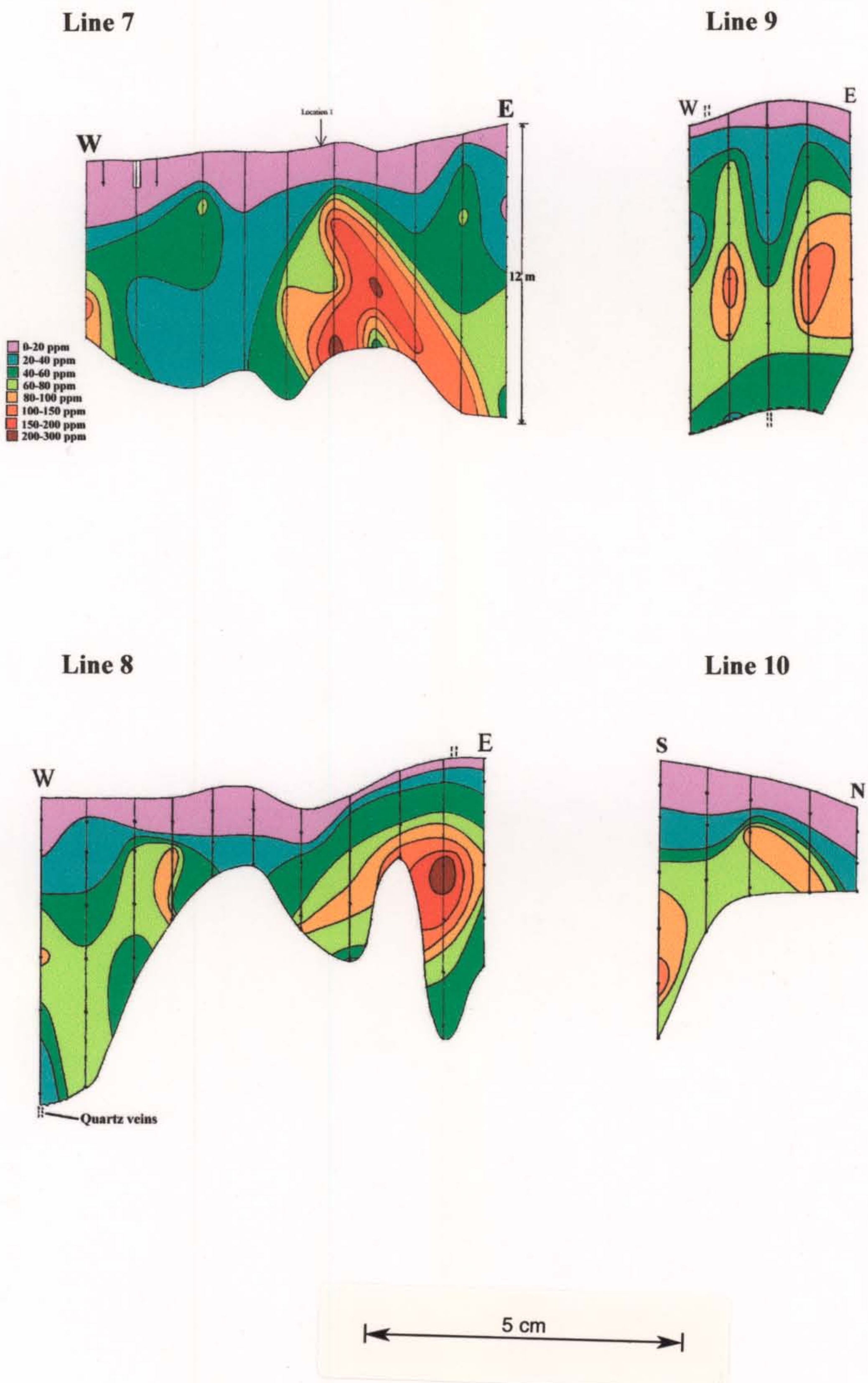
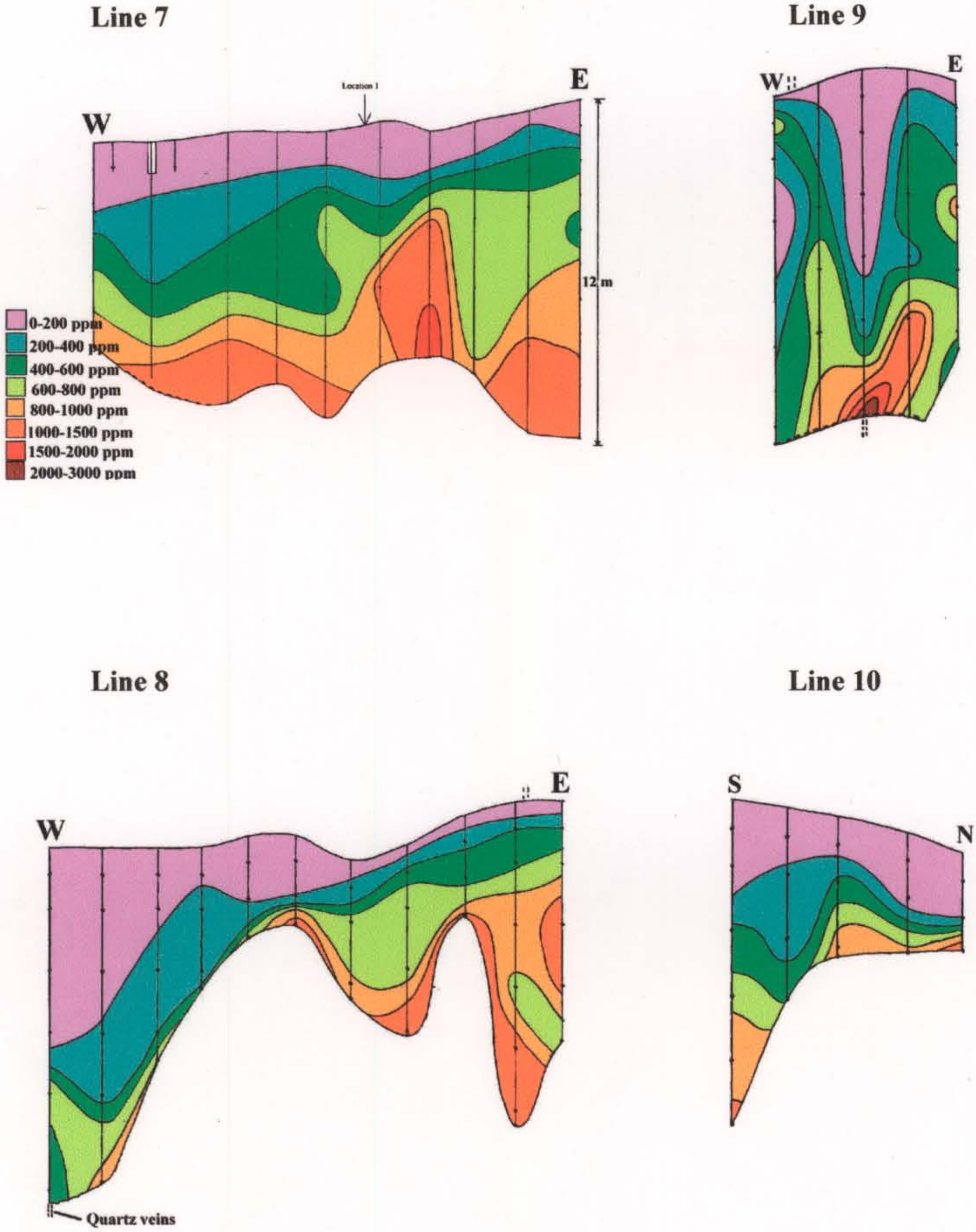


Figure 7
Lines 7 to 10 Magnesium values



See figure 3 for hole locations.

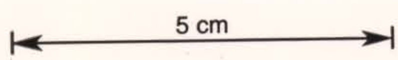
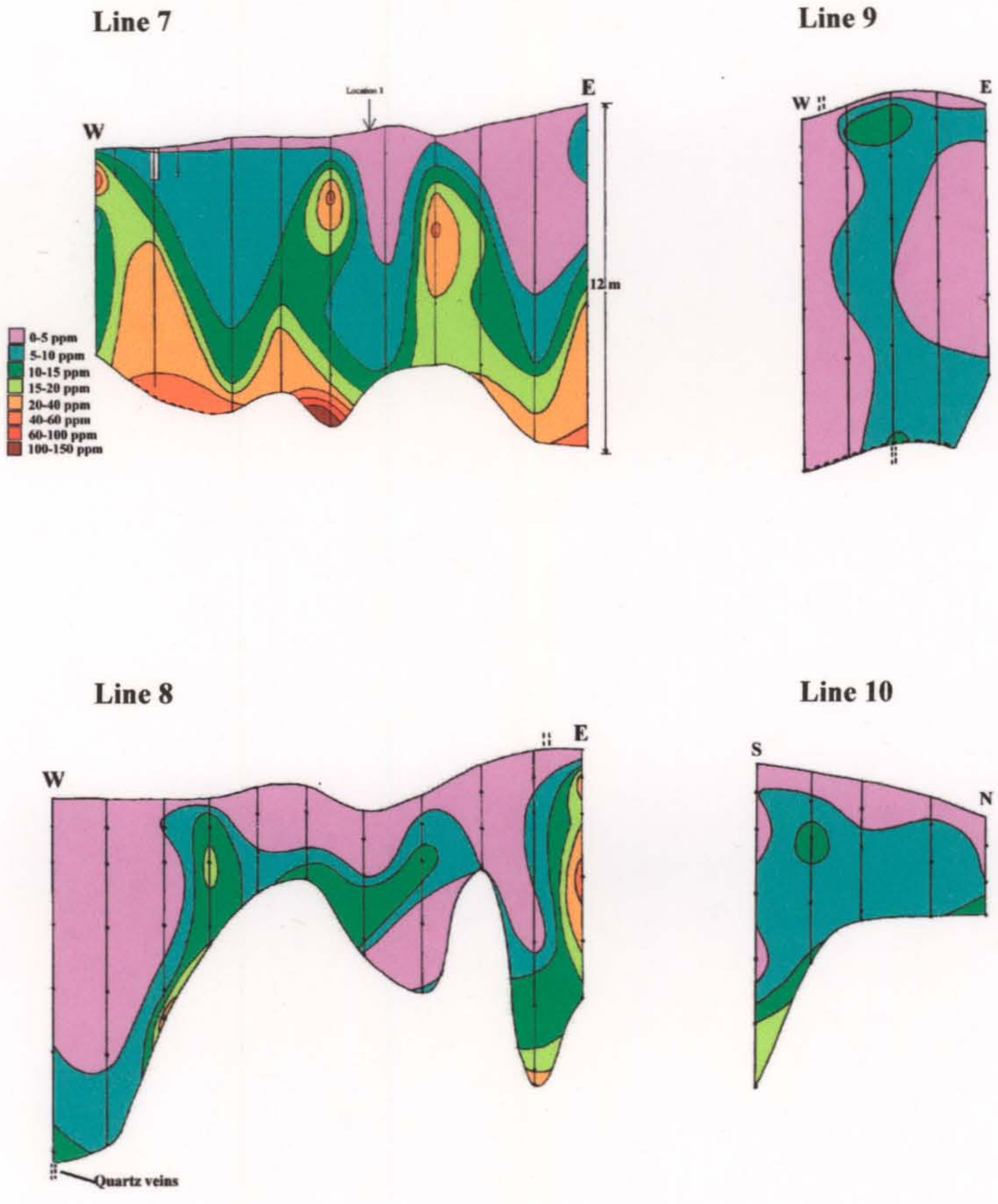


Figure 8
Lines 7 to 10 Calcium values



See figure 3 for hole locations.

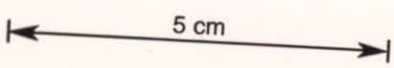
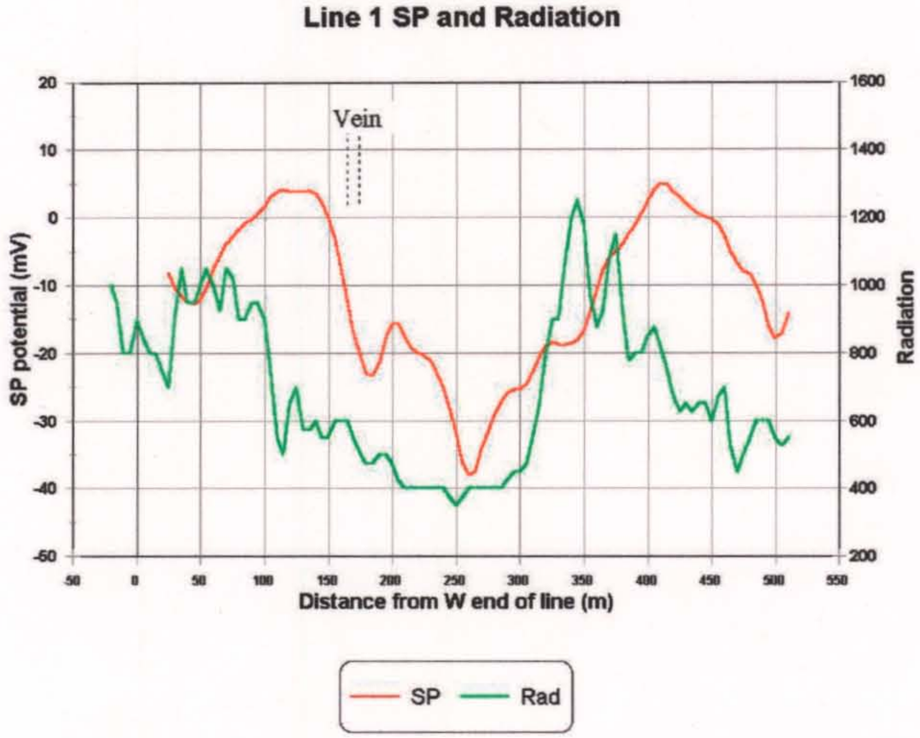
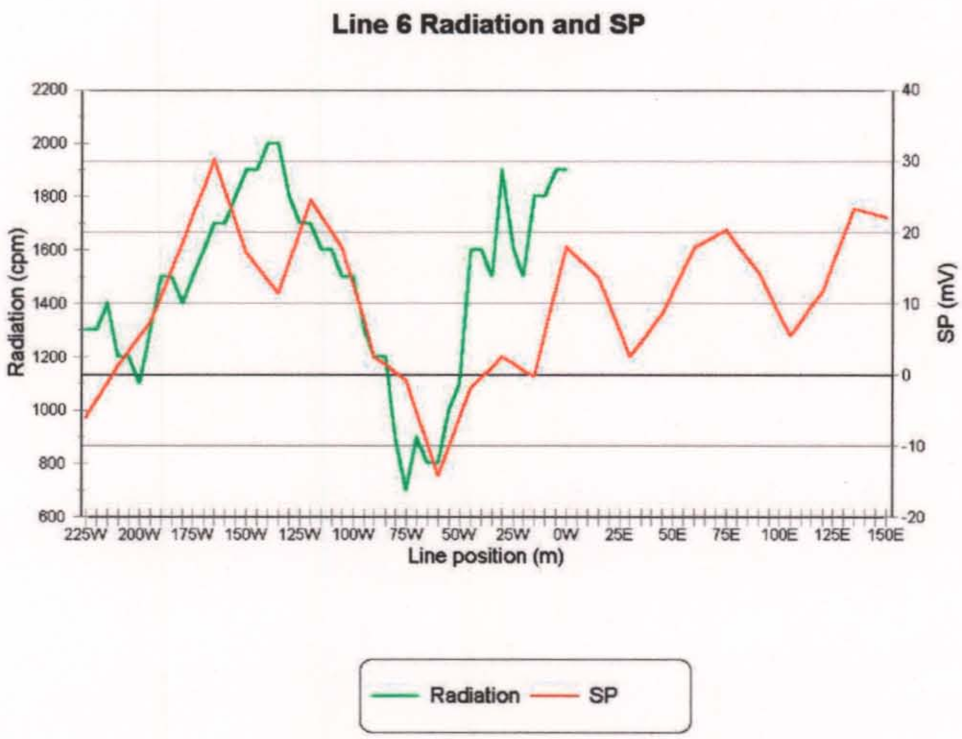


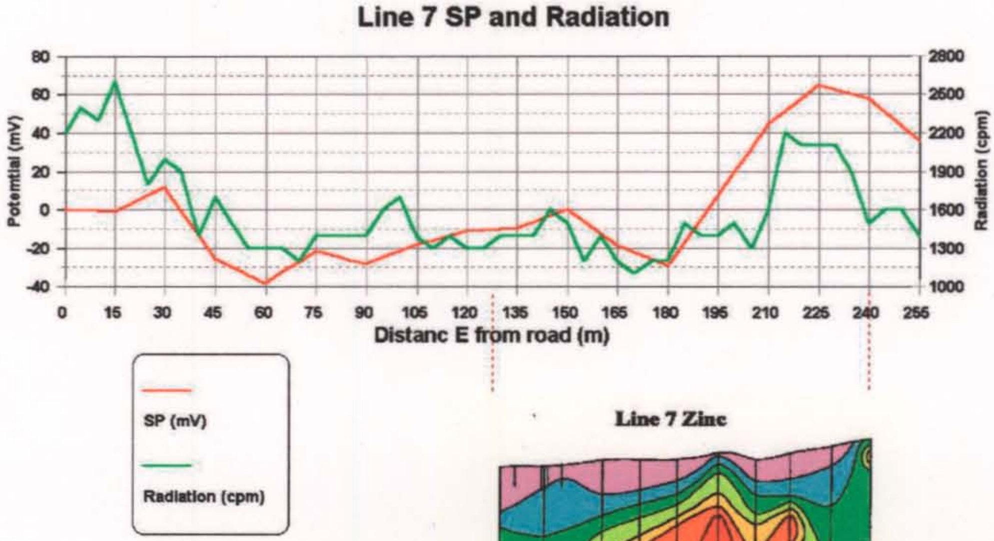
Figure 9
Lines 1 and 6 SP and Radiation

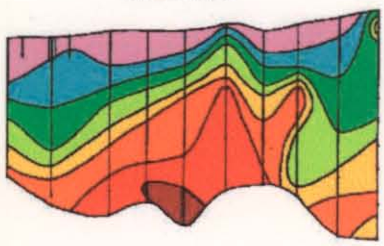


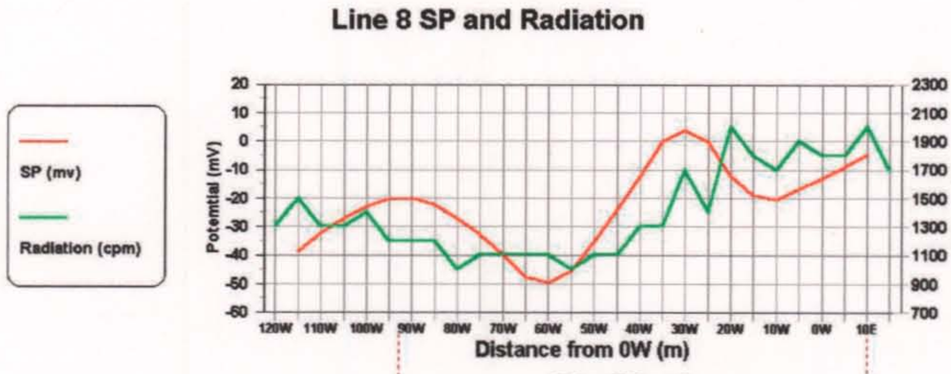


5 cm

Figure 10
Lines 7 and 8 SP and Radiation







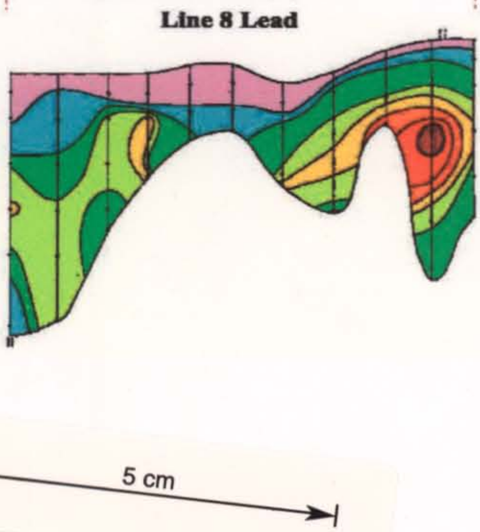
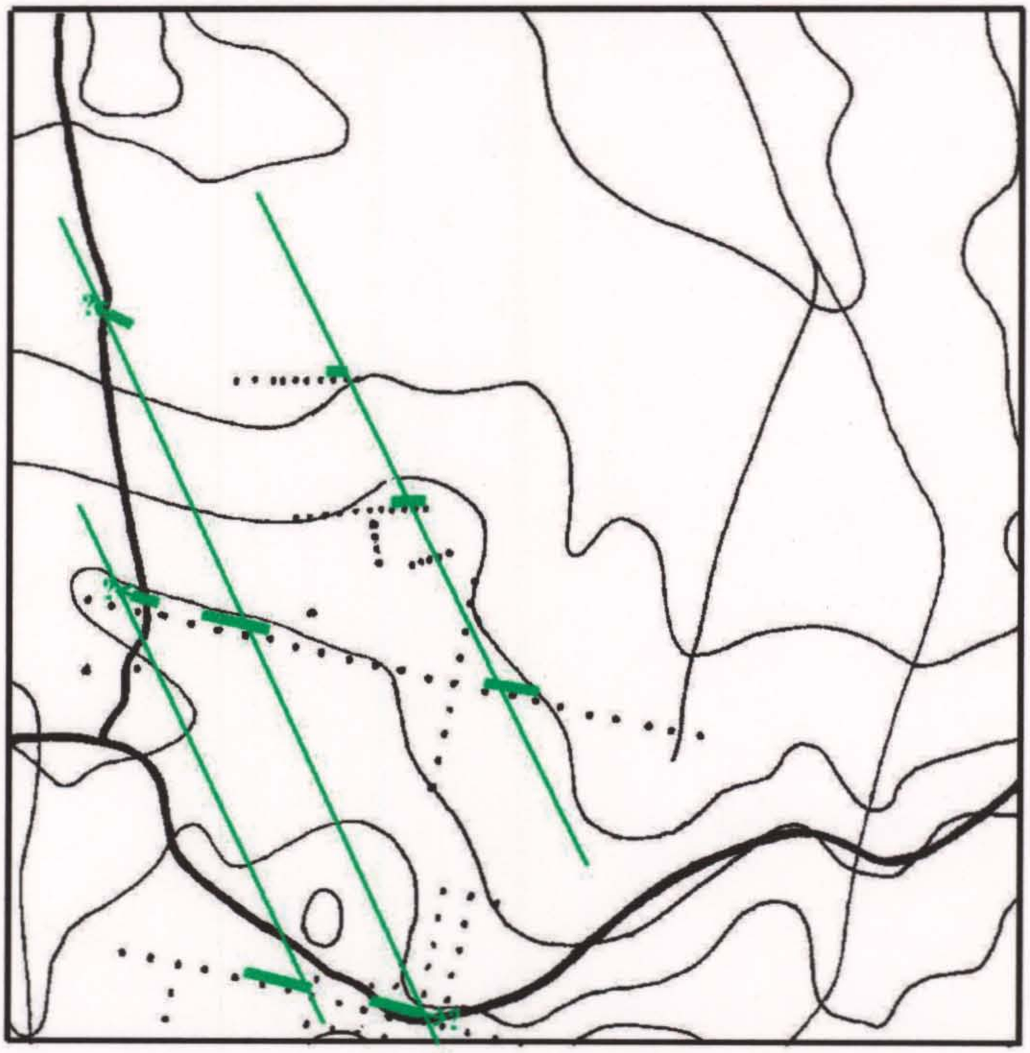


Figure 11
Radiation trends in the NE of the lease



500 m

5 cm

Figure 12
Weathered granite colour

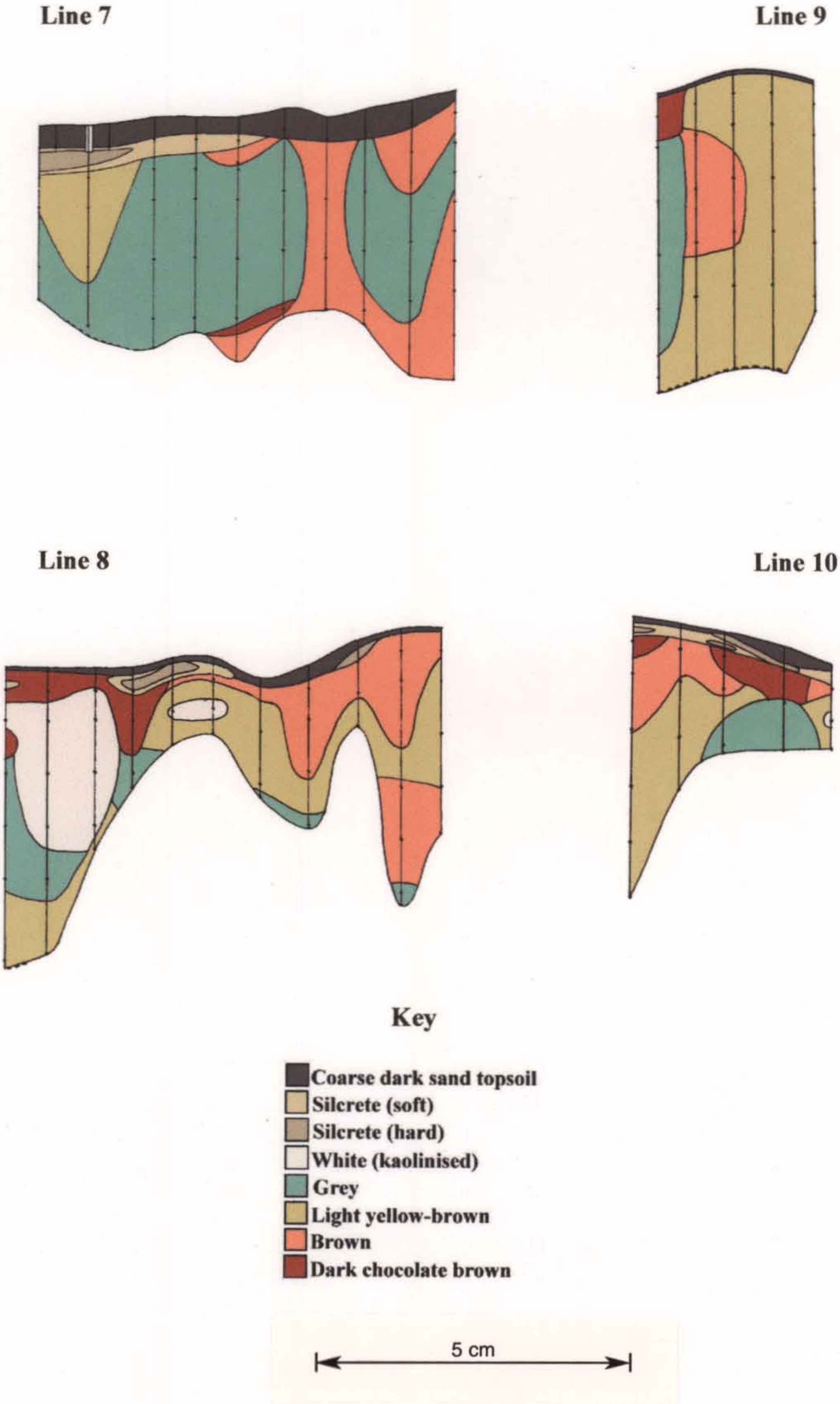
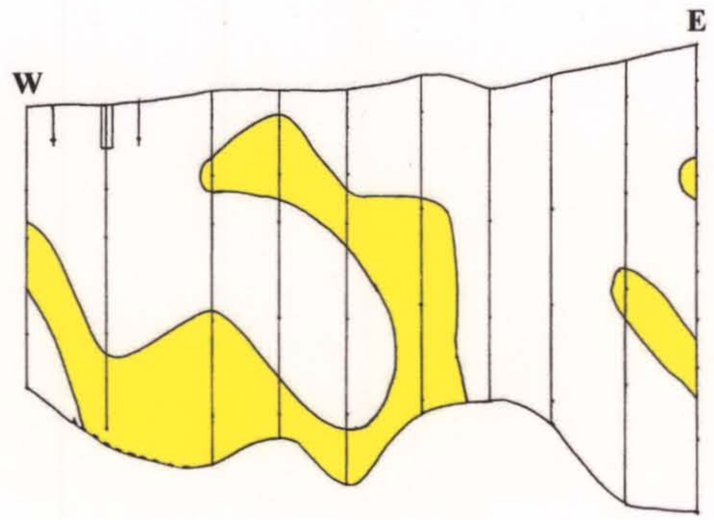
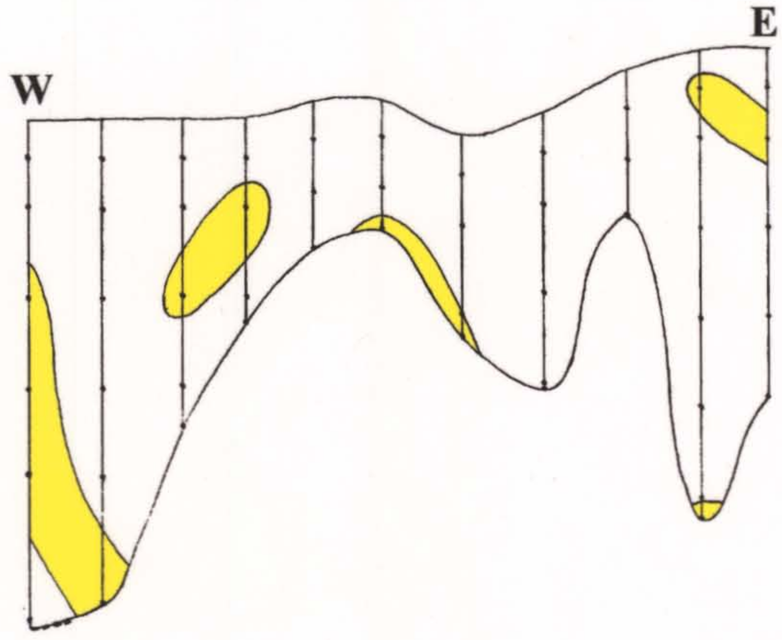


Figure 13
Native metal and sulphides for lines 7 and 8

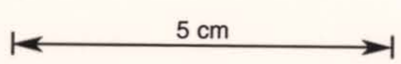
Line 7



Line 8



Native metal and sulphide locations shown in yellow



Appendix A

Line 1 Radiation and SP

Position on Line 1 (from W to E)	Radiation (cpm)	SP (mV)
-25	1000	
-20	1000	
-15	900	
-10	700	
-5	900	
0	900	0
5	800	
10	800	
15	800	-12.5
20	700	
25	700	
30	1100	-11.9
35	1000	
40	900	
45	1000	-14.2
50	1000	
55	1100	
60	900	4.2
65	950	
70	1150	
75	900	-7.1
80	900	
85	900	
90	1000	7.9
95	900	
100	900	
105	600	0.8
110	500	
115	500	
120	800	6.6
125	600	
130	550	
135	600	1.9
140	600	
145	500	
150	600	-5.5
155	600	
160	600	
165	600	-30.6
170	500	
175	500	
180	450	-20.3
185	500	
190	500	
195	500	-6.8
200	450	
205	400	
210	400	-32.8
215	400	
220	400	
225	400	-8.1
230	400	
235	400	
240	400	-47
245	350	
250	350	
255	400	-34

Position on Line 1 (from W to E)	Radiation (cpm)	SP (mV)
255	400	-34
260	400	
265	400	
270	400	-28.4
275	400	
280	400	
285	400	-22.1
290	450	
295	450	
300	450	-28.6
305	500	
310	600	
315	700	-7.6
320	900	
325	900	
330	900	-30.5
335	1200	
340	1200	
345	1300	-4.9
350	1050	
355	900	
360	850	-8.9
365	1000	
370	1150	
375	1150	0.9
380	700	
385	850	
390	750	0.3
395	850	
400	850	
405	900	11.5
410	750	
415	750	
420	600	-5.7
425	650	
430	650	
435	600	6.3
440	700	
445	600	
450	600	-7.1
455	750	
460	650	
465	400	-7.6
470	500	
475	500	
480	600	-10.2
485	600	
490	600	
495	600	-29.7
500	500	
505	550	
510	550	7.3
515		
520		
525		-25

Appendix B

Line 6 radiation and SP

Location on Line 6	Radiation (cpm)	SP (mV)
225W	1300	0
220W	1300	
215W	1400	
210W	1200	-12
205W	1200	
200W	1100	
195W	1300	14.5
190W	1500	
185W	1500	
180W	1400	0.1
175W	1500	
170W	1600	
165W	1700	36.8
160W	1700	
155W	1800	
150W	1900	23.6
145W	1900	
140W	2000	
135W	2000	10.5
130W	1800	
125W	1700	
120W	1700	12.1
115W	1600	
110W	1600	
105W	1500	36.8
100W	1500	
95W	1300	
90W	1200	-1.4
85W	1200	
80W	900	
75W	700	6.4
70W	900	
65W	800	
60W	800	-8.2
55W	1000	
50W	1100	
45W	1600	-20.2
40W	1600	
35W	1500	
30W	1900	16.4
25W	1600	
20W	1500	
15W	1800	-11.5
10W	1800	
5W	1900	
0W	1900	10.9

Location on Line 6	Radiation (cpm)	SP (mV)
0W	1900	10.9
5E		
10E		
15E		25
20E		
25E		
30E		2
35E		
40E		
45E		3
50E		
55E		
60E		13.8
65E		
70E		
75E		21.8
80E		
85E		
90E		18.6
95E		
100E		
105E		10.1
110E		
115E		
120E		0.9
125E		
130E		
135E		22.2
140E		
145E		
150E		24.4
155E		
160E		
165E		19.6

Appendix C

Line 7 radiation and SP

Location on line 7 (E from road)	Radiation (cpm)	SP (mV)
0	2200	0
5	2400	
10	2300	
15	2600	-0.9
20	2200	
25	1800	
30	2000	11.7
35	1900	
40	1400	
45	1700	-25.6
50	1500	
55	1300	
60	1300	-37.9
65	1300	
70	1200	
75	1400	-21.3
80	1400	
85	1400	
90	1400	-28.2
95	1600	
100	1700	
105	1400	-18.2
110	1300	
115	1400	
120	1300	-11.1
125	1300	
130	1400	
135	1400	-9.4
140	1400	
145	1600	
150	1500	0.2
155	1200	
160	1400	
165	1200	-18.6
170	1100	
175	1200	
180	1200	-28.9
185	1500	
190	1400	
195	1400	7.3
200	1500	
205	1300	
210	1600	44.8
215	2200	
220	2100	
225	2100	64.7
230	2100	
235	1900	
240	1500	57.7
245	1600	
250	1600	
255	1400	36.3

Appendix D

Line 8 AAS results

Hole number	Depth (m)	Results (ppm) Cu	Pb	Zn	Ca	Mg
1	0.9	15	33	68	23	400
	2.1	13	48	33	18	700
	4.3	13	88	68	48	1125
	6.4	13	40	57	25	1050
	8.2	13	53	50	13	750
2	0.9	20	40	38	3	400
	2.1	20	60	25	8	550
	4.3	25	228	43	5	925
	6.4	25	160	38	1	775
	8.5	23	63	70	13	1175
	11	23	50	38	23	1125
3	0.9	20	43	8	0	350
	2.1	23	60	10	0	500
	3.4	28	100	40	5	1075
4	0.9	28	55	15	8	525
	2.1	30	63	30	15	925
	4.3	33	90	38	3	725
	6.4	13	55	73	5	1200
	6.7	13	38	63	8	1150
5	0.9	13	5	5	5	225
	2.1	10	48	15	5	725
	4.3	13	73	43	13	825
	4.9	13	80	38	5	925
6	0.9	8	0	3	5	50
	2.1	8	25	5	5	200
	3.4	15	35	53	15	1150
7	0.9	13	5	8	1	50
	2.1	10	23	13	5	125
	3.7	8	43	55	8	700
8	0.9	25	8	5	13	100
	2.1	35	83	30	18	475
	4.3	20	60	25	13	350
	4.9	15	85	28	15	400
9	0.9	10	15	8	5	75
	2.1	13	75	13	0	100
	4.3	13	78	20	3	400
	6.4	15	57	20	8	400
	7.3	18	43	43	28	800
10	0.9	23	23	8	3	75
	2.1	13	33	8	0	50
	4.3	10	48	10	1	175
	6.4	8	68	10	3	225
	8.5	10	73	15	3	325
	11.6	20	73	40	8	850
11	0.9	35	13	10	0	78
	2.1	13	18	6	3	95
	4.3	13	55	18	0	150
	6.4	20	90	15	3	178
	8.5	23	55	57	5	775
	12	23	25	33	13	450

Line 8 Radiation and SP results

Position relative to hole 2	SP results (mV)	Radiation (cpm)
120W	-45.4	1300
115W		1500
110W		1300
105W	-25.9	1300
100W		1400
95W		1200
90W	-17.7	1200
85W		1200
80W		1000
75W	-31.7	1100
70W		1100
65W		1100
60W	-55.9	1100
55W		1000
50W		1100
45W	-25.0	1100
40W		1300
35W		1300
30W	12.0	1700
25W		1400
20W		2000
15W	-24.4	1800
10W		1700
5W		1900
0W (hole 2)	-13.4	1800
5E		1800
10E		2000
15E	0.0	1700

Appendix E

Line 9 AAS results

Hole number	Depth (m)	Results (ppm)				
		Cu	Pb	Zn	Ca	Mg
1	0.9	13	18	13	8	200
	2.1	18	30	20	0	238
	4.3	20	95	48	3	875
	6.4	20	83	60	3	550
	8.5	18	85	50	5	700
	9.1	18	63	53	5	425
2	0.9	10	20	15	6	275
	2.1	13	53	30	5	450
	4.3	15	73	48	3	525
	6.4	15	143	45	3	375
	8.5	18	105	75	5	1125
	12	15	43	115	9	775
3	0.9	30	18	43	13	127
	2.1	15	20	30	8	175
	4.3	13	25	20	8	180
	6.4	10	50	33	5	163
	8.5	13	70	40	6	313
	12	13	57	85	10	1675
4	0.9	10	28	30	10	233
	2.1	8	65	33	1	360
	4.3	9	73	40	6	500
	6.4	10	110	55	6	1000
	8.5	13	85	65	1	700
	12	10	40	68	4	900
5	0.9	15	30	20	4	650
	2.1	18	48	28	4	275
	4.3	8	33	10	0	38
	6.4	8	63	28	0	213
	8.5					
	12	10	43	55	4	500

Appendix F

Line 10 AAS results

Hole number	Depth (m)	Results (ppm)				
		Cu	Pb	Zn	Ca	Mg
1	0.9	8	0	3	5	50
	2.1	8	25	5	5	200
	3.4	15	35	53	15	1150
2	0.9	18	13	10	6	50
	2.1	13	40	13	8	100
	4	15	95	43	8	875
3	0.9	13	8	3	3	75
	2.1	20	93	33	6	550
	4.3	15	63	57	6	975
	4.6	13	63	60	8	975
4	0.9	13	8	5	5	125
	2.1	13	25	23	13	275
	4.3	10	75	35	5	300
	6.4	10	63	53	11	575
5	0.9	18	5	0	5	25
	2.1	10	28	5	0	50
	4.3	8	78	28	8	450
	6.4	8	88	43	3	700
	8.5	10	105	70	15	975
	10.7	10	57	73	20	1025