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CORPORATE EXPLORATION OF TASMANIAN MINERAL PRODUCTS

EL 16/68

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A.C.I. MINERAL RESOURCES DIVISION

CORPORATE EXPLORATION OF TASMANIAN MINERAL RESOURCES

EL/16/68 - PROGRESS REPORT DECEMBER, 1968 - AUGUST, 1969

SYNOPSIS

1. AIM

To locate mineral deposits in Tasmania of potential interest to the A.C.I. Group.

2. REASON

The desire of A.C.I. to diversify into profitable raw materials.

3. SUMMARY AND CONCLUSIONS

A.C.I. Operations Pty. Ltd. were granted a 537 square mile Exploration Licence in North-West Tasmania, in November, 1968. During the 1968/69 Field Season, preliminary investigations were carried out on some copper lodes, a tin lode and dune sands. A Stream Sediment geochemical survey was also carried out.

3.1. The Copper Lodes. Four abandoned copper mines have been examined over a 7-mile strip, within the licence area. The most prospective area to date is around the old Clump Mine where pyrite-chalcopyrite mineralisation is present over an 80' width in a shear zone. Old workings have proved the mineralisation over a strike length of 450' to a depth of 70'- 100' below surface. Old dump material has analysed up to 13% copper and leached samples from the old workings have assayed from 0.019% to 3.4% copper.

Other mines examined, the Reward, Central Mount Balfour and the Blocks, have in the past yielded high-grade ore from narrow ore bodies (5' - 12' wide.) There are reasonable prospects for locating new, and proving extensions of, existing ore bodies in the area as earlier work has been severely hampered by very poor exposure and the non-development of ferruginous gossans.

Geochemical orientation surveys have not been successful. In most cases all the minerals (including pyrite) have been completely removed from the upper parts of mineralised zones, leaving white porous quartz.

Limited geophysical work carried out by other companies in the area indicate that the Induced Polarisation Method (I.P.) will delineate potential mineralised areas.

The work carried out to date is sufficiently encouraging to justify further and intensified exploration.

3.2. Stream Sediment Survey

A stream sediment geochemical survey was carried out over an area of about four square miles, to the west of Balfour townsite.

One copper anomaly was located reflecting deposition of copper salts by water issuing from the adits of the Central Mount Balfour Mine.

The absence of other anomalies is due to either an absence of bedrock mineralisation and/or to the stream sediments being derived almost exclusively from the elluvial deposits, which blanket the area.

3.3. Tin Lode in ML 58M 68

A tin bearing lode has been examined on a 5-acre mining lease held by Mr. K. Jaeger of Smithton in the centre of the A.C.I. Operations Pty. Ltd. Licence area. The lode comprises tin bearing kaolinite with variable amount of quartz and local sulphides within dominantly argillaceous country rocks.

Auger holes proved actual intersections of 1'+ and 4.5' at two discrete open cuts with SnO_2 values of 4.8% and 2.4% respectively.

The available data are very encouraging and the grade of tin is high, despite the narrow width of the ore body.

Extensions of this lode may occur on ground held by A.C.I. to the south of the Lease.

3.4. The Sand Dunes

Sixtyfive auger holes were drilled to a maximum depth of 30' in sand dunes between Temma and the Arthur River in Exploration Licence 16/68.

Two generations of sand dunes were recognized, the older dunes containing 0.26%- 2.22% heavy minerals. The heavy mineral content of the younger dunes ranged between 0.1% and 0.54%.

Analytical work on the heavy minerals indicated a virtual absence of cassiterite, with ilmenite and andalusite each accounting for about 30% of the heavy minerals. The ilmenite has a high chrome content and would be unsuitable therefore as a source of titanium. Zircon and rutile occur in minor amounts only.

The most prospective area outlined by the drilling programme contains about 2 million tons of sand with a mean heavy mineral content of 1.11% with

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andalusite the only mineral of value; this and the remaining sand dunes do not justify further work.

4. RECOMMENDATIONS

It is recommended that :-

4.1. The Copper Lodes

4.1.1. Topographic maps be obtained by aerial photogrammetry of the areas around the copper lodes.

4.1.2. The existing mines be accurately surveyed and mapped on a scale 40' = 1 inch, and numerous old workings be cleaned out for sampling.

4.1.3. The regional structure be investigated by field mapping at a scale of 1" = 400'.

4.1.4. A regional electromagnetic (E.M.) geophysical survey be carried out over the prospective area to delineate areas for further investigation.

4.1.5. Induced polarisation (I.P.) geophysical surveys be carried out over E.M. anomalies and existing mines.

4.1.6. Following satisfactory results from 4.1.1. to 4.1.4 above, a drilling programme be laid out.

4.2. Geochemical Stream Sediment Surveys.

No further stream sediment geochemical surveys be carried out in areas where extensive elluvial deposits are developed.

4.3. Tin Lode ML 58M 68

4.3.1. A.C.I. obtain an interest in the lease held currently by Mr. Jaeger by either negotiating an option to purchase the lease from Jaeger for cash, or for a percentage of all profits made by working the minerals on his lease OR pegging Jaeger's lease and applying to the Tasmanian Mines Department stating that Jaeger has not fulfilled labour conditions.

4.3.2. That f urther work be carried out over the lease and adjoining ground. This would entail detailed mapping, pitting, trenching and auger drilling, together with limited geophysical surveys.

4.4. The Sand Dunes

No further work be undertaken over the sand dunes.

THE COPPER LODES

5. INTRODUCTION

5.1. Location: In November, 1968, A.C.I. Operations Pty. Ltd. were granted a 537 square mile Exploration Licence area in north-west Tasmania located to the south and west of Smithton (see Figure l). Preliminary evaluation work within the area showed the presence of copper bearing lode formations at points over a lateral distance of about 6 miles (A.C.I. Technical Centre Report 9039/1/68). The area covered in this section is shown on Plan l at a scale of 1 inch = 2150'., showing also the main rivers and topographical features.

5.2. Access. Access to the copper lode area is possible by one track only running south from Marrawah to the Arthur River, which is crossed by means of a ferry with a 4-ton limit. The ferry often does not run during Winter when the river is in flood. An unsealed road exists between the Arthur and Nelson Rivers but from Temma to the Nelson River the track is rough and locally boggy A very rough track suitable only for 4-wheel vehicles links Temma and Balfour where an old camp exists close to the copper prospects.

Access will be improved shortly by the construction of a bridge over the Arthur River downstream of the ferry, due for completion late this year. The track between the Nelson River and Temma is due for improvement also. In about 3 years' time the Foresty Department will bridge the Arthur River south of Smithton and logging roads will be cut in the area between Frankland and Arthur Rivers. It is possible that the Frankland will also be bridged to provide access to timber between the Frankland and Nelson Rivers.

5.3. Physiography. The area containing the copper lodes shown on Plan l comprises a westward sloping plain (ancient erosion surface) supporting button grass and low scrub.

The button grass plains are dominated by Mounts Balfour and Frankland which rise to 1350' and 1420' respectively about the mean plain level of 650'. Local remnants of tertiary basalt form small hills around Balfour Camp and the Clump. The Frankland River and Tin Creek have cut deep valleys to a level about 150' below the plains, and their numerous small tributaries occupy steep incised gulleys. The river valleys and adjacent slopes are densely timbered with areas of severe horizontal bush.

The rainfall at Balfour is about 100 inches per annum, the majority of the precipitation falling during Winter months, and 4-wheel drive tracks over the button grass plains are made impassable. Additionally, several creeks on the Balfour trcck flood and can cut off Balfour from Temma.

6. PREVIOUS WORK

Balfour was the focus of extensive prospecting activities in the early 1900's following the discovery of a copper bearing lode (Point I on Plan I), and the establishment of Murray's Reward Mine. As a result of the prospecting work, copper minerals were located at Points 2, 3, 4 and 5 on Plan I, and some underground development work carried out. All activity on the copper prospects ceased between 1911 and 1914, presumably as a result of the slump in copper prices. Following the Great War some limited prospecting work is believed to have been carried out for copper and the dumps at the Reward Mine were reworked by Robert Sticht, then Manager of the Mount Lyell Railway Company.

Since 1945 the area of the copper lodes has formed part of large exploration licences held by organizations such as RTZ and Pickards Mather. Available information from the Mines Department shows that, prior to 1956, no work was carried out over the old copper prospects. In 1956 a syndicate of local Smithton businessmen took out a 25 sq. mile Special Mining Licence covering all the known copper occurrences and attempted to sell the licence on the basis of the old copper workings. Between 1962 and 1965 B.H.P. obtained a farm-in agreement to evaluate a tin show close to Murray's Reward Mine and the Central Mine (Point 2 on Plan I.) Six drill holes were proposed but no further action taken. *These were drilled.*

In 1966 the Smithton Syndicate ran a series of Induced Polarisation lines over copper prospects 1, 2,3 and 4 (see Plan I) and in all cases positive anomalies were obtained but no follow-up work was carried out.

Since 1910 the area of the copper prospects has received no more than cursory attention and following A.C.I's preliminary evaluation of the area, more detailed work has been initiated by the Mineral Resources Division.

7. GEOLOGY

7.1. General Geology. The country rock adjacent to the lode matter represented on Plan I comprise dark grey carbonaceous silty mudstone with thin silt bands and laminae showing evidence of ripple marking. Interbanded argillaceous sandstones and quartzites are subordinate, but exhibit minor scour features. Between Tin Creek and Balfour Camp, roadside cuttings expose typical flysh sediments. Chloritic slates are also sporadically developed. The precise age of these sediments is unknown but have been classed as "Younger" Pre-Cambrian by Longman and Mathews (1962).

The strike of the sediments in the vicinity of the lodes is between N.N.W. and N.W. with a steep dip to the west, although reversals have been noted locally, due probably to minor flexures. Westward towards Temma the limited available information indicates a similar strike, but the dip is between 30° - 65° to the west. There is possibly a major anticlinal structure to the west of the lodes, although extensive regional mapping will be required to confirm this hypothesis. The degree of bedrock exposure is very poor, the area being covered by a variable deposit of elluvial quartz gravels overlain by peaty soil. The elluvial deposits cover all the plains and also cover the sides of the valleys due presumably to creep. They comprise sub-angular quartzite fragments in a medium grained matrix. The elluvials are generally 1' - 3' thick, but locally can be up to 10' thick in ancient stream courses. They are clearly water deposited, although the amount of transport is small.

The elluvial deposits probably formed during and shortly after the formation of the erosion surface now represented by the button grass plains. The soil cover is often thick, although no definite profile has yet been recognised, sandy peaty soil resting sharply on the elluvial deposits.

7.2. Surface Evidence of the Lodes.

The elluvial and soil cover over most of the area makes the tracing of the lodes very difficult as only the most resistant formations are exposed. At Murray's Reward Mine the surface expression of the known copper ore body comprises white quartz veins and pods interbedded with contorted graphitic slate bearing irregular developments of vein quartz. The quartz is commonly cellular although all traces of mineralisation have been removed. This "gossan" maintains its character through the Central Mine area (2 on Plan I) but northwards at Point A a road cutting exposes 4½' of brecciated slate with quartz veins and extensive haematite staining. Further north the "gossan" is patchily exposed on the east side of Emmits Creek (A) comprising haematitic cellular quartz. Between this point and the junction of Tin Creek and the Frankland River no true "gossan" has been identified, but the inferred extent of the lode is shown on Plan I, based on Ward (1911) who examined the area during the height of prospecting activities.

To the west of the previously mentioned lode-line a cupriferous lode was exploited around 1910 (Area 3 on Plan I). Numerous shallow workings are present but no surface expression of the lode can be seen now. At Point B to the north of Area 3, trenching has exposed a thin iron "gossan" varying between 5' and 3' in thickness, which cannot be directly related to the copper lode proven in Area 3.

To the north of the Clump, cupriferous quartz was located in an old stream bed (4 on Map I), and subsequent underground work proved a wide zone of mineralisation. In the area around the stream bed no "gossan" was found, due to the covered nature of the ground. The old prospectors, following the line of this lode, located mineralised quartz in creek beds at Points C and D on Plan I, and the inferred extension of the lode is based on Ward's (1911) report.

To the south of Balfour a iron-rich "gossan" several feet wide is clearly visible on a hogs-back type ridge (Area 5 on Plan I.) No mineralisation is evident at the surface, although underground development has proved cupriferous ore. Between this "gos san" and Balfour the continuity of the lode cannot be determined due to the covered nature of the ground.

8. THE COPPER PROSPECTS

During the past field season the few areas where early work proved copper ore, have been examined, but the intervening areas still have to be covered. These areas are discussed below in numerical order.

8.1. Murray's Reward Mine.

8.1.1. Historical. The Murray Reward Mine is located on a ridge 1/4 mile west of Balfour on the north side of Tin Creek. Copper was first discovered on the north bank of Tin Creek and development consisted of the following :-

a) A shaft was sunk 22 yards north of Tin Creek.
b) An adit was driven west into the hillside, north of Tin Creek. The main lode dipping westward was 12' wide with good ore on the hanging wall. Drives were cut to the north and south along the line of the lode, the northern drive encountering pockets of rich ore and leached ore in a quartz gangue. Stoping was carried out above the drives over an average width of 5'.
c) A second adit was driven westward some 120' south of the No. I adit and after some unproductive cross-cutting, the main lode was located and proven to be irregular in trend. Stoping was then initiated.
d) Two winzes 90' apart were driven in the vicinity of the No. 2 adit and stoping at lower levels carried out. The lode was between 7 1/2' and 11 1/2" wide and a section quoted by Ward (1911) is as follows :-

Hanging Wall - 4' quartz + slate fragments with numerous veins of chalcopyrite, covellite and pyrite.

2'6" massive ore - chalcopyrite, chalcocite, covellite, pyrite

and a little quartz.
1' quartz + slate fragments with chalcopyrite, covellite and pyrite veins.
Footwall.

e) A third adit on the western side of the ridge was driven eastward 500' north of the No. 1 adit. The lode was poorly defined with quartz veins over a width of 50'. Some quartz veins were leached, others retaining pyrite, chalcopyrite and covellite. The best ore-shoot was 1/2' - 1' wide.

f) Following Ward's (1911) Report, it is believed that further deeper workings were carried out at the Reward Mine, but no records exist. Prior to 1910, 1,286 tons of picked ore were shipped out from Balfour assaying up to 30% copper.

g) Around 1920 some of the dump material was re-processed by R. Sticht, the current manager of the Mount Lyell Mine.

h) In 1965, B.H.P. roughly mapped the adits and in 1966 the Smithton Syndicate carried out a very limited I.P. survey over the mine.

8.1.2. Current Work. The area of the Reward Mine was mapped on a rough 1" = 40' base map, compiled by B.H.P. (Pace and Compass traverses.) The Nos. 1 and 2 adits and associated cross-cuts were mapped, but the lower workings were inaccessible due to water and to collapsed winzes. An orientation geochemical survey was carried out over the lode to determine the suitability of geochemistry for tracing the lateral extent of the lodes.

8.1.3. Geology. The country rocks around the Reward Mine comprise grey carbonaceous mudstones, often with orange, limonitic coatings, green chloritic shales and thin interbedded siltstones. Surface outcrop is relatively sparse due to a cover of elluvial quartz which varies from 3" to 2' in thickness and supports a peaty soil. The sediments around the mine workings dip westwards at between 70° and 90°, the strike being broadly N.N.W. A fault extends from Tin Creek northwards through old shafts, the maximum width of faulted ground visible being about 12 - 15' near Tin Creek. The best fault exposures are in the sides of the collapsed shafts where intensely distorted and brecciated dark grey graphitic slates are associated with white vein quartz containing small cavities. No iron-staining is visible in this "gossan" The sediments adjacent to the fault show very variable dips and strikes with local reversals. Several small folds are exposed on the Balfour track, pitching at 40°- 50°

to the south. The surface geology may be tentatively interpreted as steeply dipping strata cut by a shear-type fault.

Adits I and 2 of the Reward Mine have been mapped, using compass and tape, and the geology is shown in Plan 2. Adit No.3 was inaccessible as the portal had completely collapsed.

No.1 Adit cuts the lode formation over a visible width of 9', the contacts being masked by timbering. The visible lode is vein quartz with minor amounts of malachite and copper sulphate. The 10' of sediments to the east of the lode shows very severe deformation with the development of minor graphite. Thin mineralised quartz veins are present throughout this sequence with evidence of much leaching.

The No.2 Adit and associated drives and cross-cuts show a zone of disturbance approximately 25' - 30' wide, with mineralised quartz veins and one massive irregularly mineralised quartz vein, which strikes at about 330°.

The lode dips steeply to the west and the associated zone of disturbance contains several faults, dipping westward at 40- 60°. The structure is tentatively interpreted as a shear zone with mineralised quartz emplaced in the gouge, but the pitch of the mineralised lode is not determinable from the current field data. The width of the massive quartz lode is about 10' - 12' although the mineralisation is irregular in distribution.

8.1.4. Geochemistry. An orientation geochemical survey was conducted across the lode of the Reward Mine comprising 18 pits at 25' intervals in an east-west direction. Each pit was dug to bedrock and channel samples of the soil and elluvium obtained. Chip bedrock samples were also obtained from each pit. Each sample was dried and sieved through a 80 # screen. The prepared samples were analysed for Ni, Pb, Cu, Zn, full results being presented in Appendix A.

Significant variations only occur in the Cu values and a marked anomaly (Maximum 1350 p.p.m.)occurred in Pits 2-6 in the soil and elluvium horizons. No anomaly is present at bedrock.

The copper anomaly is located on the eastern slope of the hill, the crest of which is marked by the "quartz gossan." The anomaly is considered to be due to copper rich surface water migrating through the porous soil and elluvium from the mullock dumps situated to the north of the geochemical line.

8.1.5. Geophysics. Three east-west I.P. geophysical lines were run across the Reward Mine at 300' spacing, but their precise locations were not known as the marker pegs had been removed. However, from the information on the I.P. sheets, the two northern lines, to the north of Tin Creek, showed moderately strong anomalies over the mine workings. The southern line, south of Tin Creek, showed a low, deep anomaly on the extrapolated line of the lode, suggesting that the ore body pitches southwards.

The information indicates that the I.P. method is a useful tool for locating mineralisation of the Reward Mine type.

8.2. The Central Mount Balfour Mine.

8.2.1. Historical. The Central Mount Balfour Mine is situated due north of the Reward Mine on the same lode. The following work was carried out.

a) Two shafts were sunk 20' apart on an east-west line, the westerly shaft proving chalcopyrite, covellite and pyrite in a quartz gangue at 45' below surface, the minerals being leached out at shallow depths.
b) An adit was driven eastwards into the ridge. Drives north and south from the adit proved good quality quartose ore, within slates showing some copper mineralisation. The strike of the lode showed some irregularities and was proven over a length of at least 250', but no data are available concerning its width.
c) A shaft was sunk to exploit the lode at the 150' level and driving carried out, but no ore of value was located.
d) A second adit was driven eastward proving 12' of quartzose
e) Work was suspended when the good ore proved in surface workings pinched out above the 150' level.

8.2.2. Current Work. The surface geology was mapped as at the adjacent Reward Mine, and the accessible underground workings briefly examined.

8.2.3. Geology. The country rock is similar in lithology and gross structure to the Reward Mine. Surface exposures of the lode show a 2' wide leached quartz vein in a fault zone approximately 20' wide, containing numerous massive veins with rare leached cavities.

Two adits driven eastward at the Central Mine were briefly examined.

The main lode matter comprises two quartz veins 2' and 4' wide respectively, separated by 9' of distorted shales with common quartz veins. Pyrite is present in both veins and the original presen ce of copper minerals is indicated by leached cavities and copper sulphate stains. The lode dips westward at about 75° but the investigations to date have not determined the pitch of the ore body. The second adit cuts a 3' massive quartz vein within a very distorted sequence of shales, with siltstone interbeds bearing discordant quartz veins. The massive vein is not directly associated with the main lode at the adit level.

The somewhat sparse geological information at the Central Mount Balfour Mine indicates a lode formation between 3' and 9' wide dipping westwards. Good ore has been produced from the mine in the past, although records indicate that the ore zone pinched out at the 150' level. It is possible that further oreshoots are present at greater depths at the Central Mount Balfour Mine.

8.3. The Blocks Prospect.

8.3.1. Historical. The Blocks Prospect is situated some 3 miles north-north west from the Reward Mine (see Plan 1.) The prospect appears to lie to the west of the extrapolated line of the Reward Mine lode, although tectonic displacement could be responsible.

Copper mineralisation was discovered at the Blocks Prospect early this centruy and the following work was carried out :-

a) Following discovery of a lode, trenching delineated an ore body striking N40° W. Two shafts, 240' apart, were sunk on the lode but progress below the 35' level was hampered by water.

b) Eastward from (a) a second lode, 12' wide was reportedly discovered. A large shaft was sunk between the two ore bodies and reached 70' below surface before water prevented further progress.

c)A further shaft was sunk to a depth of 31' some 450' north-west from the large shaft. The lode was proved to be 8' wide dipping 65° west, and good ore was produced. North of this shaft the lode was proved to be 4 1/2' thick and extensively leached.

8.3.2. Current Work. The area of the Blocks Prospect has been briefly examined and several adits mapped. All work in this area is at a very early stage.

8.3.3. Geology. The Block area consists of westward dipping shales, mudstone and interbedded quartzites, striking north-north west.

The lode formation extends in a north-north west direction through high density of dilapidated old working and samples of good ore have been obtained from the mullock dump of one shaft. The ore consisted of three main types, white quartz with traces of chalcopyrite, covellite and malachite; white quartz with covellite, chalcopyrite and malachite; brecciated green slate in a quartz matrix with chalcopyrite and pyrite. These three ore types were assayed giving 0.15%, 14.8% and 7.9% copper respectively.

The ore obtained from the mullock heap is presumed to come from shaft proving 8' of lode (Section 8.3.1. c)). The lode formation does not form a topographic feature and no "gossan" was observed.

Quartz veins are present within the area but show no evidence of mineralisation. A further lode formation occurs to the north of the main shafts (8 on Plan I), where trenching proved a minor lode 5'3" wide, comprising mineralised shales and slates with minor leached quartz veining.

Without detailed mapping and geophysical control, little interpretative work can be done on this prospect, but the grade of ore obtained from the mullock dump, although coming from a thin lode, justifies further investigation. Additionally, further ore bodies may be present within the poorly exposed area.

8.3.4. Geophysics. The Smithton Syndicate ran three lines of I.P. geophysics in the area to the east of the old workings, details above. Several probable/possible anomalies (low magnitude) were detected which might indicate additional ore bodies.

8.4. The Clump Prospect.

8.4.1. Historical Work. Mineralised quartz was first discovered at the Clump Prospect around 1900 in the sides of a small creek. Subsequent work consisted of a 20' long trench adjacent to the creek which proved bands of graphitic slate quartzose material and vein quartz carrying pyrite and chalcopyrite, but showing evidence of oxidation and leaching. The principal work between 1900 and 1910 consisted of underground prospecting of the lode by means of an adit which cut the lode 90' below the trench and with associated drives and crosscuts. Ward (1911) reported at length on the underground work and the extent of the underground workings are shown on Plan 3, based on Ward's information.

The details of the underground works may be summarised as follows:-

a) At 266' from the adit entrance a thin quartz vein containing pyrite, chalcopyrite and bornite occurs in graphitic slate.

b) The main lode was encountered 321' from the adit entrance and continued for 105' through lode matter.

c) A rise was driven to the surface 75' from the western wall of the lode, the intervening strata comprising successive bands of ore in various stages of alteration. The lode matter is mainly quartzose with bands of mineralised and graphic slate. The mineralisation consisted of pyrite and chalcopyrite.

d) A drive was put in for 38' to the north-west of the adit along the wall of the lode, passing through shattered slate cemented with silica and carrying splashes of chalcopyrite and pyrite.

e) A further north-western drive was started 73' beyond the first and carried 28' along the brecciated vein carrying pyrite and chalcopyrite.

f) The No.1 South Drive follows the north-eastern wall of the lode for 378' and passes through brecciated graphitic slate, cemented with silica and dolomite with pyrite and chalcopyrite. The ore is cavernous and occurs as a succession of lenses overlapping one another at the ends. A branch lode was encountered 302' from the main adit possessing a north easterly strike. The branch lode is 27' wide and a drive was carried 40' along a particularly rich ore shoot. Towards the end of this drive the ore became increasingly leached and cavernous. The branch lode consists of interbanded mineralised quartz veins and graphitic/mineralised slate.

g) The No.2 South Drive connects with the main adit near the rise to the surface. Near the shaft the lode matter is dense quartz but the drive cuts obliquely across the strike of the lode passing into softer leached ore with lenses of pyrite and chalcopyrite.

h) The No. 1 cross-cut connecting the two south drives showed the lode to comprise bands of graphiticslate and quartzose material often carrying pyrite and chalcopyrite. Water was encountered flowing from the floorof the cross-cut.

i) The No. 2 cross-cut proved the ore body to be 75' wide and of similar composition to the No. 1 cross-cut.

Following the underground work, a production shaft was sunk into the old workings at the site of the rise to the surface. The shaft was timber lined to the 90' level and a pumping chamber excavated. Work then stopped presumably due to the recession in copper prices.

The only other work carried out over the Clump Prospect was in 1965 when the Smithton Syndicate ran 3 lines of Induced Polarisation geophysics in the area.

8.4.2. Current Work. The area around the Clump shaft and adit was mapped at 40' = 1 inch, using tape and compass. Plan 4 shows the main features of the area together with the three I.P. geophysical lines. Work was hindered initially by the dense scrub cover, but during a period of fine weather much of the area was burnt, enabling the sporadic rock outcrops to be examined.

When first located the adit leading to the old workings was practically full of water, the entrance having partially collapsed forming a dam to the water issuing from the workings. The adit was drained and once the water level fell the timbers supporting the first 30' of the adit collapsed and the timber and wall rock was removed to facilitate access to the workings. A layer of thixotropic limonitic clay was left to a depth of between 1 and 2' in the workings. Due to bad air and rotten timberwork, geological work was limited to a rough examination of the main adit. Further draining of the drives will be required before they can be examined.

8.4.3. Geology of the Clump Prospect. As can be seen from Plan 4, rock exposures in the area of the Clump Prospect are very few, the area being covered by a veneer of elluvial quartz overlain by peaty soil supporting light bush and scrub. The few exposures show dark grey silty mudstone with numerous thin light grey silty laminae, locally showing evidence of ripple-marking. Thin siltstone bands occur within this sequence locally showing minor cut and fill structures. All the available non-diastrophic structures indicate that the sediments have a normal facing. The strike of the sediments is generally west-north west with a dip to the north east. The dip is generally steep although in the western portion of the Plan it is between 10° and 50°. In this area of low dip small scale normal S drag folds are developed pitching at between 20° and 30° to the north west. Two shafts are shown in the Plan, the Main Shaft being sunk on the ore body explored by the underground workings. A second shaft 50' deep is present 400' to the west, and a thin near vertical lode is exposed, striking north-north-west in a country rock of grey carbonaceous shale containing minor quartz veining and leached cavities. The lode is about 2' wide at the surface but increases gradually with depth to approximately 3' to 4' at the base of the shaft. Lode matter on the dump comprises dense quartz with abundant pyrite and traces of chalcopyrite and covellite. Leaching is severe in much of the dump material.

Two trenches are present adjacent to the main Clump Shaft. In the northerly trench carbonaceous mudstones contain irregular quartz veins and cellular limonite cavities. The main trench, 23' long, cuts obliquely across the inferred strike of the lode.

At the south end of the trench weathered carbonaceous mudstones are present with pyritic mineralisation and minor quartz veins. This lithology passes northwards through a series of minor faults mineralised with pyrite, graphite and limonitic cavities into massive quartz bearing minor pyritic mineralisation and limonitic cavities. Fragments of graphitic slate are included in the massive quartz especially on its southern side where extensive brecciation is evident. The dump adjacent to the main shaft is formed of carbonaceous and graphitic shale with minor pyrite and chalcopyrite; brecciated siliceous lode with abundant carbonate, common disseminated euhedral pyrite (mainly pyritohedrons) and minor chalcopyrite together with similar materials bearing rich chalcopyrite and minor pyrite. The country rock in the adit comprises dark grey-black carbonaceous silty mudstone bearing sporadic thin silt laminar. The strike is constant in the first 250' of the adit, although the dip shows some variation due probably to minor folding. 280' from the adit portal a complex fault zone is present the gouge of which is some 2'6" wide consisting of intensely disturbed black graphitic shale. This fault strikes 285° dipping 65° to the north east. The sediments to the north of this fault show some irregularity in dip and graphite is developed near the contact. Considerable distortion is apparent in the mudstones between the fault and the contact with the main lode 314' from the adit portal, with the development of graphite. Copper sulphate stains are sporadically developed on the mudstone in this section of the adit. The contact of the lode and the country rock is sharp, striking 325° and dipping at a steep but variable angle to the north-east. The lodes between the contact and the timbering adjacent to the main shaft (352' from portal) comprises dark grey-black graphitic slate, often silicified to a quartzose nature with irregular pods, lenses and veins of quartz. Brecciation and minor contortion are common in hand specimens, although the detailed structure of the lode is masked by a thick deposit limonite on the walls of the adit. White micritic carbonate is commonly associated with the quartz and quartzose portions of the lode. The mineralisation was not studied in detail in situ but samples were taken at frequent intervals along the adit. Pyrite and chalcopyrite are present in the majority of specimens, although leaching is often well advanced. Two bands of non-mineralised, sparingly graphitic, mudstone, 3' and 2' wide respectively, separate the mineralised lode matter. Specimens were not obtained from the timbered section of the adit nor from the pump house and shaft bottom, where a further 25' to 30' of lode matter is exposed, making a total lode width of about 70'.

Specimens 318'; 324.3'; 327'; 329.2'; 332.8'; 334'; 335'; 336'; 337'; 339'; 341'; 345'; 347'; 349' and 352' southwards from the adit portal together with two specimens from the shaft dump were assayed for copper, zinc and lead, with results being tabulated in Appendix B.

The results indicate that the copper content of the adit sample is variable with a maximum of 3.4%. The adit samples are all extensively leached due to being submerged for many years, but dump samples are fresh. The high (13.3%) copper value sample was obtained from large blocks of ore on the dump and the data in Appendix B are considered sufficient to justify extensive further work.

8.4.4. Geophysics. Owing to the covered nature of the ground, little can be determined of the lateral continuity of the lode by geological mapping. The position of the geophysical I.P. anomalies obtained by the Smithton Syndicate are shown plotted on Plan 4. The anomalies on lines 2 and 3 are very strong but incomplete, I.P. readings not being taken to the north-east of the anomaly. A small moderate anomaly was recognised on line I, but I.P. coverage did not extend a sufficient distance to the north-east to cover the extrapolated extent of the main lode.

The I.P. geophysics have been successful insofar that major anomalies coincide with the mineralised zone. The I.P. anomaly will be produced by the graphite, pyrite and chalcopyrite in the mineralised zone and the graphitic sediments adjacent to the lode will add to the width and magnitude of the anomaly. The I.P. technique will therefore locate zones of tectonic disturbance where the carbonaceous country rock has been altered to graphite. The mineralisation of the Clump prospect is restricted to the graphitic portions of the area and thus the I.P. method is a useful exploration tool.

8.4.5. Geochemistry. A geochemical orientation survey was carried out across the presumed outcrop of the mineralised zone comprising 18 pits at 25' intervals, in order to ascertain the usefulness of geochemistry in this part of the licence area. Each pit was taken to bedrock with the exception of Pit 6, where a thick boulder bed was proved beneath the soil reflecting the presence of an old stream course. Channel samples were taken through the soil and elluvium profiles and chip samples obtained of the bedrock. The character of the bedrock is shown on Plan 4, and indicates a substantial width of white quartz, extensively disaggregated and exhibiting small cavities. Each sample was analysed for total copper, zinc, lead and nickel and the results are given in Appendix A.

From the above data no strong anomaly exists over the geochemical line although pits 8 to 12 show Cu values of 40 to 125 p.p.m. at the elluvial horizons. The bedrock samples show no Cu values of interest although copper mineralisation was observed in the old workings below the geochemical pits. All minerals have been completely leached from surface bedrock leaving a white quartz with small cavities. Geochemistry is therefore of little value for delineating possible ore bodies in geographical and climatic environments similar to the Clump. Additionally, the surface expression of potential ore bodies is likely to be a white, cavernous quartz "gossan."

From Ward (1911) copper minerals were observed only in the region around the Clump Prospect in creek beds where stream erosion had cut down at least 50' below the main peneplain level of the area. It is considered that complete leaching occurred during the period of plantation and only recent erosion has exposed partially leached and gossanous material.

9. DISCUSSION

The copper lodes examined to date extend along seven mile line. Continuity of mineralisation has not been proven, due to the covered nature of the ground. The available information is mainly from wo rkings which have remained untouched for 50 to 60 years.

The mineralisation is a straight chalcopyrite-pyrite type, with mere traces of lead and zinc. Of the workings already examined the Clump Mine is by far the most promising, having a wide zone of mineralisation, yielding local good copper values. The Reward Mine, the Central Mount Balfour Mines and the Blocks shafts have in the past yielded good ore from relatively narrow ore bodies.

Geochemical orientation surveys have been undertaken with poor results and the best tool for locating new and extending knowledge of existing deposits is geophysics, an E.M./I.P. survey being the most promising method of attack.

The regional structure of the copper lodes is not known at present, although locally the mineralisation occurs along shear zones. In order to obtain a fuller understanding of the ore bodies, extensive regional mapping and aerial photo interpretations will be required.

The information obtained to date is sufficiently encouraging to continue and to intensify exploration of the area around the existing copper shows. Currently the area is remote from railheads, electricity and main roads, but in the next three years the Arthur River will be bridged at the Arthur Ferry and south of Smithton, enabling any major ore body to be opened up within reasonable reach of existing ports.

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STREAM SEDIMENT SURVEY

10. INTRODUCTION

A stream sediment geochemical survey was conducted over an area of about 4 square miles, situated immediately west of Balfour townsite within the A.C.I Exploration Licence area (see Plan 5).

The geochemical survey was carried out concurrently with an investigation of the old copper mines present within the sampled area.

11. TOPOGRAPHY AND DRAINAGE

The surveyed area consists of a westward sloping erosion surface overlooked by Mount Balfour and Mount Frankland. The erosion surface has been deeply dissected by numerous small creeks and streams. The main stream of the area is Tin Creek, which occupies a deep bed and flows into the River Frankland, which drains to the sea via the Arthur River. The overall drainage pattern is extremely youthful, although several parts of the Frankland River shown on the north-east corner of Plan 5 have in plan view relatively mature meanders. However, these meanders occupy deep (c 150') valleys and it is considered probable that the Frankland River was originally flowing on the erosion surface and that gradual lowering of the sea level enabled the river to entrench itself without changing its sinuosity. Subsequent erosion of this surface has produced the myriad of small creeks running into Tin Creek or the headwaters of the Nelson River.

12. GEOLOGY

The area consists of steeply dipping argillites with interbedded quartzites and siltstone, (flysch type deposits.) Outcrops are sparse, the whole area being covered by elluvial quartz deposits up to 3' in thickness. Much of the sediment in the streams has been derived from the elluvial deposits and any contribution from the true bedrock, be it mineralised or not, will be very small indeed.

13. SAMPLING

Sample locations were pinpointed on aerial photographs of scale 1" = 750' approx. and are shown on Plan 5. All stream sediment samples were collected from active streams and sieved to obtain a - 80 # fraction which was stored in paper packets. In total 132 stream sediments were collected, together with eight bedrock samples, to give an idea of background mineral values.

14. RESULTS

All samples were analysed for total copper, zinc, lead and nickel, using the rapid Atomic Absorption method, and results are tabulated in Appendix A.

15. DISCUSSION

The only significant geochemical anomaly is in the copper values from samples 01/101 and 104, and can be related in the field to water discharging from abandoned adits along the east side of Emmetts Creek (from the Central Mine.) The lead value of bedrock sample 06/241 is a little higher than normal, but of no major significance. The anomalous zinc values are low but may indicate some mineralisation in the area shown on Plan 5.

The geochemical survey has given little information regarding known copper deposits and has not located any possible new areas of mineralisation. It is very probable that in the area covered by the survey all the stream sediments are derived from the elluvial cover, a transported deposit itself, and therefore the only anomalies will be due to deposition of salts by water, e.g., copper rich water from old adits. *It is therefore concluded that the geochemical survey* has been of little value and future stream sediment surveys should be carried out where the elluvial quartz deposits are absent or where appreciable erosion of bedrock has occurred.

TIN LODE IN MINING LEASE 58M 68

16. INTRODUCTION

In November, 1968, A.C.I. Operations Pty. Ltd. obtained an Exploration Licence (No. 16/68) over 537 square miles in North West Tasmania. This licence excluded several small mining leases located around Balfour townsite (see Plan 6) held by local prospectors.

In the early 1900s the area around Specimen Hill (Plan 6) was worked extensively for elluvial tin and about 1920-40 a local prospector named Barney Williams sank a shaft on the southern side of Specimen Hill and reputedly obtained large specimens of cassiterite from a clayey lode. Restricted trenching of this clayey lode exposed tin bearing clay at two points, some 200' apart. In 1964-66 B.H.P. held the whole of Specimen Hill as a farm-out from a Syndicate of Smithton businessmen who had, in 1958, taken out a 25 square mile Special Mining Licence over Specimen Hill and the adjoining old copper mines. Examination of all B.H.P's geological maps indicated that they had not recognised or investigated the tin lode. Following the break-up of the Smithton Syndicate in 1967, K. Jaeger pegged a lease of 5 acres around the tin bearing clay (see Plan 6) and to date has carried out no work, thus failing to fulfil the labour conditions of the Lease. He gave A.C.I. permission to briefly examine the lease and this section gives the results of a two-day investigation.

17. GEOLOGY

The main topographic features of the area within Jaeger's Lease are shown on Plan 7, based on a rapid tape and compass survey The road shown cutting across the plan was originally a costean cut by B.H.P. but failing in many places to reach bedrock. The surface of the whole area is covered by elluvial deposits up to 5' thick which have been extensively worked for elluvial tin resulting in a very irregular topography.

The sporadic bedrock exposures indicate the area to be underlain by grey-dark shales or mudstones containing numerous thin silt laminar and sporadic siltstone and quartzite bands. The sediments strike between north and east dipping eastward at between 45° and 78°. Slatey cleavage and minor folds have been recorded and the sediments are well jointed.

The "Clay Lode" is exposed in two open cuts, A and B, with details as follows :-

17.1. Cut A.

A face 12' wide trending approximately 070° is exposed consisting of soft clayey material. In the upper centre portion of the face a lens of white clay rich in tin some 1.5' wide is developed, but appears to pinch out with depth.

To the north-east of this central core orange clay with thin tin stringers passes rapidly into decomposed shales. Westward from the white lens orange clays with a few white bands predominate for about 7½' before apparently grading into brown weathered shales.

Samples of the lode beneath the sticky and irregular face were obtained from two auger holes drilled at 45° angle to 120° and 030° respectively. The logs of both bores are given in Appendix B. Borehole 4 drilled to the north-east passed through yellow and orange, locally white, clays with green silty shale bands. On assay, only traces of tin were detected.

The second borehole (No.5) drilled to the southwest passed through orange and white clays with siltstone fragments and the basal 1'3" of the bore white clay with tin. The borehole terminated in this clay. Assay results give the 5'6" - 6'9" intersection an SnO_2 content of 4.8%, the remaining samples containing only traces of tin.

The preliminary investigation of Cut A indicates local zones of tin rich kaolinitic clays within completely decomposed shales. The relationship of the tin rich lens in the upper part of the exposure and the tin rich clay intersection in borehole 5 is obscure and further detailed work is required to elucidate the structure in this area. No complete lode intersection can be determined although a 1' true width assayed 4.8% SnO_2.

17.2. Cut B. This open cut comprises a very narrow, deep trench cut into the side of the hillside overlooking extensive elluvial tin working. The best exposure is in the northern face of the trench where 9" of white clay is exposed in contact with yellow brown disaggregated fine quartzite. The western side of the trench exposes white clay and bores 2 and 3 were drilled into this face at about 45° to 230° and 207° respectively (see Appendix B for details.)

Borehole 2 gave a true intersection of 4.65', assaying 2.4% SnO_2, but Borehole 3 gave a poor intersection, and it is possible that the reef quartz fragments represent a lens within the lode or elluvial deposits present in a deep scour. From overall considerations the lode appears to strike at about 300° and may be continuous with the lode formation recorded in Cut A.

Analyses of white clay from both open cuts indicated a well crystallised kaolinite with minor amounts of quartz. Microscopic analysis also identified small amounts of green tourmaline.

It is concluded tentatively that the clayey lode matter containing good tin values is in fact a decomposed greissen associated locally at least with some sulphide mineralisation (at base of bore 2). The overall implications of the identification suggest the presence in the area of some acidic intrusion which must be at depth as no exposures of such intrusions occurs around Balfour, in fact the nearest granite is 15 miles to the south-west.

18. DISCUSSION

The small lease held by Jaeger contains a tin lode of possible commercial importance and kaolin would be a valuable by-product from tin abstraction. The lateral extent of the lode is unknown but could extend southwards into the A.C.I. licence area. Northwards the lode, if present, occurs in a 40-acre lease held by V.J.Davies, who currently is setting up a plant to treat the elluvial gravels. Further work is required on this tin lode and access to the lease can be obtained by either negotiating favourable option terms or by pegging the lease on non-fulfilment of labour conditions by Jaeger.

THE SAND DUNES

19. INTRODUCTION

The coastal zone of Exploration Licence 16/68 in North-West Tasmania is characterised by extensive sand dunes (see Plan 8), two generations of which were recognised in an earlier preliminary survey (R9039/1/68). Spot sampling of these dunes indicated that the older, fine, non-shelly dunes contained appreciable amounts of heavy minerals, whereas the yellow, shelly dune sands were impoverished in heavy minerals.

Spot sampling of three distinct dunes of the older type when subject to mineral separation and analysis indicated local appreciable tin values and constant minor amounts of chromite. The results were sufficiently encouraging to justify a broad exploratory drilling programme of the dune sands between Temma and the Arthur River.

20. GEOLOGY

20.1. General Geology. The distribution of the sand dunes between Temma and the Arthur River are shown in plan 8, together with the main rivers, creeks and bush tracks. The sand dunes vary in elevation from a few feet to about one hundred feet above the base level resting on steeply dipping Pre-Cambrian sediments.

20.2. Drilling Programme. A total of 65 auger holes were drilled over the sand dunes at locations shown on Plan 8 to a maximum depth of 30'. The total footage drilled was 1380' and bulk samples were taken over adequate intervals, quartered on site and suitable amounts bagged and forwarded to Sydney for analysis.

20.3. Detailed Geology. The drill logs for all the auger holes are presented in Appendix C. Between Temma and Sandown Creek (see Plan 8) two visually distinct dune sands were recognised, a light grey, fine grained sparingly shelly sand and a younger light grey-yellow, orange flecked, fine grained shelly sand. The surface division between these two sand types is shown on Plan 8, the more shelly sand occurring on the seaward side of the dunes. In places such as Rebecca Lagoon and the Nelson River the younger dunes extend for a considerable distance inland probably concealing at depth remnants of the older dunes.

Relatively few auger holes were drilled between Sundown Creek and the Arthur River as previous work has shown a paucity of heavy minerals in the very extensive sand dunes (plan 8). Drilling and field panning along a line parallel to the coast-line indicated that immediately north of Sundown Creek the dune sands were fine grained, sparingly shelly with about 1% heavy minerals. Continuing northwards the sands become gradually coarser and more shelly with an apparent fall off in heavy mineral content.

Additionally, several peaty horizons were proved although little differences were apparent in sand character across these bands.

South of Temma the dune sands are medium grained, yellowish in colour, and contain appreciable shelly debris and very little heavy mineral. In view of these factors only limited drilling was carried out in this area.

21. EXPERIMENTAL WORK

A complete list of samples obtained from the auger holes is given in Appendix C.

21.1. Heavy Mineral Separation. Each field sample on arrival in the Laboratory was dried and riffled to give a representative sample of approximately 100 grams. The heavy minerals were separated from this sample using bromoform (S.G.2.85) and the heavy mineral content of all the analysed samples are expressed as a percentage on plan 8.

21.2. Microscopic Analysis. All the heavy mineral fractions were mounted on slides with Lakeside 70 and the mineral components determined by grain counts (500 - 700 grains identified per slide.) The following minerals were identified :-

Andalusite, zircon, rutile, tourmaline, carbonate (as shell), garnet, chromite, ilmenite and leucoxene,

and the percentages of each of these components in the heavy mineral fraction are detailed in Appendix C.

A few chromite grains were positively identified but the ilmenite content may reflect the ilmenite plus chromite content of the dune sands.

21.3. Magnetic Separation. Wilfley table concentrates were obtained from bulked sample of boreholes 35 - 39 inclusive, and passed through a magnetic separator. The following fractions were obtained :-

Non-magnetic, moderately magnetic and strongly magnetic.

The magnetic fractions were assayed for TiO_2, Fe_3O_3 and Cr_2O_3.

22. RESULTS

22.1. Heavy Mineral Distribution. The heavy mineral content of the samples analysed varies from 0.1% to 2.2% and is presented on plan 8. The old, sparingly shelly dunes sands contain between 0.25% and 2.22% of heavy minerals with the majority of samples running 0.5%. A variation in heavy mineral content of 0.1% - 0.54% occurs in the newer dune sands only one sample being 0.5%. Although there is a slight overlap in heavy mineral values for the two sand dune types, the data obtained support the conclusion that, in the area between Temma and Sundown Creek two distinct sand dune types exist.

22.2 Composition of the Heavy Mineral Fraction. Details of all the grain counts are presented in Appendix C.

22.2.1. Cassiterite. No cassiterite was recognised during grain counts and 47 heavy mineral concentrates from boreholes 2, 9, 11, 15, 35, 37, 38, 39, 43, 47, 51, 52, 55 and 57 were assayed for SnO_2 value of 1.8% in the heavy mineral fraction (A.C.I. Technical Centre Report 9039/1/68).

In view of the disappointing SnO_2 values in the new boreholes, the heavy mineral samples from Tas. 15 were re-analysed, giving an SnO_2 value of 0.005% Subsequent investigation showed that the original sample of Tas 15 sent for analysis was obtained from tabling a large sample of dune sand. Prior to the dune sand test the table had been used to treat a high SnO_2 bearing alluvial sand.

It is certain that the 1.8% SnO_2 in the tabled heavy minerals of Tas 15 was due to contamination resulting from careless operation of the Wilfey table by the Mineral Processing Laboratory.

22.2.2. Zircon and Rutile. Zircon and Rutile are very minor components of the heavy minerals (5%) and of no economic significance unless as by-products from a beneficiation plant.

22.2.3. Ilmenite. Ilmenite is an important component of all the heavy mineral samples varying from 20% - 45% of the total heavy mineral. In grain counts it was not possible to distinguish separately ilmenite and chromite and bulked samples from boreholes 35, 36, 37, 38 and 39, which show the heavy mineral concentrations, were tabled.

The resulting heavy minerals were treated in a magnetic separator and the strongly and moderately magnetic fractions obtained. The assays of these are shown in Appendix B.

The strongly magnetic fraction consists mainly of a high TiO_2 ilmenite with an appreciable chrome and chromite content. The moderately magnetic fraction also contains some 30% of ilmenite with a similar chemical composition. The high Cr_2O_3 value renders the ilmenite of little commercial importance.

22.2.4 Other Minerals. Tourmaline varies between 11% and 37% and leucoxene between 5% and 15% of the heavy minerals. Garnet, mafic minerals, and shell fragments comprise the remainder of the heavy minerals but none of these minerals has any economic value.

23. DISCUSSION

The heavy mineral content of the majority of the dune sands examined is low and the most prospective dune area lies to the south of Sardine Creek. Boreholes 35 - 39 inclusive were drilled in this dune, the results of which are summarised in Appendix C. The mean heavy mineral content of this dune is 1.11% consisting of 33% andalusite, 27% ilmenite + chromite, 18% zircon and 1.6% rutile, with outlined sand reserves of about 2 million tons.

A market survey carried out by the Melbourne Office indicated that demand for andalusite is very low in Australia and Overseas markets are already satisfied by supplies from nearby sources. Additionally the price of andalusite is low at $24.5 per ton and therefore this mineral is of little commercial value as a heavy mineral component of dune sands. It is concluded that the heavy mineral content of the sand dunes is of no commercial value.

24. REFERENCE

R9039/1/68 - Corporate Exploration of Tasmanian Mineral Resources. Progress R port H.G.Davies 9 pp.

Longman, M.J., and Mathews, W.L., 1962, - Geology of the Bluff Point and Tiowutta Quadrangles. Tas.Dept. Min. Tech. Report 6 1961. pp.48-54.

Ward, L.K., 1911, The Mount Balfour Mining Field, Geol. Surv.Bull.10. Tas. Min. Dept. 165 pp.

APPENDIX A - GEOCHEMICAL RESULTS.

1. REWARD MINE

PIT NO.	HORIZON	Cu ppm	Zn ppm	Pb ppm	Ni ppm
1	Soil S	105	5	15	5
	Elluvium E	Lost			
	Bedrock B	50	5	15	5
2	S	1350	10	70	5
	E	270	5	15	5
	B	60	5	15	5
3	S	430	5	15	5
	E	270	5	15	5
	B	60	5	15	5
4	S	375 720	5	15	5
	E	155 170	5	15	5
	B	50	5	15	5
5	S	390	5	15	5
	E	220	5	15	5
		35 95	5	15	5
6	S	450	5	15	5
	E	100			
	B	55			
7	S	55	5		
	E	35			
	B	35			
8	S	55			5
	E	35			
	B	70	5	35	5
9	S	50	5		
	E	35			
	B	25			
10	S	20			
	E	30		20	5
	B	25	5	35	

APPENDIX A

PIT NO.	HORIZON	Cu ppm	Zn ppm	Pb ppm	Ni ppm
11	S	80			
	E	90	5		
	B	35	15		5
12	S	110	5		
	E	40			
	B	20			
13	S	30	5		
	E	30			
	B	20			
14	S	45	5		
	E	20			
	B	25			
15	S	40			
	E	25			
	B	30	15	25	5
16	S	80	10		
	E	60 10	5	20	5
	B	45	10	20	5
17	S	70			
	E	40			
	B	25	5		5
18	S	40			
	E	35	5		
	B		NO SAMPLE OBTAINED		

NOTE: Where no figures quoted Zn <5 p.p.m., Pb <15 p.p.m., Ni <5 p.p.m.

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APPENDIX "A"

2. CLUMP MINE

Pit No.	Horizon	Geochemical Results			
		Cu ppm.	Zn ppm	Pb ppm	Ni ppm
1	Soil (S)	5	< 5	<15	< 5
	Eluvation (E)	40	5	<15	< 5
	Bedrock (B)	<10	< 5	<15	< 5
2	S	10	15	<15	< 5
	E	15	5	<15	< 5
	B	<10	< 5	110	< 5
3	S	< 5	< 5	<15	
	E	10	< 5	<15	< 5
	B	<10	< 5	<15	< 5
4	S	< 5	< 5	<15	< 5
	E	25	10	<15	< 5
	B	10	< 5	<15	< 5
5	S	< 5	< 5	<15	< 5
	E	-	-	-	< 5
	B	<10	< 5	<15	< 5
6	S	< 5	10	<15	< 5
	E 1	10	< 5	<15	< 5
	E 2	<10	< 5	<15	< 5
7	S	< 5	< 5	<15	< 5
	E	<10	< 5	<15	< 5
	B	<10	< 5	<15	< 5
8	S	5	5	<15	< 5
	E	90	30	<15	< 5
	B	<10	< 5	<15	< 5
9	S	10	10	<15	< 5
	E	125	35	<15	< 5
	B	<10	< 5	<15	< 5
10	S	5	10	<15	< 5
	E	25	5	<15	< 5
	B	<10	< 5	<15	< 5
11	S	5	< 5	<15	< 5
	E	40	10	<15	< 5
	B	<10	< 5	<15	< 5
12	S	15	10	<15	< 5
	E	95	25	<15	< 5
	B	<10	< 5	<15	< 5
13	S	15	15	15	< 5
	E	40	10	<15	< 5
	B	<10	< 5	<15	< 5
14	S	< 5	< 5	15	< 5
	E	20	10	<15	< 5
	B	<10	< 5	<15	< 5

2. CLUMP MINE (cont.)

Pit No.	Horizon	Geochemical Results Cu ppm.	Zn ppm	Pb ppm	Ni ppm
15	S	10	< 5	<15	< 5
	E	50	15	<15	< 5
	B	<10	< 5	<15	< 5
16	S	< 5	< 5	<15	< 5
	E	20	5	<15	< 5
	B	<10	< 5	<15	< 5
17	S	< 5	< 5	<15	< 5
	E	60	20	<15	< 5
	B	<10		<15	< 5
18	S	< 5	25	<15	< 5
	E	60	65	<15	< 5
	B	<10	< 5	<15	< 5

3. STREAM SEDIMENT RESULTS.

SAMPLES:

01/10-34	06/101
01/36-53	06/216
01/55-90	06/221
01/200-240	06/227
01/101-104	06/230
	06/237
	06/239
	06/240-1

All samples contained:

Ni	< 5 ppm	Pb	<15 ppm.
Cu	< 5 ppm	Zn	< 5 ppm.

with the following exceptions:-

Sample No.	Ni (ppm)	Sample No.	Cu (ppm)	Sample No.	Zn (ppm)
06/101	10	01/104	350	01/201	15
		06/101	40	01/204	15
	Pb (ppm)	06/215	24	01/205	10
06/241	285	06/239	10	01/240	30
		06/241	10	01/101	10
	Cu (ppm)			01/102	10
01/200	15		Zn (ppm)	06/101	20
01/241	10	01/42	15	06/215	50
01/101	440	01/51	20		
01/102	40	01/200	20		

APPENDIX B - ASSAY RESULTS.

1. Copper Assays from Clump Mine.

	% Cu	% Zn.	%Pb.
Dump A	13.3	0.004	-
Dump B	0.77	0.010	-
318'	0.17	0.006	0.01
324.3'	0.069	0.019	-
327'	0.61	0.010	
329.2'	1.0	0.004	
332.8'	Shale		
334.4'	1.7	0.003	0.19
335'	1.6	0.006	-
336'	3.4	0.010	-
337'	0.71	0.008	
339'	0.019	0.006	
341'	3.2	0.007	
345'	0.11	0.007	
347'	Shale		
349'	0.084	0.003	
352'	Trace		

All adit samples were taken from leached walls of working and distance are measured from portal.

APPENDIX "B"

2. TIN BORE HOLE. LOGS AND ASSAYS

B.H.4. Angle 45° to 030°.

		SnO_2
Brown soil fill and rubble.	0 - 6'	
Yellow-orange sticky clay with irregular bands, blebs and wispy laminae of greeny grey shaley clay	6' - 4'0	<0.1%
Interbanded white and orange clay	4'0"- 5'3"	0.3%

B.H. 5. Angle 45° to 120°

		SnO_2
White and orange sticky clay	0 - 3'	<0.1%
Orange clay and hard grey siltstone fragments	3' - 4'6"	<0.1%
Orange and white clay passing down into clay with siltstone fragments	4'6"-5'6"	
White clay becoming pink with depth	5'6"-6'9"	4.8%

Best intersection 1' + 4.8% SnO_2

B.H. 2 Angle 45° to 230°.

		SnO_2
Exposed face 9" white clay		4.06%
White sticky clay with tin	0- 3'	3.05%
White sticky clay becoming yellowed passing down into disaggregated yellow-brown sand in basal 9 inch.		
Dark greeny grey massive friable weathered sulphide with abundant pyrites	4'6"-5'0"	0.4%

Approximate True Width of load 4.65"

Mean SnO_2 content 2.4%

B.H. 3. Angle 45° to 207°.

White light-grey sticky clay	0 - 6"	
Reef quartz fragments set in a sticky white clay matrix	6" - 3'	

No analyses run.

APPENDIX C - DUNE SANDS.

1. Auger hole sample list.

B/H	Depth.	Analysis
D.1	0"- 3'9" 3'0" - 10'0" 10'0" - 20'0" 20'0" - 21'9"	Heavy Mineral Evaluation 1 sample
D.2	2'6"- 5'0") 5'0" - 10'0") 10'0" - 15'0") 15'0" - 20'0") 20'0" - 25'0") 25'0" - 30'0")	A Heavy Mineral Evaluation 6 samples
D.3	1" - 5'0" 5'0" - 10'0" 10'0" - 13'0"	B Heavy Mineral Evaluation 3 samples
D.4	0" - 3'0") 3'0" - 10'0") 10'0" - 15'0") 15'0" - 20'0") 20'0" - 22'6")	A Heavy Mineral Evaluation 5 samples
D.5	6" - 5'0" 5'0"-9'0"	None
D.6	1' - 5'0" 5'0" - 10'0" 10'0" - 15'0" 15'0" - 20'0" 20'0" - 25'0" 25'0" - 28'0"	A Heavy Mineral Evaluation 6 samples
D.7	1' - 5'0" 5'0" - 10'0" 10'0"-15'0" 15'0" - 19'0"	A Heavy Mineral Evaluation 4 samples
D.8	No samples	-
D.9	0' - 3'0" 3'0"-10'0" 10'0" - 15'0" 15'0" - 20'0" 20'0" - 25'0"	A Heavy Mineral Evaluation 5 samples.
D.10	0' - 5'0" 5'0" - 10'0" 10'0" - 15'0"	B Heavy Mineral Evaluation 3 samples
D.11	1' - 5'0" 5'0" - 10'0" 10'0" - 15'0" 15'0" - 20'0" 20'0" - 25'0" 25'0" - 30'0"	A Heavy Mineral Evaluation 6 samples
D.12	1' - 5'0" 5'0" - 10'0" 10'0" - 11'6" 11'6" - 14'0" 14'0" - 20'0" 20'0" - 25'0"	A Heavy Mineral Evaluation 6 samples
D.13	1' - 5'0" 5'0" - 10'0" 10'0" - 15'0" 15'0" - 20'0" 20'0" - 25'0" 25'0" - 30'0"	B Heavy Mineral Evaluation 6 samples
D.14	2'0" - 5'0" 5'0" - 10'0" 10'0" - 15'0" 15'0" - 20'0" 20'0" - 25'0"	A Heavy Mineral Evaluation 5 samples

B/H	Depth.	Analysis.
D.15	1'6" - 5'0" 5'0" - 10'0" 10'0" - 15'0" 15'0" - 20'0" 20'0" - 25'0" 25'0" - 30'0"	A Heavy Mineral Evaluation 6 samples
D.16	0" - 6'0" 6'0" - 11'0"	B Heavy Mineral Evaluation 2 samples.
D.17	0" - 5'6" 5'6" - 7'6" 7'6" - 10'0" 10'0" - 15'0" 15'0" - 20'0" 20'0" - 25'0"	B Heavy Mineral Evaluation 6 samples.
D.18	1' - 5'0" 5'0" - 10'0" 10'0" - 15'0" 15'0" - 20'0"	A Heavy Mineral Evaluation 4 samples.
D.19	0" - 5'0" 5'0" - 10'0" 10'0" - 20'0"	A Heavy Mineral Evaluation 1 sample
D.20	1' - 10'0" 10'0"- 20'0"	Hold
D.21	1' - 15'	A Heavy Mineral Evaluation 1 sample
D.22-25	No samples.	
D.26	1' - 10'0" 10'0"- 17'0" 17'0" - 25'0" 25'0" - 30'0"	A Heavy Mineral Evaluation 4 samples.
D.27	1' - 10'0" 12'6" - 20'0" 20'0" - 25'3"	A Heavy Mineral Evaluation 4 samples
D.28	1' - 5'0" 5'0" - 10'0" 10'0" - 15'0" 15'0" - 20'0" 20'0" - 25'0" 25'0" - 27'3"	A Heavy Mineral Evaluation 6 samples
D.29	1' - 5'0" 5'0" - 10'0" 10'0" - 15'0" 15'0" - 20'0" 20'0" - 25'0"	A Heavy Mineral Evaluation 5 samples
D.30	0 - 5'0" 5'0" - 10'0" 10'0" - 13'0" 13'0" - 16'0" 16'0" - 20'0" 20'0" - 25'0"	B Heavy Mineral Evaluation 6 samples
D.31	1' - 5'0" 5'0" - 10'0" 10'0" - 15'0" 15'0" - 20'0"	B Heavy Mineral Evaluation 4 samples
D.32	1' - 5'0" 5'0" - 10'0" 10'0" - 15'0" 15'0" - 20'0" 20'0"-24'0"	
D.33	0 - 5'0" 5'0" - 10'0" 10'0" - 15'0" 15'0" - 20'0"	A Heavy Mineral Evaluation 4 samples
D.34	1' - 10' 10' - 20'	Hold

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APPENDIX C.

B/H	Depth.	Analysis
D.35	0 - 5'0" 5'0" - 10'0" 10'0" - 15'0" 15'0" - 20'0" 20'0" - 25'0" 25'0" - 30'0"	A Heavy Mineral Evaluation 6 samples
D.36	6" - 5'0" 5'0" - 10'0" 10'0" - 15'0" 15'0" - 20'0" 20'0" - 25'0" 25'0" - 30'0"	B Heavy Mineral Evaluation 6 samples
D.37	0' - 5'0" 5'0" - 10'0" 10'0" - 13'0" 13'0" - 16'0" 16'0" - 20'0" 20'0" - 25'0"	A Heavy Mineral Evaluation 6 samples
D.38	0 - 5'0" 5'0" - 10'0" 10'0" - 17'0"	A Heavy Mineral 3 samples
D.39	0' - 5'6" 5'6" - 10'0" 10'0" - 15'0" 15'0" - 20'0" 20'0" - 25'0" 25'0" - 30'0"	A Heavy Mineral Evaluation 6 samples
D.40	1' - 5'0" 5'0" - 10'0" 10'0" - 15'0" 15'0" - 20'0" 20'0" - 25'0"	A Heavy Mineral Evaluation 5 samples
D.41	0' - 5'0" 5'0" - 10'0" 10'0" - 15'0" 15'0" - 20'0" 20'0" - 25'0" 25'0" - 30'0"	A Heavy Mineral Evaluation 6 samples
D.42	0' - 5'0" 5'0" - 11'6" 11'6" - 15'0"	B Heavy Mineral Evaluation 3 samples
D.43	0' - 5'0" 5'0" - 11'6" 11'6" - 16'9" 16'0" - 25'0"	A Heavy Mineral Evaluation 4 samples
D.44	1'6" - 5'6"	Hold
D.45	5'0" - 10'0" 10'0" - 15'0" 15'0" - 20'0" 20'0" - 25'0"	A Heavy Mineral Evaluation 4 samples
D.46	Tas.19	
D.47	0' - 5'0" 5'0" - 10'0" 10'0" - 15'0" 15'0" - 20'0" 20'0" - 25'0"	A Heavy Mineral Evaluation 5 samples
D.48	1' - 5'0" 5'0" - 15'0" 15'0" - 25'0"	Hold
D.49	2' - 10'0" 10'0" - 17'6" 17'6" - 25'0"	A Heavy Mineral Evaluation 3 samples

B/H	Depth	Analysis	B/H	Depth	Analysis
D.50	2' - 10'0" 10'0" - 20'0"	B Heavy Mineral Evaluation 2 samples.	D.58	6" - 8'6" 8'6" - 16'6" 16'6" - 25'0"	B Heavy Mineral Evaluation 3 samples
D.51	3'6" - 10'0" 10'0" - 15'0" 15'0" - 20'0" 20'0" - 22'6"	A Heavy Mineral Evaluation 4 samples	D.59	1' - 9'0" 9'0" - 14'6" 14'6" - 17'6" 17'6" - 24'9"	A Heavy Mineral Evaluation 4 samples
D.52	0' - 5'6" 5'6" - 7'6" 7'6" - 15'0" 15'0" - 22'6" 22'6" - 30'0"	A Heavy Mineral Evaluation 5 samples	D.60	6" - 8'6" 8'6" - 17'0" 17'0" - 24'3"	B Heavy Mineral Evaluation 3 samples
D.53	2'6" - 7'6" 7'6" - 15'0" 15'0" - 18'6"	B Heavy Mineral Evaluation 3 samples	D.61	6" - 8'6" 8'6" - 17'0" 17'0" - 23'9"	A Heavy Mineral Evaluation 3 samples
D.54	0' - 10'3" 10'3" - 14'9" 14'9" - 22'6" 22'6" - 30'0"	B Heavy Mineral Evaluation 4 samples	D.62	2' - 10'0" 10'0" - 17'6" 17'6" - 23'4"	B Heavy Mineral Evaluation 3 samples
D.55	0' - 5'6" 5'6" - 15'0" 15'0" - 25'0"	A Heavy Mineral Evaluation 3 samples	D.63	2'1" - 5'3" 5'3" - 7'6" 7'6" - 12'0" 12'0" - 19'0" 19'0" - 25'0"	A Heavy Mineral Evaluation 5 samples
D.56	0' - 8'0" 8'0" - 16'6" 16'6" - 25'0"	A Heavy Mineral Evaluation 3 samples	D.64	0' - 8'6" 8'6" - 17'0" 20'0" - 25'0"	B Heavy Mineral Evaluation 3 samples
D.57	6" -8'0" 8'0" - 12'0" 12'0" - 15'6" 15'6" - 20'0" 20'0" - 25'0"	A Heavy Mineral Evaluation 5 samples	D.65	0' - 10'0" 10'0" - 20'0"	A Heavy Mineral Evaluation 2 samples

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APPENDIX C

2. Heavy Minerals - Quantitative Evaluation

B/H.	Depth	% Heavies	Andalusite	Zircon	Cassiterite	Tourmaline	Rutile	Ilmenite	Chromite	Garnet	Shell	Mafics	Leucoxene
D.1	10'0"-20'0"	0.108	26.5			12.9	+	8.2		+	41.2	+	11.2
D.2	2'6"-5'0"	1.168	51.1	3.3		13.1	+	19.		+	2.6	+	10.9
	5'0"-10'0"	0.812	41.5	3.0		19.6	+	15.8		+	4.5	+	15.5
	10'0"-15'0"	1.085	45.7	2.4		12.7	2.4	24.1	+	2.4	3.8	+	6.5
	15'0"-20'0"	0.969	39.5	+		20.6	+	23.3	+	2.1	5.3	+	9.1
	20'0"-25'0"	0.963	45.8	1.1		16.6	.8	21.2	+	1.9	3.2	+	9.4
	25'0"-30'0"	0.793	38.9	2.3		14.3	.8	22.3	+	2.1	6.8	+	12. 5
D.4	0' - 3'0"	0.375	35.7	3.0		13.8	1.8	28.8		1.5	3.7	+	11.7
	3' -10'0"	0.749	37.7	3.1		12.8	+	14.3		2.5	20.9	+	8.7
	10;0"-15'0"	0.566	26.9	4.2		15.9	1.2	24.3	+	3.0	16.9	+	7.5
	15'0"-20'0"	0.697	30.3	3.3		11.7	1.3	28.3	+	1.7	13.9	+	9.3
	20'0"-22/6"	0.640	35.8	2.7		12.3	1.4	29.6	+	2.5	7.2	+	8.3
	1' - 5'0	0.824	43.5	1.8		16.2	1.1	22.8		2.8	1.4		10.3
D.6	5'0"-10'0"	0.665	42.2	1.5		14.3	0.8	24.1	+	2.9	2.6	+	11.4
	10'0"-15'0"												
	15'0'-20'0	0.700	35.1	2.1		15.3	1.4	31.0	+	2.4	2.5	+	10.0
	20'0"-25'0"	0.840	39.7	1.3		15.3	0.9	26.5	+	2.3	5.2	+	8.7
	25'0"-28'0"	0.773	34.9	1.5		15.1	1.7	30.7	+	3.2	2.0	+	10.9
D.7	1' - 5'0"	0.652	41.2	1.1		16.4	1.2	22.5	+	3.1	5.8	+	8.6
	5'0"-10'0"	0.766	40.2	1.1		17.1	0.7	21.5	+	1.6	9.2	+	8.5
	10'0"-15'0"	0.467	38.3	1.6		21.3	1.3	19.7	+	2.1	7.8	+	7.8
	15'0"-19'9"	0.732	36.3	0.9		19.4	0.8	19.7	+	2.1	11.6	+	9.2
D.9	0' - 3'0"	0.583	28.7	2.1		18.5	0.4	31.1	+	4.5	7.1	+	7.6
	3'0"-10'0"	0.860	28.5	1.9		19.0	1.6	21.1	+	2.5	18.9	+	6.4
	10'0"-15'0"	0.877	25.1	1.1		19.7	0.7	25.6	+	2.6	17.9	+	7.3
	15'0"-20'0"	1.181	30.0	0.9		23.5	0.8	16.2	+	2.8	19.1	+	6.6
	20'0"-25'0"	0.886	32.9	0.8		19.4	0.3	20.1	+	2.6	17.1	+	6.9
D.11	1' - 5'0"	0.688	27.6	1.7		27.2	1.1	25.2	+	2.6	6.1	+	8.5
	5'0"-10'0"	1.021	36.1	0.9		23.3	0.5	20.0	+	2.0	9.5	+	7.6
	10'0"-15'0"	0.723	36.4	0.9		23.3	0.9	15.9	+	2.4	10.7	+	8.5
	15'0"-20/0"	0.742	36.9	1.1		20.1	1.1	19.2	+	3.2	9.5	+	8.7
	20'0"-25'0"	0.929	36.0	1.1		17.9	1.7	26.0	+	2.4	7.4	+	7.4
	25'0"-30'0"	0.780	34.1	0.9		24.5	0.7	19.3	+	2.0	9.3	+	9.3

2. Heavy Minerals - Quantitative Evaluation

B/H	Depth	% Heavies	Andalusite	Zircon	Cassiterite	Tourmaline	Rutile	Ilmenite	Chromite	Garnet	Shell	Mafics	Leucoxene
D.12	1' - 5'0"	0.325											
	5'0"-10'0"	0.368											
	10'0"-11'6"	0.432											
	11'6"-14'0"	0.328											
	14'0"-20'0"	0.660											
	20'0"-25'0"	0.448											
D.14	2'0" - 5'0"	0.556	26.2	2.7		18.4	2.0	36.3	+	3.2	3.1	+	8.0
	5'0"-10'0"	0.784											
	10'0"-15'0"	0.768	33.0	1.1		18.9	2.5	29.8	+	2.6	5.3	+	6.7
	15'0"-20'0	0.847	34.5	1.7		19.2	1.3	23.2	+	2.9	8.0	+	9.2
	20'0"-25.0"	1.020	31.9	1.4		16.5	2.4	30.5	+	3.1	6.4	+	7.8
D.15	1'6"-5' 0"	1.185	24.1	1.7		23.6	1.9	35.1	+	3.0	2.0	+	8.6
	5'0"-10'0"	0.553	35.3	0.9		24.0	0.6	20.3	+	3.4	6.0	+	9.3
	10'0"-15'0"	0.836	28.9	2.4		16.0	2.5	38.7	+	3.1	3.7	+	4.5
	15'0"-20'0"	1.545	28.7	2.0		19.3	2.0	35.4	+	3.4	3.1	+	6.1
	20'0"-25'0"	0.700	31.1	1.8		20.5	1.5	27.2	+	3.4	7.0	+	7.3
	25'0"-30'0"	0.822	27.6	1.4		21.0	1.0	31.4	+	3.4	7.4	+	6.7
D.18	1' - 5'0"	0.216											
	5' - 10'0"	0.365											
	10'0"-15'0"	0.385											
	15'0"-20'0"	0.368											
D.19	0' - 5'0"												
	5'0"-10'0"	0.467											
	10'0"-20'0"												
D.21	1' - 15'0"	0.311											
D.26	0' - 10'0	0.538											
	10'0"-17'0"	0.281											
	17'0"-25'0"	0.222											
	25'0"-30'0"	0.340											
D.27	1' - 10'0"	0.185											
	10'0"-12'6"												
	12'6"-20'0"	0.406											
	20'0"-25'3"	0.407											

APPENDIX C.

2. Heavy Minerals - Quantitative Evaluation

B/H.	Depth	% Heavies	Andalusite	Zircon	Cassiterite	Tourmaline	Rutile	Ilmenite	Chromite	Garnet	Shell	Mafics	Leucoxene
D.28	1' - 5'0"	0.494											
	5'0"-10'0"	0.451											
	10'0"-15'0"	0.557											
	15'0"-20'0"	0.641											
	20'0"-25'0"	0.427											
	25'0"-27'3"	0.372											
D.29	1" - 5'0"	0.383											
	5'0"-10'0"	0.334											
	10'0"-15'0"	0.304											
	15'0"-20'0"	0.279											
	20'0"-25'0"	0.264											
D.33	0' - 5'0"	0.648	32.6	1.3		21.1	1.1	23.4	+	2.4	9.2	+	8.8
	5'0"-10'0"	0.613	32.5	1.1		20.5	1.5	29.0	+	2.4	5.0	+	7.9
	10'0"-15'0"	0.742	36.5	1.2		22.0	1.4	23.9	+	2.0	2.4	+	10.7
	15'0"-20'0"	0.647	31.9	0.9		19.1	1.2	29.4	+	2.5	4.3	+	10.7
D.35	0' - 5'0"	2.220	34.4	1.5		16.0	1.0	26.0	+	1.9	4.4	+	14.7
	5'0"-10'0"	2.193	23.5	5.1		13.1	3.8	43.8	+	3.7	1.6	+	5.4
	10'0"-15'0"	1.173	26.8	2.7		15.9	3.3	34.4	+	4.3	2.4	+	10.0
	15'0"-20'0"	0.835	31.7	1.3		20.3	1.9	24.2	+	3.5	3.8	+	13.2
	20'0"-25'0"	0.855	33.0	1.3		21.3	1.3	22.5	+	3.7	4.2	+	12.7
	25'0"-30'0"	0.657	30.1	1.5		21.8	0.9	29.3	+	3.6	3.3	+	9.3
D.37	0' - 5'0"	0.768	32.5	1.6		18.0	1.3	30.1	+	2.6	3.5	+	10.4
	5'0"-10'0"	0.718	34.4	1.0		20.4	1.0	21.2	+	2.0	7.1	+	12.8
	10'0"-13'0"	0.584	32.5	1.2		19.8	0.9	23.9	+	2.9	6.7	+	12.0
	13'0"-16'0"	1.170	21.4	3.9		13.2	2.7	41.0	+	3.3	3.5	+	10.9
	16'0"-20'0"	1.465	26.1	3.0		14.6	2.4	35.6	+	2.6	4.8	+	10.9
	20'0"-25'0"	1.460	32.2	1.7		18.2	1.8	29.8	+	4.7	2.9	+	8.7
D.38	0' - 5'0	0.944	35.7	1.1		18.0	1.8	30.2	+	2.3	3.2	+	7.6
	5'0"-10'0"	0.896	37.4	1.8		20.3	1.4	22.0	+	2.6	4.7	+	9.8
	10'0"-17'0"	0.991	39.5	0.6		18.3	1.7	26.1	+	2.9	3.4	+	7.5
D.39	0' - 5'6"	0.707	34.5	1.6		21.0	1.6	34.5	+	1.8	4.3	+	9.5
	5'6"-10'0"	1.286	30.9	2.2		19.2	2.4	32.7	+	3.2	3.1	+	6.4

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APPENDIX C.

2. Heavy Minerals - Quantitative Evaluation

B/H	Depth	% Heavies	Andalusite	Zircon	Cassiterite	Tourmaline	Rutile	Ilmenite	Chromite	Garnet	Shell	Mafics	Leucoxene
D.39	10'0"-15'0	0.589	34.9	1.0		16.6	1.2	17.3	+	2.1	14.5	+	12.4
cont.	15'0"-20'0	1.149	34.8	1.0		21.4	1.4	19.7	+	1.5	8.1	+	12.0
	20'0"-25'0	1.665	32.0	2.2		20.3	1.3	29.5	+	3.6	2.9	+	8.3
	25'0"-30'0	1.170	31.9	2.2		20.3	2.3	28.8	+	3.8	3.0	+	7.6
D.40	1' - 5'0"	0.292											
	5'0"-10'0	0.196											
	10'0"-15'0	0.370											
	15'0-20'0	0.301											
	20'0"-25'0	0.380											
D.41	0' - 5'0	0.436											
	5'0"-10'0"	0.305											
	10'0"-15'0	0.776											
	15'0"-20'0	0.597											
	20'0"-25'0	0.519											
	25'0"-30'0	0.501											
D.43	0' - 5'0	0.422											
	5'0"-11'6"	0.402											
	11'6"-16'9	0.714											
	16'9"-25'0	0.707											
D.45	5'0"-10'0"	0.430											
	10'0"-15'0	0.504											
	15'0"-20'0	0.340											
	20'0"-25'0	0.308											
D.47	0' -5'0	0.666	34.2	1.5		22.1	1.3	24.9	+	3.7	2.7	+	9.5
	5'0"-10'0												
	10'0"-15'0	0.803	33.4	1.7		22.6	1.5	24.2	+	3.8	5.1	+	7.5
	15'0-20'0	0.986	34.4	1.2		20.6	0.8	25.4	+	3.6	4.9	+	9.1
	20'0"-25'0	1.687	31.6	1.2		23.0	1.3	22.5	+	3.1	5.3	+	11.9
D.49	2' - 10'0	0.353											
	10'0-17'6"	0.293											
	17'6-25'0"	0.245											

APPENDIX C.

2. Heavy Minerals - Quantitative Evaluation

B/H	Depth	% Heavies	Andalusite	Zircon	Cassiterite	Tourmaline	Rutile	Ilmenite	Chromite	Garnet	Shell	Mafics	Leucoxene
D.51	3'6"-10'0"	0.702	39.1	1.4		18.0	1.0	22.5	+	3.2	6.1	+	11.4
	10'0-15'0	1.049	38.7	1.0		19.5	1.9	21.0	+	2.1	5.4	+	10.4
	15'0-20'0	1.067	39.6	1.0		20.3	1.1	11.5	+	2.9	4.0	+	8.6
	20'0"-22/6"	0.633	38.4	1.2		22.2	1.5	20.7	+	2.5	5.3	+	8.2
D.52	0' - 5'6"	0.688	36.9	1.0		22.8	1.0	14.7	+	2.0	7.1	+	14.5
	5'6"-7'6"	0.768	30.6	0.8		23.1	1.5	28.2	+	3.0	3.6	+	11.3
	7'6"-15'0	0.669	39.3	1.3		26.3	1.3	13.3	+	1.7	5.3	+	11.3
	15'0"-22.6"	0.763	38.3	0.5		26.7	0.7	11.6		2.9	7.2	+	12.1
	22'6"-30'0"	0.819	38.5	1.4		22.4	0.8	17.8	+	3.2	6.6	+	9.2
D.55	0' - 5'6"	1.796	16.0	5.6		10.6	2.9	55.6	+	3.1	1.0	+	5.1
	5'6" - 15'0"	1.226	26.7	0.8		24.4	1.5	27.7	+	3.0	4.3	+	11.5
	15'0" - 25'0	1.253	21.0	2.3		19.4	3.1	37.6	+	3.1	3.7	+	9.6
D.56	0' - 8'0"	0.739	26.8	1.2		24.1	1.2	26.0	+	2.9	6.6	+	11.1
	8'0 - 16'6"	0.578	30.7	1.6		23.0	1.3	23.5	+	2.9	4.9	+	11.9
	16'6"- 25'0"	0.507	30.4	1.5		25.0	0.9	22.3	+	2.8	4.5	+	12.5
D.57	6" - 8'0"	0.445	32.7	1.0		19.6	2.1	22.2	+	2.7	6.3	+	13.3
	8'0"-12'0	0.523											
	12'0- 15'6"	0.774	23.2	2.9		16.1	2.6	36.5	+	4.5	2.4	+	11.8
	15'6"-20'0"	0.789	31.0	1.5		25.3	1.9	19.8	+	2.7	5.1	+	12.7
	20'0"-25'0"	0.341	30.5	0.6		26,8	0.3	14.0	+	2.4	9.5	+	15.8
D.59	1' - 9'0"	0.656	24.6	1.7		19.8	0.9	28.0	+	3.4	5.3	+	16.2
	9' - 14'6"	0.692	27.0	2.7		18.1	2.1	28.9	+	3.0	3.5	+	14.7
	14'6"-17'6"	0.949	24.6	1.9		19.5	1.7	29.1	+	3.2	4.0	+	16.0
	17'6"-24'9"	0.648	23.9	2.3		24.4	1.6	25.5	+	4.3	5.5	+	12.4
D.61	6" - 8'6"	0.254											
	8'6"-17'0"	0.253											
	17'0"-23'9"	0.306											
D.63	2'1 - 5'3"	0.276											
	5'3"-7'6"	0.253											
	7'6"-12'0"	0.203											
	12'0"-19'0"	0.256											
	19'0"-25'0"	0.267											

APPENDIX C

2. Heavy Minerals - Quantitative Evaluation

B/H.	Depth	% Heavies	Andalusite	Zircon	Cassiterite	Tourmaline	Rutile	Ilmenite	Chromite	Garnet	Shell	Mafics	Leucoxene
D.65	0'- 10'0"	0.216											
	10'0"-20'0"	0.200											
D.10	0' - 5'0"	0.342											
	5'0"-10'0"	0.405											
	10'0-15'0"	0.499											
D.13	1' - 5'0"	0.706											
	5'0" - 10'0"	0.382											
	10'0"-15'0"	0.441											
	15'0"-20'0"	0.625											
	20'0"-25'0"	0.606											
	25'0"-30'0"	0.623											
D.36	6' - 5'0"	1.262	34.6	1.4		19.0	0.5	20.1	+	2.1	6.5	+	15.7
	5'0"-10'0"	1.102	35.3	1.4		21.2	1.0	19.3	+	3.0	8.2	+	10.5
	10'0"-15'0"	1.104	37.9	1.6		18.3	1.5	20.2	+	2.5	5.4	+	12.4
	15'0"-20'0"	1.226	36.0	1.9		19.3	1.2	20.1	+	3.0	8.3	+	10.1
	20'0"-25'0"	1.232	34.9	2.0		17.8	1.2	19.4	+	2.6	9.9	+	12.2

APPENDIX C

3. HEAVY MINERAL CONCENTRATE ASSAYS

FRACTION	B.H.	% Fe_2O_3	% TiO_2	% Cr_2O_3
STRONGLY MAGNETIC	35	36	26	8
	36	39	22	6
	37	42	18	11
	38	38	21	14
	39	37	22	9
SLIGHTLY MAGNETIC	35	23	6	8
	36	20	6	4
	37	23	5	6
	38	22	5	6
	39	21	6	7

APPENDIX C

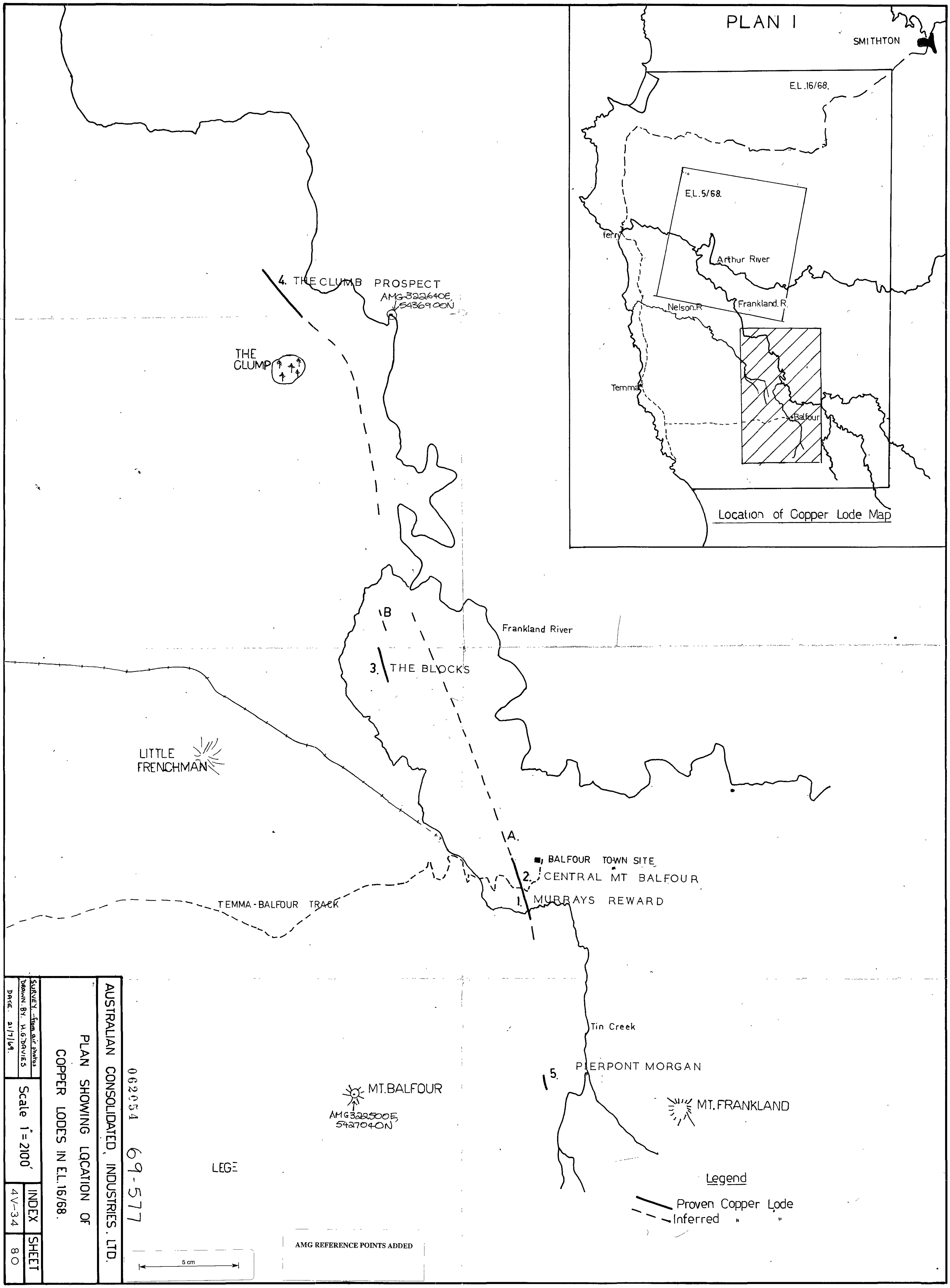
4. Evaluation of most prospective dune area.

B.H. +	Depth.	Mean % Heavy Mineral	Andalusite % in sand.	Illmenite + Chromite %	Zircon %	Rutile %	Cassiterite %
35	30'	1.322	30	32	2.7	2.0	0.015
36	30'	1.185	35	19	1.6	1.0	Not analysed
37	25'	1.018	30	30	1.9	1.6	0.001
38	17'	0.948	38	26	1.2	1.7	0.01
39	30'	1.094	33	27	1.7	1.7	0.017
		1.11	33%	27%	1.8%	1.6%	App.0.01

052

27. <u>DISTRIBUTION</u>

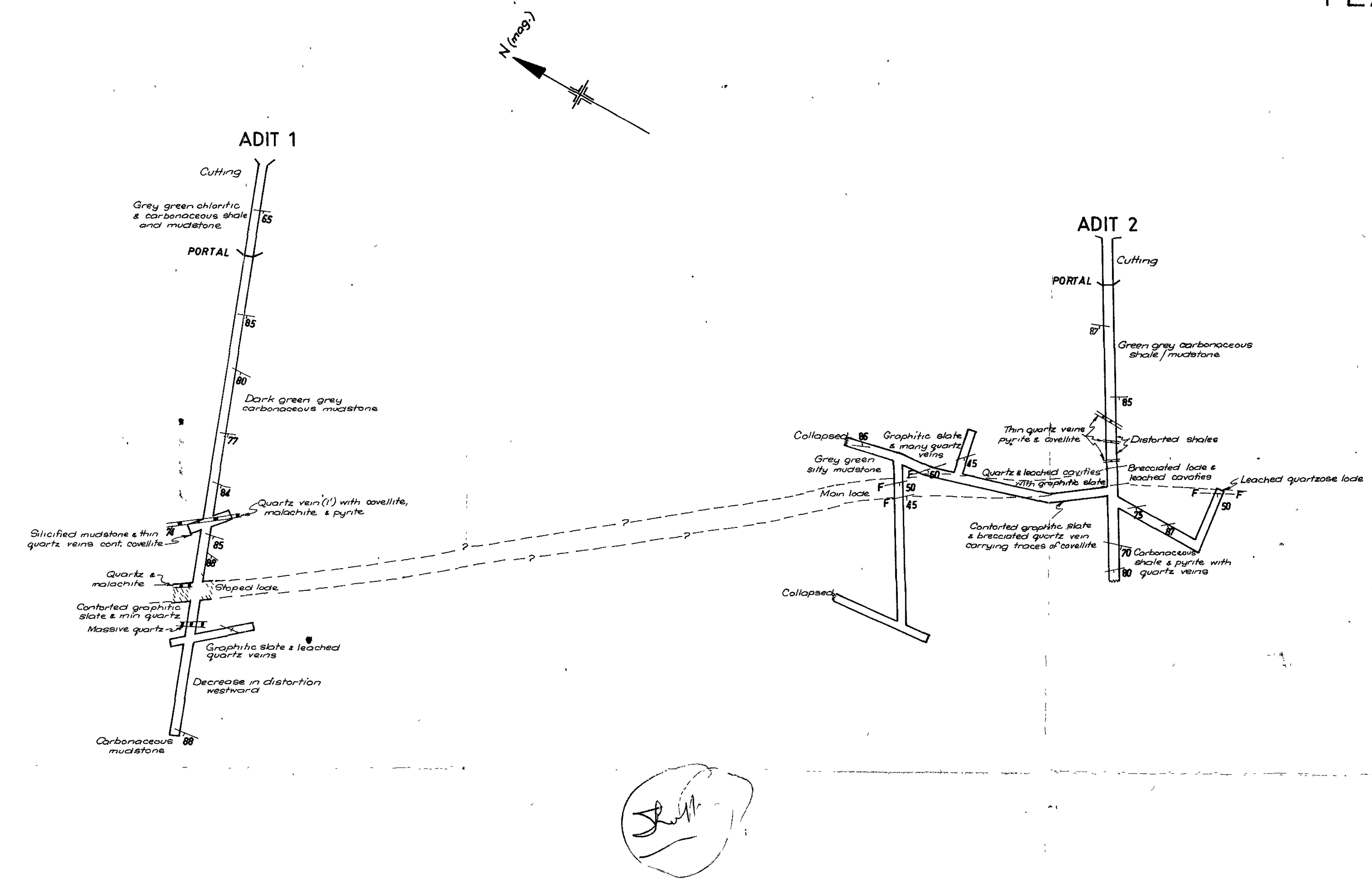
R.W. Brack
E.N. Barbour
H.G. Davies
J. Carpenter
W. Key



PLAN I
SMITHTON
E.L.16/68.
E.L.5/68.
ferry
Arthur River
Frankland. R.
Nelson.R
Temma
Balfour
Location of Copper Lode Map
4. THE CLUMB PROSPECT
AMG 322640E, 5436900N
THE CLUMP
B
Frankland River
3. THE BLOCKS
LITTLE FRENCHMAN
A.
BALFOUR TOWN SITE
2. CENTRAL MT BALFOUR
1. MURRAYS REWARD
TEMMA-BALFOUR TRACK
Tin Creek
5. PIERPONT MORGAN
MT. BALFOUR
AMG 322500E, 5427040N
MT. FRANKLAND
Legend
Proven Copper Lode
Inferred " "
AUSTRALIAN CONSOLIDATED, INDUSTRIES. LTD.
PLAN SHOWING LOCATION OF COPPER LODES IN E.L.16/68.
062054 69-577
SURVEY - from air photos
DRAWN BY. H.G.DAVIES
DATE. 21/7/69.
Scale 1"=2100'
INDEX 4V-34
SHEET 80
5 cm
AMG REFERENCE POINTS ADDED

3384

PLAN 2



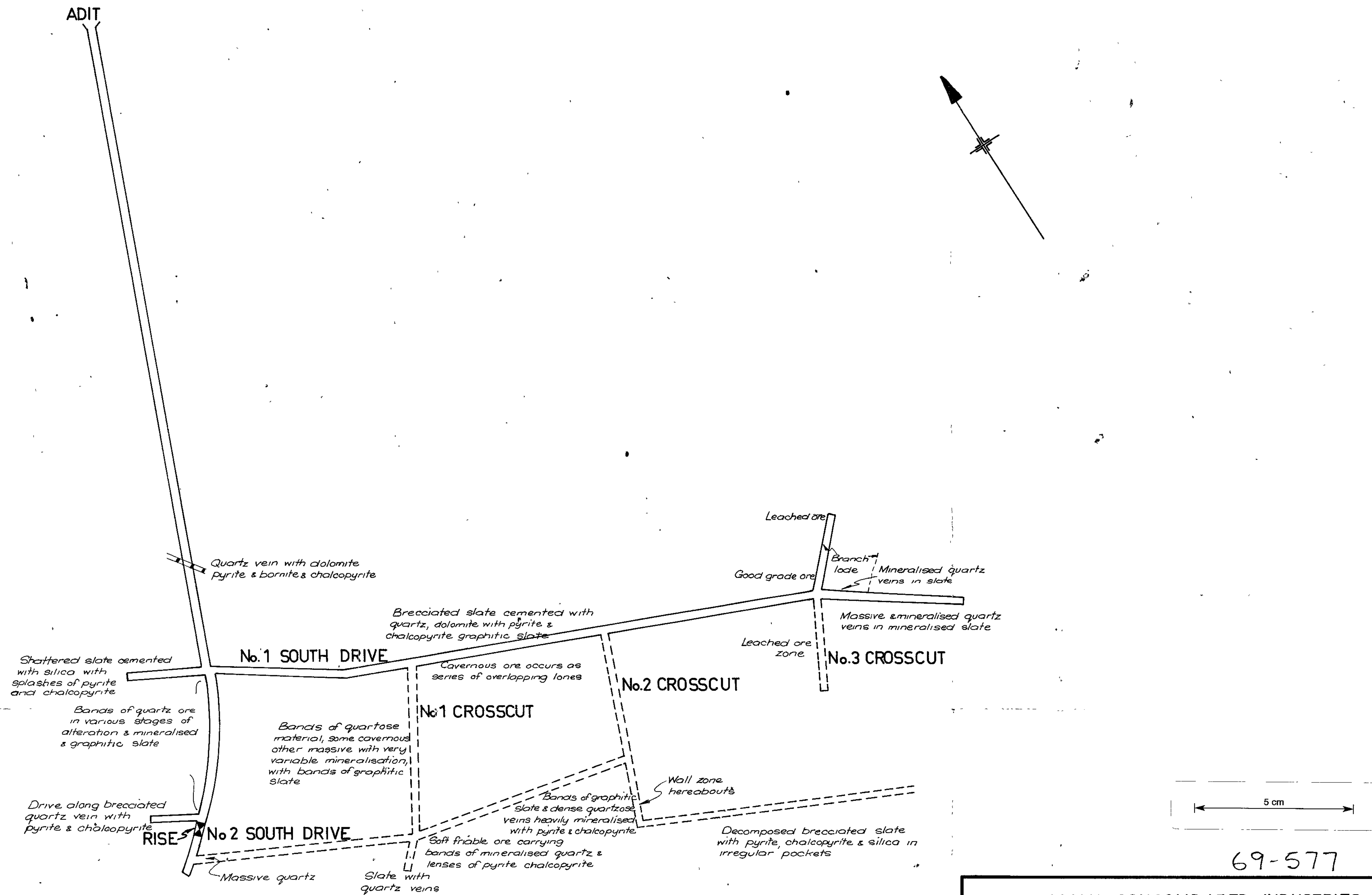
69-577

AUSTRALIAN CONSOLIDATED INDUSTRIES LTD.			
PLAN AND GEOLOGY OF ADITS 1 & 2 MURRAYS REWARD MINE - BALFOUR			
SURVEY By M Bird & G Pollington		INDEX	SHEET
DRAWN H.G Davies 21-7-69	CHECKED	4V-34	81
TRACED G Taylor 25-8-69	SCALE 1" = 40'-0"		

3385

062055

PLAN 3



69-577

AUSTRALIAN CONSOLIDATED INDUSTRIES LTD.

ROUGH PLAN AND GEOLOGY OF THE CLUMP MINE- BALFOUR (AFTER WARD 1911)

		INDEX	SHEET
SURVEY From old mine notes			
DRAWN H.G. Davies 21-7-69	CHECKED	4V-34	82
TRACED G. Taylor 25-8-69	SCALE 1" = 40'-0"		

062056 3386

5 cm

69-577

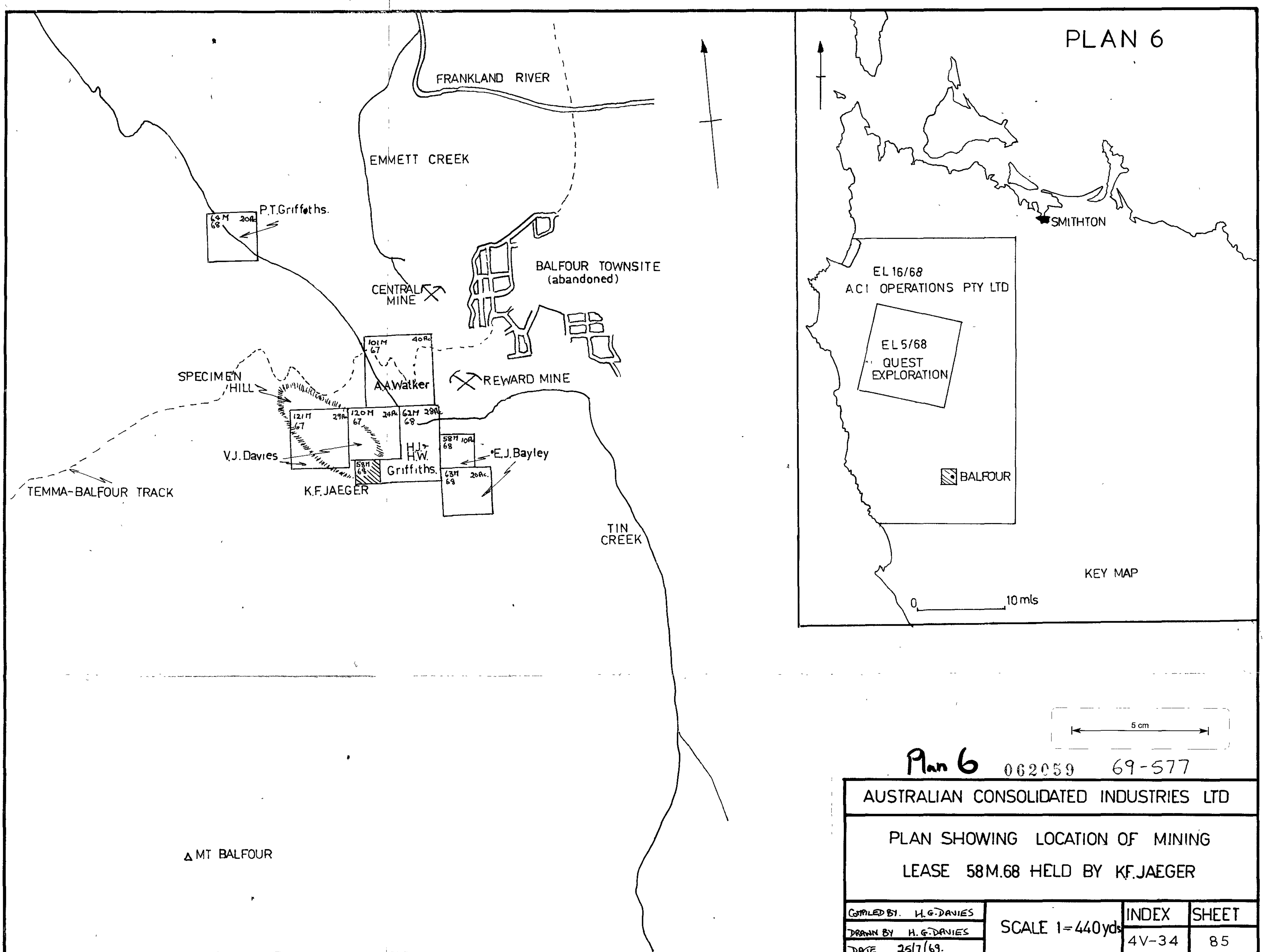
3307

062058

Plan 5

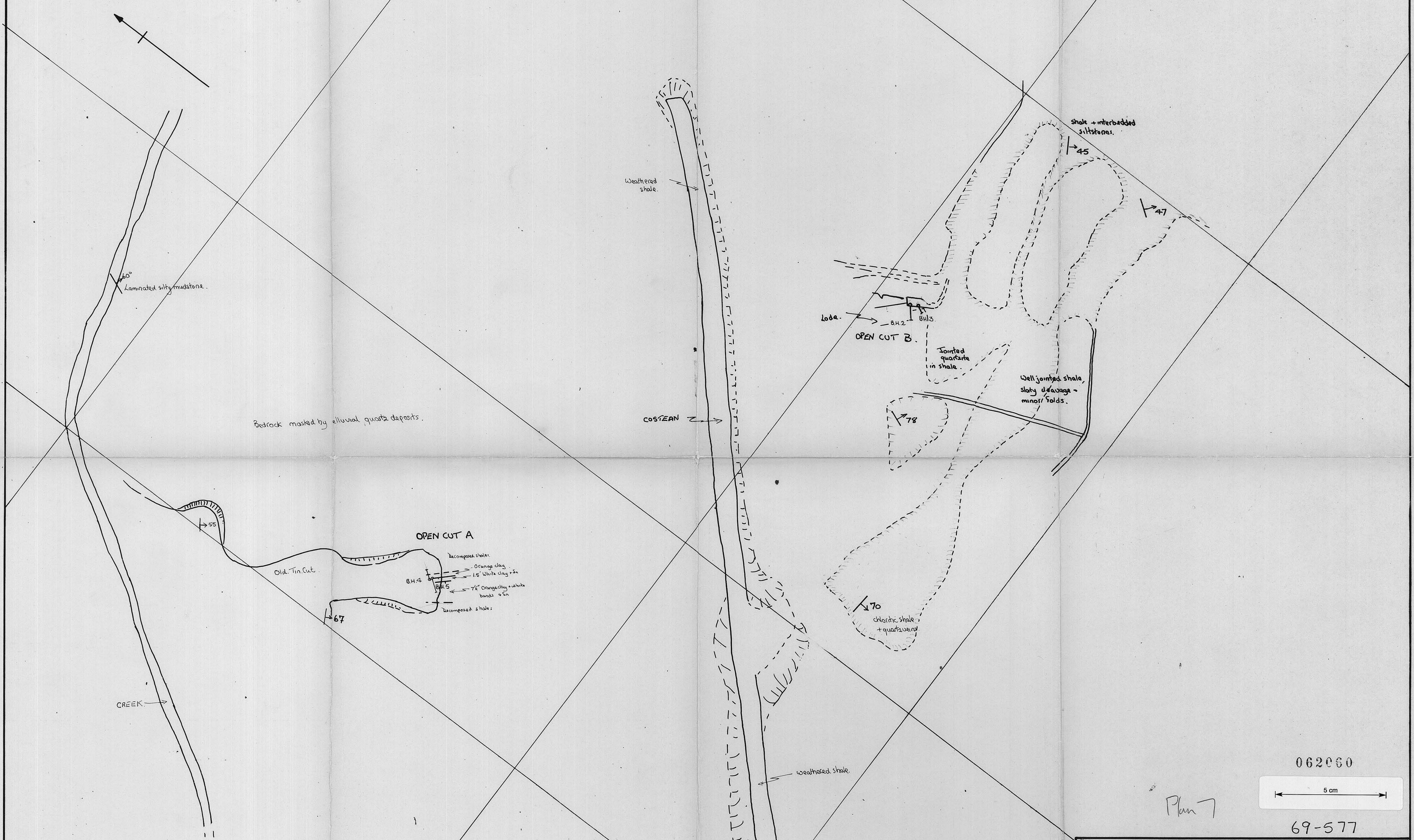
69-577

(13388


PLAN 6
FRANKLAND RIVER
EMMETT CREEK
P.T.Griffiths.
64M 68 20Ac
BALFOUR TOWNSITE (abandoned)
CENTRAL MINE
101M 67 40Ac
A.A.Walker
REWARD MINE
SPECIMEN HILL
121M 67 29Ac
120M 67 24Ac
62M 68 28Ac
58M 68 10Ac
H.J. & H.W. Griffiths.
E.J.Bayley
V.J.Davies
58M 68
K.F.JAEGER
63M 68 20Ac.
TEMMA-BALFOUR TRACK
TIN CREEK
MT BALFOUR
SMITHTON
EL 16/68
ACI OPERATIONS PTY LTD
EL 5/68
QUEST EXPLORATION
BALFOUR
KEY MAP
0
10 mls
5 cm
Plan 6 062059 69-577
AUSTRALIAN CONSOLIDATED INDUSTRIES LTD
PLAN SHOWING LOCATION OF MINING LEASE 58M.68 HELD BY K.F.JAEGER
COMPILED BY. H.G.DAVIES
DRAWN BY H.G.DAVIES
DATE 25/7/69.
SCALE 1"=440yds
INDEX 4V-34
SHEET 85

3389

PLAN 7



062060

Plan 7

69-577

AUSTRALIAN CONSOLIDATED INDUSTRIES LTD

SKETCH PLAN OF TIN LODE EXPOSURES
WITHIN M.L.58M.68 BALFOUR . TASMANIA

Surveyed. M. C. BIRD	SCALE 1"=20'	INDEX	SHEET
Drawn. H. G. DAVIES		4V-34	86
Date 28.7.69.			

3390

B.H. No.	INTERVAL	% HEAVY MINERALS
1	0'—3'-9"	
	3'-9"—10'-0"	
	10'-0"—20'-0"	0.108
	20'-0"—21'-9"	
2	2'-6"—5'-0"	1.168
	5'-0"—10'-0"	0.812
	10'-0"—15'-0"	1.085
	15'-0"—20'-0"	0.969
	20'-0"—25'-0"	0.963
	25'-0"—30'-0"	0.793
3	1'-0"—5'-0"	
	5'-0"—10'-0"	
	10'-0"—13'-0"	
4	0"—3'-0"	0.375
	3'-0"—10'-0"	0.749
	10'-0"—15'-0"	0.566
	15'-0"—20'-0"	0.697
	20'-0"—22'-6"	0.640
5	6"—5'-0"	
	5'-0"—10'-0"	
6	1'-0"—5'-0"	0.824
	5'-0"—10'-0"	0.665
	10'-0"—15'-0"	
	15'-0"—20'-0"	0.700
	20'-0"—25'-0"	0.840
	25'-0"—28'-0"	0.773
7	1'-0"—5'-0"	0.652
	5'-0"—10'-0"	0.766
	10'-0"—15'-0"	0.467
	15'-0"—19'-9"	0.732
8	No Samples	
9	0'—3'-0"	0.582
	3'-0"—10'-0"	0.860
	10'-0"—15'-0"	0.877
	15'-0"—20'-0"	1.181
	20'-0"—25'-0"	0.886
10	0"—5'-0"	0.342
	5'0"—10'-0"	0.405
	10'0"—15'-0"	0.499
11	1'-0"—5'-0"	0.688
	5'-0"—10'-0"	1.021
	10'-0"—15'-0"	0.723
	15'-0"—20'-0"	0.724
	20'-0"—25'-0"	0.929
	25'-0"—30'-0"	0.780
12	1'-0"—5'-0"	0.325
	5'-0"—10'-0"	0.368
	10'-0"—11'-6"	0.432
	11'-6"—14'-0"	0.328
	14'-0"—20'-0"	0.660
	20'-0"—25'-0"	0.448
13	1'-0"—5'-0"	0.706
	5'-0"—10'-0"	0.382
	10'-0"—15'-0"	0.441
	15'-0"—20'-0"	0.625
	20'-0"—25'-0"	0.606
	25'-0"—30'-0"	0.623
14	2'-0"—5'-0"	0.448
	5'-0"—10'-0"	0.556
	10'-0"—15'-0"	0.784
	15'-0"—20'-0"	0.768
	20'-0"—25'-0"	1.020
15	1'-6"—5'-0"	1.185
	5'-0"—10'-0"	0.553
	10'-0"—15'-0"	0.836
	15'-0"—20'-0"	1.545
	20'-0"—25'-0"	0.700
	25'-0"—30'-0"	0.822
16	0"—6'-0"	
	6'-0"—11'-0"	
17	0"—5'-6"	
	5'-6"—7'-6"	
	7'-6"—10'-0"	
	10'-0"—15'-0"	
	15'-0"—20'-0"	
	20'-0"—25'-0"	

B.H. No.	INTERVAL	% HEAVY MINERALS
18	1'-0"—5'-0"	0.216
	5'-0"—10'-0"	0.365
	10'-0"—15'-0"	0.385
	15'-0"—20'-0"	0.368
19	0"—5'-0"	
	5'-0"—10'-0"	0.467
	10'-0"—20'-0"	
20	1'-0"—10'-0"	
	10'-0"—20'-0"	
21	1'-0"—15'-0"	0.311
22–25	No Samples	
26	0"—10'-0"	0.538
	10'-0"—17'-0"	0.281
	17'-0"—25'-0"	0.222
	25'-0"—30'-0"	0.340
27	1'-0"—12'-6"	0.185
	12'-6"—20'-0"	0.406
	20'-0"—25'-3"	0.407
28	1'-0"—5'-0"	0.494
	5'-0"—10'-0"	0.451
	10'-0"—15'-0"	0.557
	15'-0"—20'-0"	0.641
	20'-0"—25'-0"	0.427
	25'-0"—27'-3"	0.372
29	1'-0"—5'-0"	0.383
	5'-0"—10'-0"	0.334
	10'-0"—15'-0"	0.304
	15'-0"—20'-0"	0.279
	20'-0"—25'-0"	0.264
30	0"—5'-0"	
	5'-0"—10'-0"	
	10'-0"—13'-0"	
	13'-0"—16'-0"	
	16'-0"—20'-0"	
	20'-0"—25'-0"	
31	1'-0"—5'-0"	
	5'-0"—10'-0"	
	10'-0"—15'-0"	
	15'-0"—20'-0"	
32	1'-0"—5'-0"	
	5'-0"—10'-0"	
	10'-0"—15'-0"	
	15'-0"—20'-0"	
	20'-0"—24'-0"	
33	0"—5'-0"	0.648
	5'-0"—10'-0"	0.613
	10'-0"—15'-0"	0.742
	15'-0"—20'-0"	0.647
34	1'-0"—10'-0"	
	10'-0"—20'-0"	
35	0"—5'-0"	2.22
	5'-0"—10'-0"	2.193
	10'-0"—15'-0"	1.173
	15'-0"—20'-0"	0.835
	20'-0"—25'-0"	0.855
	25'-0"—30'-0"	0.657
36	6"—5'-0"	1.262
	5'-0"—10'-0"	1.102
	10'-0"—15'-0"	1.104
	15'-0"—20'-0"	1.226
	20'-0"—25'-0"	1.232
	25'-0"—30'-0"	
37	0"—5'-0"	0.768
	5'-0"—10'-0"	0.718
	10'-0"—13'-0"	0.548
	13'-0"—16'-0"	1.170
	16'-0"—20'-0"	1.465
	20'-0"—25'-0"	1.460
38	0"—5'-0"	0.944
	5'-0"—10'-0"	0.896
	10'-0"—17'-0"	0.991
39	0"—5'-6"	0.707
	5'-6"—10'-0"	1.286
	10'-0"—15'-0"	0.589
	15'-0"—20'-0"	1.149
	20'-0"—25'-0"	1.665
	25'-0"—30'-0"	1.170
40	1'-0"—5'-0"	0.292
	5'-0"—10'-0"	0.196
	10'-0"—15'-0"	0.370
	15'-0"—20'-0"	0.301
	20'-0"—25'-0"	0.380

B.H. No.	INTERVAL	% HEAVY MINERALS
41	0"—5'-0"	0.436
	5'-0"—10'-0"	0.305
	10'-0"—15'-0"	0.766
	15'-0"—20'-0"	0.597
	20'-0"—25'-0"	0.519
	25'-0"—30'-0"	0.501
42	0"—5'-0"	
	5'-0"—11'-6"	
	11'-6"—15'-0"	
43	0"—5'-0"	0.422
	5'-0"—11'-6"	0.402
	11'-6"—16'-9"	0.714
	16'-9"—25'-0"	0.707
44	1'-6"—5'-6"	
45	5'-6"—10'-0"	0.430
	10'-0"—15'-0"	0.504
	15'-0"—20'-0"	0.340
	20'-0"—25'-0"	0.308
47	0"—5'-0"	0.666
	5'-0"—10'-0"	N.A.
	10'-0"—15'-0"	0.803
	15'-0"—20'-0"	0.986
	20'-0"—25'-0"	1.687
48	1'-0"—5'-0"	
	5'-0"—15'-0"	
	15'-0"—25'-0"	
49	2'-0"—10'-0"	0.353
	10'-0"—17'-6"	0.293
	17'-6"—25'-0"	0.245
50	2'-0"—10'-0"	
	10'-0"—20'-0"	
51	3'-6"—10'-0"	0.702
	10'-0"—15'-0"	1.049
	15'-0"—20'-0"	1.067
	20'-0"—22'-6"	0.633
52	0"—5'-6"	0.688
	5'-6"—7'-6"	0.768
	7'-6"—15'-0"	0.669
	15'-0"—22'-6"	0.763
	22'-6"—30'-0"	0.819
53	2'-6"—7'-6"	
	7'-6"—15'-0"	
	15'-0"—18'-6"	
54	0"—10'-3"	
	10'-3"—14'-9"	
	14'-9"—22'-6"	
	22'-6"—30'-0"	
55	0"—5'-6"	1.796
	5'-6"—15'-0"	1.226
	15'-0"—25'-0"	1.253
56	0"—8'-0"	0.739
	8'-0"—16'-6"	0.578
	16'-6"—25'-0"	0.507
57	6"—8'-0"	0.445
	8'-0"—12'-6"	0.523
	12'-0"—15'-6"	0.774
	15'-6"—20'-0"	0.789
	20'-0"—25'-0"	0.341
58	6"—8'-6"	
	8'-6"—16'-6"	
	16'-6"—25'-0"	
59	1'-0"—9'-0"	0.656
	9'-0"—14'-6"	0.692
	14'-6"—17'-6"	0.949
	17'-6"—24'-9"	0.648
60	6"—8'-6"	
	8'-6"—17'-0"	
	17'-0"—24'-0"	
61	6"—8'-6"	0.254
	8'-6"—17'-0"	0.253
	17'-0"—23'-9"	0.306
62	2'-0"—10'-0"	
	10'-0"—17'-6"	
	17'-6"—23'-4"	
63	2'-1"—5'-3"	0.276
	5'-3"—7'-6"	0.253
	7'-6"—12'-0"	0.203
	12'-0"—19'-0"	0.256
	19'-0"—25'-0"	0.267
64	0"—8'-6"	
	8'-6"—17'-0"	
	17'-0"—20'-0"	
	20'-0"—25'-0"	
65	0"—10'-0"	0.216
	10'-0"—20'-0"	0.200

PLAN 8

LEGEND

SAND DUNES

O 32 BOREHOLE No. & LOCATION

- - - - - BUSH TRACK

Plan 8

062061 69-577

AUSTRALIAN CONSOLIDATED INDUSTRIES LTD.

PLAN SHOWING DEVELOPMENT OF SAND DUNES BETWEEN THE ARTHUR RIVER AND OPOSSUM CREEK IN EL. 16/68 NORTH WEST TASMANIA

Compiled from uncontrolled air photos by H.G. Davies

DRAWN	CHECKED	INDEX	SHEET
TRACED G. Taylor 22-8-69	SCALE 1" = 2,150' (approx.)	4V-34	87

5 cm

3391