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E.L. 17/73

BEACONSFIELD

REPORT ON THE GEOLOGY, MINERALIZATION

AND EXPLORATION POTENTIAL OF THE

LICENCE AREA

OPEN FILE

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Map showing Geology, E.L. 17/73, Beaconsfield.	

GEOLOGY

As a result of mapping of EL 17/73 few significant changes were recorded in the stratigraphy of the area. However some new opinions on the structure are presented.

Stratigraphy

The following new units were recorded when mapping the Beaconsfield area.

- (i) A small dike or sill of fine grained dark green felty textured basic igneous rock containing some small ragged brown phenocrysts has been recorded near Eaglehawk Gully to the south of the licence. The rock is probably of basaltic composition. The age of the intrusion is unknown but it is most likely closely related to either the Jurassic dolerites or Tertiary basalts.
- (ii) In the north western part of the licence a moderately well indurated relatively coarse conglomerate was recorded underlying semi-consolidated Tertiary quartz gravels. The fresh rock is rarely seen. Where visible it is a pale greenish grey colour, and contains from 40% to 75% clasts. Clasts range in size from 1.0 to 30 cm in diameter and are mostly sub-rounded to well rounded. Approximately 60% to 70% of clasts comprise a medium grained greenish grey well foliated to phyllitic quartz sericite sandstone. Approximately 20% - 30% of clasts are vein quartz. Remaining clasts are variable and include quartzite and some sub angular fragments of red and black cherty argillite. Some weathered exposures of the conglomerate include poorly exposed sandstone, and sticky white clays which are apparently derived from siltstone lenses.

The age of this unit is uncertain. It is older than all Tertiary beds in the area with the possible exception of the Deep Lead beds. The degree of induration shown in fresh outcrops indicate it could be considerably older than Tertiary, and perhaps as old as Lower Permian.

In addition to the new units described above some comments concerning other units mapped in the area by previous workers are in order.

In spite of a fairly thorough search of the area where the swampy lakes occur at the south end of the licence no significant limestone outcrops could be located. These lakes are reputed to be flooded limestone quarries, but their size makes this unlikely. It is assumed that the area was originally one of swamps and sink holes with small limestone outcrops which were quarried. This view is supported to some extent by Robertson, (1887).

Beds of supposed Cambrian age west of Cabbage Tree Hill consisting mostly of yellowish weathering phyllites and phyllitic sandstone are remarkably similar to rock exposed east of Cabbage Tree Hill near the crushing plant of Woodfield and French, and on the main road to Launceston. These eastern beds pass north into less weathered bluish to greenish grey slates and phyllites with minor sandstone that are similar to some of the Transition Beds seen in the drill core from drill holes B4 and A6. North of these eastern phyllities and slates old workers mapped a series of deeply weathered slates and sandstones

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with minor limestone in Beaconsfield to the east of Weld Street. These rocks are no longer exposed due to the town development. However unless a major fault occurs between the two areas, for which there is no evidence, the two areas are both likely to be part of the same sequence. On the accompanying map all these beds are assumed to be Cambrian.

Structure

The structure of the area is probably considerably more complex than indicated on the map, but due to the poor exposure over much of the area there is little evidence for this structural complexity. Examination of aerial photographs revealed 21 poorly defined lineaments. These possibly represent faults or large joint systems, however in general there is little geological evidence to support these lineaments as being genuine features. Some in fact could be the result of extensive human activity in the area.

The area mapped can be divided into four structural units as follows:

- i) The North East Area: This extends north east from Beaconsfield, occupying the area between Middle Arm and Beauty Point Road. Coastal outcrops are relatively good and indicate the area is covered with a conformable sequence of Permian sediments that dip north east generally between 10° and 16° . The lowest mapped Permian beds in the area are a dark calcareous mudstone. A mudstone of this nature is a most unusual type of sediment to occur as the lowest member of a transgressive marine sequence and a coarse sandstone or conglomerate would be expected. As no such sandstone or conglomerate has been recorded, a fault striking approximately north west is assumed to have down faulted the Permian to the north east and now forms the south west boundary of the area. Minor patches of thin semi-consolidated quartz gravels of Tertiary age overlie the Permian sediments.
- ii) The North West Area: This area is situated north west of Pease Creek and a line joining it to the large dam at the head of Brandy Creek. Near the mouth of Pease Creek a north east striking fault is recorded that has apparently uplifted the Permian beds on the north west side at the coast by approximately 250 metres. This fault is inferred to follow the valley of Pease Creek under alluvial cover. Approximately on this bend some displacement of the contact between the Cabbage Tree Conglomerate and Transition Beds may occur.

Within the area that is north west of the inferred fault, a gently dipping indurated conglomerate outcrops at a number of places and is overlain by semi-consolidated quartz gravels of Tertiary age. Only one dip is recorded in the conglomerate and this indicates a gentle dip to the north west. The age of the conglomerate is unknown, but in view of its induration and its relationship to the inferred fault along Pease Creek it could be of Lower Permian age.

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- iii) The Central Belt: This zone coincides with the topographic high of Cabbage Tree Hill and its extension north of Brandy Creek. The zone is bounded on the western side by a well defined fault along the lower western slopes of Cabbage Tree Hill separating the Cabbage Tree Conglomerate from Cambrian phyllites to the east. The eastern boundary is an inferred fault separating the Permian sediments from Cambrian rocks.

The rocks within the zone generally dip north east at 40° - 60° in the case of Ordovician rocks, and more steeply with some folding indicated in the case of Cambrian Rocks. In the Brandy Creek area a small anticline is mapped in the Cabbage Tree Conglomerate.

Within this zone a significant north-north westerly striking fault has been mapped from old mine records and the work of old prospectors on the east side of Cabbage Tree Hill. This fault is the Main Cross Course of the Tasmania Mine. Further to the east a second significant fault is recorded at the eastern limits of the mine workings and in drill holes in the area. This fault was encountered at levels beneath the Deep Lead and seems to coincide with the contact between a dark fine grained limestone to the east and the Transition Beds to the west. Available evidence indicates that the intersection of the fault with the limestone horizon has created a zone of shattering along which a gorge was eroded. This gorge is now filled with alluvium and forms the Deep Lead. The Deep Lead has been traced by a gravity survey, (Howland-Rose 1964), from the southern edge of the mapped area to Brandy Creek. The extension of the Deep Lead north into the north western structural zone may possibly be defined by the weak photo lineaments 19 and 20.

The attitude of the fault that controls the position of the Deep Lead is of considerable importance to any proposal to develop the Tasmania Mine below 15 level. If the fault dips more steeply than the enclosing strata it will eventually cut the reef at depth and displace it.

In addition to the faults discussed, one other small fault with a similar trend has been recorded on M.L.5M/76. This fault has sub horizontal slickensides on the fault plane which may possibly indicate that all the north west and north north west striking faults have undergone some transcurrent movement. Several photo lineaments have a similar trend, and one of these, No.1, appears to control the emplacement of a basalt dyke.

A number of weak lineaments observed on the aerial photographs cut across the central zone. In general these strike between 025° and 050° and some are approximately parallel to the trend of the Tasmania Reef (045° - 050°). One of these lineaments, (11), could represent the extension of the Tasmania Reef across the fault controlling the Deep Lead. None of these lineaments can be related to any obvious displacement of the rocks in the area. However, on the north side of the lineament passing through the Brandy Creek area (15), the Cabbage Tree Conglomerate is folded into a small anticline, perhaps as the result of movement on this lineament.

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Two other lineaments striking 085° (12,13), cross Cabbage Tree Hill and the projection of these to the west coincides with a probable south side west displacement of the major fault between the Cabbage Tree Conglomerate and Cambrian beds.

- iv) South West Area: The area is poorly exposed and consists of a basement of steeply dipping Cambrian phyllites in which some folding is indicated. Semi-consolidated quartz gravels of Tertiary age overlie much of the area. Two north east striking photo lineaments cut the area near Cabbage Tree Ridge. One of these passes right across the ridge but no displacement of beds is observed. In the far west one north west striking photo lineament (9) occurs.

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Structural Control and Paragenesis of Mineralization in the Tasmania Reef.

At Beaconsfield known significant economic gold deposits are restricted to one vein, the Tasmania Reef, although numerous other small gold bearing veins of different orientation have been located.

The Tasmania Reef is well defined striking between 045° and 050° and dipping between 50° and 60° to the south east. Within the reef significant economic mineralization is restricted to the zone where the reef cuts the Transition Beds, a sequence of quartzite, quartz carbonate sandstone and some shale and grit.

Solomon (1969) indicates that the Tasmania Reef occupies a tensional fissure developed between two transcurrent faults or shears, and suggests that if this is so other fissures probably developed en echelon between the faults, and hence may host reefs similar to the Tasmania. Solomon's idea is sound and is supported to some extent by the nature of the reefs in the Moonlight cum Wonder and Brandy Creek workings. Reefs in these areas are generally thin, lensoidal and discontinuous, and represent the weak development of mineralization in tight fissures parallel to the main faults. Recent mapping has located a west dipping, north north west striking fault exposed in a pit on ML 5M/76. This fault has sub-horizontal slickensides on its surface indicating that at least some transcurrent movement has taken place on faults with this strike.

At and near surface, the western end of the Tasmania Reef is cut by faults (ie the Main Cross Course), and the eastern end is obscured by the Deep Lead. Below No. 5 level, (715') the western end of the reef is clearly controlled by the contact between the Transition Beds and the underlying Cabbage Tree Conglomerate which dips about 50° to 55° to the north east. At the eastern end of the reef, control is exerted by the contact between the Transition Beds and an overlying dark limestone. Old mine records and reports indicate that the eastern end of the levels frequently passed into broken ground, pug, and/or porous limestone before solid limestone was reached. These descriptions together with information from drill holes in this area indicate that this contact is probably faulted and hence control at the eastern end of the reef may not be entirely lithological as has previously been assumed. This situation is only likely to be resolved if and when development of the Tasmania Mine takes place below the 1500 foot level, in which case the nature of this eastern contact will be of considerable significance to future development.

The reef consists of white to bluish vein quartz, brown to cream carbonate and variable amounts of pyrite, arsenopyrite, chalcopyrite, galena, sphalerite and free gold. Petrographic and mineragraphic examination of four core samples was carried out by Lowder (1979). He notes a close relationship between the carbonate and sulphides and his observations together with examination of the core indicate that quartz mineralization predated the introduction of carbonate and sulphides. Deformation of the reef evidently continued throughout the period of deposition since as well as brecciation and recrystallization of the early quartz, carbonate and sulphides are also affected. Lowder considers that the textural relationships indicate early introduction of arsenopyrite closely followed by pyrite, both of which preceded much of the deformation. Later chalcopyrite commonly replaces pyrite along fractures as does galena. Galena also replaces chalcopyrite. The carbonate has been identified as mainly dolomite with minor calcite.

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In summary, it seems that the Tasmania Reef is a normal fissure vein in which mineralization fluids have filled open spaces and replaced wall rock in an open fissure. The early phase of mineralization was quartz rich. Deformation continued and later carbonate/sulphide-rich fluids penetrated fracture zones in the quartz and replaced quartz. There is strong evidence to indicate that the productive zone of the vein occurs in a particular, favourable host rock suite. The physical characteristics of this suite allowed the retention of an open fissure and the geochemical character probably facilitated ore deposition.

The source of the mineralizing fluids remains unknown. Three possible sources are considered.

- i) Remobilization of metal ions, sulphur and gangue from country rock during metamorphic processes.
- ii) Remobilization of metals and sulphur from pre-existing zones of enriched rock, perhaps syngenetic sulphide bearing horizons in sediments. The remobilization being caused by either metamorphic events, tectonic events, or the effects of igneous activity.
- iii) Fluids arising from an unknown igneous source.

Either of the first two alternatives would provide greater scope for additional exploration than the third, as they are likely to affect a far greater area of country. However available evidence indicates that the third alternative is most likely.

The first alternative has been considered. However, because of the low grade of metamorphism displayed by rocks in this area it is not considered as a viable proposition. Pelitic rocks in the area are nowhere of higher rank than phyllites, fossils are found in the Transition Beds, quartzites not completely recrystallized, and calcareous rocks from the older sequences are all referred to as limestones rather than marble. All this suggests that metamorphic processes operating in the area were unlikely to result in the generation of mineralizing fluids.

The second alternative has been considered and examined in more detail. Early in the mapping of the area, common to abundant mineralization was noted in a horizon of fine black quartz conglomerate and grit near the base of the Cabbage Tree Conglomerate. Finely disseminated sulphides varied from sparse to abundant and were closely associated with a common to abundant green mineral thought to be malachite. As considerable gold mining and prospecting had been carried out along this zone, (the Moonlight cum Wonder, Brandy Creek and North Tasmania workings), it was thought that it may also carry some gold, and perhaps represented a low grade syngenetic copper/gold/uranium deposit. It was thought that this horizon may represent the source of sulphur and metals remobilized into the Tasmania Reef, or alternatively could in its own right represent a viable exploration target. Fifteen rock samples (AS1 to AS15) were collected from the zone and assayed for a variety of metals. Of these samples 12 returned gold values below 0.01 ppm, the other three values being 0.01, 0.04 and 0.59 ppm. Au. As the highest copper value obtained was 42 ppm, the green mineral was obviously not malachite. In view of the high chrome results obtained (190 to 10400 ppm) it is most likely the green mineral is a secondary chrome mineral derived from detrital

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chromite in the conglomerate. No significant lead, zinc, silver, uranium or arsenic values were obtained. In view of the disappointing analytical results obtained it is most unlikely that the horizon has contributed to the mineralization in the Tasmania Reef.

The third alternative is now considered most likely to provide the source of the mineralizing fluids. Only basalts and dolerites are known to occur in the immediate vicinity, however granitic rocks are common elsewhere in north eastern Tasmania. If an unexposed igneous body is the source of the mineralizing fluids, exploration potential of the area is likely to be restricted to the general vicinity of the intrusive or to the vicinity of any similar intrusive bodies.

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Exploration Potential of the Beaconsfield Area.

The potential for finding further significant gold bearing reefs in the Beaconsfield area appears restricted to the search for fissures with the same trend as the Tasmania Reef. There is ample evidence to show that veins striking in a general north westerly direction do carry gold, but in all cases these veins are small, lensoidal in nature, and discontinuous, rarely containing significant quantities of economic mineralization. In view of these well established facts there can be no point in examining structures with a north westerly strike.

Numerous cross cuts were constructed from the workings of the Tasmania Mine and other shafts in its vicinity in attempts to find repetitions of the Tasmania Reef. Some veins with similar dip and strike to the Tasmania Mine were located and, according to the opinions expressed in old records, did contain gold values (Cundy and Fawcett, 1914). However due to their small size and/or low grade these veins were not worked. One such vein south of the Tasmania Reef appears to warrant further investigation.

The North Tasmania mine is the only other group of workings in the area in which a reef striking in a north east direction was worked. An old newspaper report provided by Mr. H.G. Bleazard confirms this, but the high gold values reported in the article as being obtained from this reef were obviously not maintained as little subsequent work was carried out.

It is apparent that the only significant hard rock exploration targets in the exploration licence are those areas where there is evidence of cross-cutting structures with a general north easterly strike that may contain reefs. It can be assumed that such structures will only contain productive veins where they cut the Transition Beds, or beds with similar lithology. In view of the assumed origin of the mineralizing fluids as discussed in the previous section it is most likely that those fractures in proximity to the Tasmania Reef are more likely to contain significant mineralization than more distant fractures. Hence at this stage exploration should be confined to the existing Prospecting Licence.

The other significant exploration target in the area is the Deep Lead. Old records indicate that significant alluvial gold was found at various levels in the Deep Lead, in particular Robertson (1887) refers to the Ophir Shaft passing through thick auriferous wash between 100 and 160 feet below surface. Other reports suggest that other auriferous zones that yielded up to several ounces of gold per load were encountered in the lead. There is no record as to the size of the loads referred to, but as these had to be of manageable size rich material is indicated. It can be assumed that in addition to the Tasmania Mine other auriferous reefs in the area shed gold that has found its way into the Deep Lead. Hence the Deep Lead may well contain significant quantities of alluvial gold, particularly downstream from the Tasmania Mine.

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Outline of Proposed Exploration Program and Discussion of Targets.

It is recommended that a two part exploration program be undertaken.

- a) An examination of possible fractures with a similar trend to the Tasmania Reef as indicated by geological mapping and on aerial photographs.
- b) An investigation by diamond drilling for a significant reef reputed to exist to the south of the Tasmania Reef.

Program A

It is proposed to conduct this program by carrying out a program of shallow auger and/or percussion drilling across possible fracture zones in an attempt to obtain for analysis, chip samples at any reefs in these zones. The program will be carried out in two stages. The first stage is essentially an orientation program and a series of holes will be drilled over the western extension of the Tasmania Reef to see if the technique will prove effective. At this stage two other targets will also be tested. The second phase will involve testing remaining targets with a similar trend, and possibly carrying out drilling in zones where vein quartz occurs if any of the samples collected from these areas in a previous survey return significant gold values.

A number of targets have been established for this program. With one exception these are based on the existence of weak photo lineaments of appropriate strike that cut the Transition Beds. From north to south, lineaments with this trend are 2,3,5,6,7,8,11,14,15,17. At this stage lineaments 2 and 3 can be disregarded as they are entirely in ground held by B.H.P., and lineaments 7,8,11 and 17 can also be disregarded as they do not appear to cut Transition Beds.

This program is likely to be expensive due to various physical conditions existing in and controlling the extent of the exploration zone. These are as follows.

- i) The presence of the Deep Lead beds overlying much of the Target Zone, i.e. the Transition Beds. As these beds are up to 400 feet thick, penetration by percussion or auger drilling is not practical.
- ii) The narrow western edge of the Target Zone is generally covered by scree derived from Cabbage Tree Hill. In places the scree is quite deep, is often deeply weathered, and contains significant amounts of vein quartz some of which could be gold bearing.
- iii) There is evidence for deep weathering in the area and oxidized zones have been noted in drill core at depths below 1000 feet. It is hence likely that significant geochemical values of metals other than gold will be leached from near surface rocks.

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- iv) The narrow width of veins, (1 to 5 metres) will require close spaced drill holes, probably about 10 metres.

Some geochemical analysis has been carried out on drill core from holes A6, A7, B4, B4B to see if a geochemical halo existed around the Tasmania Reef. In general the wall rock is devoid of metal values. However anomalous gold and to a lesser extent copper, zinc and arsenic was found close to the main reef where the wall rock contained quartz carbonate veining with or without sulphides. At distances greater than 10 metres from the main reef the fine quartz carbonate veins appeared barren. It seems that a narrow halo (up to 10 metres) of weakly mineralized fine quartz carbonate \pm sulphide veins may occur on either the foot wall, the hanging wall or both.

- v) Quartz fragments picked up in the weathered zone may be surface float. If these carry gold values spurious results could be obtained. It will hence be necessary to make sure the final sample from any hole is obtained from bed rock only.

The first phase of the program will test the technique on the western end of the Tasmania Reef. It will then test lineament 15 in the Brandy Creek area. Finally a line of holes will be drilled to test the area east of the North Tasmania Mine. The reef in this area is reputed to strike north east and in addition the area may be cut by a fault or fracture zone extending down Pease Creek.

The second phase of the program will test lineaments 5,6, and 14, and possibly also lineament 11 (possible extension of Tasmania Reef), and 7,8,9, and 10. In addition areas from which anomalous quartz has been collected will be tested and any additional work required in the Brandy Creek or North Tasmania area will be carried out.

Program B

This program involves some diamond drilling to look for a reef of significant size reputed to occur at deeper levels to the south of the Tasmania Mine.

Hudson (1923) reports that in 1887 a cross-cut was driven south at the 500' level and located a branch lode that yielded 10,000 oz. gold. The cross-cut was supposedly continued for a total distance of about 400 feet where a pyritic lode trending parallel to the main reef and 6 to 8 feet wide was cut. Due to gas emanating from it this lode was sealed up and not worked. Assays from this reef are reported by Hudson to have been between 10 and 15 dwt/ton.

Hudson further reports the intersection of a similar reef in the Bonanza Mine at a depth of about 1000 feet and assaying 11 dwts Au per ton. It is reported that the Bonanza company did not develop this reef as it occurred in a corner of their property and was only in their property over a very limited area. Various plans and sections held in the office of government geologist J.A. Noldart have pencilled notes on them indicating the presence of this reef in the Bonanza Shaft at a depth of 1056' and assaying 14 dwt Au/ton.

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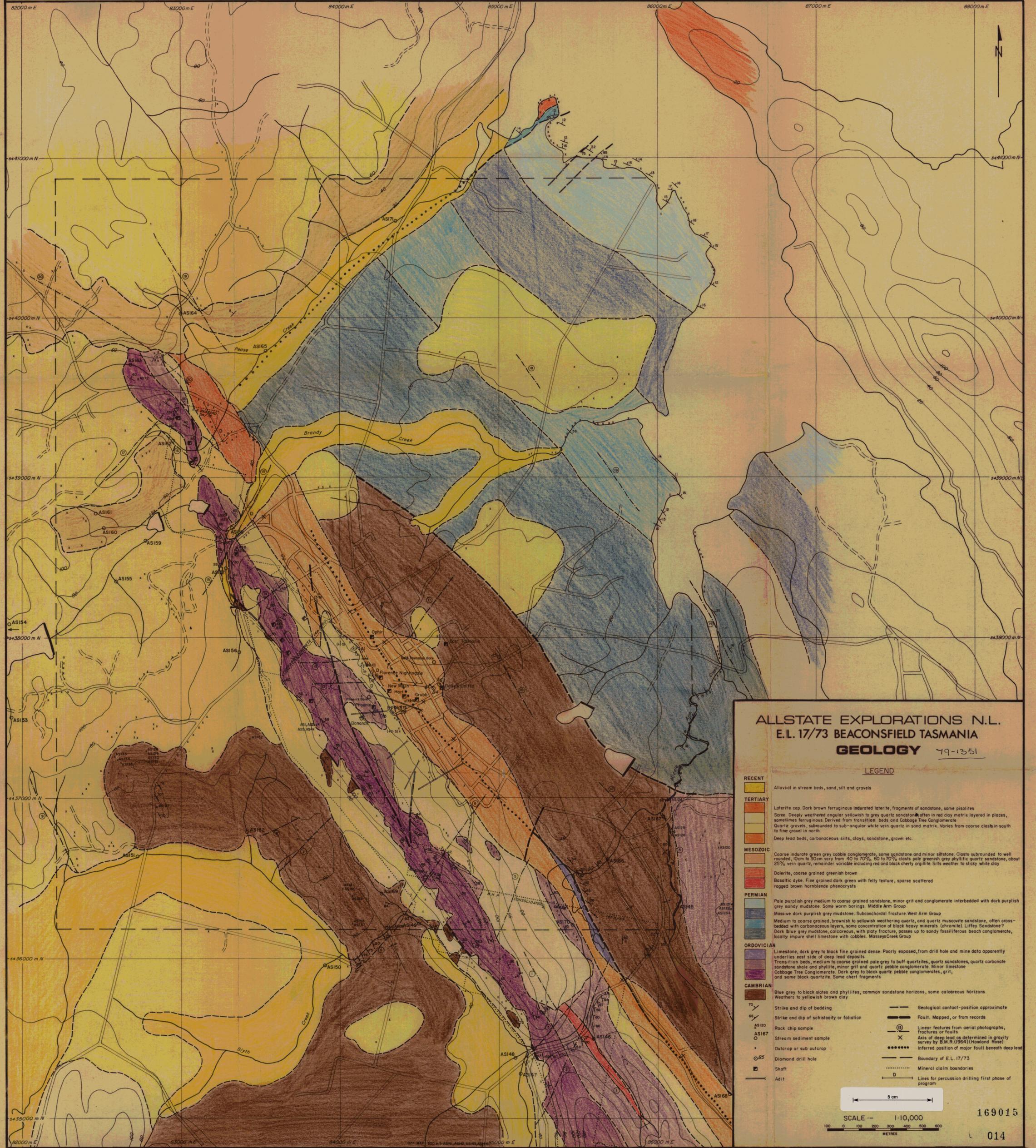
It is considered likely that these two reefs are the same.

In 1969 the Tasmania Mines Department drilled hole B5 to a depth of 663 feet at an inclination of -75° towards Harts Shaft in an attempt to intersect this reef. The reef was not intersected, but between 373 and 440 feet no core could be recovered due to bad ground and no assaying was done of this section of the hole.

It seems most likely that the two reefs reported by Hudson are in fact the same reef. As there is no record of similar reefs being intersected by either Harts or Grubb shaft it is probable that the reef does not persist to the surface. It would hence seem logical to try to intersect this reef close to its position in the Bonanza Shaft and then follow it from there.

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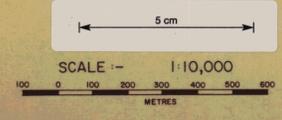
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ALLSTATE EXPLORATIONS N.L.
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LEGEND

- RECENT**
 - Alluvial in stream beds, sand, silt and gravels
 - TERTIARY**
 - Laterite cap. Dark brown ferruginous indurated laterite, fragments of sandstone, some psilolites
 - Scree. Deeply weathered angular yellowish to grey quartz sandstone, often in red clay matrix layered in places, sometimes ferruginous. Derived from transition beds and Cabbage Tree Conglomerate
 - Quartz gravels, subrounded to sub-angular white vein quartz in sand matrix. Varies from coarse clasts in south to fine gravel in north
 - Deep lead beds, carbonaceous silts, clays, sandstone, gravel etc.
 - MESOZOIC**
 - Coarse indurate green grey cobble conglomerate, some sandstone and minor siltstone. Clasts subrounded to well rounded, 10cm to 30cm vary from 40 to 70%. 60 to 70% clasts pale greenish grey phyllitic quartz sandstone, about 25% vein quartz, remainder variable including red and black cherty argillite. Silts weather to sticky white clay
 - Dolerite, coarse grained greenish brown
 - Basaltic dyke. Fine grained dark green with felt texture, sparse scattered ragged brown hornblende phenocrysts
 - PERMIAN**
 - Pale purplish grey medium to coarse grained sandstone, minor grit and conglomerate interbedded with dark purplish grey sandy mudstone. Some worm borings. Middle Arm Group
 - Massive dark purplish grey mudstone. Subconchoidal fracture. West Arm Group
 - Medium to coarse grained, brownish to yellowish weathering quartzite, and quartz muscovite sandstone, often cross-bedded with carbonaceous layers, some concentration of black heavy minerals (chromite). Liffey Sandstone?
 - Dark blue grey mudstone, calcareous, with platy fracture, passes up to sandy fossiliferous beach conglomerate, locally impure shell limestone with cobbles. Massey Creek Group
 - ORDOVICIAN**
 - Limestone, dark grey to black fine grained dense. Poorly exposed, from drill hole and mine data apparently underlies east side of deep lead deposits
 - Transition beds, medium to coarse grained pale grey to buff quartzites, quartz sandstones, quartz carbonate sandstone shale and phyllite, minor grit and quartz pebble conglomerate. Minor limestone
 - Cabbage Tree Conglomerate. Dark grey to black quartz pebble conglomerates, grit, and some black quartzite. Some chert fragments
 - CAMBRIAN**
 - Blue grey to black slates and phyllites, common sandstone horizons, some calcareous horizons
 - Weathers to yellowish brown clay
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- Geological contact—position approximate
 - Strike and dip of schistosity or foliation
 - Fault. Mapped, or from records
 - Linear features from aerial photographs, fractures or faults
 - Rock chip sample
 - Stream sediment sample
 - Axis of deep lead as determined in gravity survey by E.M.R. (1964) (Howland Rose)
 - Outcrop or sub outcrop
 - Inferred position of major fault beneath deep lead
 - Diamond drill hole
 - Boundary of E.L. 17/73
 - Shaft
 - Mineral claim boundaries
 - Adit
 - Lines for percussion drilling first phase of program



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