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LYELL E.Z. EXPLORATIONS

Queenstown

Report on

HAZELL HILL AREA

59-289

REPORT ON REGIONAL GEOLOGY OF
HAZELL HILL AREA
LYELL E.Z. OPERATIONS

MICROFILMED

Lyell Hill Area (2 copies)

L.E.E. July 1959

Report No. G101

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AMG REFERENCE POINTS ADDED

10th July,

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REGIONAL GEOLOGY OF HAZELL HILL AREA

1. Date of Investigation: 16.3.59 to 19.3.59, 24.3.59 to 27.3.59.
2. Man Days in the Field: 16
Personnel: Geologist: R.G. Elms
 Bushman: M. Maywood
3. Location: The area investigated, approximately 45 chains wide, lies symmetrically about a photobearing of 205° on photograph 20/904/65. The northern and southern limits of the area were 90 and 150 chains distant from the photocentre.

4. TOPOGRAPHY

Approximately one third of the described area, that portion lying to the north and east, is not covered by heavy timber and scrub. The heavily timbered area follows, in general, the course of the Wanderer River, and is, as might be expected, deeply dissected by short tributaries of the Wanderer.

The north eastern portion has button grass cover, is generally undulating, suffering only mild dissection from a few small creeks.

Parallelling the entire eastern boundary of the area is a very steep sided 'V' shaped valley.

5. LITHOLOGYIntroduction

The arrangement of the topics is, in the author's opinion, in the order of oldest to youngest. It must be emphasised that it is his present opinion only, perhaps to be modified later in the light of more detailed work. The arrangement is quite dependent on the author's interpretation of the structure, and also on the fact that no unconformity was found where it might have been expected.

Subdivisions are made on lithological grounds, and for convenience. No age significance is suggested by the subdivisions. The author would go no further than to regard the whole assemblage of sediments and metasediments as Cambro-Ordovician in age.

I. Greywacke Sequences(a) Sequence west of schist belt

West of the Wanderer River in the valley of a small creek was a sedimentary sequence having a variable W. dip of from 65° - 80° . The

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strike varied from 015° to 350°.

As the sequence was ascended, the following succession was observed.

Dark grey thin bedded slates (LE1183) and siltstones (LE1184), overlain by LE1185 type - a massive bedded dark greenish sandstone (?). Above this an alternating succession of thick beds (10') of dark grey-green shales and greenish greywacke (LE1186) occurred.

The highest beds observed were of fine pebble conglomerate (LE1187) interbedded with dark grey-green sandstones or siltstones.

LE1187 is characterised by the high proportion of pebbles to matrix. The pebbles (maximum 1/2" diameter) are generally well rounded and are composed of quartz, black chert and rock fragments (decomposed). Hence it is classed as a subgreywacke conglomerate.

The sequence as described would approximate in thickness to 500'.

The writer believes that this sequence has enough greywacke type material to suggest a relationship with the sequence of greywacke sandstones to the east of the schisted belt, and, from west to east, has proposed a faulted and sheared sequence of anticline, syncline and anticline for the area with the Osmund synclinal structure to the east.

(b) Dark green micaceous sediments

These consist, in general, of an alternation of dark green micaceous relatively thin bedded (1'-2') sandstone and siltstone grade sediments. Some greywacke members are present (LE1170). At times the sediments are very thin bedded (1" - 3").

The strike varies from 345° to 010°, while the dip ranges from 45° east to 80° east. Since the dip variation is gradual, and irregular in pattern, it may be adequately accounted for by lenticularity of beds or by dragfolding.

The order of thickness of these sediments is 800'. Bands of white siliceous pebbles are relatively common, particularly in the finer grained beds. These pebbles appear identical to those found in Owen type conglomerate so a common source is suggested.

Minor shearing in places has produced quartz chlorite mica schists (e.g. LE1171) which exhibit poorly developed schistosity. LE1170 is an example of a slightly sheared greywacke. Minor shearing can be explained by bedding plane thrust or drag faulting and folding.

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In general, however, the sequence does not exhibit any noticeable shearing.

II. "Dundas" Schists

The schists of the area exhibit a schistosity which has, in general, a northerly (0° - 010°) strike, and a steep westerly (70° - 80°) dip. There is little variation in the character of the schists, which are of the quartz chlorite, quartz sericite or quartz sericite chlorite schist type.

In general they have a fine grained greyish-green matrix in which abundant rounded pseudoporphyratic quartz occurs. A number of the collected specimens could be regarded as typical, e.g. L1155, L1157, or L1160.

L1156 is noteworthy as it is a fine grained chlorite schist carrying abundant fine grained pyrite, some sphalerite and a lesser amount of very fine grained galena. This mineralised layer of schist was only a few inches wide, and was conformable with the enclosing metasediments.

As mapped in this area, the schists occupy a belt some 20 chains wide in east-west extent. The western limit is a faulted contact (the Wanderer Fault) against a Cambrian (?) sequence of slates, siltstones, sandstones and, at times, fine pebble conglomerate. To the east the schists have apparently been faulted against Owen Conglomerate type sediments.

It is perhaps worth mentioning that the extremely close similarity, particularly in thin section, of the schist type (L1170) produced by minor shearing within the generally unshered and apparently overlying sequence of dark green greywacke sediments to the schist type (L1165) of the strongly sheared belt suggests, to the author, that the original rock type from which the schists were derived was a greywacke sediment.

As will be seen on plate P89, the picture is complicated by faulting, but nowhere was evidence of Jukesian Movement found between schist and unaltered sediments.

This leads to the point that the term "Dundas", as rather blindly applied in the past, may have little real meaning. Any schist which has a pseudoporphyratic texture has been classified as Dundas ^(assumed M-U Cambrian?) in age. This may be the case, but it is just as likely not to be. In the absence of palaeontological evidence, structural relations should be studied before an attempt is made to assign even a relative age.

As mentioned earlier, no field evidence has been found which suggests unconformity of the schist sequence with undoubted Owen Conglomerate

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type sediments. If the schists are part of a conformable Lower Palaeozoic sequence of sedimentation, it becomes apparent that schisting as a guide to age is not worth much. Rocks of varying ages may be schisted to give similar looking rocks, provided a basic lithological similarity exists through a fair proportion of the sequence. That some lithological similarity exists is evidenced by comparison of samples LE1165 and LE1170. Microscopically, they are extremely similar slightly sheared lithic greywackes, yet one comes from within the main shear zone, the other to the east of it.

III. Fragmental Occurrences of Eastern Part of 20/8 Grid

East of the baseline of the grid on anomaly 20/8, and particularly to the east of the Fault 1, are a number of occurrences of apparently unshered siliceous sediments, for example LE1146 on line 16S, and LE1167 on the baseline midway between lines 16S and 12S. Both of these are micaceous quartz sandstones. Occurrences of siltstone and chloritic shale were also observed.

Unfortunately none of these occurrences of unshered sediments were outcrops. Although in some instances the rock fragments were found in places where little transportation would have been possible, it is still impossible to deduce relationship of these sediments to the schists.

It is possible, and perhaps probable, that these fragmental occurrences are somewhat weathered examples of the micaceous sandstones and shales which occur further east in the valley of the Wanderer River.

IV. Owen Type Sandstones

Occurring to the west of the western limit of the undoubted Owen type conglomerate as shown on plate P88 are some 800 feet of pinkish-brown micaceous sandstones (LE1172) conformably ^{under}overlying the Owen type conglomerate, and conformably overlying the dark green micaceous sediments to the west.

The changes in facies from dark green micaceous sandstone to this Owen type was quite gradual.

V. Gordon

Along the Wanderer River at the SW corner of the grid of anomaly 20/8, and for some ten chains to the south, outcrops of a mid to dark grey, hard, dense, fine grained limestone (LE1149) were noted. At times the grey surface of the limestone was mottled with abundant fine white anastomosing calcite veins. No fossils were found, but on structural

grounds the limestone is placed in the Ordovician.

The Limestone presumably occurs as a thin down-faulted wedge bounded to the east by a fault having an 015° trend, and possibly to the west by a subparallel one some 150 ft. away. To the north the wedge may be cut off by a fault striking at 120° . To the south, nothing is yet known. No outcrop was available on the western side of the Wanderer River to confirm these inferences.

On weathering the limestone developed a rusty coloured surface, which, coupled with the apparently massive nature of the rock, made determination of dip and strike difficult. The best estimate of strike is 350° , and of dip, 55° west.

Evidences of shearing in the limestone were available.

Several small (6" wide) parallel zones of brecciation striking at 015° were noted, and in another instance a near vertical zone several feet wide, consisting of soft brecciated material, was found striking at 315° .

VI. Dyke Rocks

(a) Mica lamprophyre (LE1162)

This dyke was conformable with the schistosity of the enclosing schists and in every way appears comparable with similar dykes found in the Queenstown area. Only the one small occurrence was noticed, which varied from 2 inches to 20 inches. The dyke is post-schistosity in age.

LE1162 is a porphyritic rock with a fine grained greenish-grey groundmass in which is set an abundance of small biotite crystals.

(b) LE1163 type

This is a fine grained dark greyish-brown rock occurring in which are two sets of quartz veins carrying fine galena.

6. MINERALISATION

As observed, the two types were of very minor nature.

Type 1 Pyrite-sphalerite-(galena) Association (LE1156)

Abundant fine grained pyrite with lesser amounts of very fine grained sphalerite occurred in a fine grained chlorite schist. The mineralised band was only a few inches wide and was observed in one place only. The occurrence was regarded as of academic interest only, and analysis was made only to confirm the presence of sphalerite.

The analysis yielded the following percentages: Zn 5.25%, Pb 0.64%.

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These figures probably represent only the proportion of the elements present, as no attempt was made to collect a representative sample.

Type 2 Quartz-galena Association (LE1163)

The transgressive quartz veins to be seen in the fine grained dyke rock (LE1163) carry a small amount of fine grained galena. No analysis was made.

No significance is attached to either occurrence at this stage.

7. STRUCTURE AND TECTONICS

A. General

It is suggested that the principal structural elements of the Hazell Hill area can be explained by postulating tectonic forces directed in an easterly or north-easterly direction. These forces were active principally as part of the Tabberabberan Orogeny.

Evidence for faulting shown was of the following nature:

- (a) Abrupt and marked changes in the course of the Wanderer River associated with strong parallel jointing.
- (b) Where a fault was anticipated, outcrop was sometimes conspicuously lacking in an area of generally good outcrop. (This the author accepted as suggestive of faulting, because it is probable a fault zone would weather more readily than undisturbed rocks.)
- (c) Otherwise inexplicable structure (limestone abutting against schist) was regarded as best explained by faulting.

The north-east - south-west forces resolve into a northerly directed shearing couple which has expressed itself as a NNE-SSW belt of schisting and faulting.

The east-west component has yielded a series of reasonably strong faults trending at 315°, and possibly other less obvious faulting.

The dominant structural elements are a series of three strong sub-parallel NNE (015°-030°) trending faults, presumably of high angle dip.

Displacement on the NNE faults is indeterminate at this stage, but for the 315° fault bounding the Gordon Limestone block, a downward throw of very considerable extent, say 5000', can be suggested. In passing, it is interesting to note the fairly close coincidence in the fault directions proposed and two of the directions of I.P. linears discovered in the Moore's Valley area.

B. NNE-SSW Faulting

The westernmost NNE fault is the Wanderer Fault which parallels the course of the Wanderer River and marks the western limit of schistosity development.

Fault (1) lies some 20 chains east of the Wanderer River marking the eastern limit of schistosity, and also forming the western limit of the block of Gordon Limestone.

Fault (2) forms the eastern limit of the Gordon Limestone block. The northern extension of this fault and also fault (1) is open to speculation. There is no reason to suppose any great horizontal movement on any of these NNE faults.

Fault (3), as will be noticed on the tectonics plate, lies a variable distance east of Fault (2).

The very nature (a steep sided 'V' shaped valley) of the physiographic expression of this feature suggests a relatively recent origin. The author inclines to the view that this feature is of much more recent origin than other faulting in the area.

Possibly this valley could be due to selective erosion of a softer bed, but the slight discordances in the valley's trend and strike trend favour the fault theory.

It may also be suggested that this feature be regarded as a long-established line of ^{weak} ~~weakness~~ and the present physiographic expression an expression of recent movement on this line of weakness. However, at this stage there seems to be no evidence to support this view.

C. Tectonics

The Tabberabberan tectonics may be conveniently divided into four phases.

- (i) Compression (generally E-W), to give N-S aligned folding (e.g. Osmund Syncline).
- (ii) NNE faulting - Wanderer Fault, Faults (1) and (2) followed by development of schistosity with shearing between Wanderer and Fault (1). Probably schisting and shearing was at depth with associated re-crystallisation, with only faulting and folding effected the upper part of the sequence.
- (iii) Intrusion of minor dykes.

(iv) Downfaulting (315° bearing) to preserve little altered Gordon Limestone. Intrusion or mobilisation of galena bearing quartz as vein material.

After a long hiatus possible Tertiary faulting occurred along generally N-S lines.

D. Origin of Schists

It is impossible to be dogmatic about the origin of the schists, but there can be little doubt that dynamic action determined the texture, and strong re-crystallisation was partly due to syntectonic magmatic activity. However, intense sericitisation, such as is commonly reported as a product of hydrothermal alteration in the ore zone was not observed.

To account for the development of schistosity, there is no need to suggest great relative movement between the Wanderer Fault and Fault (1), and in the final analysis, there is no need for any movement at all.

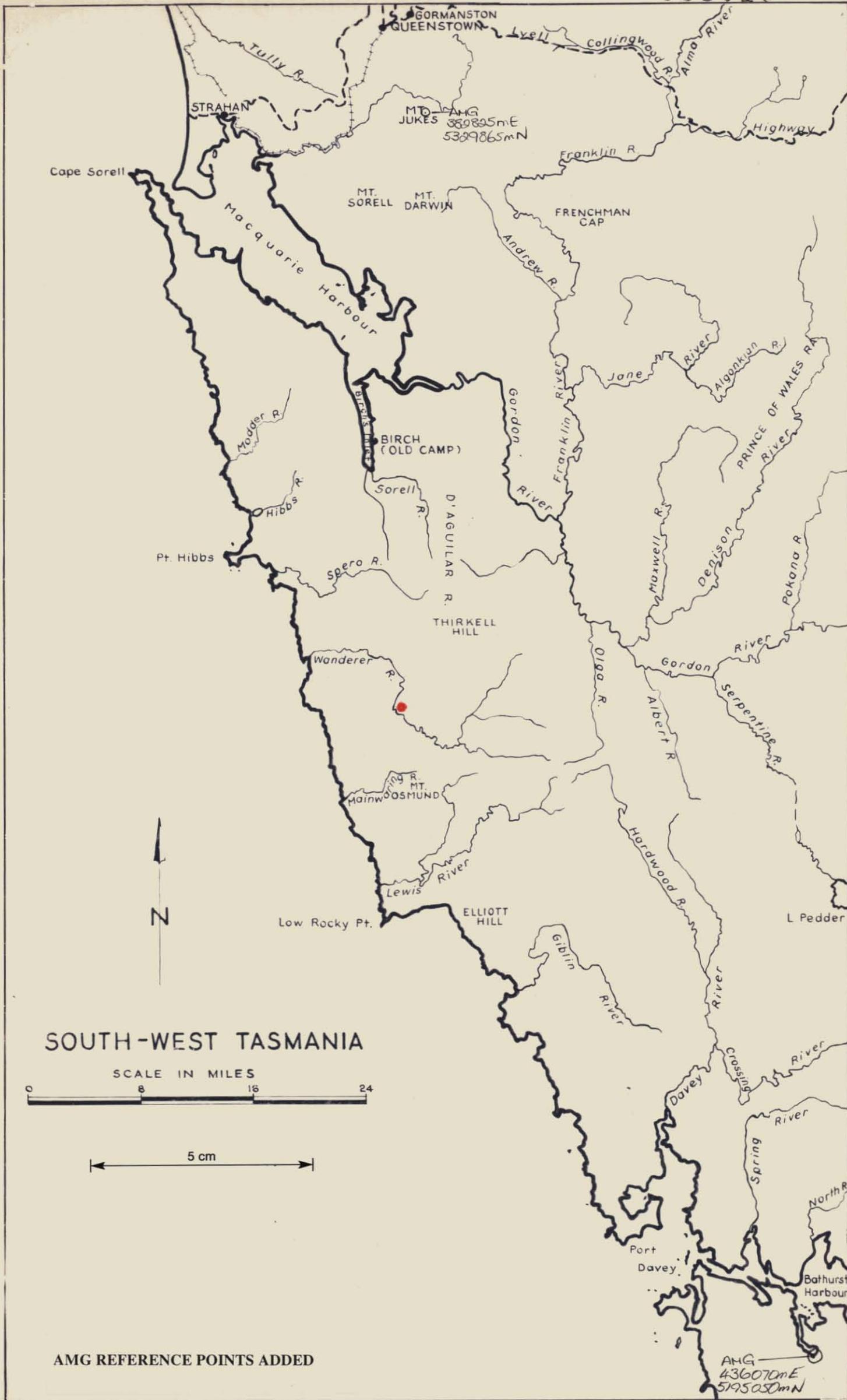
However, evidence exists to suggest movement did occur after schistosity was at least reasonably well developed (fracturing in dykes, themselves post-schistosity).

Continued compression on a combination of very tight folding and relatively incompetent beds gave rise to a zone of strong schistosity, while immediately east of the schist zone the rocks remained unshisted because folding was more open and the relative competence was possibly such that concentric shearing and cleavage development was sufficient to relieve compression.

Robert G. Elms.

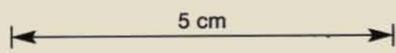
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|----|-----------------|------|--|
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| 2. | Solomon, M. | 1957 | Unpublished M.Sc. Thesis. |
| 3. | Elms, R.G. | 1958 | G51 Report on Examination of Hazell Hill and Mount Osmund Areas. |
| 4. | Elms, R.G. | 1959 | G80 Report on Anomaly 20/8. |



SOUTH-WEST TASMANIA

SCALE IN MILES

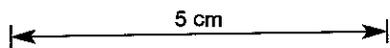


AMG REFERENCE POINTS ADDED

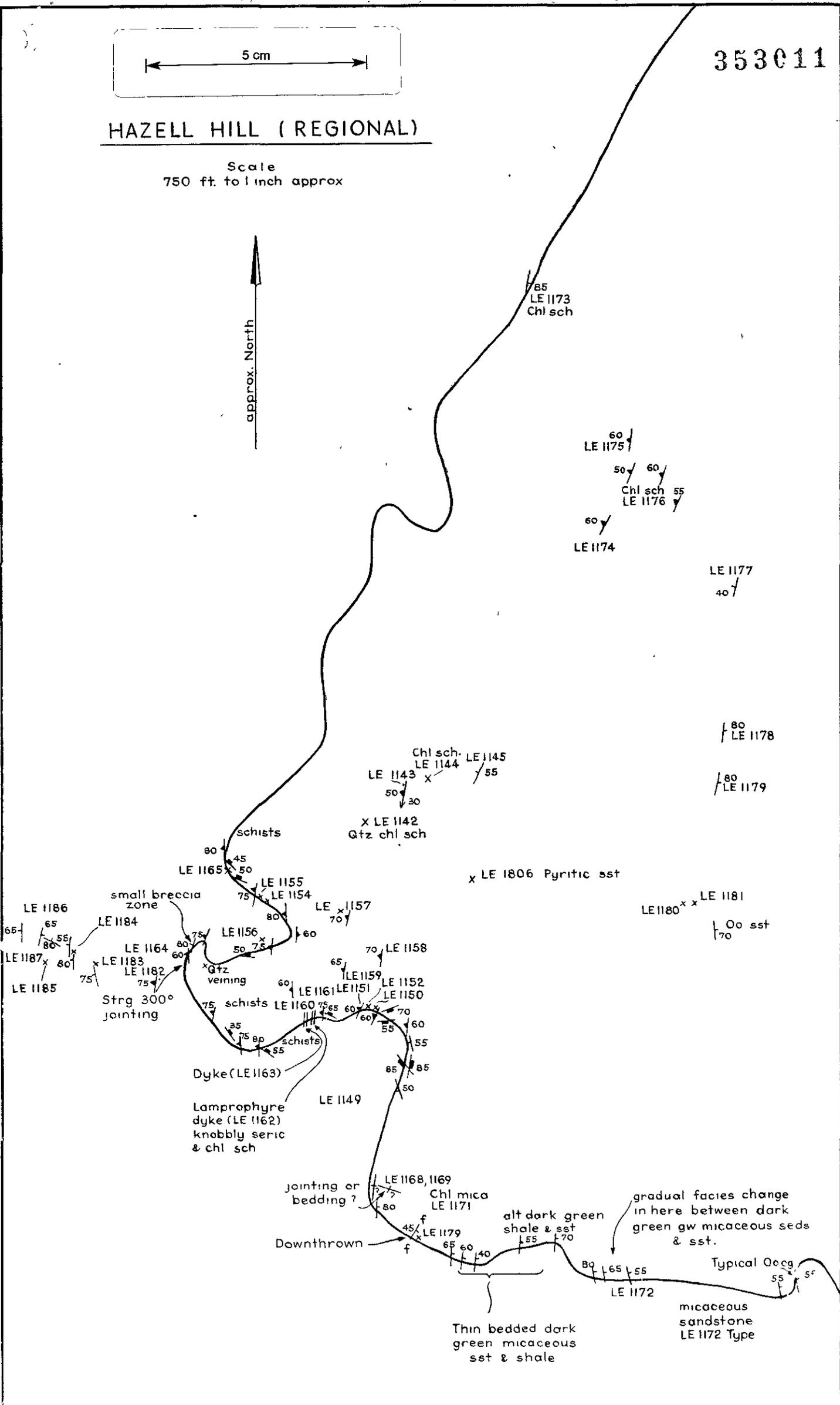
AMG
436070mE
5195050mN

HAZELL HILL (REGIONAL)

Scale
750 ft. to 1 inch approx



approx. North



85
LE 1173
Chl sch

60
LE 1175
50 60
Chl sch 55
LE 1176
60
LE 1174

LE 1177
40

80
LE 1178

80
LE 1179

Chl sch.
LE 1144
LE 1143 x
50 30
x LE 1142
Qtz chl sch

x LE 1806 Pyritic sst

LE 1180 x x LE 1181
00 sst
70

schists
80 45
LE 1165 x 50
LE 1155
LE 1154
LE x 1157
75 80
70

LE 1186
65 65
LE 1184
80 55
LE 1187 x 80
LE 1185
75
LE 1164
80
LE 1183
LE 1182
75
Strg 300°
jointing
75
Qtz
veining
60
LE 1159
LE 1151
LE 1152
LE 1150
75
LE 1160
75 60
60
55
60
55
85 85
50

Dyke (LE 1163)
Lamprophyre
dyke (LE 1162)
knobby seric
& chl sch

LE 1149
LE 1168, 1169
Chl mica
LE 1171
LE 1179
45 f
65 60
40

alt dark green
shale & sst
70

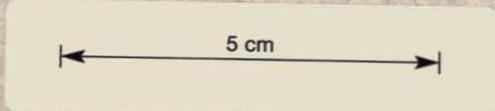
gradual facies change
in here between dark
green gw micaceous seds
& sst.

Downthrown

Thin bedded dark
green micaceous
sst & shale

Typical Ooqg
55 5
micaceous
sandstone
LE 1172 Type

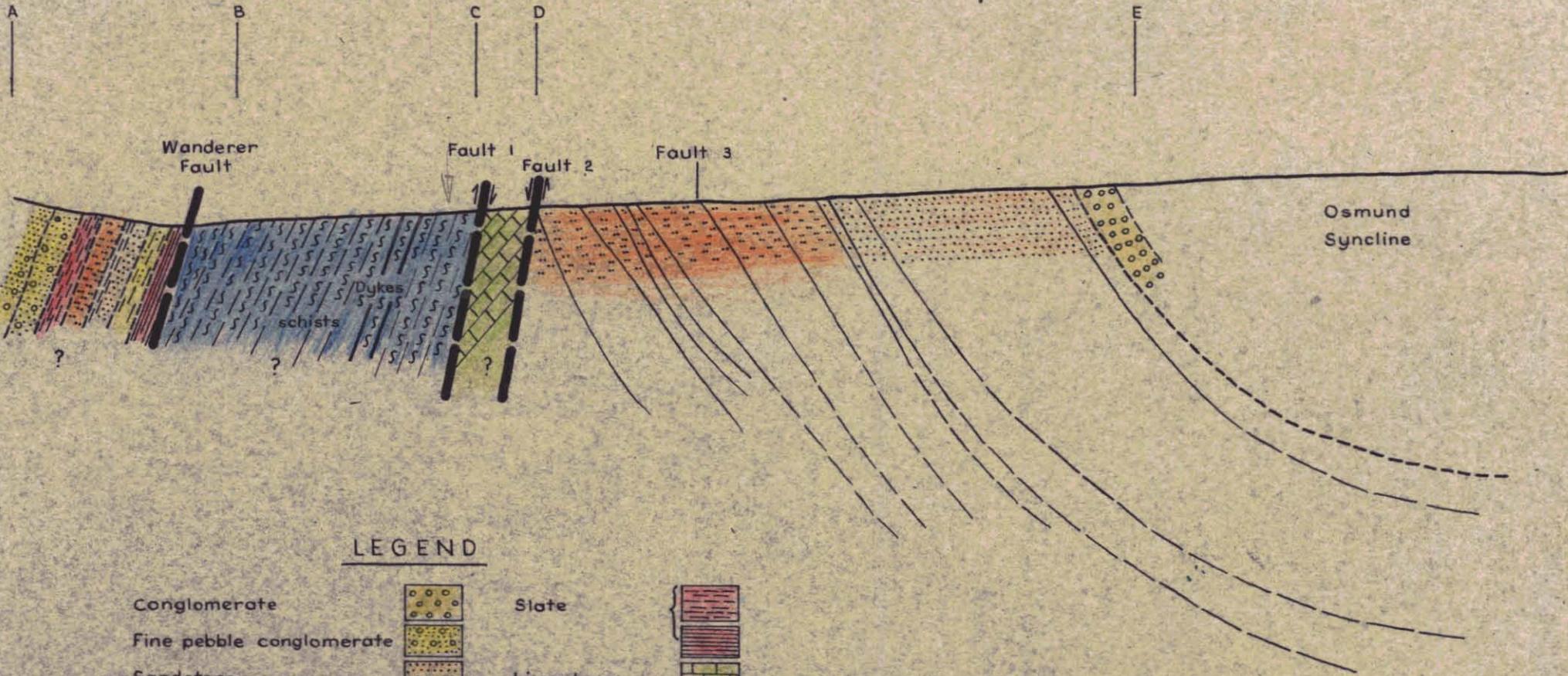
HAZELL HILL AREA E-W SECTION ALONG WANDERER RIVER



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WEST

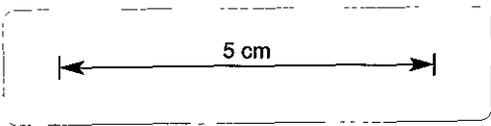
EAST



LEGEND

Conglomerate		Slate	
Fine pebble conglomerate		Limestone	
Sandstone		Schists	
Greywacke			
Siltstone			

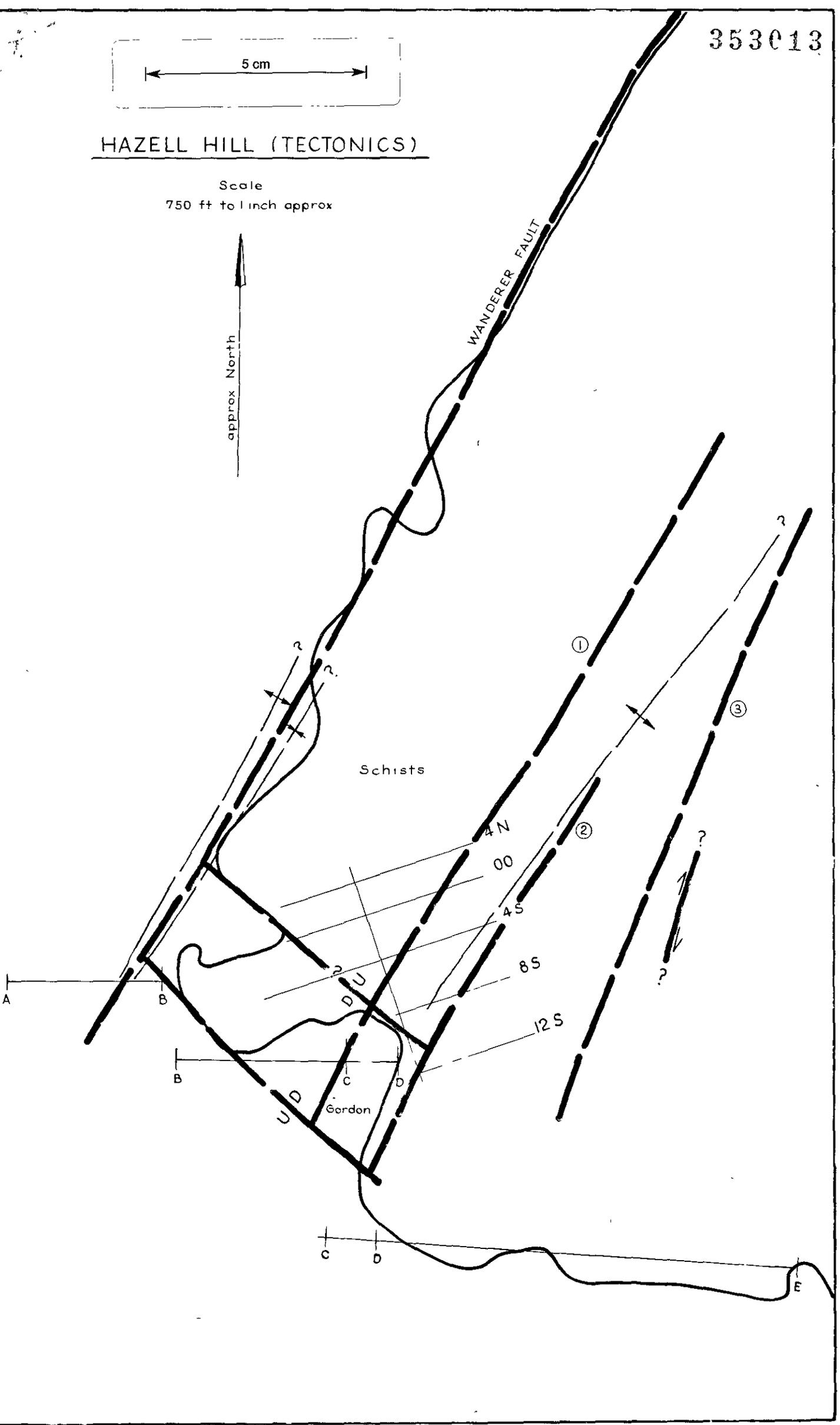
LYELL - IZ - EXPLORATIONS
 O. F. BROWN

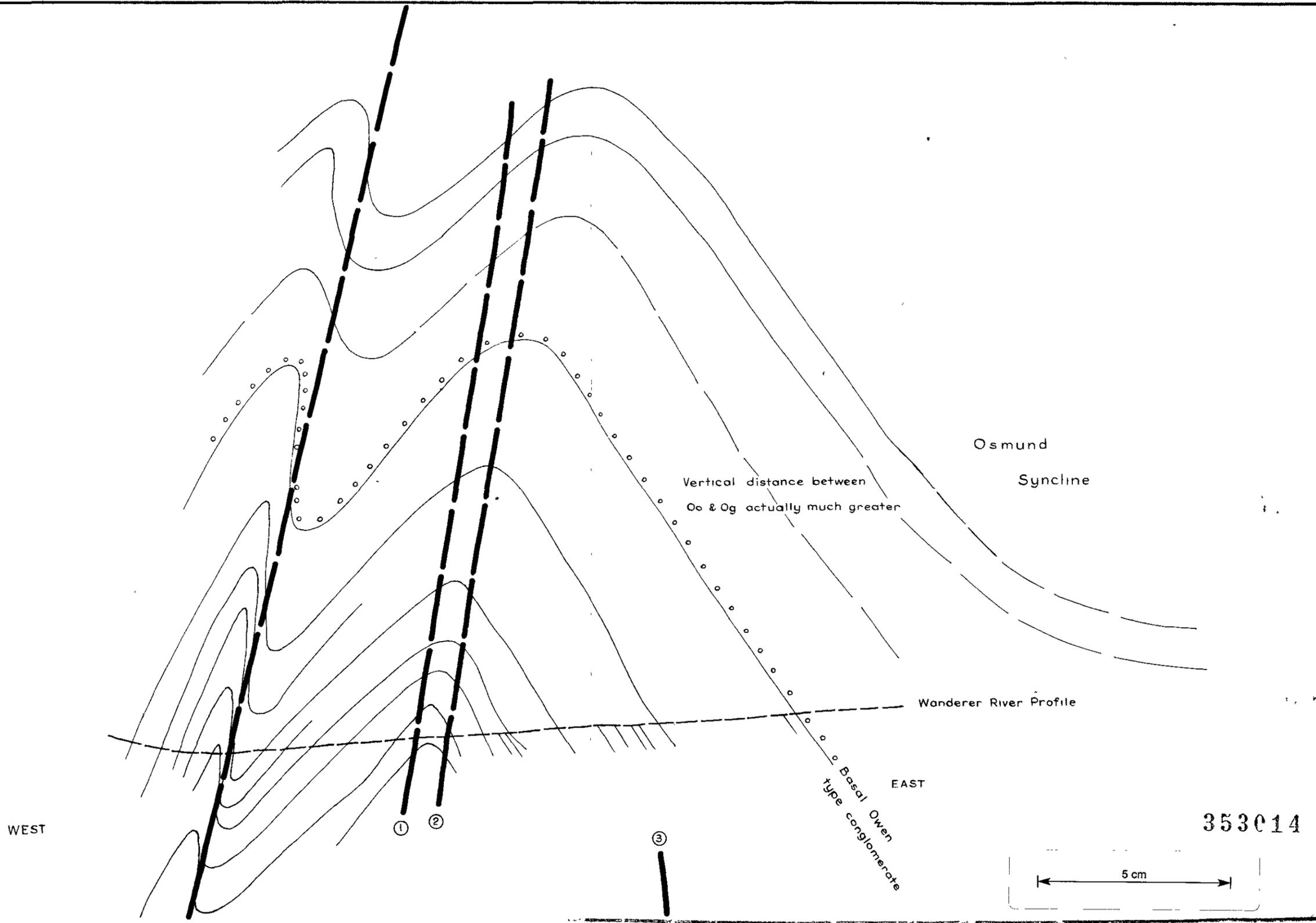


HAZELL HILL (TECTONICS)

Scale
750 ft to 1 inch approx

approx North





References	LYELL E.Z. EXPLORATIONS				
	QUEENSTOWN				
	HAZELL HILL AREA				
	PROPOSED STRUCTURE PRIOR TO FAULTING AND SHEARING				
	Survey			Scale Not to scale	Q41
	Geology	R.G.E.	Apr '59		
Geophysics					
Geochemistry					
Drawn	R.G.E.	Apr '59		Sheet	
Traced	D.S.	July '59		No.	