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LYELL E.Z. EXPLORATIONS

Queenstown

Report on

GEOLOGY OF THIRKELL HILL AREA

Geology of Thirkell Hill Area (2 copies)
L.E.E. June 1959.

Report N° G 79

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To: Mr. G.F. Hudspeth

I. GEOLOGY OF THE THIRKELL HILL AREA

1. Date of Investigation: 28.3.59 to 6.4.59

2. Man Days in the Field: 22

Personnel: Geologist: R.G. Elms
Bushman: M. Maywood

3. Location: The two areas of investigation lie wholly within a three mile long north-south belt centred approximately on Thirkell Hill. The approximate east-west extent of this belt is one mile. These areas of investigation are situated on photo 19/904/9, some 90 chains north, and 120 chains south of the photocentre.

4. Topography

The northern area is situated entirely within a flat button grass plain which is at times cut by gently sloping valleys.

The southern area lies at the southern edge of a small button grass plain which is cut by steep sided relatively deep valleys draining to the south west. This plain drops sharply away to the south to the lower level of the Tertiary gravels of Moore's Valley.

5. Geology

A. Southern Area

(a) Lithology

(i) Dundas: At the eastern end of this area several occurrences of Dundas metasediments were seen in a south flowing creek. These are represented by specimens LE1189 and LE1190.

LE1189 is a dark green quartz chlorite schist having a fine grained dark green chloritic matrix in which were abundant round grains of clear quartz (up to 1/10" in diameter).

LE1190 is a hard, mid-grey to greenish siliceous sediment having a fine grained siliceous groundmass in which occurs round grains of clear quartz (up to 1/10" in diameter).

Some 20 yards upstream from the locality of LE1190 the rock had the appearance of being sheared, and white quartz veins, at times 3" wide, parallelled the strike of the foliation.

The impression gained was that LE1189 was similar to LE1190, but its slightly more chloritic nature rendered it more amenable to shearing, the effect of which it showed.

In the creek, between the localities of LE1190 and LE1189, was found a poor exposure of poorly sorted breccia conglomerate very close to the photo-interpreted Dundas-Owen contact. This rock was striking at 345° magnetic, but the dip was indeterminate.

In all observed cases, the pebbles were of quartz-chlorite schist (LE1189 type) set in a dark green ground mass. The pebbles were generally subangular, and very varied in size, ranging up to an observed maximum diameter of 12".

It is possible this conglomerate is the equivalent of the Jukes Conglomerate.

(ii) Owen Conglomerate: The primary purpose of investigating the area south of Thirkell Hill was to locate the proposed northern boundary fault of Moore's Valley - the Thirkell Fault.

As a consequence of this, and because outcrop was sparsely distributed, no attempt was made to determine the complete Owen sequence.

However, a brief statement of the rock types occurring in the approximate and incomplete sequence is possible. This follows in order youngest to oldest:

Medium grained quartz sandstone.

Pink micaceous quartz sandstone (with zones of limonite cementation, e.g. LE1188, where faulting occurred). This sometimes varies to a very coarse grained (to 1/16") quartz sandstone. Fairly massively bedded.

Thin bedded (6") pink medium grained quartz sandstone.

Fine siliceous pebble conglomerate (pebbles have ¼" maximum diameter).

Pink coarse grained pebbly sandstone with thin (2") pebble bands (Maximum pebble diameter 1½").

These beds represent the eastern limb of a syncline, the western half of which has been displaced by the Lyell Shear.

(b) Structure:

The existence of the Thirkell Fault is indicated in the western part of the area by discordant dips, by strong jointing, and by brecciation which is particularly evident in the pink micaceous sandstone unit.

Within this sandstone are irregular sheet like concentrations of limonite, and sometimes quartz veining. However, it proved impossible to trace indications of faulting more than 10 chains or so, or to gain information as to the direction of fault movement.

B. Northern Area

(a) Lithology

Owen Conglomerate: Due to the probability of faulting affecting the bottom part of the sequence, the complete reliability of the stated bottom seven members is not claimed. It is also possible that the very basal members are missing.

The seven members of Unit 1 of the Owen sequence probably occupy no more than 500' in the stratigraphic column. The statement of the column, in order, oldest to youngest, is

Unit 1

Fine grained light green quartz chlorite schist (LE1194).

Greyish white quartz schist (LE1193) with schistosity poorly developed.

Dark purple siliceous schist (LE1191) in which bedding is indicated by pebble bands. Before shearing this was probably similar to the fine purple pebble conglomerate described below.

Greywacke. LE1192 is composed of fairly large rounded to subangular grains of quartz and felspar set in a darkgreen, fine grained groundmass of chloritic and sericitic material.

This rock differs from Pettijohn's definition of greywacke in lacking extreme angularity and size of constituent grains.

Light brown quartz sericite schist. Only a small thickness was evident, of the order of 20'. Possibly this represents a fine grained sandy band in the conglomerate which readily responded to shearing.

Siliceous pinkish-purple pebble conglomerate, in which pebbles occasionally attained a 3" diameter. The conglomerate seems intermediate in character between Owen and Jukes type. In places a considerable proportion of subangular pebbles occur. At times soft schist or slate pebbles are numerous.

Fine pebble conglomerate with most pebbles in the $\frac{1}{4}$"-$\frac{1}{2}$" diameter range, and a very few exceeding 1". The pebbles were siliceous - quartz, quartz schist and quartzite. The fine grained matrix has a purplish-grey colour.

Unit 2

Buff coloured, siliceous pebble conglomerate with siliceous pebbles attaining a maximum diameter of 3" at times. As the sequence is ascended, the conglomerate becomes relatively thin bedded (1'-2').

Thin bedded (3"-6") siliceous pebble conglomerate, the pebble size of which averages ¾" and, occasionally, reaches 1½", occurs near the top of the unit.

It was apparent that as the sequence was ascended, the pebble size showed a general reduction, and also that the thickness of the beds diminished.

The thickness of this unit is approximately 850'.

Unit 3

Greenish micaceous quartz sandstone, which developed a brown colouration on weathering. This sandstone alternated with a soft greenish grey shale. Both rock types are represented in LE1195. The sandstone is generally massive bedded, alternating with thin (6") beds of shale.

However, at one good outcrop, there was a rapid alternation of thin (½") beds of sandstone and shale. Above and below this outcrop in section the sandstone occurs massively bedded, so the thin bedding is not typical of this unit.

Within this sandstone-shale unit occasional thin (6") beds of typical Owen pebble (1" average diameter) conglomerate occur. This unit is some 400' thick.

Unit 4

Unit 4 is lithologically similar to Unit 3. It consists of an alternation of the same sandstone and shale, but the sandstone to shale ratio is much increased to 3:1 approximately. Occasional thin (6") pebble bands (½" average pebble diameter) occur providing evidence of normal facing.

This unit is 280' thick.

Unit 5

Soft, grey-green, slightly micaceous shale (LE1196) forms a small unit some 70' thick before the top unit of the sequence is reached.

Unit 6

An alternation of thin beds (6"-12") of green micaceous sandstone and fine grey-green shale forms the top unit. The beds become even thinner (3") at the very top of the sequence. Graded bedding is well developed, and shows the beds are not overturned. This unit is 450' thick.

In all this Owen Conglomerate sequence occupies approximately 2500' of the stratigraphic column.

(b) Structure

The Owen Conglomerate occurs in a synclinal structure, the western limb of which is partly faulted out against the Lyell Shear.

On photographs, a due NW trending fault is apparent, but it was not located on the ground. However, strikes measured on the ground suggest the block on the northern side of this fault moved in a northwesterly direction.

On the east side of this area the bottom of the described sequence certainly shows signs of shearing, which no doubt is associated with movement along the Owen-Dundas contact.

Robert G. Elms.

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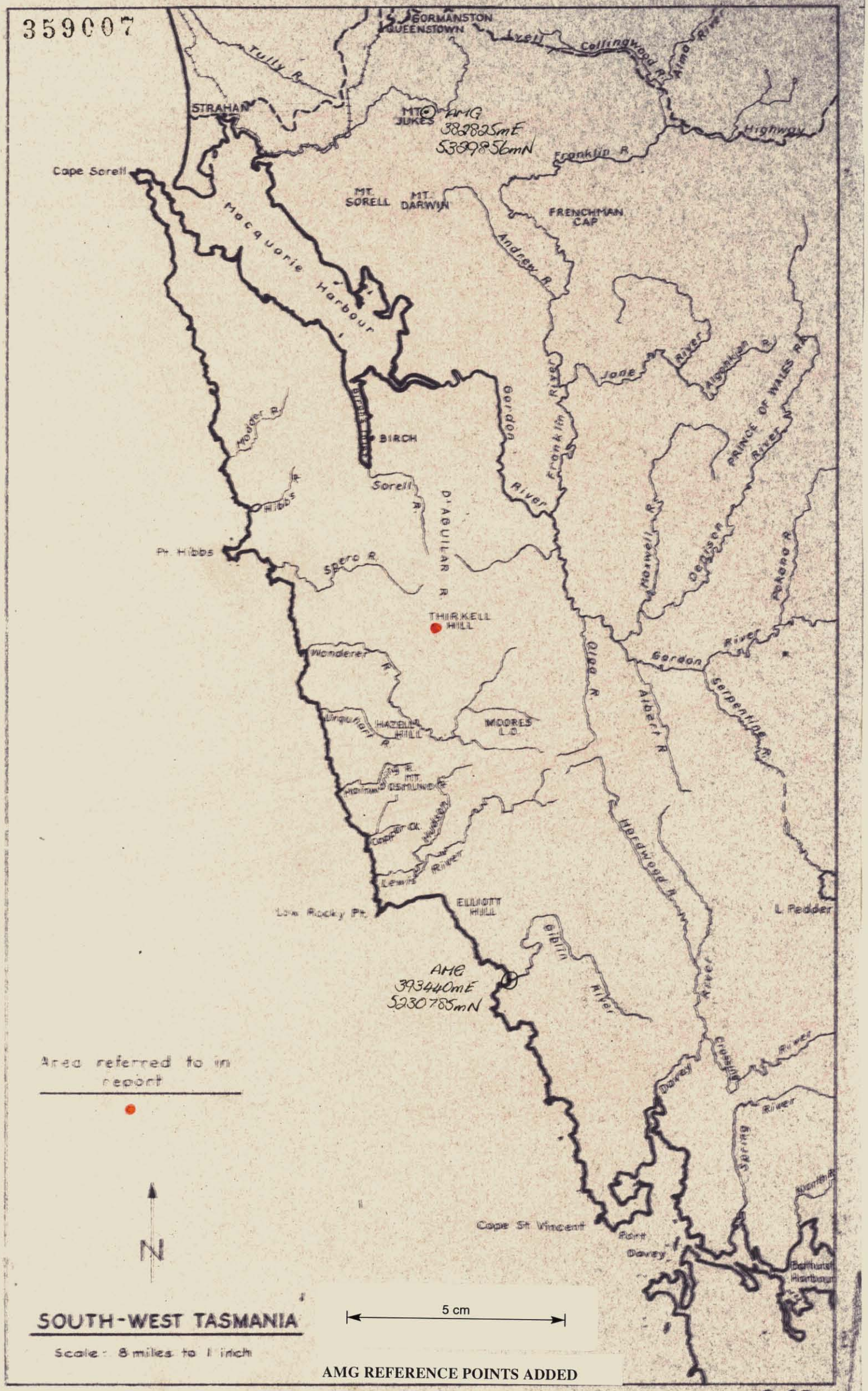

AMG REFERENCE POINTS ADDED

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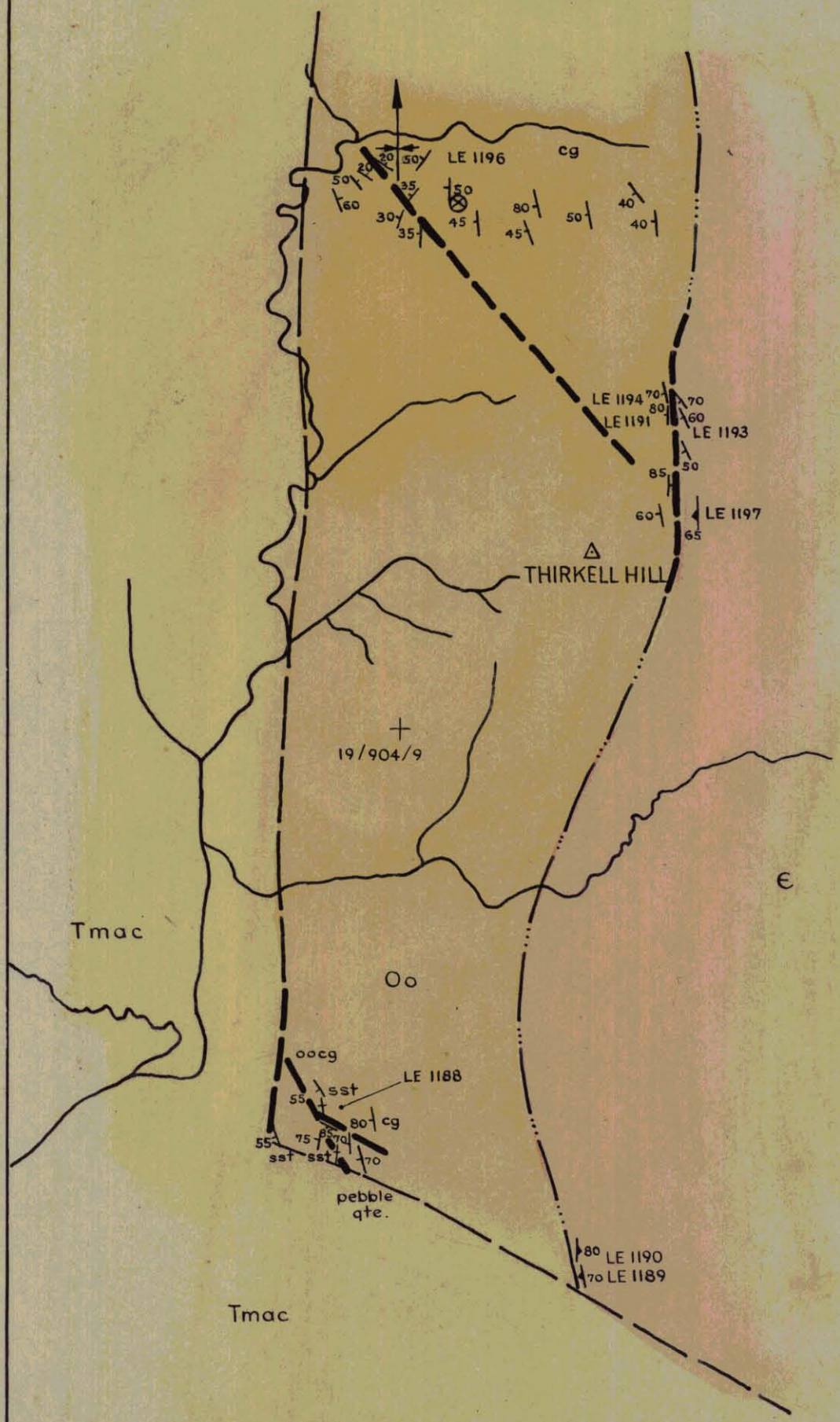


THIRKELL HILL AREA

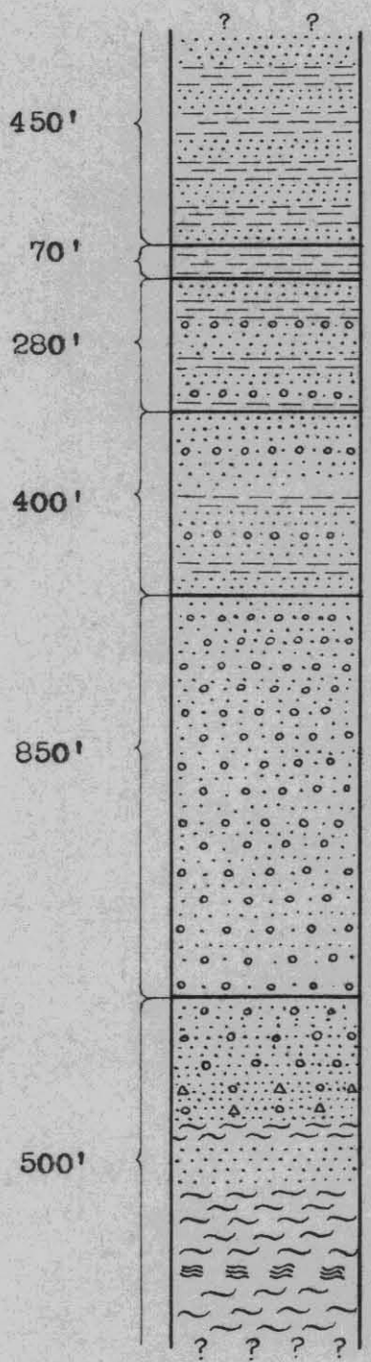
LEGEND

- Fault (from fieldwork)
- Fault (from photo interpretation
- Linear Feature - probable fault
- Syncline

THIRKELL HILL

Stratigraphic column of
Owen Conglomerate

Vert.Scale: 400' to I"



Unit 6 An alternation of thin bedded green micaceous sandstone and grey-green shale.

Unit 5 Grey-green micaceous shale.

Unit 4 Lithologically similar to Unit 3, but proportion of sandstone to shale higher - 3:I

Unit 3 Green micaceous quartz sandstone & thin shale bands. Occasional thin conglomerate bands.

Unit 2 Siliceous pebble conglomerate. As column is ascended, bedding thickness becomes less, and pebble size diminishes.

Unit I Purple coloured fine pebble conglom.
Coarse pebble conglomerate of purple colour.
Quartz sericite schist.
Greywacke.
Purple siliceous schist with pebble bands.
Quartz schist.
Quartz chlorite schist.