

UR1975_30

Seismic survey at the proposed fishing lake, Four Springs, near Frankford.

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A seismic survey was undertaken as part of the site investigation for a proposed dam site (fig. 1) at Four Springs [DQ878177], 9 km south-east of Frankford. The earth dam will have a maximum height of 10 m; the reservoir, which will have an area of about 2.5 km² will be used for fishing.

Seismic investigations were used to determine:

- (1) the depth of weathering at the dam site
- (2) the possibility of a buried channel
- (3) the depth of weathering at the proposed spillway site, and
- (4) the suitability of a quarry site as a source for rock facing.

GEOLOGY

The whole boundary of the proposed lake area and stream catchment is of dolerite rock. Alluvium covers the floor of the valley, and trial pits dug into the alluvium revealed clay. Some Permian pebbles are present, but their source is not known.

On the dam site itself are dolerite derived soil and some outcrops of rock. Trial pits dug along the centre line of the proposed dam reveal a considerable depth of weathered material. On the north-west part of the dam pits were dug by back-hoe to about 2.5 m, however, close to the river, and on the south-west side the pits are more shallow, 1.5-2 m deep, and localised hard rock was encountered.

The weathering profile on dolerite is very irregular as it proceeds most rapidly along joints and fissures, leaving pinnacles of unweathered rock and often large residual boulders. In trial pits the following weathering sequence was observed:

- Crumbly red soil
- Red clay
- Grey and red clay surrounding centres of harder material
- Brittle, yellow and mottled rock with joint infillings of calcite, clays and iron oxides
- Hard blue rock with weathered joints

SEISMIC SURVEY

There is no sharp boundary between soil and rock, merely a series of irregular layers of generally increasing strength. In a refraction seismic survey the rock-type is deduced from the velocity with which shock waves travel through it. Spreads with closely spaced geophones are used to detect the interfaces between shallower, low velocity layers, whilst spreads using more widely spaced geophones detect deeper refractors.

Parts of the dam site centre line were covered by 91.4 m spreads (geophone spacing 7.6 m), parts by 36 m spreads (geophone spacing 3 m), or by both. Where the 36 m spreads were not used a queried line joins the interpreted rock-depths (fig. 2).

Owing to the inhomogeneous nature of the material, travel times for the shock waves are variable and deducing the characteristic wave velocity is open to error.

INTERPRETATION

Dam Site

The interpreted seismic section along the dam site is shown in Figure 2. Materials which show seismic velocities of less than 760 m/s are considered to be soil and deeply weathered rock which is weak enough to be ripped. However large tough boulders, or rock-pinnacles may be present. Velocities between 1830 m/s and 3800 m/s indicate dolerite rock which is at various stages of weathering, but is too hard to be ripped. Velocities of over 5000 m/s represent fresh dolerite.

The weathering profile is irregular, ranging from 1-5 m in thickness. On the north-west side of the river, the rock surface appears to be stepped. The rock is closest to the ground surface below the river and at the north-west end of the dam.

There is no indication of any buried channels. However there may be a permeable layer of pebbles below the stream; this could be determined by digging a test pit.

Although the weathering is deep, the weathered material is relatively impermeable, so that trial pits held over a metre of water after rain.

One or two diamond drill holes, 9 m deep will be used to examine the rock, and for pump-in permeability tests.

Spillway

The inlet of the proposed spillway is in a rocky area, however the seismic survey indicates that south of the rocky knob, below 97 m a.s.l., the thickness of weathered material increases rapidly to more than 6 m (fig. 3).

Quarry site

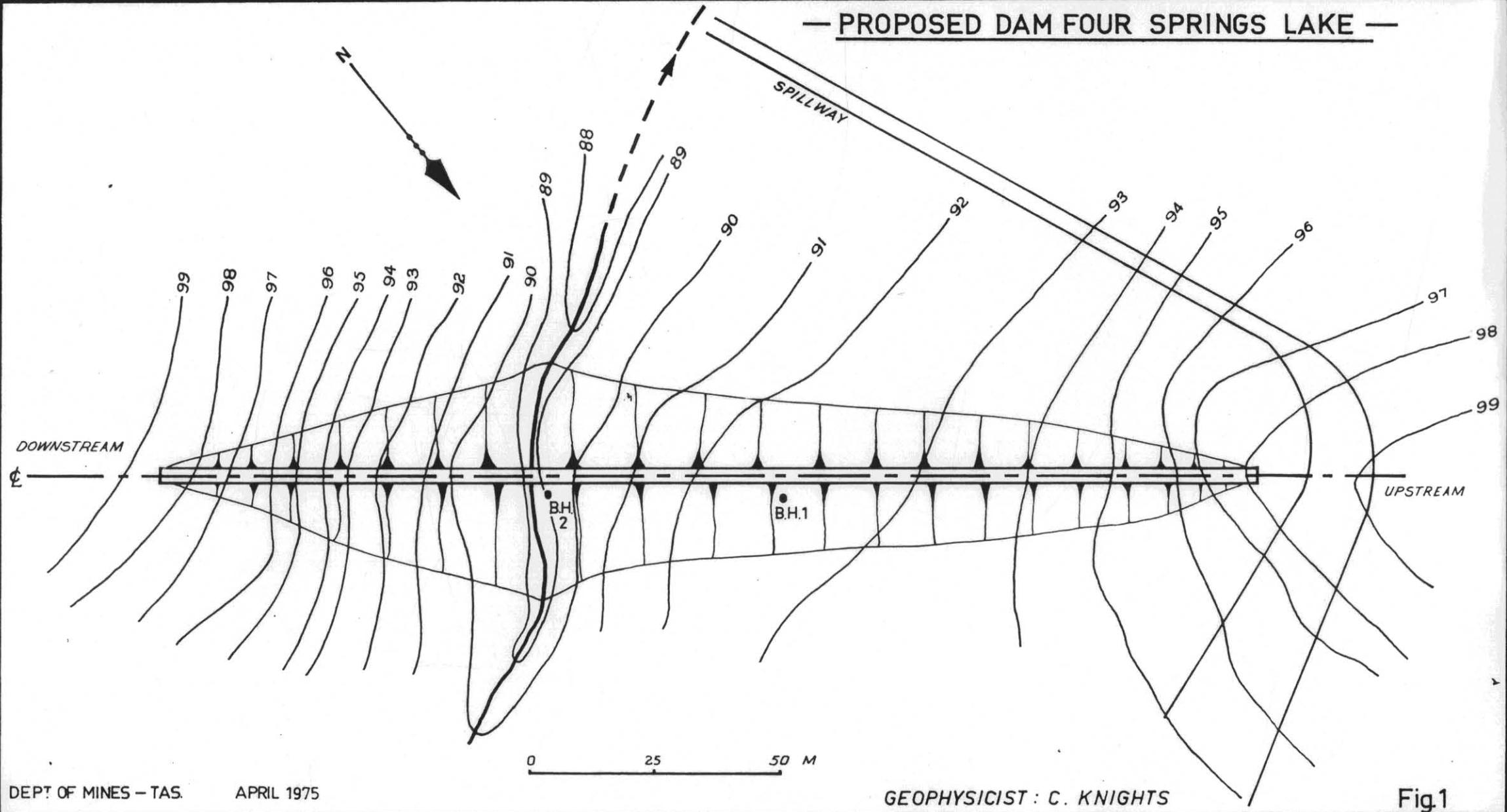
Rock pieces greater than 0.3 m square are required to face the dam, and fresh, crushed, rock is needed for the filter.

Dolerite crops out towards the top of the hill, north-west of the dam. The suitability of this rock was investigated using two seismic spreads with a geophone spacing of 3 m.

The lower spread (8) indicates that rock with a velocity of 2500 m/s is present within one metre of the surface. Spread 9, near the top of the hill, indicates deeper weathering. In both cases rock is closer to the surface at the northern ends of the spreads.

Rock with a velocity of 2500 m/s is only marginally suitable for facing the dam, and is not fresh enough to be used as a filter. It is likely that good rock is present at depth, and this could be determined by using a longer spread.

— PROPOSED DAM FOUR SPRINGS LAKE —



DEPT OF MINES - TAS

APRIL 1975

GEOPHYSICIST : C. KNIGHTS

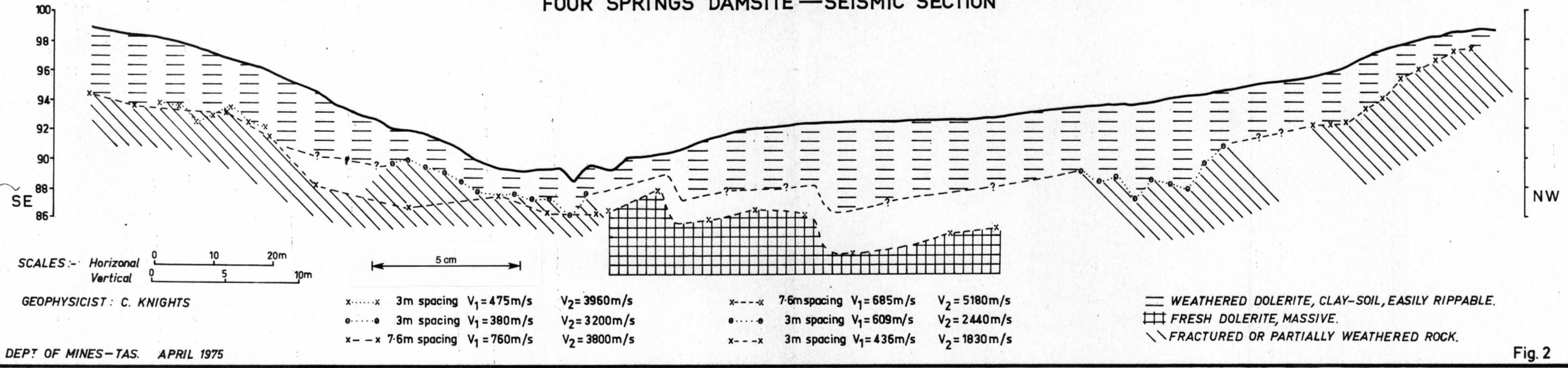
Fig.1

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0 25 50 M

5 cm

FOUR SPRINGS DAMSITE — SEISMIC SECTION



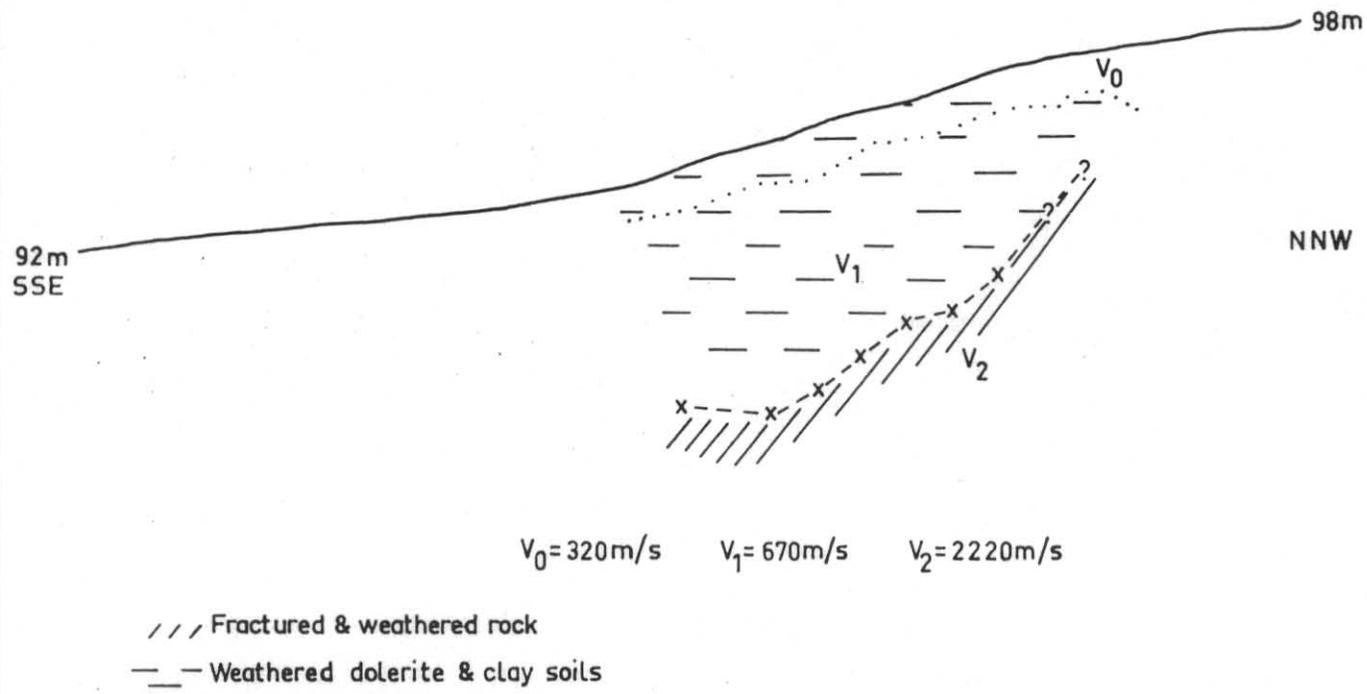
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Fig. 2

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SEISMIC SECTION PARALLEL TO SPILLWAY (ABOUT 12m EAST)

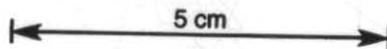


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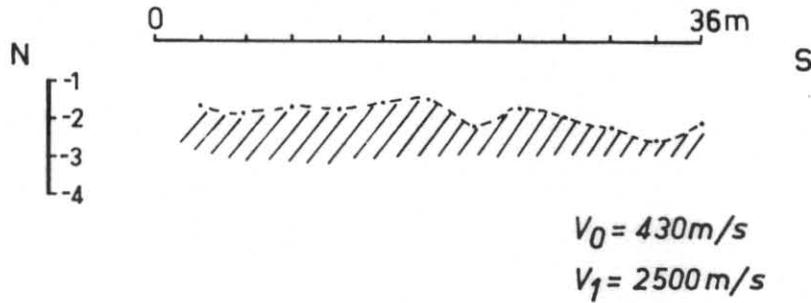
GEOPHYSICIST: C. KNIGHTS

Fig.3

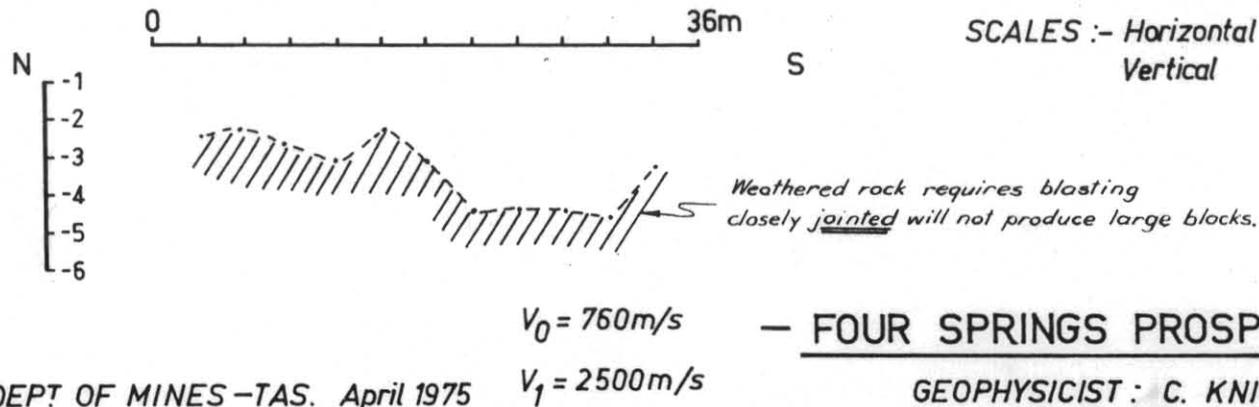
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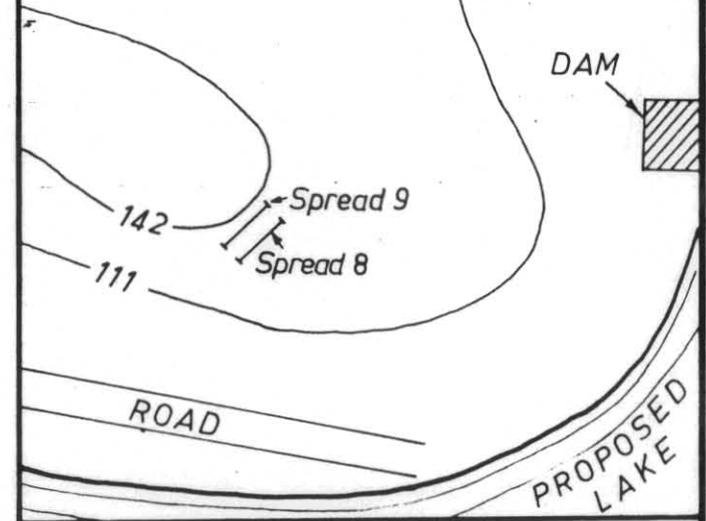
SPREAD 8 (10m FROM TOP OF HILL)



SPREAD 9 (5m FROM TOP OF HILL)



SCALE
0 50m



LOCATION PLAN

SCALES :- Horizontal 0 10 20m
Vertical 0 5 10m

— FOUR SPRINGS PROSPECTIVE QUARRY —

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GEOPHYSICIST : C. KNIGHTS

Fig 4

5 cm

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