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24. Report on the geology of a dam site on the Emu River.

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PART 1. PRELIMINARY INVESTIGATIONS

The site is on the Emu River, 18 km south of Burnie [39/864250]. Access to the river is easy even for two wheel drive vehicles and is obtained from the Burnie-Highclere road by way of the A.P.P.M. private Pet, Granites and Boulder Roads. These roads lead to a flood plain on the west bank about 200 m upstream from the dam site, which is in a steep sided gorge. Vegetation is generally thick and in some places almost impenetrable. A two-pole bridge was constructed to gain access to the east bank.

The dam site and storage area lie entirely within the Blythe granite mass which is exposed over an area of about 260 km^2, and in Tertiary times was capped by extensive flows of basalt. Since that time the basalt has been completely removed from the area of the dam site and storage and the granite has been deeply weathered.

As is commonly seen in Tasmania, the granite has weathered deeply, leaving cores of hard granite surrounded by soft gravelly or clay-like weathering products. Large weathering cores or 'boulders' are seen around the steeper slopes of the site, but are not clear evidence of solid rock close beneath.

SEISMIC SURVEY

Because of the difficult terrain neither the abutments nor the storage area were examined in detail. Extensive clearing would be required to do this and a seismic survey was conducted as the best means of obtaining general information on the state of the underlying rock. This survey consisted of two 40 m spreads along an assumed centre line on each abutment, and a single 40 m spread in the vicinity of the saddle 900 m on a bearing 070°(t) from the centre line (fig. 40).

Abutment spreads

These spreads show an irregular surface layer of 1 to 4 metres of low seismic velocity material (300-400 m/s). This overlies a layer 5 to 6 m thick of material having a seismic velocity of 1,200 m/s. Some spreads show a further layer of 3,600 m/s below this.

These layers are interpreted as:

(1) Soil and loose weathered material with some large embedded rock cores; 1-4 m.

(2) Compact weathered granite in the state of gravelly clay also containing rock cores; 5-6 m.

(3) Unweathered but jointed granite.

Saddle spread

In this area the bush was found to be so thick that even the configuration of the ground was difficult to determine. A spread was fired in the approximate location of the saddle and showed that the deeply weathered material (2) reached to a depth of more than 30 m with little indication of unweathered rock.

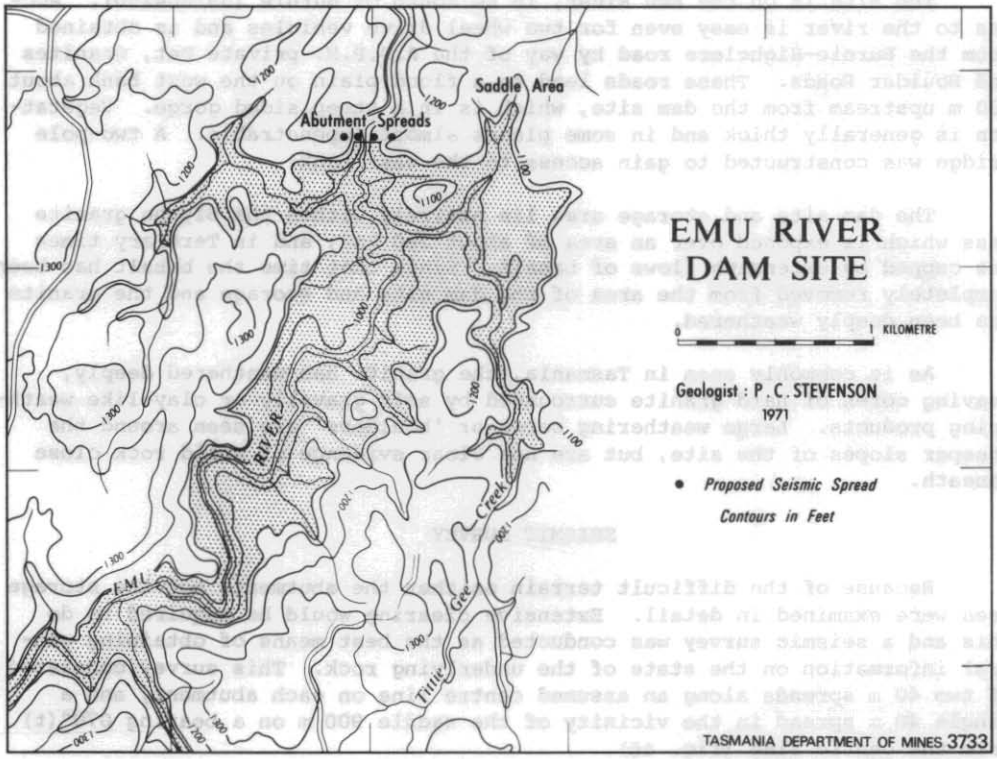

Figure 40.

5 cm

CONCLUSIONS

The granite is deeply weathered in the dam area, and *in situ* hard granite is present only at depth in spite of the rock cores apparent on the surface.

The saddle area, which has a limited freeboard is particularly suspect.

Extensive further seismic investigation followed by drilling and permeability testing would be required to prove the site, and for these purposes cleared lines would be necessary.

PART 2. GRANITE WEATHERING

The dam site was revisited on 15-16 September 1971 in order to re-examine the nature of the granite weathering.

BOULDER ROAD SECTIONS

The best sections in the area are to be seen along Boulder Road, which is about one kilometre to the west of the dam site. Here the basalt-capped plateau has been cut into by the small western tributaries of the Emu River. The basalt cap appears to be quite thin, perhaps 15 m in thickness and the rest of the slopes consist of weathered and unweathered granite. The former is by far the most extensive, and has developed a rain-washed soil profile up to 3 m thick even on steep slopes. (fig. 51a, b). Minor features of the granite such as aplite dykes and pegmatites are still plainly visible even in deeply weathered rock, and the base of the soil profile is marked as the position at which these features are no longer discernible (fig. 51c).

As little unweathered granite is seen, the thickness of the weathered part is difficult to estimate. The age of the weathering is generally assumed to be Tertiary, because of the chemically active humid climate of that time and predates the extrusion of the basalt. This means that the weathering may be expected to extend laterally under the present basalt cap. The weathering profile in the granite may be more than 25 m in thickness and will have been controlled by the Tertiary, and not by the present, relief. The granite is not being greatly affected by present day weathering and is certainly not developing such deep weathering profiles.

The unweathered granite in the Boulder Road sections is only seen as kernels of hard granite in a matrix of weathered rock. At the surface these weather out as groups of boulders, a name which is accurate as far as shape and size is concerned, but is best avoided as attrition and transport have played no part in their formation. Along the road banks partially exposed kernels up to about 5 m in diameter are exposed, and are composed of hard, but fractured and incipiently weathered granite (fig. 41a).

The origin of the kernels is best appreciated as a late stage in the deep chemical weathering of the granite (fig. 41d).

No fresh bedrock is seen and the depth to it in the region of the road cuts is unknown.

DAM SITE GORGE (fig. 41c)

The seismic survey indicated that compact weathered granite in the state of gravelly clay forms most of the abutment slopes. These slopes bear scattered masses of hard granite but as at Boulder Road, these must lie in

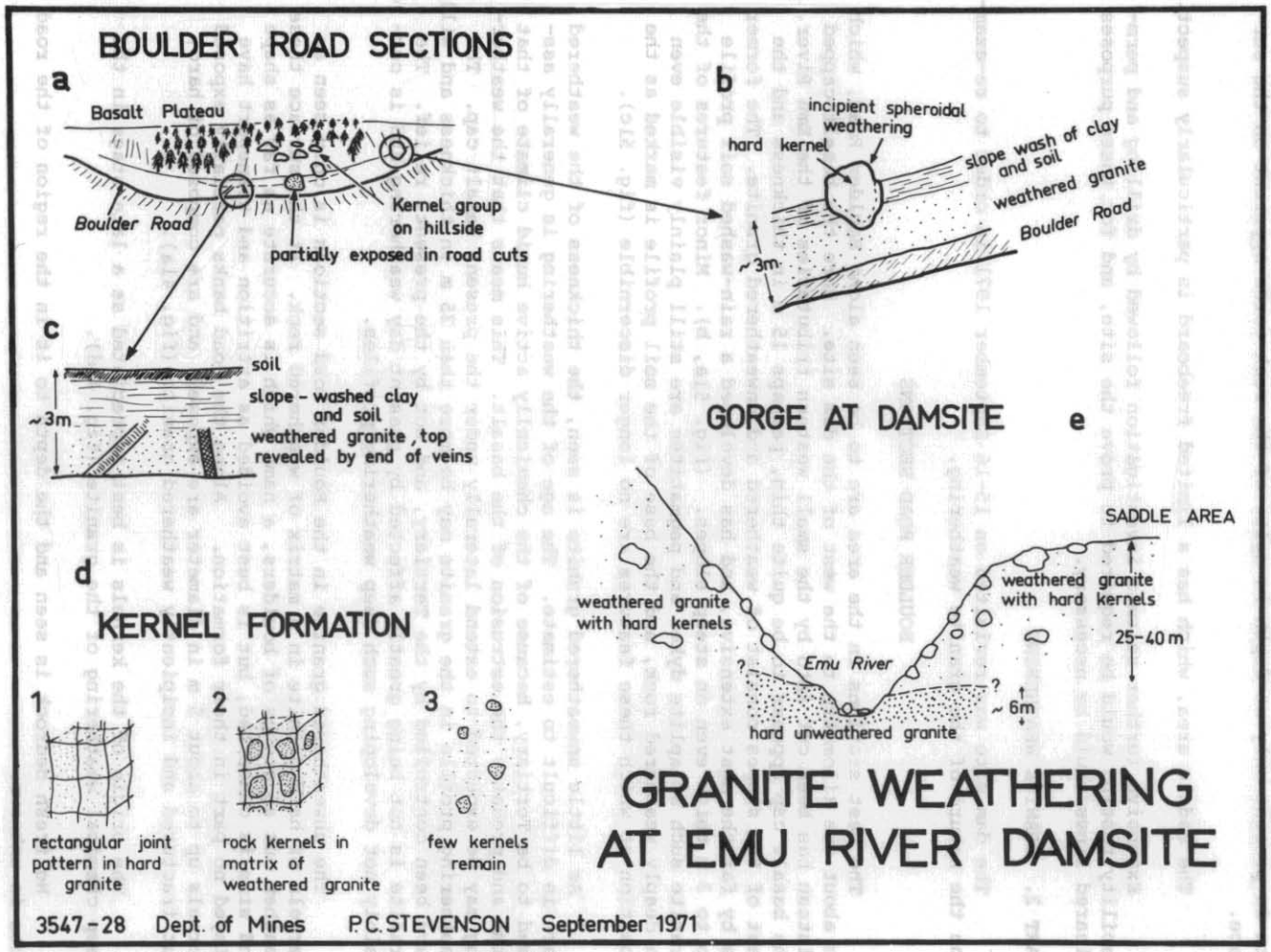
5 cm
BOULDER ROAD SECTIONS
a
Basalt Plateau
Boulder Road
Kernel group on hillside
partially exposed in road cuts
b
incipient spheroidal weathering
hard kernel
slope wash of clay and soil
weathered granite
Boulder Road
~3m
c
soil
slope - washed clay and soil
weathered granite, top revealed by end of veins
~3m
GORGE AT DAMSITE
e
SADDLE AREA
weathered granite with hard kernels
weathered granite with hard kernels
25-40 m
Emu River
?
?
~6m
hard unweathered granite
d
KERNEL FORMATION
1
rectangular joint pattern in hard granite
2
rock kernels in matrix of weathered granite
3
few kernels remain
GRANITE WEATHERING AT EMU RIVER DAMSITE
3547-28 Dept. of Mines P.C.STEVENSON September 1971

Figure 41.

a matrix of weathered rock. In the lowest part of the gorge, however, the granite is seen to be hard almost everywhere, especially downstream from the seismic spreads. Here hard fresh unweathered and almost unjointed granite forms slabs 12-15 m across. The river runs over these slabs and the existence of rapids shows that the rock forming the river bed is hard.

The profile of this hard rock surface away from the river can only be guessed. The seismic results at the saddle to the east of the site indicated that unweathered rock had not been reached at a depth of 30 m, and as little indication of hard rock was seen on the abutment spreads it seems likely that the hard rock surface is approximately horizontal and passes under the abutments at about 6 m above river level along the centre line.

STORAGE AREA

No direct information is available to describe the rock conditions in the storage area. Nevertheless the slopes on either side of the river flood plain are similar to those seen at Boulder Road and it may be assumed that they consist of weathered granite with groups of kernels. The flood plain is floored with at least 2 m of brown clays and soils and the depth of solid granite beneath is unknown. Because a great depth to bedrock would be difficult to account for on geomorphological grounds, however, a reasonable assumption would be that the hard rock surface seen in the gorge extends upstream and is found at no great depth beneath the floor plain.

CONCLUSIONS

Almost all of the dam site area is formed of deeply weathered, compact homogenous unjointed granite in the form of a stiff gritty clay containing groups of hard granite kernels. These kernels are especially evident on steep slopes, and are also somewhat concentrated by river section.

Hard weathered granite with few joints forms a sub-horizontal floor just above the level of the river at the centre line, so that the river is slightly incised into hard rock at this point.