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Water supply for a golf course at Penguin

W.L. Matthews

The Penguin Council is constructing a golf course about 1.5 km south-east of the town [DQ224461]. The existing town water supply is inadequate to supply water for the greens and fairways and another source is being investigated which would be capable of supplying 450 000 l/day. Three possible dam sites on Myrtle Creek and its tributaries upstream from the proposed golf course, and a turkey's nest type dam in the middle of the course are being considered. One of the dam sites has been cleared in preparation for dam construction. A gravel area was uncovered on one abutment during this work and because of this the council asked the Department of Mines to examine this site and the other two valley sites. It was also requested that the groundwater possibilities be investigated.

RELIEF AND GEOLOGY

Myrtle Creek and its tributaries rise in the northern part of Dial Range and are fairly deeply entrenched. They flow in a generally north-east direction to within about 2 km of the coast and then flow south-east for about 5 km to enter the River Leven estuary. The basalt on the ridge behind the coast probably blocked the more direct flow to the sea near Penguin.

The geology of the area has been mapped by Burns (1963) and reported on by him in 1965 (fig. 1). Cambrian chert and spilite crop out in isolated areas along the sides of the valley of Myrtle Creek between the golf course site and the River Leven. Ordovician mudstone, conglomerate and sandstone occur on the northern end of Dial Range. Talus from these rocks cover the steeper slopes. Tertiary sand and gravel underlie the basalt and extensive areas occur south of Penguin. A strip of Cainozoic sand and gravel south of Myrtle Creek may be of the same age. Alluvium occurs along the beds and flood plains of the streams.

GEOLOGY AROUND THE DAM SITE

Dam site 1, on which work has commenced, is situated on a headwater tributary of Myrtle Creek below a small valley entering from the west (fig. 1). A more detailed sketch plan of the area is shown in Figure 2.

There are few exposures of bedrock in the area apart from conglomerate outcrops in the stream bed and on the flanks of the slopes about 400 m upstream from the dam site. Possible exposures of conglomerate also occur about 200 m upstream from the dam site, but low on the sides of the valley: these might be large boulders although they appear to display similar dips. The upper conglomerate exposures pass gradationally into sandstone with pebble bands and finally into beds consisting mainly of sandstone. Lower in the valley around the dam site, only soil and unconsolidated material is exposed. This is dominantly a red clay soil derived from the weathering of the Gnomon Mudstone containing quartz, and quartz and chert pebbles derived from the conglomerate uphill and concentrations of hematite boulders, particularly around Pits 2 and 3. On the eastern side of the stream a zone of grey soil and gravel is exposed on the surface and this is the material that has halted work on the dam. As the red clay occurs on the slopes upstream and downstream and also on the opposite bank it seems likely that this material is talus that has extended further downslope than in other areas due to a steeper slope or it could be the result of an ancient landslide. The material is likely to be relatively permeable and its thickness (at least in the area of the dam) should be determined as a cut-off would need to be dug to less permeable material. Alternatively the dam centre line could be relocated

a few metres upstream to avoid this material.

The other consideration is the depth of gravel in the alluvium around the creek. This should be determined so that a cut-off can be extended to weathered rock (probably Gnomon Mudstone).

Samples have been collected from the various test pits around the dam site. Quick dispersion tests undertaken indicate that material in Pit 2 and 6 show signs of dispersion when in contact with fresh water. If this material is used in the construction of the dam, special attention should be given to compaction of the material to exclude the possibility of the development of piping.

Dam site 2 is situated upstream from dam site 1 in a shallow part of the valley. It is unlikely that a single dam would hold the required amount of water and perhaps two small dams would be required.

Burns (1963) mapped the surrounding area as being underlain by Moina Sandstone. There are no outcrops except downstream in excavations around the tip and along a roadway west of the tip. The holding capacity of the area should be examined closely as sand is the dominant product from the weathering of this rock. Suitable material for building the dam may not occur nearby. There is some red, lateritic, clayey soil on the eastern side of the area near the road to the tip.

Subsurface investigations should be undertaken to determine the nature of the material underlying any site in this area before it is considered as a possible site for a dam. This would probably be done with a backhoe.

Dam site 3 is situated in a deeply entrenched part of Myrtle Creek where the amount of water stored will depend on the height of the dam. Again there are few rock outcrops except in the bed of the creek at the dam site where a purple 'worm-cast' sandstone (Moina Sandstone) crops out. In some exposures it appears to have horizontal bedding while in others it may have a downstream dip. The west bank is dominantly underlain by conglomerate boulders, while sandstone boulders underlie the east bank. Sandstone boulders occur upstream from the site and a probable conglomerate outcrop (deeply weathered) occurs in a quarry east of the creek south-east of the site. The distribution of the two rock types suggests the possibility of a fault traversing the area although some of the boulder areas probably represent talus deposits shed from areas further up the slopes of Dial Range.

As a dam site, the main unknown factor is the depth of talus and unconsolidated material on the abutments. The material is likely to be very permeable and would require a cut-off. The permeability of the exposed rock in the bed of the stream is unknown and will depend on the frequency and openness of fractures. Suitable material for building the dam would have to be carted. The main advantage of the site is that it is on a permanent stream.

GROUNDWATER PROSPECTS

Three bores have been drilled near the dam sites but the positions of only two of these are known with a fair degree of accuracy (fig. 1). Hole 1 was pumped at 750 l/min when drilled and in the summer of 1974/1975 was pumped continuously at a set rate of 600 l/min when drilled for 10 weeks. About 5.5 m of unconsolidated material was struck in the hole (0.2 m of gravel at the bottom of this material) before slate and some clay were encountered. The hole was drilled to about 37 m in a low lying area. Hole 2 was drilled on a narrow ridge and struck about 5 m of soil and clay followed

by 19 m of "red rock" which was underlain by 12 m of conglomerate with pyrite. This hole yielded only 15 l/min. Hole 3 penetrated 8.5 m of soil, clay and weathered basalt, 0.6 m of peat, about 26 m of "sub-basalt" and 33 m of green quartzite. It yielded 270 l/min.

Large quantities of groundwater have been obtained in the area. It is not definitely known which rock the high yielding bore penetrated but it is likely that it was the chert unit as this consists of interbedded chert and mudstone and underlies the spilite which crops out at several places near the bore. Chert also occurs at the golf course site and topographically the area is encouraging.

CONCLUSIONS AND RECOMMENDATIONS

It is apparent that some subsurface investigations should be undertaken at all dam sites before further work is carried out. Site 1, where clearing has already been undertaken, appears the most suitable provided talus on the east bank and alluvium in the creek bed is thin enough for a cut-off to be installed.

Groundwater supplies may be obtained but yields cannot be accurately forecast because of the limited number of water bores that have been drilled in the area. The same rock as encountered in the high yielding bore may occur at the golf course but variations in the jointing in the rock could markedly affect the amount of water obtainable. The possibility of groundwater in the unconsolidated gravels at the golf course could be examined as a possible source of water.

Some seismic work is suggested on the dam sites to determine depths of unconsolidated material on the slopes and also on the valley floor (except for dam site 3). Seismic and resistivity work may be useful in comparing the situation of the high yielding bore with that at the golf course.

REFERENCES

- BURNS, K.L. 1963. Geological atlas 1 mile series. Zone 7 sheet 29 (8115N). Devonport. *Department of Mines, Tasmania.*
- BURNS, K.L. 1965. One mile geological map series. K/55-6-29. Devonport. *Explan.Rep.geol.Surv.Tasm.*

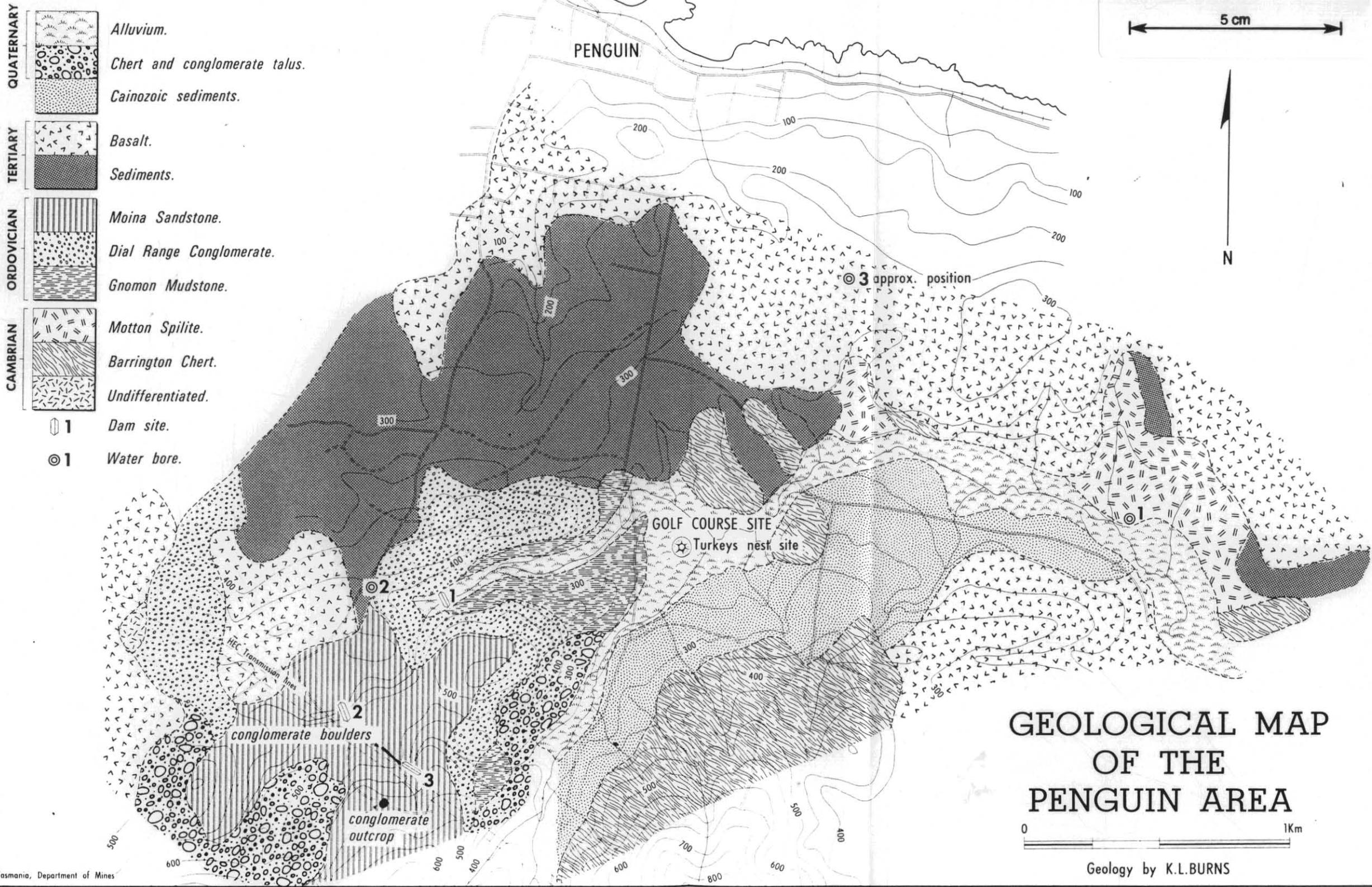


Figure 1

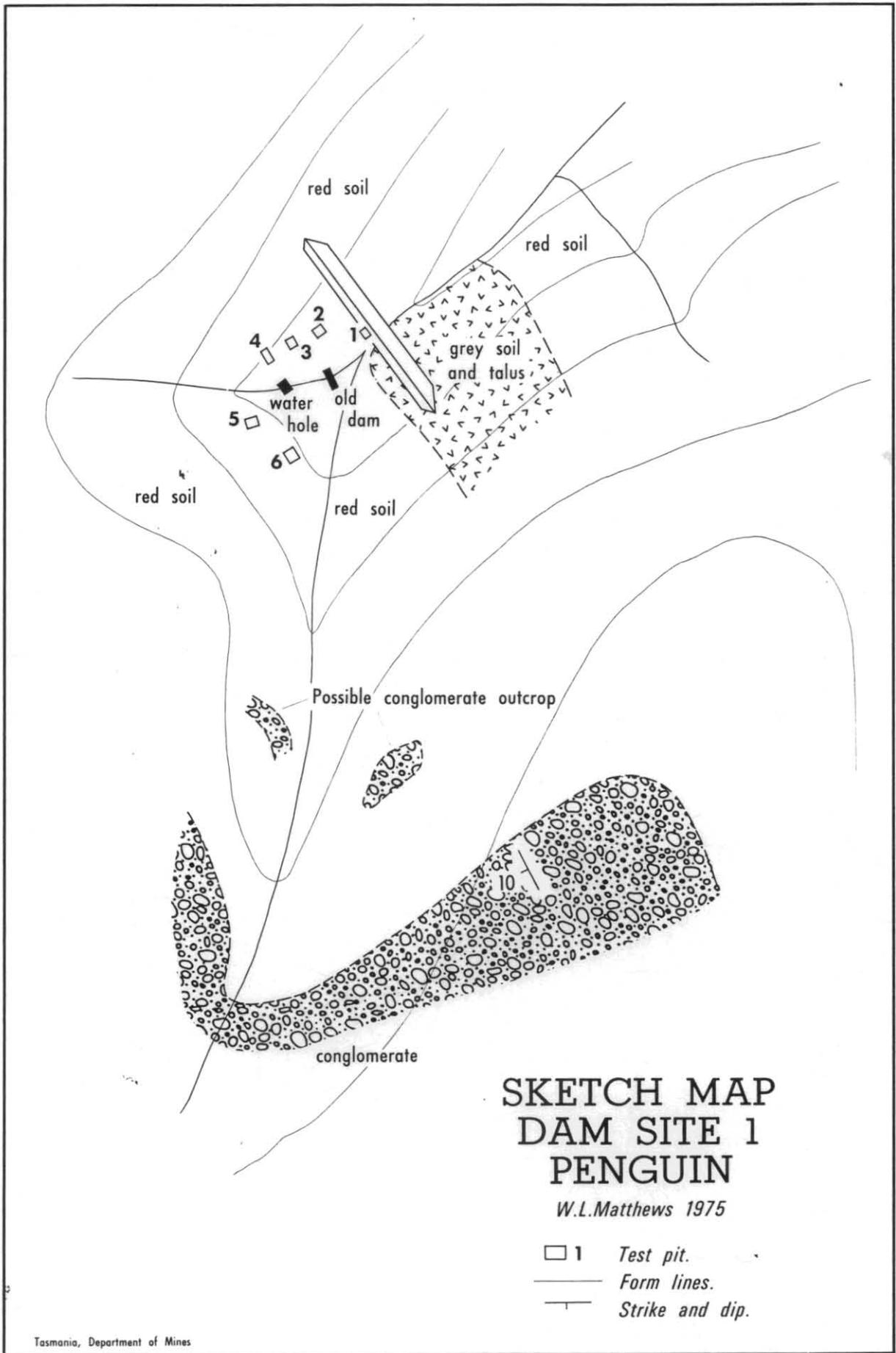


Figure 2