UR1978_06

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Geological notes on proposed central East Coast dam-sites.

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Abstract

Nine proposed dam-sites briefly investigated on the central East Coast are all underlain by Jurassic dolerite. Permeable dolerite boulder beds occur at six sites, and will present constructional difficulties. Accordingly, only three sites are considered suitable for dams; these are located on the Apsley, Swan and Wye Rivers.

As part of the Tasmanian Water Resources Survey, the Rivers and Water Supply Commission requested brief geological investigations to be made at ten potential dam-sites on the central East Coast (fig. 1). In addition, the Commission required comments on the regional groundwater potential of the area. Nine sites were investigated; the Denison Gorge was impassable following heavy rain.

GEOLOGY

All ten sites are underlain by Jurassic (fig. 2), generally fresh and unweathered and invariably jointed to varying degrees. The dolerite is usually covered by a veneer of dolerite scree and outcrop of obviously in *situ* bedrock amounts to less than 10% of the total area studied. Deposits of rounded dolerite gravel and boulders, often interbedded with orange-brown alluvium, occur at each of the sites. Some of the rivers were visited during or after heavy rain, when water levels were high and the streams carried high suspended loads. As a result, the geology of the river bed at some places could not be definitely established. Another problem which has a bearing on dam suitability is the thickness of the superficial Quaternary deposits at each site; each thickness given is a minimum value obtained from exposed sections along river banks.

1. Douglas River [FP008804]

In situ dolerite occurs in small cliff sections on valley slopes at creek level near the proposed dam-site. Sporadic outcrops occur in the river channel upstream from the site. The rock is fresh, with two prominent sets of vertical joints trending approximately north and west. A third, poorly developed set trends north-east. Spacing is irregular, the most common density being 0.3 - 1 m. The floor of the valley is composed of boulder deposits 30 - 50 m wide, with a minimum thickness of 1.5 - 2 m. No *in situ* dolerite occurs in the channel either at or downstream of the dam-site.

2. Swan River [EP912663]

This appears to be a suitable site for a dam. The river flows in a narrow channel between steep valley sides and permeable boulder beds are generally absent. The dolerite scree is considered to be thin (<1 m) and *in situ* dolerite occurs at shallow depth. Outcrops occur in the creek near and downstream from the proposed site. The nature of the dolerite can be observed at Hardings Falls, where the river drops about 50 m into an impressive amphitheatre of solid rock. Here the predominant fractures are major sub-horizontal joints dipping 5 - 15° NW-WNW. A weaker sub-vertical set is also present. On the platform immediately behind the falls, the dolerite is essentially massive and unjointed.

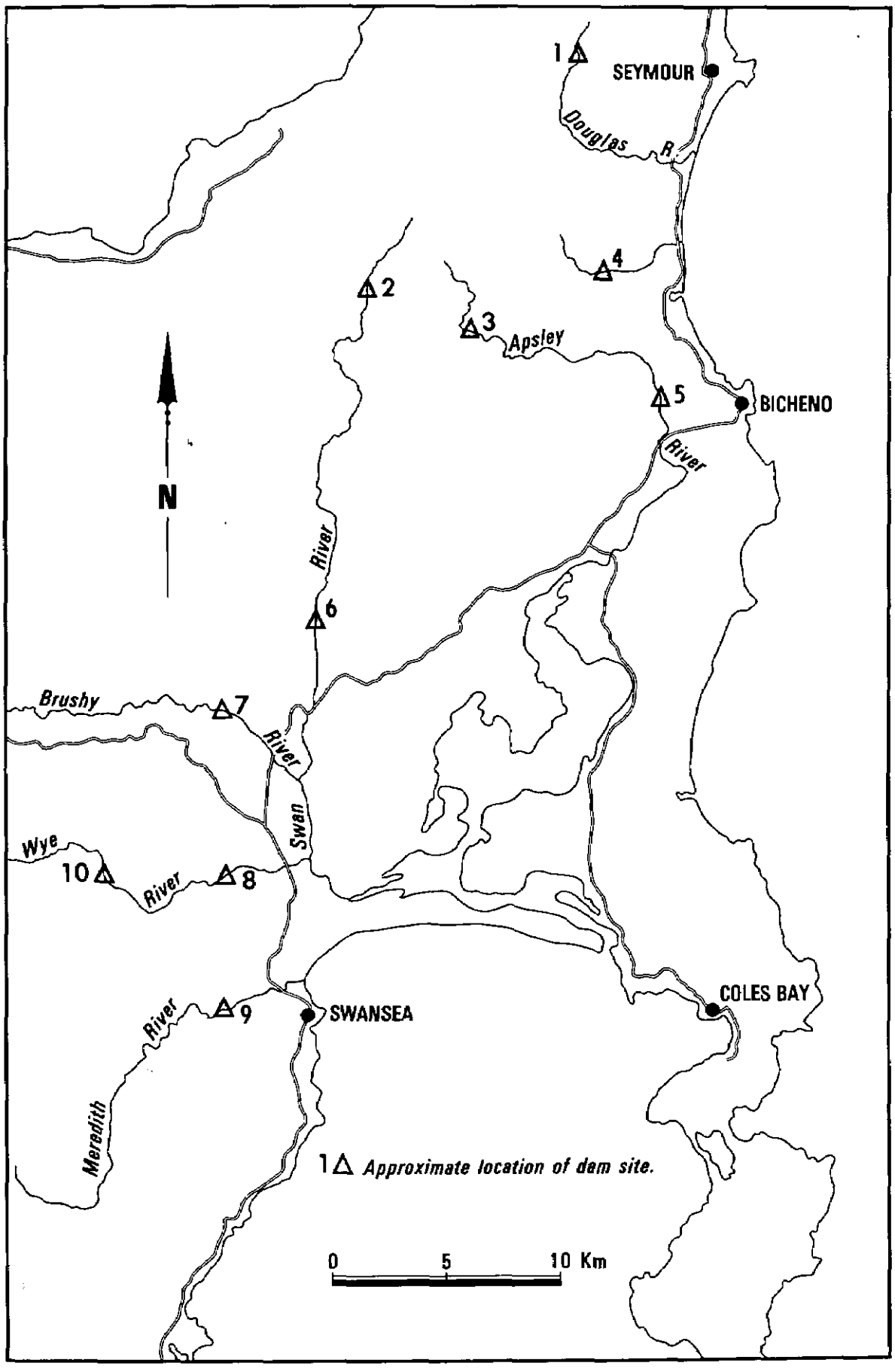


Figure 1. *Location of possible dam sites.*

5 cm

3. Apsley River [EP954655]

This is also a suitable dam-site. The valley is narrow and steepsided, solid bedrock crops out in the channel and on both sides, and permeable boulder beds are absent. Jointing is generally irregular in orientation, continuity and density, but one major set dips 5 - 15° upstream, producing bench-like outcrops on the river bed. Weaker vertical fractures occur. Further upstream, the river has cut a prominent escarpment in dolerite scree, deposited 2 - 3 m of boulders and alluvium, and partly eroded the deposits along an arcuate dry channel bed at the base of the escarpment.

4. Denison River [FP002690]

This site was not visited.

5. Apsley River [FP038637]

The present river flows through a narrow deposit of boulders and alluvium about 20 - 30 m wide and less than 1 - 1.5 m thick. Small outcrops of *in situ* dolerite occur in the creek bed at the proposed dam-site and on the neighbouring valley sides, but elsewhere the area is covered by scree and talus. Much of the dolerite is strongly fractured. Joints are usually very irregular and closely spaced (2 - 3 cms in places) and curved on a small scale. Predominant sets are sub-vertical trending NNE-ENE.

6. Swan River [EP891527]

The river here is actively eroding superficial deposits of interbedded dolerite boulders and dark brown alluvium, and is confined between valley sides composed mainly of dolerite scree with occasional outcrops. The Quaternary materials are, in places, at least 3 m thick and are dissected by a recent dry river channel.

Jointing in the dolerite is irregular and discontinuous and there is no apparent predominant fracture pattern, except in one outcrop which shows a persistent though minor set of closely spaced sub-horizontal joints producing flaking of the bedrock.

7. Cygnet River [EP853491]

The proposed dam-site is situated about 250 m downstream from the confluence of the Brushy and Cygnet rivers, where the presence of at least 3 m of permeable alluvium and boulder deposits will cause leakage problems. It would be better sited 200 m upstream where solid dolerite crops out in the river bed and on both sides of the river. There and at other nearby outcrops, three major sub-vertical joint directions (trending N, W and NW) with spacings of 0.1 - 0.3 m, and a fourth sub-horizontal set occur. Individual joints are rarely continuous. A prominent dry channel bed marks a recent former course of the river.

8. Wye River [EP849413]

The proposed dam-site is situated in a narrow steep sided valley whose slopes are mantled by a thin deposit of scree and talus. Sporadic outcrops of dolerite occur on the north-west bank at all elevations, where they exhibit strong vertical open fractures (spacing 2 m) and small exfoliated surfaces paralleling the hill slope. The lenticular deposits of boulder beds and alluvium are mainly confined to the south-eastern bank and are probably less than 1 - 1.5 m thick. South of and upstream from the dam-site,

the superficial deposits are thicker and a dry river channel has been cut into them. The site appears suitable for a dam.

9. Meredith River [EP849355]

The course of the river has locally been strongly affected by the presence of *in situ* dolerite; at the site, its channel has been confined on the eastern bank by a large outcrop of exfoliated bedrock, while 120 m downstream, similar material has diverted the northerly flowing stream eastwards. Two sets of joints are prominent; one is composed of strong, open vertical fractures about 1 - 2 m apart, which are sometimes confined within exfoliated slabs and usually trend at right angles to contour lines. The other is a set of strongly developed and curved exfoliation joints (spacing 1 - 2 m) which parallel hill slopes and produce large smooth surfaces sometimes cut by irregular, poorly developed secondary fractures. At no other dam-site is exfoliation developed to the same degree.

On the outside of curves, the river has eroded prominent escarpments (up to 10 m high) in dolerite and scree and deposited relatively thick layers of boulder beds and alluvium. These superficial materials are in places at least 4 - 5 m thick, and in places they have been eroded by former river courses producing dry channels. At least two well-developed river terraces are present, probably related to Pleistocene higher level fluvial stages.

The thickness and extent of the Quaternary deposits probably renders the site unsuitable for a dam.

10. Wye River [EP803408]

This site is probably suitable for a dam. The river is confined to a narrow channel virtually devoid of permeable boulder beds and apparently underlain by *in situ* dolerite at shallow depth. Bedrock crops out on the valley sides near the proposed dam-site and further upstream where thin boulder beds have been deposited. The scree and talus on the valley sides are probably <0.5 m thick.

The dolerite is unweathered and generally regularly fractured. Two sets of sub-vertical joints trend W to NW and N to NE, with spacings of 0.3 - 1 m, and a third set of sub-horizontal open joints dips NW at about 15^{o} (spacing 1 m). The dolerite is massive in places.

REGIONAL GROUNDWATER PROSPECTS

Fractured rocks

Groundwater potential of the dolerite and Triassic and Permian sediments of the central East Coast remains virtually unexplored. Only general comments can be made.

The fractured sedimentary rocks are reliable sources of small amounts of medium quality groundwater. Yields are usually in the range 4 - 20 *l*/min from individual bores, but the water may be unsuitable for drinking. The Triassic rocks at Little Swanport and Triabunna have been successfully drilled in the past, but bores are generally only able to supply individual households.

Fractured dolerite may be a reliable aquifer in topographically favourable areas, but its potential remains unknown; very few bores have been attempted anywhere in Tasmania. Yields may be similar to those from Permian

and Triassic rocks. The lack of any groundwater data from the dolerite in the area is discussed by Moore (1973), who carried out a reconnaissance hydrological survey of the Meredith River catchment area.

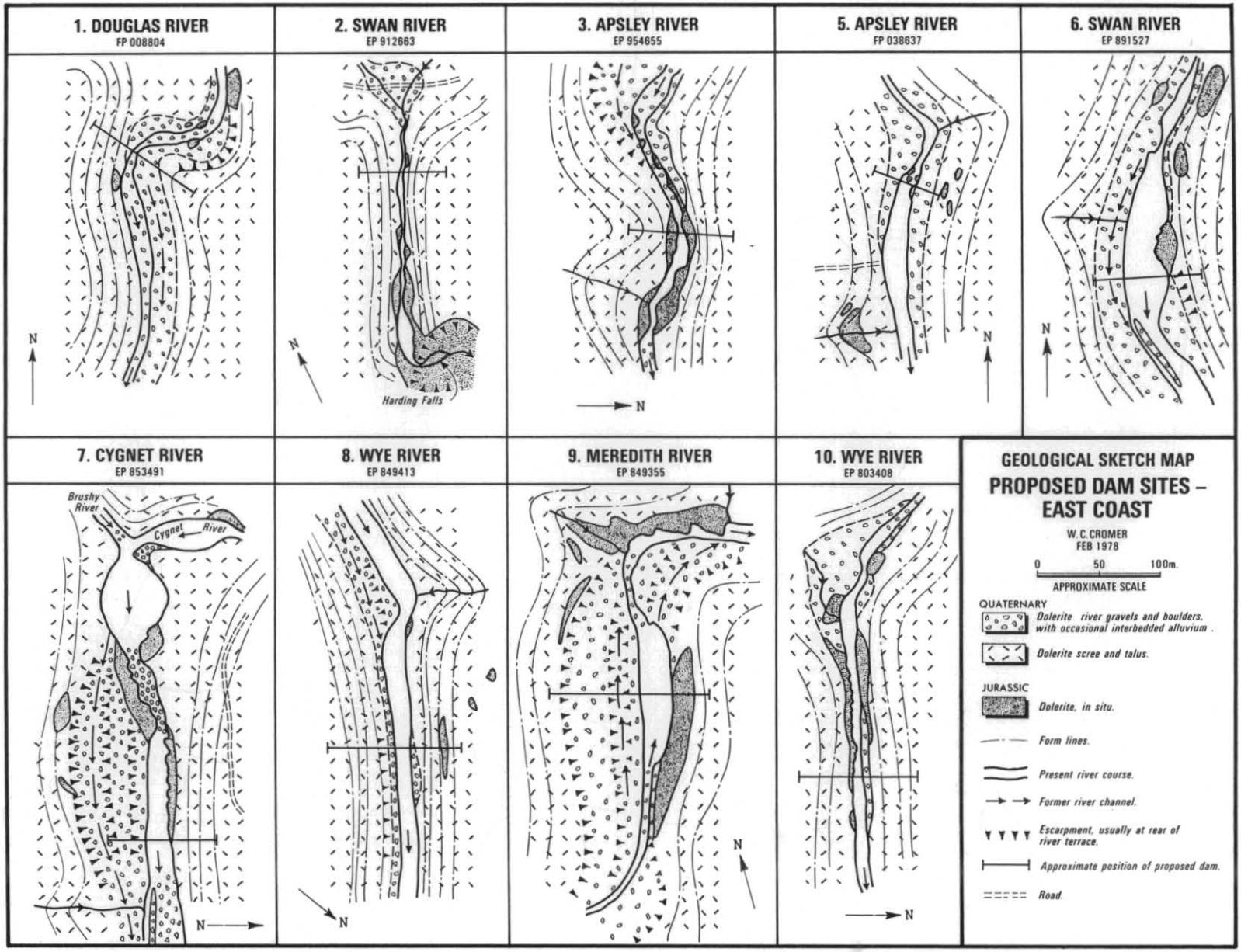
Unconsolidated rocks

Some of the more extensive coastal sand areas are potentially large suppliers of groundwater suitable for town supplies. Some work has been done on the Nine Mile Beach spit at Swansea (the most promising aquifer) and tentative results are encouraging. The groundwater lies at shallow depth and could be extracted with multiple spear bore systems similar to that presently operating at Greens Beach in northern Tasmania. Groundwater salinities at Nine Mile Beach vary from about 2000 mg/*l* at the western end, to less than 500 mg/*l* from the centre eastwards. A considerable thickness of saturated sand appears to be present.

REFERENCE

MOORE, W.R. 1973. Representative basin study : Meredith River, eastern Tasmania. *Tech.Rep.Dept.Mines Tasm.* 18:135-137.

[16 February 1978]


1. DOUGLAS RIVER
FP 008804
2. SWAN RIVER
EP 912663
Harding Falls
3. APSLEY RIVER
EP 954655
5. APSLEY RIVER
FP 038637
6. SWAN RIVER
EP 891527
7. CYGNET RIVER
EP 853491
Brushy River
Cygnet River
8. WYE RIVER
EP 849413
9. MEREDITH RIVER
EP 849355
10. WYE RIVER
EP 803408
N
GEOLOGICAL SKETCH MAP
PROPOSED DAM SITES – EAST COAST
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FEB 1978
0 50 100m.
APPROXIMATE SCALE
QUATERNARY
Dolerite river gravels and boulders, with occasional interbedded alluvium.
Dolerite scree and talus.
JURASSIC
Dolerite, in situ.
Form lines.
Present river course.
Former river channel.
Escarpment, usually at rear of river terrace.
Approximate position of proposed dam.
Road.
5 cm

Figure 2.