

UR1974-76

A geological and seismic survey of a dam site at Nubeena Road, Port Arthur.

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A seismic survey of the proposed dam site was requested by Messrs Fowler, England & Newton, consulting engineers to National Parks and Wildlife Service. The dam is intended to provide a water supply for Port Arthur and is to be constructed beside Nubeena Road about 1.7 km west of Port Arthur [EN673230].

The site is shown on Figure 1. Four seismic spreads each of 36 m were observed in the position shown.

GEOLOGY

The area to the north of the Nubeena Road forms part of a Jurassic dolerite body, whereas a sandstone-mudstone sequence of Triassic age forms the hills to the south. The sandstones are in massive horizontal beds, usually about 4 m thick, and form low waterfalls, as at A (fig. 1). Although the interbedded mudstones are poorly exposed, the beds appear to be much thicker (c. 40m).

The creek flows approximately along the line of the dolerite-sandstone contact which is exposed in the quarry 120 m to the west of the site. In the quarry the contact is nearly vertical or dips at a high angle to the south-west and the sandstone is strongly metamorphosed over a width of at least 10 m. The contact is poorly exposed again at B and the line of the contact between the quarry and this point is thought to be approximately straight.

The superficial geology is important particularly on the Triassic rocks. These are soft where unmetamorphosed and have weathered deeply, so that thick soil-creep has covered the lower slopes. The soils produced are sandy and although some clays are visible these are not preponderant in surface sections.

Some mass-movement in the form of small (3-4 m) arcuate slumps is active to the south of the dam site and has recently been so on the south abutment.

On the dolerite side, too, deep weathering has affected both the dolerite and the metamorphosed sandstone sequence of the contact, but no slumping is apparent in these materials. Here the soils are mainly sandy.

SEISMIC RESULTS

The results of the seismic spreads were as follows:

Spread 1 (on the assumed centre line)

The surface layer, ($V_0 = 300-350$ m/s) is interpreted as soil, creek mud and sand and soil-creep material, soft and easily excavated. The thickness of the surface layer ranges from 2.9 m on the abutments to 2.1 m at creek level.

The first refractor ($V_1 = 4000$ m/s) is interpreted as strongly metamorphosed sandstone or more probably dolerite, unweathered but closely fractured near the contact and requiring explosives for excavation.

Spread 2 (right abutment)

The surface layer ($V_0 = 450$ m/s) is interpreted as soil, soil-creep material, sand and clay derived from the mudstones, and deeply weathered sandstone and mudstone, easily excavated. Thicknesses of just over 4 m are observed at all points on the spread.

The first refractor ($V_1 = 2700$ m/s) is interpreted as *in situ* Triassic rocks, marginally rippable by heavy equipment.

Spread 3 (left abutment)

The surface layer ($V_0 = 400$ m/s) is interpreted as superficial sand and weathered sandstone, metamorphic and dolerite material, capable of being excavated and having a thickness of 7 to 8 m.

The first refractor ($V_1 = 5000$ m/s) is interpreted as fresh metamorphosed Triassic rock or fresh dolerite, requiring explosives for excavation.

Spread 4 (along valley floor close to creek)

The surface layer ($V_0 = 400$ m/s) is interpreted as 2-3 m of creek alluvium, easily excavated.

The first refractor ($V_1 = 5000$ m/s) is interpreted as hard, unweathered metamorphosed Triassic rock or dolerite, requiring explosives for excavation.

AUGER HOLES

Two auger holes, each 2 m deep, confirmed the presence of sand and stiff clay derived from the Triassic rocks, on the right abutment, and soft sand derived from the metamorphosed Triassic rocks on the left abutment no dolerite material was seen in this hole.

CONCLUSIONS

Hard foundation rocks are present at the site, but these lie generally under a cover of soft weathered rocks, slumped and soil-creep material and soil ranging from 2 m in thickness at the creek to 8 m on the left abutment and 4 m on the right abutment.

A hazard from soil slumping is apparent on the south side of the site.

RECOMMENDATIONS

The presence of clay at shallow depth must be assured by the excavation of trial pits with a back-hoe mainly on the south side of the site. Otherwise the sandy nature of the soils must cause some concern regarding their use as materials for the dam.

The design of the slopes on the south side should be such as to reduce the chance of mass movement into the dam. Drained berms would be suitable.

[11 November 1974]

APPENDIX 1

Examination of trial pits.

Five trial pits were excavated by back-hoe on 14 November 1974 at the positions shown in Figure 1.

The sections seen were as follows.

	Depth (m)	Description
PIT I	0 - 0.4	Sandy brown top soil.
	0.4 - 1.8	Granular crumbly firm brown clay with occasional sandstone fragments, oxidised.
	1.8 - 3.4	Brown and grey mottled firm clay, some thin sandy clay.
PIT II	0 - 0.3	Brown clay top soil.
	0.3 - 1.9	Granular brown clay.
	1.9 - 2.2	Soft grey clay grading into soft cream weathered leached siltstone-sandstone becoming harder, machine refused at 4.0 m.
	2.2 - 3.0	
	3.0 - 4.0	
	Hole making water; 2 l/min at 1.9 m.	
PIT III	0 - 0.4	Brown sandy soil.
	0.4 - 1.2	Brown granular clay.
	1.2 - 2.5	Grey plastic clay and sandy clay increasingly hard brown and grey fine sandstone, 100 mm beds. Machine refused at 2.5 m.
	1.6 - 2.5	
	Hole making water; 6 l/min from uphill at 1.2 m.	
PIT IV	0 - 0.5	Brown sandy soil.
	0.5 - 1.2	Brown sandy clay and clean sand increasingly hard banded sandstone overlying light brown sandy mudstone.
	1.2 - 2.4	Machine refused at 2.4 m.
PIT V	0 - 0.6	Sandy top soil.
	0.6 - 2.1	Orange clayey sand.
	2.6 - 2.8	Soft weathered sandstone.
	2.8 - 3.6	Soft bedded sandstone, still diggable.

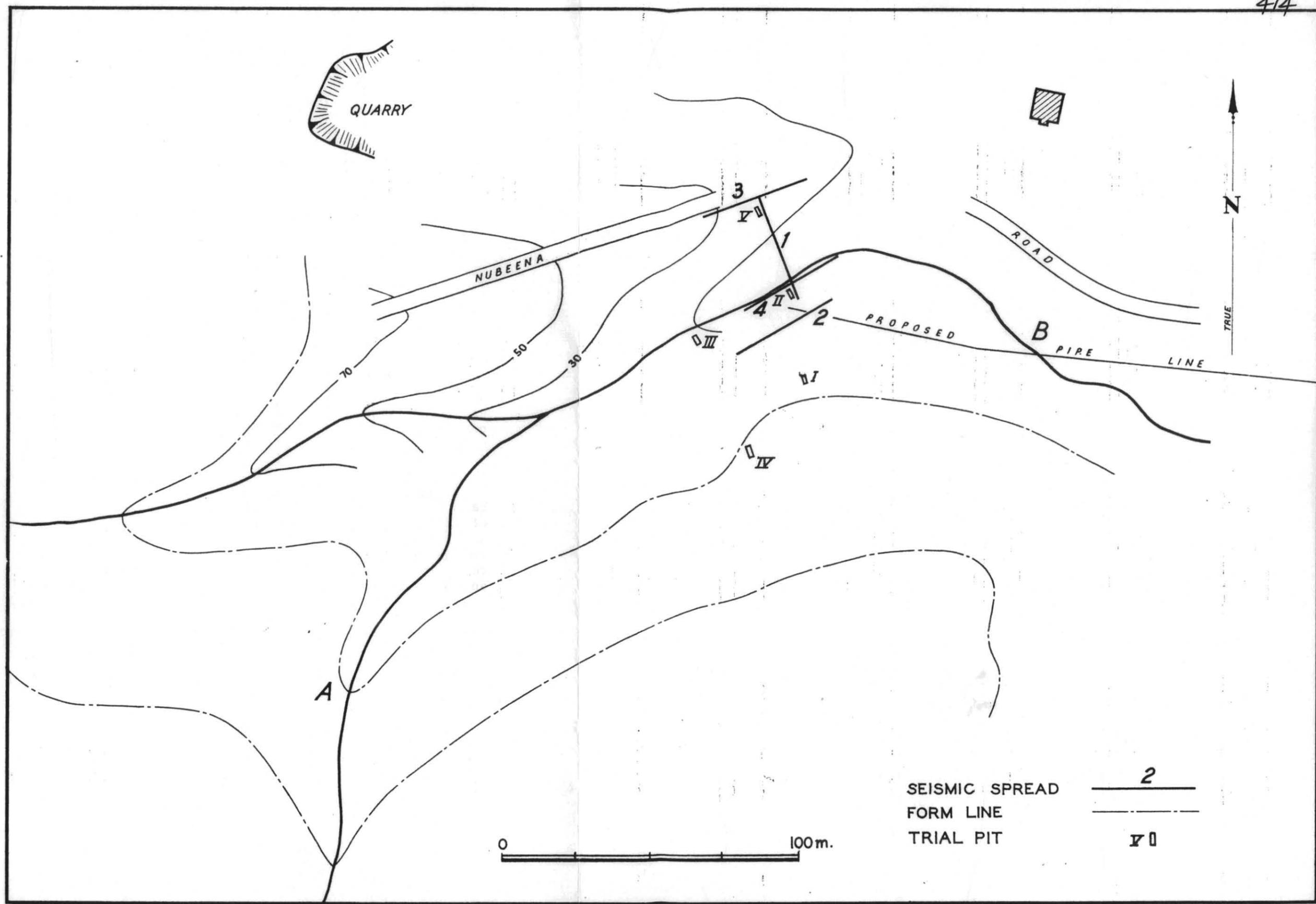
INTERPRETATION

The granular brown clay in Pits I II and III appears to be derived by soil-creep down the slopes from the Triassic mudstone and sandstone succession.

The grey and mottled clays beneath it are a weathered form of the mudstone part of the succession and they and the sandstone in Pit II III and IV are Triassic rocks *in situ*.

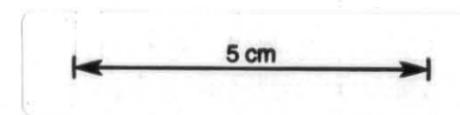
The sands and sandstone in Pit V are also of Triassic age but have been affected by the proximity of the dolerite body.

[20 November 1974]



PROPOSED DAM
 PORT ARTHUR WATER SUPPLY
 NUBEENA ROAD

GEOLOGIST: P.C. STEVENSON



DEPT. OF MINES 3922

FIG. 1