DEPARTMENT OF MINES
SOUTH AUSTRALIA

GEOLOGICAL SURVEY

SEISMIC INVESTIGATION OF DAM SITE WIRRINA HOLIDAY VILLAGE

Hd. Yankalilla

by

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GEOPHYSICIST

Rept.Bk.No.74/52
G.S. No. 5371
DM. No. 1303/72

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ABSTRACT

Seismic refraction techniques were used to investigate bedrock conditions at the site proposed for a dam at Wirrina Holiday Village. The extent of a landslip which occurs on the left abutment of the dam was determined from two seismic traverses made on the left bank of Congeratinga Creek. A seismic traverse over a saddle on the hill which forms the right abutment gave information on the depth of weathered rock likely to be encountered in excavations for the spillway.

INTRODUCTION

Wirrina Holiday Village is situated near Second Valley on Fleurieu Peninsula. Congeratinga Creek runs through the property. It is proposed that a dam be built on Congeratinga Creek near where it flows into the sea. The dam site is located in a deep steep-sided valley eroded into the bedrock, which consists of quartzites and phyllites resting unconformably on quartzitic schists. Upstream from the dam site the valley broadens and contains some alluvial flats.

Because of the steep valley sides numerous landslips have occurred. One in particular can be seen on the left bank of Congeratinga Creek where the left abutment of the dam is to be located.

Two drillholes, DH2 and DH4, placed along the axis of the dam in this vicinity show that bedrock is about 20ft. deep on the lower slopes of the left bank.

The aims of the seismic survey were:

(1) to determine the thickness of landslide or other unconsolidated material overlying fresh bedrock on the left abutment;

(2) to determine the extent of weathering in the rocks on the hill on the right bank where the spillway is to be excavated.

FIELD TECHNIQUES & INSTRUMENTATION

A Texas Instrument Co. P19 recording seismograph, which records information from 12 geophones was used to record the response of standard seismic refraction geophones in in-line spreads to explosions detonated electrically.

For each spread the following shots were fired:

(1) a centre shot, midway between geophones 6 and 7;

(2) a shot at each end of the spread, the end geophone in each case being displaced halfway towards the adjoining geophone;

(3) bracketing shots, placed 100 feet* out from the ends of the spread.

The explosive used was AN60 blasting gelignite, fired by means of a capacitance blaster and electrical detonators.

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* Because the client's survey plans are expressed in terms of Imperial units of measurement, these are used in this report in preference to the metric system of units.

For the traverses made on the left bank a geophone interval of 10 feet was used. An interval of 15 feet was used in the spillway investigations.

Plan No. 74-114 shows the locations of the traverses.

RESULTS

Times to first arrivals were obtained using a D-Mac digitizer and a Wang 600/14 computer. These were plotted as time-distance curves. Initial estimates of depths and velocities were made using conventional algorithms for dipping layers. The method reviewed by Hawkins (1961) was then used to obtain depth estimates for each geophone station and the true velocity of the bedrock. Initial sections were plotted and the theoretical time-distance curves for these derived using ray-tracing techniques. The depths to bedrock beneath each geophone station were then corrected so that errors between the theoretical curves and the observed values were minimized.

Refer to Plan No. 74-114 which shows the sections obtained from seismic interpretation.

Section AA', covering the left abutment line shows that the landslip material (near DH4) has a seismic velocity of about 3 500 ft./sec. compared with a velocity of 1 740 ft./sec. for the alluvial silts and clays near DH2. The position of the contact between the two types of material is uncertain, but probably occurs near the foot of the bank as shown. Bedrock appears to be at its deepest near DH4 where about 20 ft. of unconsolidated landslide material overlies it. A lithological change in bedrock may occur near the foot of the hill where the bedrock velocity changes from 14 000 ft./sec. to 10 000 ft./sec.

Section BB' which runs from Station 5 to Station 6(A) near the top of the right abutment shows that there is a greater thickness of weathered material on the east side of the saddle where the spillway is to be situated than on the west (dam abutment) side. The most deeply weathered section is to a depth of 24-25 ft. about 60 ft. west of Station 5. Unweathered bedrock occurs as sub-outcrop near Station 6(A). Its seismic velocity is 7 900 ft./sec. and it may be rippable with difficulty.

CONCLUSIONS

On the western bank of the Congeratinga Creek, where the left abutment of the dam is to be built, the seismic survey has shown that the thickness of landslide material should be no greater than 20-25 ft. This agrees with drillhole information in the area. The greatest thickness of unconsolidated material occurs near DH4 at the foot of the hill.

A thickness of 20-25 ft. of weathered material (2 460 ft. sec) covers the saddle where the spillway is to be built. Near the top of the right abutment of the dam this becomes thinner and bedrock appears close to the surface. Bedrock lies between elevations of 80 to 90 feet and has a seismic velocity of 7 900 ft./sec. It should be marginally rippable.

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RGN:FdeA
14/2/74

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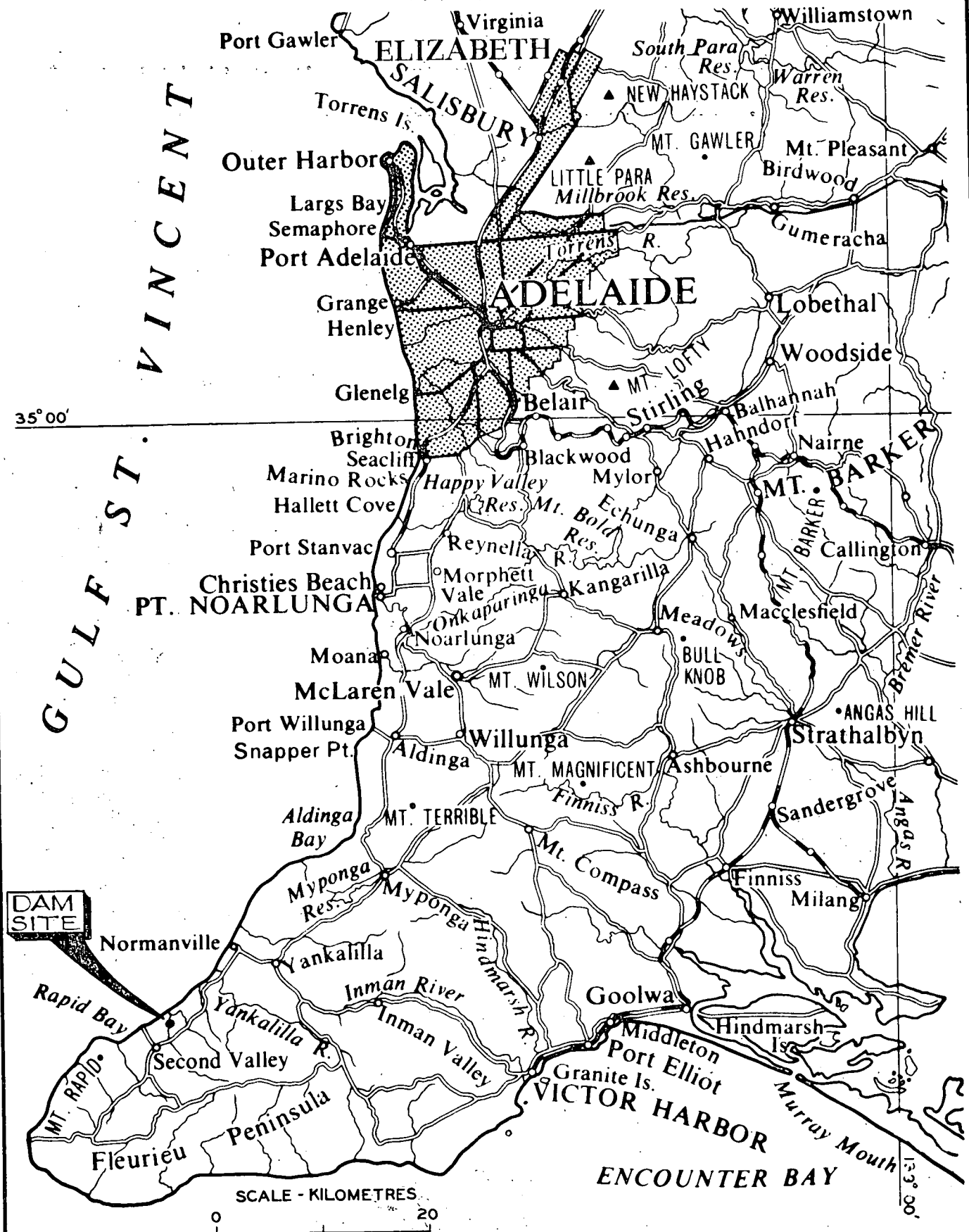
REFERENCE

Hawkins, L.V., 1961. The reciprocal method of routine shallow seismic refraction investigations. Geophysics, 26: 806-819.



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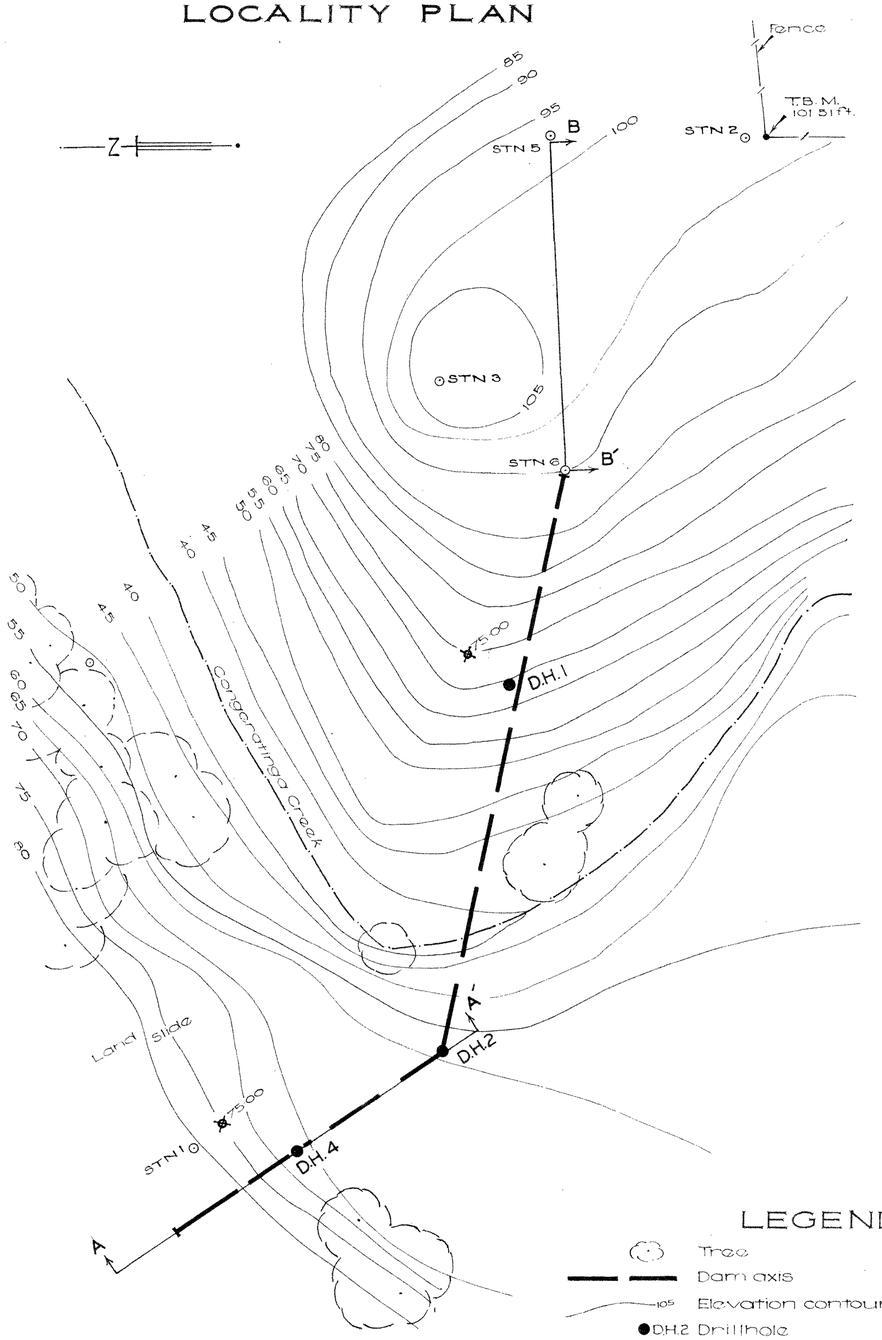
Compiled: B. Taylor	WIRRINA HOLIDAY VILLAGE DAM SITE RIVER CONGERATINGA PT SECS. 1579 & 1588 HD YANKALILLA.	Date: 5.OCT.1973
Drn: D.J.M.		Drg.No: S10525 Hc7.
Ckd: A.F.	**LOCALITY PLAN**	

P.F. No. S 10066 Hac

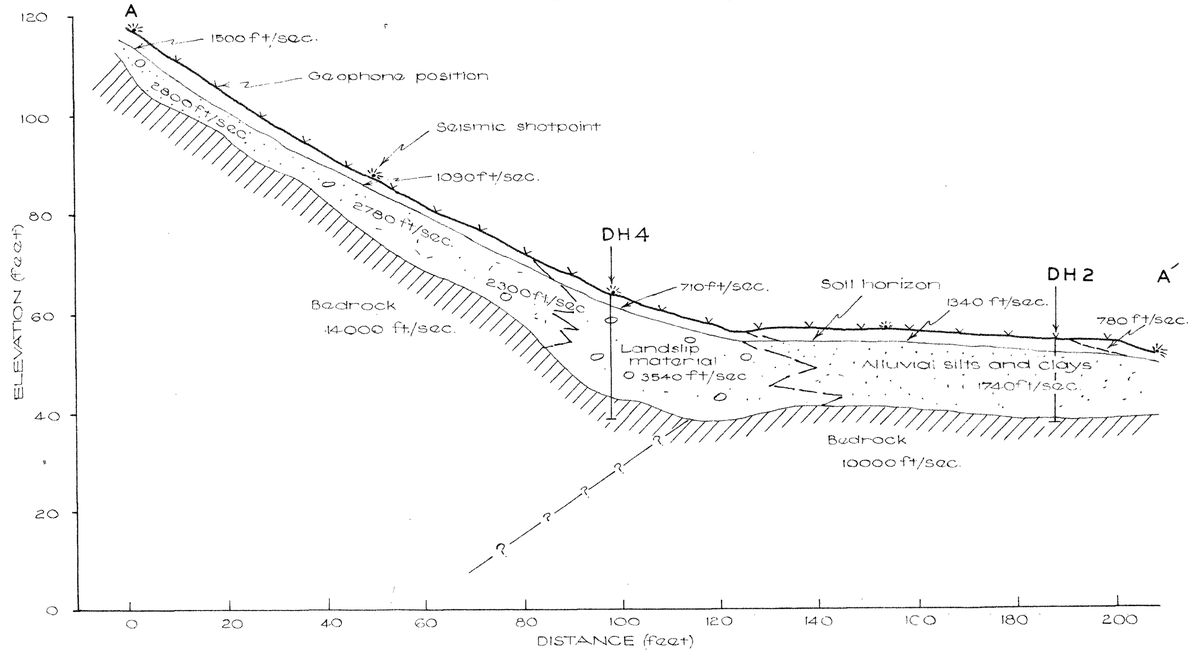
LOCALITY PLAN



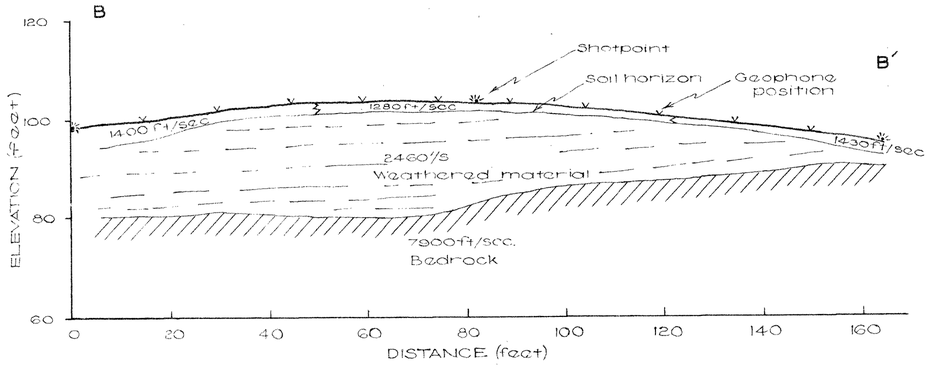
LEGEND

- Tree
- Dam axis
- 105 Elevation contour (feet above M.S.L.)
- D.H.2 Drillhole
- 75 ft contour, marker peg
- STN.10 Survey station
- A A' Seismic Section AA'

SECTION AA'



SECTION BB'



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WIRRINA HOLIDAY VILLAGE DAM SITE
SEISMIC SECTIONS AA' BB'

EXPLORATION GEOPHYSICAL SECTION	R.G. Nelson. GEOPHYSICIST	Compiled R.G.N.	Scale: 1" = 20 feet
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