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COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT

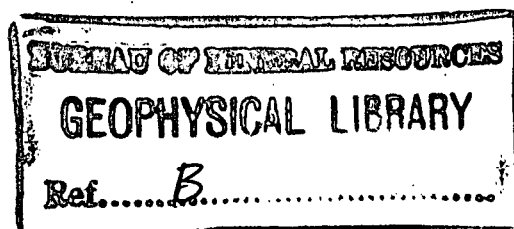
BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

RECORD No. 1963/98



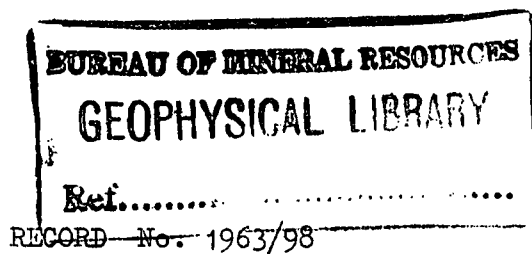
DONALDSON DAM SITE,  
PIEMAN RIVER SEISMIC REFRACTION  
SURVEY,

TASMANIA 1961



E.J. POLAK

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by

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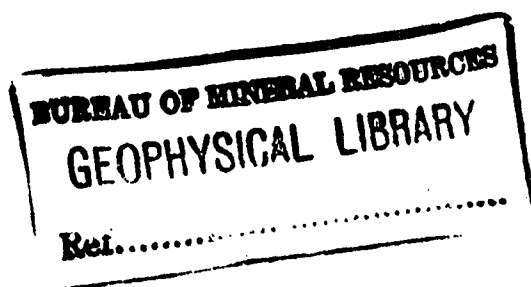
## ILLUSTRATIONS

Plate 1. Locality plan	(Drawing No. K55/B5-18)
Plate 2. Traverse plan	(K55/B5-11)
Plate 3. Seismic cross-sections	(K55/B5-12)

## SUMMARY

Details and results are given of a seismic refraction survey, made in response to an application from the Hydro-Electric Commission of Tasmania to investigate a proposed site for a dam on the tidal section of the Pieman River, Tasmania.

The depth to the bedrock at the proposed dam site was found to be about 240 ft measured from the sea level. The depth of water is about 60 ft.



## 1. INTRODUCTION

The Hydro-Electric Commission of Tasmania proposes to erect a dam on the tidal section of the Pieman River as part of the Pieman Development Scheme.

Two possible sites for the dam have been chosen by the Commission for investigation. One is roughly three miles upstream from the Pieman Heads and is called the Donaldson dam site, and the other is about three miles further upstream at Hell's Gate.

The Hell's Gate site has been previously investigated (Polak and Moss, 1959). The survey proved about 50 ft of detritus which overlies suitable foundation rock at the river bed. The construction of the dam at Hell's Gate with the tidal water, which is frequently rough and has a maximum depth of over 120 ft, would be difficult and costly. The Commission therefore requested the Bureau of Mineral Resources, Geology and Geophysics, to conduct a geophysical survey to determine the thickness of the detritus at the Donaldson dam site, where the depth of water is only 60 ft.

The survey was carried out in April 1961 by a geophysical party consisting of geophysicists E.J. Polak (party leader) and D.J. Harwood, and geophysical assistant J.P. Pigott. The Commission provided additional assistants and did the topographical survey.

## 2. GEOLOGY

The site of the proposed dam is in a steep-sided gorge of the Pieman River farther downstream than the mouth of the Donaldson River. The only access to the site is by water from Corinna (about 11 miles upstream). The location of the dam site is shown on Plate 1.

The geology of the area has been described by Spry and Ford (1957).

The proposed dam site is located on Precambrian Interview Beds, which consist of slate, argillite, and quartzite. The beds were intruded by the Precambrian dyke swarm. In the area of the proposed dam the beds dip steeply upstream. Over the most of the site there is a cover of talus material.

## 3. METHODS AND EQUIPMENT

The seismic refraction method of exploration was used in the survey at the Donaldson dam site. A detailed description of the method as used in a water-covered area has been given by Polak and Moss (1959).

The lay-out of traverses is shown on Plate 2. Traverse G was surveyed with normal geophone spreads. Fixed shot-points were placed near both ends of Traverse G. After the first set of shots, the geophones were shifted to a new position between the fixed shot-points. Weathering spreads were made at both ends of Traverse G in the mud near the banks. Traverses A, B, C, D, and F were observed as 'broadside' spreads, with shot-points upstream or down-stream from the geophone-spread location. The bedrock velocities found on Traverse G were used in the computation of 'time depths' on the broadside spreads.

The equipment used was a 12-channel shallow reflection/refraction Midwestern seismograph, with TIC underwater geophones of natural frequency 20 c/s. The total length of traverses surveyed was 3600 ft.

#### 4. RESULTS

In the interpretation of the results the following velocities of the compressional wave were observed on Traverse G and are characteristic for different media:

<u>Velocity (ft/sec)</u>	
5000	water
5600	detritus at the bottom of the river
11,000 to 15,000	bedrock

The velocity in the detritus at the Donaldson dam site is lower than the velocity measured in the detritus at Hell's Gate. The lower velocity may be an indication of the finer nature of the unconsolidated deposits at the Donaldson dam site.

The seismic velocity measured in the bedrock at the Donaldson dam site is generally lower than that measured at Hell's Gate.

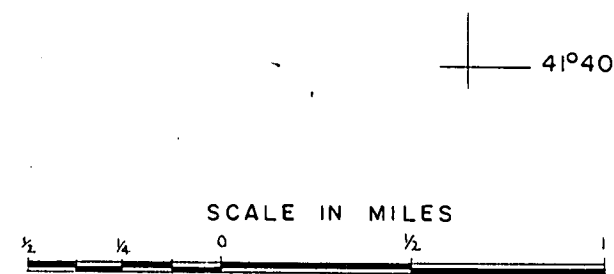
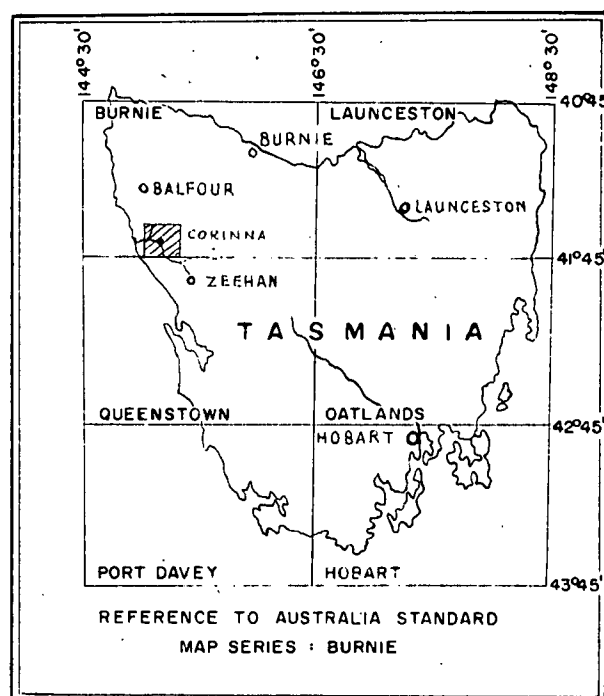
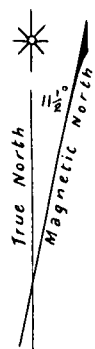
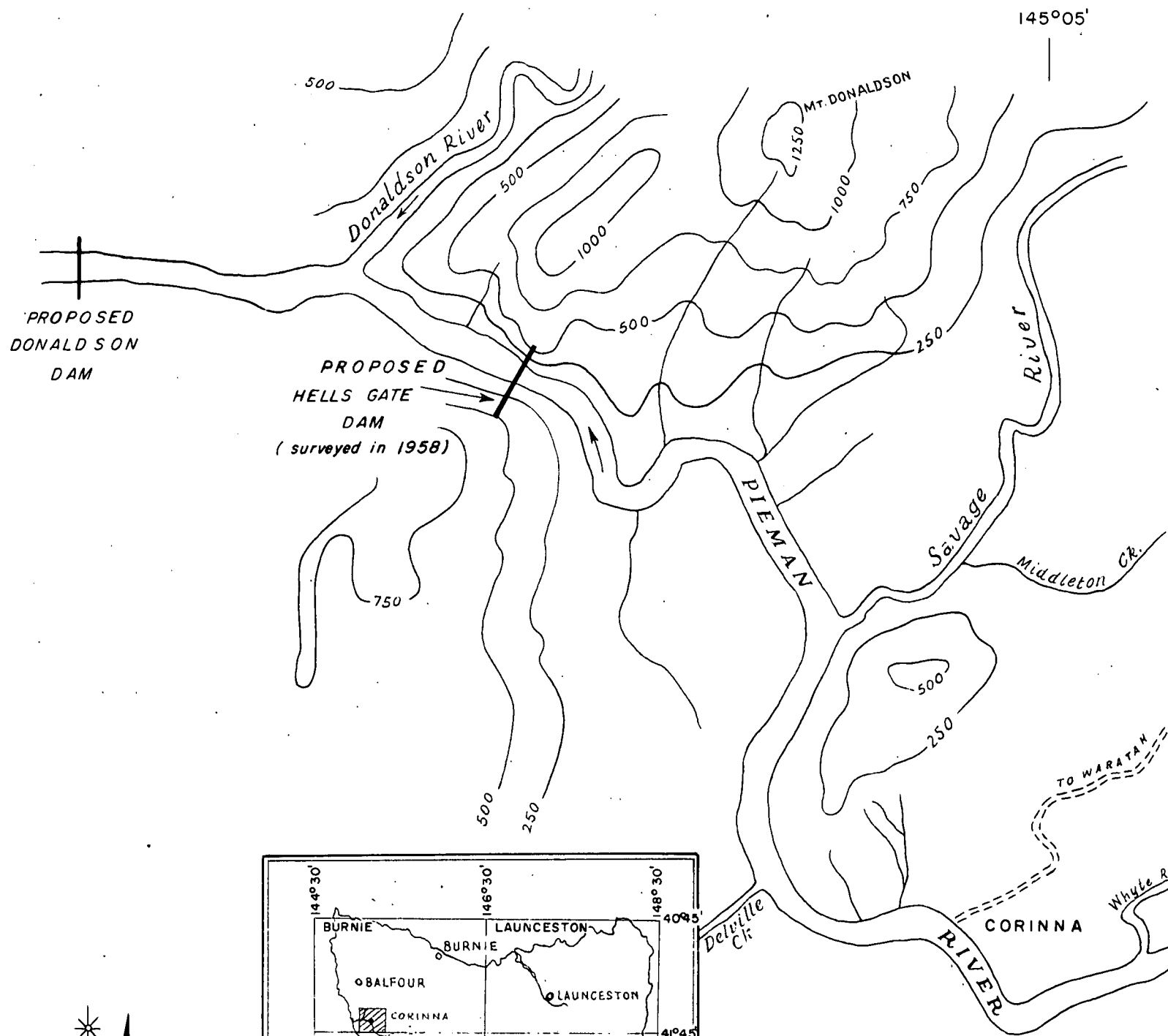
Plate 3 shows the thickness of the detritus at the bottom of the river calculated from the seismic data. The cross-section along Traverse F shows the method adopted for plotting of the data, allowing for the fact that the seismic records give the distance to the refractor and not the vertical depth. The bedrock profile is drawn as the envelope to a set of arcs, an arc being centred at each geophone position.

#### 5. CONCLUSIONS

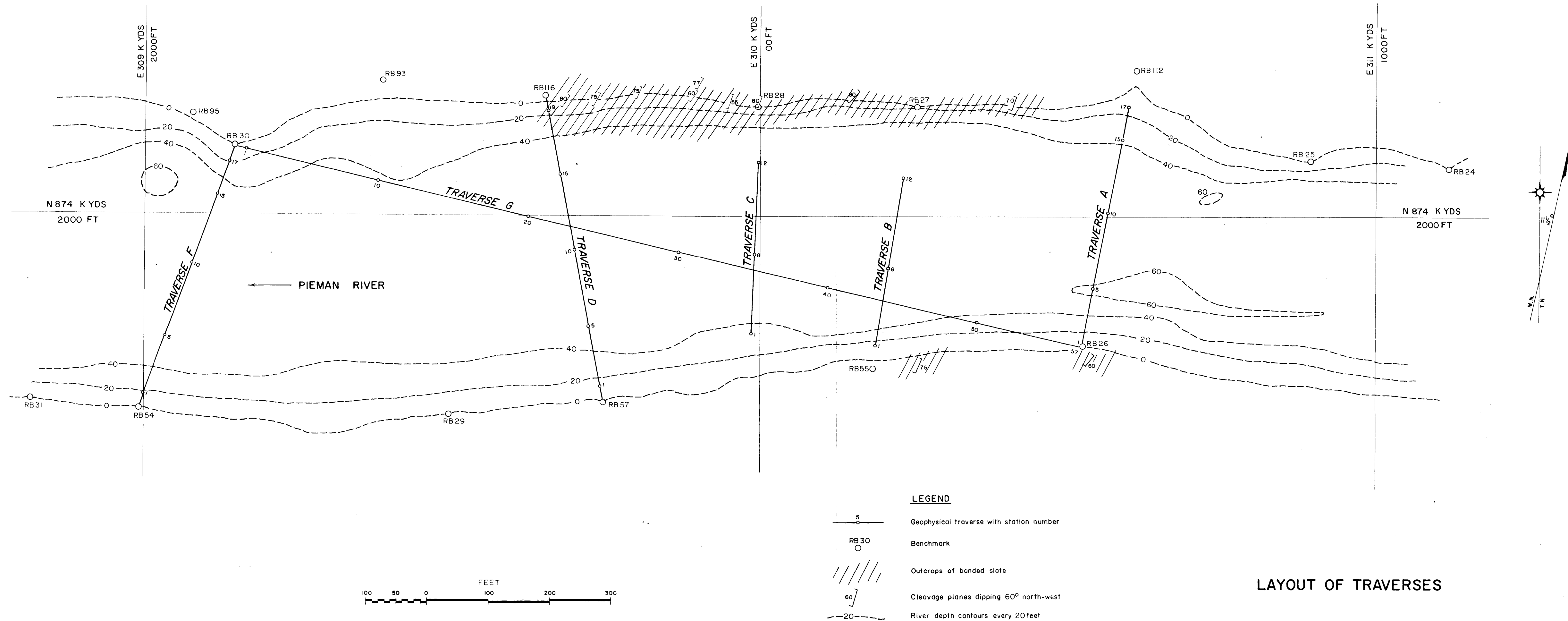
The depth to bedrock at the Donaldson dam site is up to 240 ft, and is much greater than that recorded at the Hell's Gate dam site. It is considered likely that the detritus is finer at the Donaldson dam site and may not contain many large blocks of rocks, which are believed to be present at the Hell's Gate dam site.

#### 6. REFERENCES

- |                            |      |  |
|----------------------------|------|--|
| POLAK, E.J. and MOSS, F.J. | 1959 | Seismic reconnaissance survey at the Hell's Gate dam site, Pieman River, Tasmania. <u>Bur. Min. Resour. Aust. Rec. 1959/80 (Unpubl.)</u> . |
| SPRY, A.H. and FORD, R.J.  | 1957 | A reconnaissance of the Corinna-Pieman Heads area -- Geology. <u>Pap. roy. Soc. Tas.</u> 91, 1-7.  |



DONALDSON DAM SITE  
GEOPHYSICAL SURVEY  
TASMANIA 1961  
LOCALITY MAP

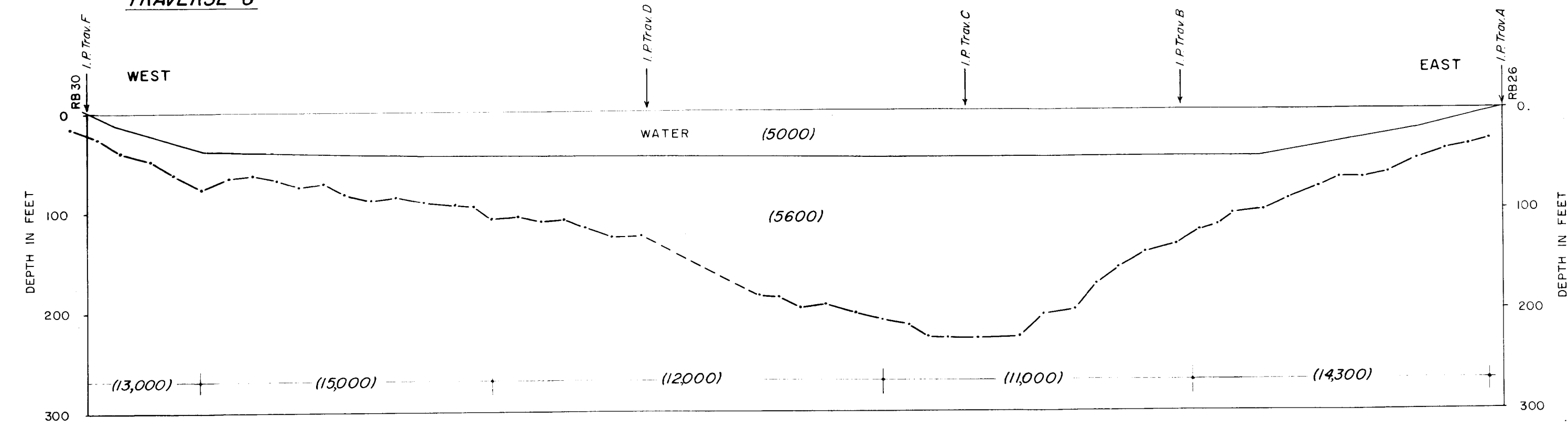


LEGEND

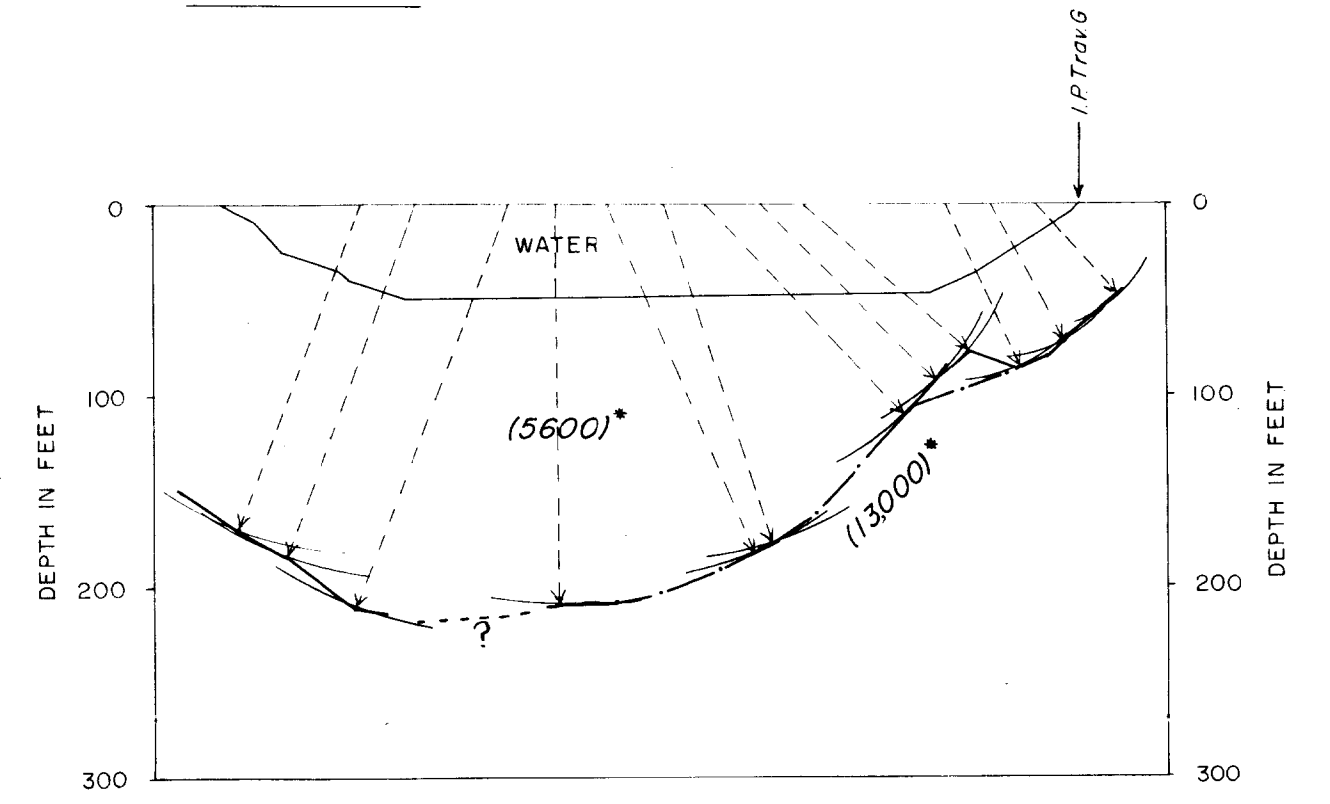
- Geophysical traverse with station number
- Benchmark
- Outcrops of banded slate
- Cleavage planes dipping 60° north-west
- River depth contours every 20 feet

LAYOUT OF TRAVERSES

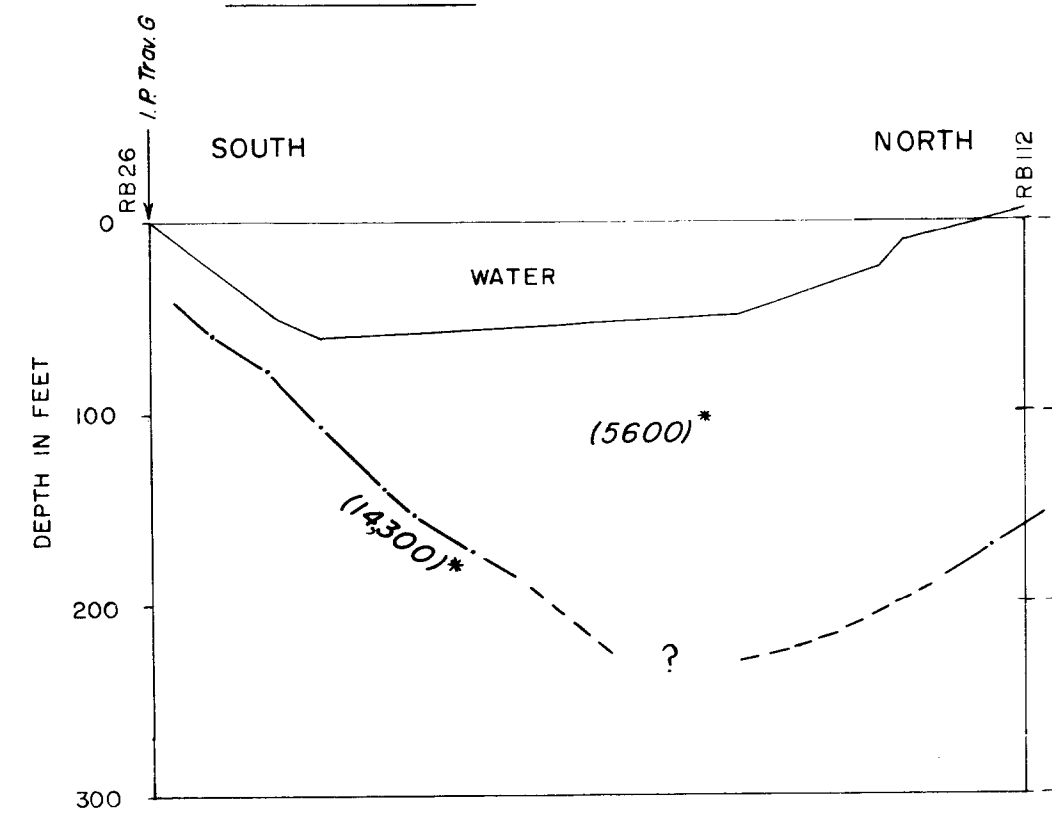
TRAVERSE G



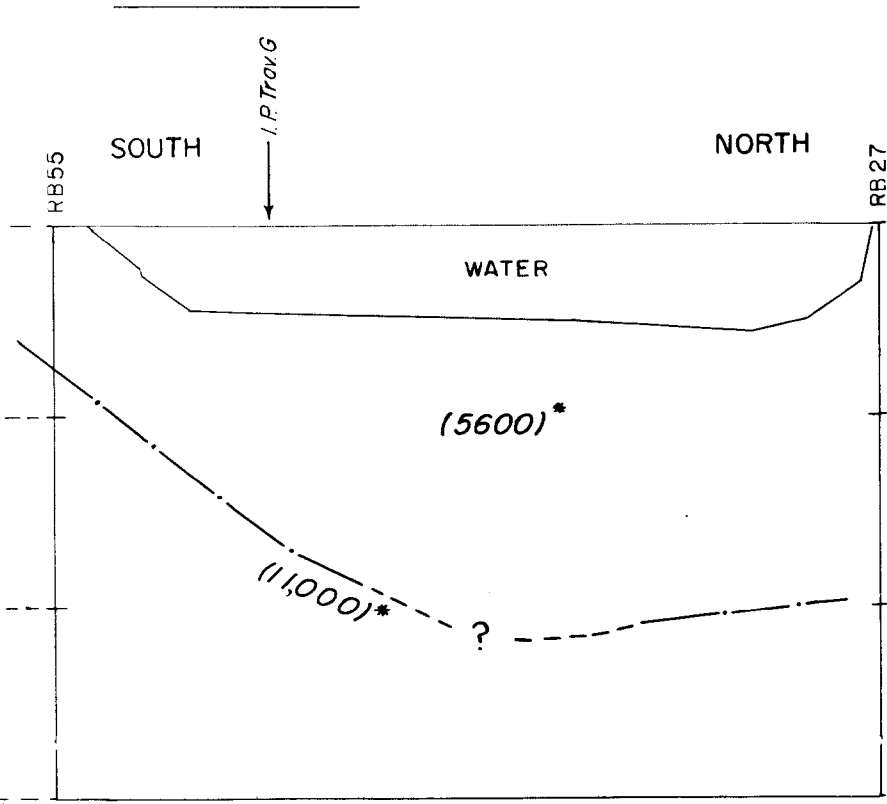
TRAVERSE F



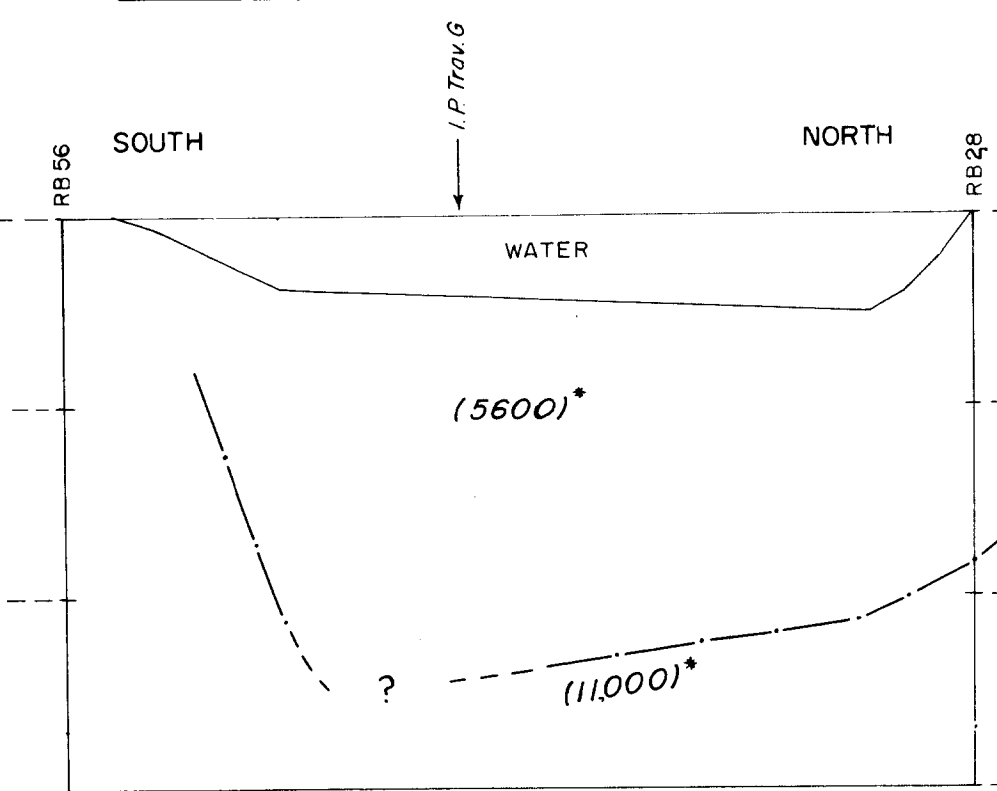
TRAVERSE A



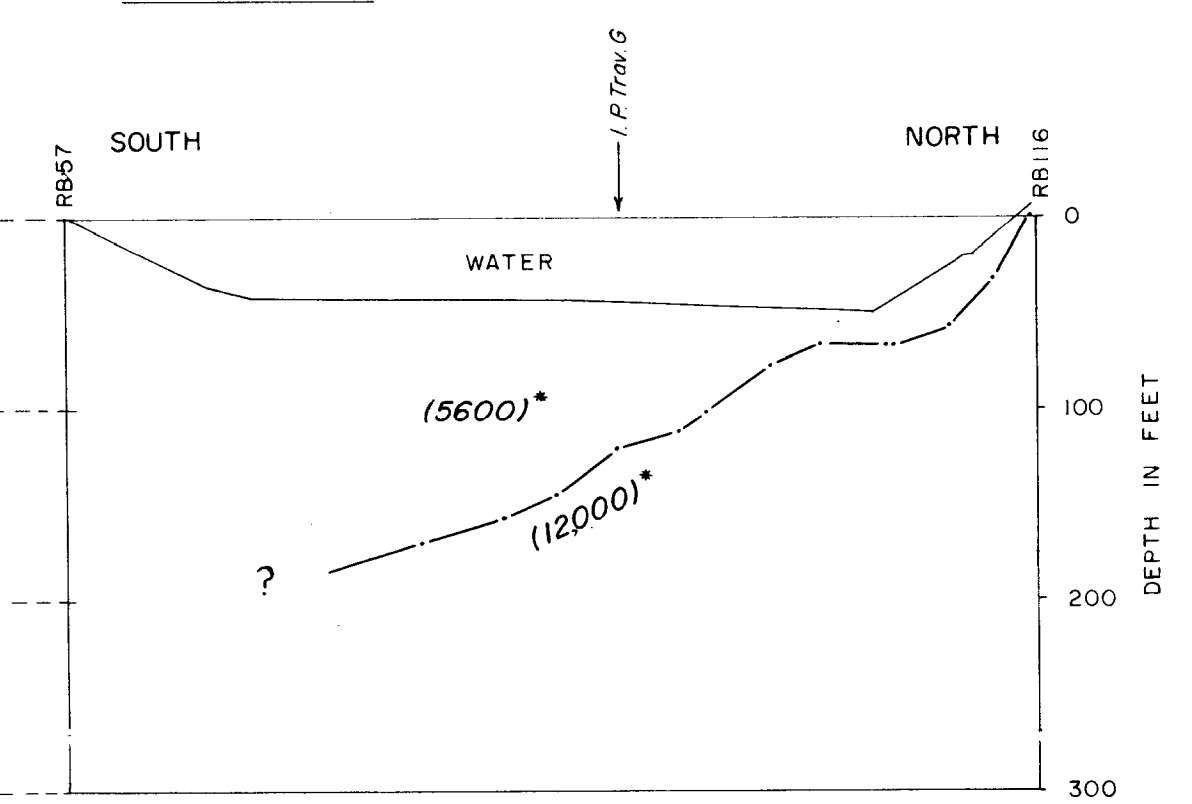
TRAVERSE B



TRAVERSE C



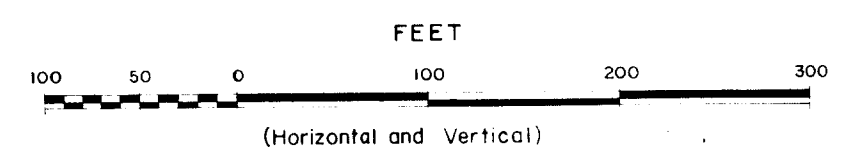
TRAVERSE D



LEGEND

- (5600) Formation with seismic velocity of 5600 ft/sec
- (11,000)\* Seismic velocity from Cross-section G
- RB 55 Benchmark
- I. P. Intersection point
- Unweathered bedrock boundary (from seismic survey)

Level datum based on approximate sea level at Donaldson dam site



TRAVERSES A, B, C, D, F, and G  
SEISMIC CROSS-SECTIONS