

## 19. Seismic survey, Derwent estuary.

D.E. Leaman

A refraction seismic survey was undertaken between Kellys Point and the Iron Pot at the mouth of the Derwent River to establish the nature and structure of the river bed. The Marine Board of Hobart and its officers assisted materially in the project by providing the tugboat *Tawe* and crew as a work vessel. Spread positions were determined by Captain Lucas using sextant sightings from the *Tawe*.

## TECHNIQUE

A hydrophone cable 180 m long was slowly towed across the river mouth by the *Tawe*. A shot cable was attached to the main cable for the first 180 m and then extended by 35-200 m depending on the required shot distance. A second smaller boat was used to load shots and reloading commenced as soon after firing as possible. In this way it was possible to fire either a series of overlapping spreads or spreads in pre-determined locations.

Charges consisting of 4.5 kg of plastic explosive with a detonator booster were fired at a depth of 5 m and anchored in position by a floating buoy at the end of the shot cable. In this way any drift of the shot was avoided.

## GEOLOGICAL SETTING

Triassic sandstones are intruded by dolerite at Kellys Point and there is evidence to suggest that the dolerite intruded from the east (Leaman, 1972). At Cape Direction and the Iron Pot, Permian siltstones dip westward at about  $10^\circ$ . On the basis of this limited information, a major structure was presumed to be present and concealed by the estuary.

The Derwent River shallows from more than 20 m north of Piersons Point to less than 15 m in the zone under examination and then deepens rapidly into Storm Bay. This 'bar' in the river restricts the entry of large bulk ships to the port of Hobart (fig. 28).

Two theories could reasonably be advanced to account for the 'bar'.

- (1) A rock connection exists between Kellys Point and Cape Direction with a thin covering of river silt and sand. This might be possible if the Derwent River once flowed south through the depressions now occupied by the D'Entrecasteaux Channel or Hope Beach. In the latter instance more than 130 m of Tertiary sediment has been proven by a seismic survey beside the South Arm Road. The Derwent River and bay system around southern Tasmania has resulted from 'drowning' of the previous valley system which had an erosional base up to 200 m below present sea level. The drowning of the old river valleys would also cover some of the lower interflaves and the bar could represent one of these features.
- (2) The 'bar' could be a remnant of the Tertiary filling in a fault trough in this part of the Hobart district. Erosion by a valley system or by current action could have left a ridge at the zone where interaction of river flows and ocean currents meet.

## SEISMIC SURVEY

The location of all spread and shot points is shown in Figure 28. Seventeen spreads were fired and only three seismic velocity groupings were noted; 1450 m/s, 1520-1670 m/s and >3200 m/s. The high velocities were only noted in the region immediately adjacent to the Iron Port and may be ascribed to Permian siltstone in a fractured state. All other spreads consistently gave results in the 1520-1670 m/s range for the material below the water interface. The velocity distribution indicated by the spreads suggests that the material dips toward the centre of the estuary from both east and west. The interface between low and high velocity materials was noted in only one spread and was shown to dip at a high angle, presumably representing a fault (fig. 28). No high velocity materials were detected beneath the medium velocity materials. Velocities of 1500-1700 m/s are typical for the Tertiary sands and clays of the Hobart district. Such materials are moderately compacted, predominantly claystone with interspersed sandstone beds. The velocities obtained in the estuary, even when averaged to allow for dip, infer that clays predominate here also. More than 100 m of this material was proved in the survey. It should be noted that the dips referred to above relate to bedding within the Tertiary materials and the velocity variations noted are assumed to be averages across the section.

### CONCLUSIONS

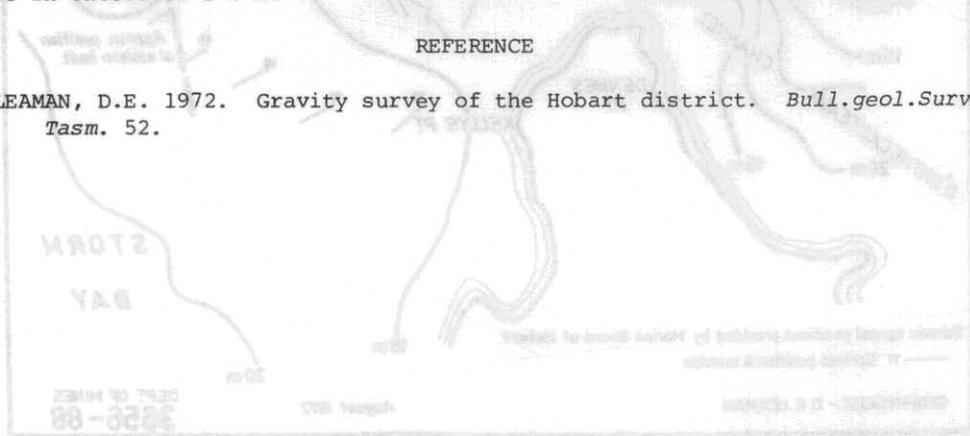
The survey has revealed that no rock shelf persists for more than 300 m from either shore and that within the first 100 m of the river bed no material more substantial than consolidated sands and clays is present. These sediments appear to occupy a fault trough.

The 'bar' in the Derwent estuary is composed of sandy clays and would be readily dredgable. Similar materials may be seen in the Sandy Bay area beneath the cover of boulder slides such as at Wrest Point.

There is no evidence to suggest any thick accumulations of river bed silt and sand. No velocity gradations were noted and intercept times imply no excess of low velocity materials (water, water-saturated silts) over actual water depth. It is therefore concluded that the silt thickness cannot be in excess of 2-3 m.

### REFERENCE

- LEAMAN, D.E. 1972. Gravity survey of the Hobart district. *Bull.geol.Surv. Tasm.* 52.



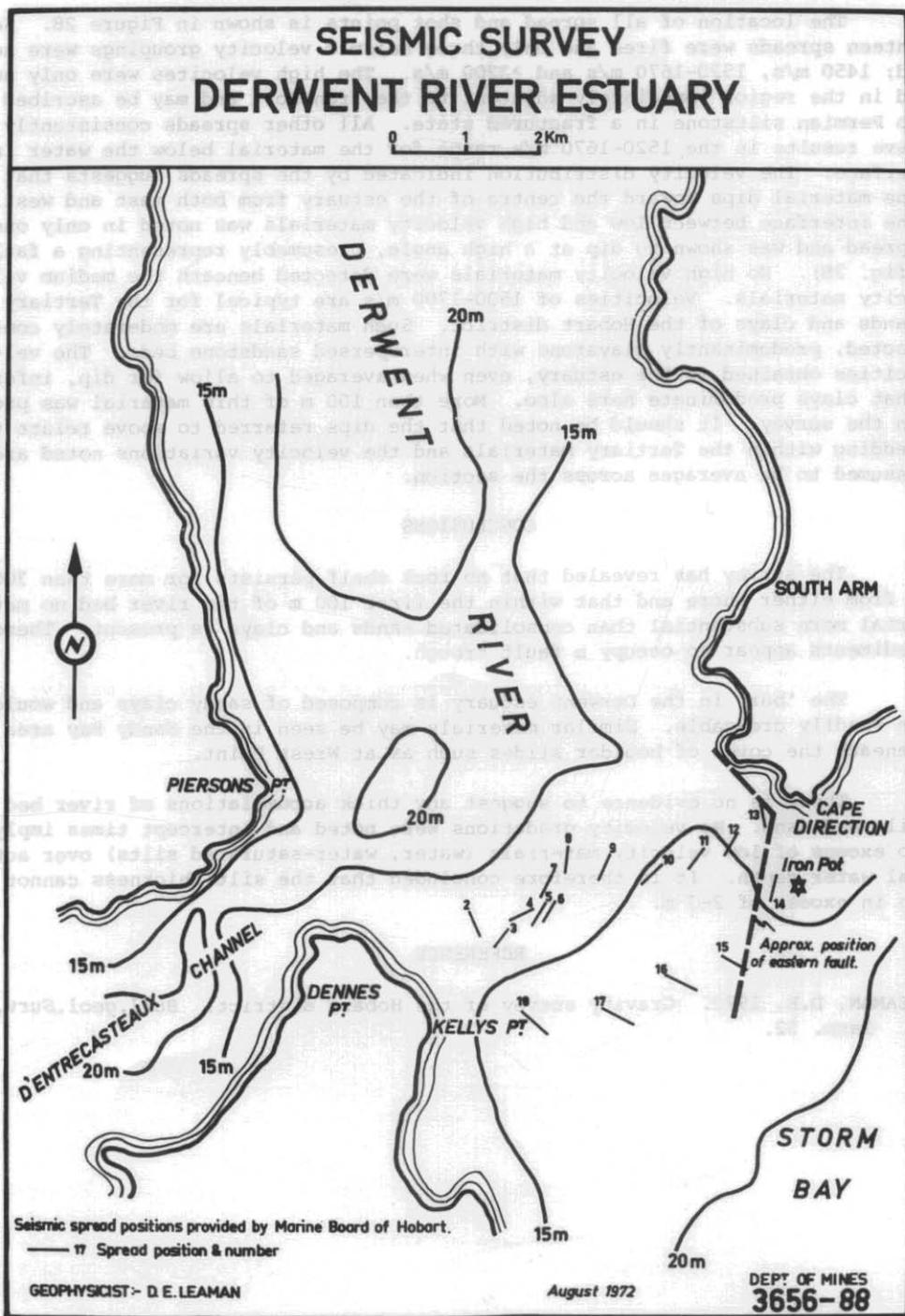


Figure 28.