1979/39. Final report on a seismic survey of the Fishermens Dock, Stanley

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Abstract

A high resolution seismic refraction survey of the Fishermens Dock, Stanley has shown the presence of basalt boulders up to 1.5 m diameter in a matrix having a velocity between 1100 and 2100 m/s. Provided that suitable heavy equipment is available, the dock may be excavated to a minimum depth of three metres below low water with the use of, at worst, minor blasting. It is anticipated that a heavy drag-line would be adequate for removing the tuff, provided maximum cutting effect is obtained by pulling from south-east to north-west.

INTRODUCTION

The Fishermens Dock at Stanley [CQ566854] lies on the south-eastern side of The Nut. The north-western side of the dock consists of a weathered tuff shelf dipping to the south-east. In the north-eastern corner of the dock the tuff is covered by basalt boulders and silt.

The area of interest was surveyed using a high resolution seismic refraction technique to determine the size and position of any boulders within the tuff matrix as well as the nature of the matrix itself. Marine data was recorded using hydrophone and spread spacings of two metres with a cross-tying spread every six metres. To allow for the removal of water statics, the depth of water was measured at each shotpoint and hydrophone. The land spreads were shot using a geophone interval of between 4.5 and 8 metres.

RESULTS

The spreads recorded on the north-west side of the dock at low tide showed velocities of less than 2100 m/s within the top 25 m of the weathered tuff. Thus on the marine recordings, the presence of any high velocity (>2100 m/s) segment producing a step in the travel-time curve or a local 'early' arrival indicates a wholly or partially embedded boulder in the lower velocity matrix. Depth resolution of this method is poor, but good accuracy is achieved in horizontal positioning and boulder size.

The velocity of the matrix was less than 2100 m/s with much of the area to be deepened showing a velocity of less than 1600 m/s, consistent with a weathered tuff. As the south-western end of the dock is approached there is an overall reduction in the measured velocities indicating greater weathering of the tuff. The material with a velocity of less than 1600 m/s could be easily removed using a backhoe or similar piece of equipment. There are no substantial increases in seismic velocity (and hence rock strength) with depth in the volume of material to be excavated. Boulder size is less than 1.5 m for all boulders noted. The lack of any major inhomogeneity in the areas traversed indicates that it is unlikely the properties of the matrix in the remaining parts of the dock will differ significantly from those in the area surveyed.

If a drag-line is to be used for excavation, it is recommended that the direction of cutting be from south-east to north-west against the dip of the tuff. A heavy drag used in this matter would cut most of the tuff rather than glancing off the dipping surface and clearing only loose

materials. Precautions should be taken against the collapse of the unstable bank at the north-west end of the unloading apron.

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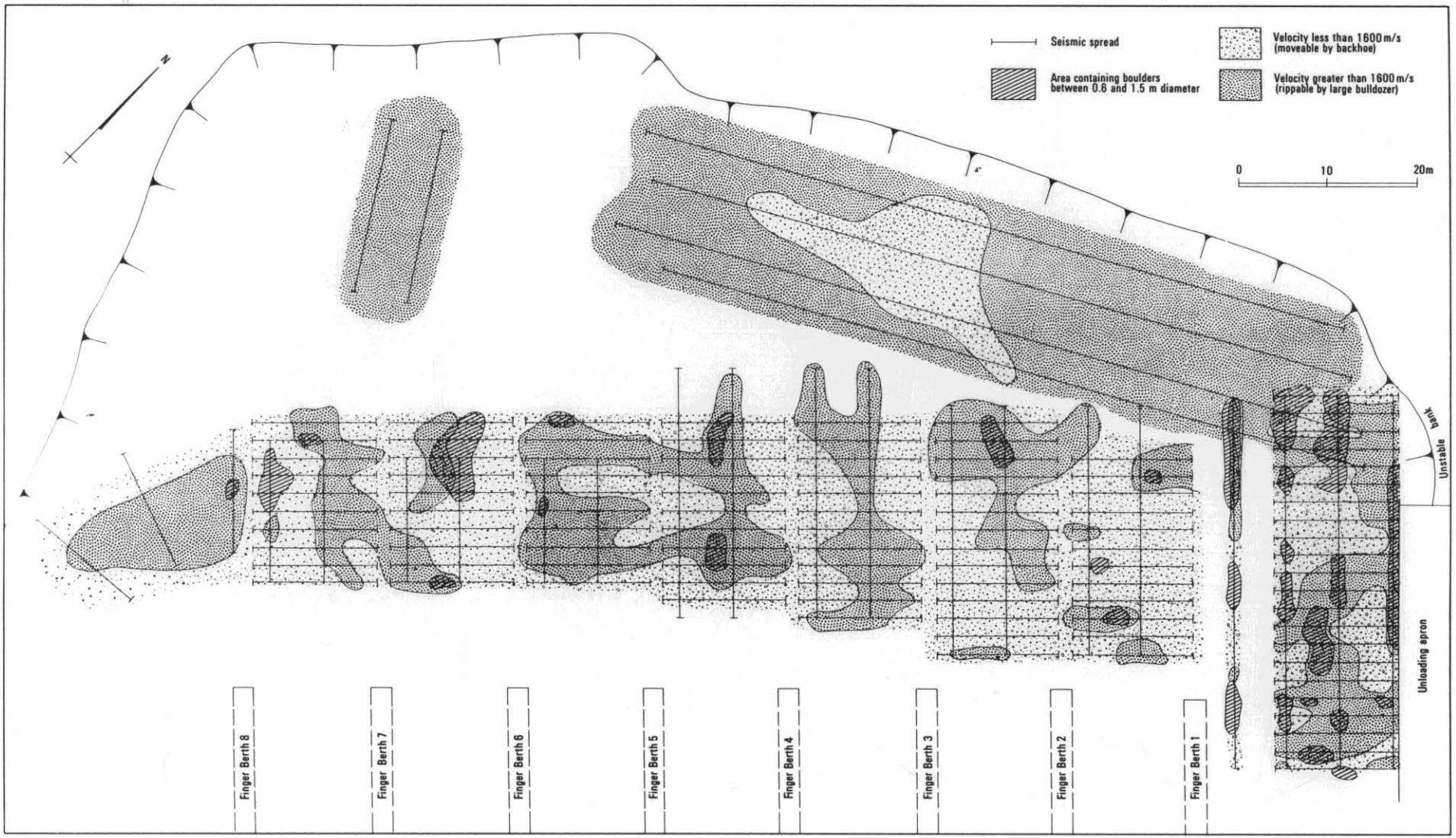
5 cm
Seismic spread
Area containing boulders between 0.6 and 1.5 m diameter
Velocity less than 1600 m/s (moveable by backhoe)
Velocity greater than 1600 m/s (rippable by large bulldozer)
0
10
20m
N
Unstable bank
Unloading apron
Finger Berth 8
Finger Berth 7
Finger Berth 6
Finger Berth 5
Finger Berth 4
Finger Berth 3
Finger Berth 2
Finger Berth 1

Figure 1.