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Seismic surveys for bridge site investigations, Mathinna  
Secondary Road.

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Abstract

Seismic surveys for bridges at Evercreech and Beauty Flat on the South Esk River have revealed thin veneers (<5 m) of gravel and alluvium on stiff clay at Evercreech and fractured sandstone at Beauty Flats.

INTRODUCTION

Examination of two bridge sites on the South Esk River south of Mathinna was requested by the Department of Main Roads in May. Flow conditions in the river have delayed the investigation as explained below.

The first site, on Beauty Flat Road [EQ823032] at a crossing known as Barnes Bridge proved very awkward. At this site, an old wooden bridge had been replaced by a steel and concrete structure which had subsequently failed at the midstream pier due to founding of the pier in a gravel bed of the river. This had eroded with increasing flows. The structure was removed and no cross river access has existed from the time of requesting this investigation. Examination of foundation conditions in the region of the failed pier ideally required an along stream seismic spread in order to properly examine the river bed section. At times of summer flow, an extended shingle bank would permit such a survey. However in the present conditions only a cross stream spread was possible and this was undertaken only after river levels were sufficiently low to permit the necessary manpower and cable transfers. The survey may be considered adequate but far from ideal.

The second site, on Evercreech Road [EQ802080], is located approximately 20 m downstream from the existing wooden bridge. The survey at this site was undertaken along the proposed centre line of the new structure, along the present bridge and along the river banks.

BEAUTY FLAT ROAD BRIDGE

Jointed, competent sandstone and quartzite are exposed in the river bank above the western abutment of the bridge and the seismic survey indicates that this material shelves under the abutment and into the river. The following comments are based on a river reference level at the base of the main wall at the western abutment or about one metre at the failed pier. Near the western abutment, about 3 m of gravel overlies a high velocity bed-rock interface which dips gently eastward. The cover of water and gravel varies across river, but does not appear to exceed 5 m at any point and is about 4 m at the position of the failed pier. This would imply about 3 m of gravel. As interpreted, this appears to be a maximum estimate. The bedrock interface shows some irregularities but the relief is little more than one metre.

The presence of a relatively thin and partly patchy veneer of gravel on a firm impervious bedrock probably accounts for the failure of the pier. Scouring and uplift pressures combined would be more than adequate at times of raised flows.

EVERCREECH ROAD BRIDGE

Weathered sandstone and mudstone is exposed (?) east of the bridge. Presence of derived gravel and talus confuse the exact situation. A flood plain extends west of the bridge. No velocities in excess of 1800 m/sec were observed around this site and the river appears to be flowing very near the interface between materials with a velocity of 1500 m/sec and 1800 m/sec. To the west, the lower velocity material represents alluvium and gravel. A velocity of 1800 m/s is typical for compacted clay or very deeply weathered mudstone. However, the velocity distribution is very regular and consistent and a thick deposit of firm clay may be implied.

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