

**TASMANIA DEPARTMENT OF MINES  
UNPUBLISHED REPORT 1982/50**

**Investigation of cracked houses at Beach Road, Legana**

*by W. R. Moore*

Auger drilling was undertaken in May to investigate the causes of cracking in houses at 47 to 55 Beach Road, Legana. The drilling showed that all of the houses are underlain by clay, with the testing of these clays showing them to be expansive with linear shrinkage ranging from 17 to 24%. As the surrounding houses, and particularly those downslope on the river side of Beach Road, did not show any excessive cracking it is thought that the movement causing the cracking of the houses at 47–53 Beach Road is not an incipient landslide movement but vertical movement as the result of the clays expanding and contracting with varying moisture content.

This hypothesis can only be proved by long-term monitoring, and it is proposed to keep monitoring the cracks on the houses. It is also proposed to drill two further sets of holes, as close as possible to the original holes, and to test the clays again, particularly the moisture content. The next set of holes will be drilled after the winter rains with the second set in autumn, giving a complete year's record.

Only by such long term records is it possible to find the depth at which the moisture content of the clays remains reasonably constant. It is this depth to which any underpinning needs to be taken for it to be effective.

**Sample Testing**

All the samples collected from the auger drilling on the four house blocks along Beach Road on 18–19 May have been tested in the soil laboratory at Hobart and are now undergoing grain size analysis at the Department of Mines laboratory in Launceston.

***47 Beach Road***

The hole on this block was drilled to 3.3 m in clay. At this depth the drill appeared to hit heavy gravel which it could not penetrate. Samples were collected every metre, with the moisture content decreasing from 34% at the surface to 16%. The clay liquid limits were also high at the surface and declined towards the bottom of the hole. The plastic limit was average and linear shrinkage was 20%. X-ray diffraction showed kaolinite to be the dominant clay mineral with only a trace of montmorillonite present. Only one sample was X-rayed from this block.

The difference in thickness of the clay at this locality and the different moisture content may provide the reason why the cracking on this house is not as severe as on the other three houses at Beach Road. The linear shrinkage is still high enough to produce foundation movement with varying seasonal fluctuations.

***49 Beach Road***

The hole on this block was drilled to 7.0 m with the moisture content consistent between 30% and 58% below the immediate ground surface. The liquid limits were high at 2.0 m and 7.0 m, the plastic limit average for the Tamar Valley, and the linear shrinkage 20%. X-ray diffraction showed that the clays were composed of montmorillonite and kaolinitic clay minerals with montmorillonite the most abundant.

Although these samples did not show any great variation in moisture content compared with

some of the samples from other blocks in Beach Road, the presence of montmorillonite and the high linear shrinkage of the samples indicate that movement is very likely to occur in these clays with varying moisture content. The expansion and contraction of the clays will produce movement in the house foundations resulting in cracking.

### **51 Beach Road**

The hole on this block was drilled to 7.0 m in clay with samples collected every 1.5 metres. The moisture content of the clay was reasonably constant to 7.0 m where it increased sharply from 27% to 46%. The clay showed high liquid limits at 2.5 m and 7.0 m with linear shrinkage of 17% to 23% at these depths. X-ray diffraction showed kaolinite and montmorillonite as the minerals present with montmorillonite dominant at 7.0 metres.

These results show that movement is very likely to occur in these clays with varying moisture content and this in turn will produce movement in the house foundations.

### **53 Beach Road**

The hole on this block was drilled to 7.0 m in a clay sequence and samples were collected every metre. The moisture content was high to 4.0 m at between 28% and 36%, then declined sharply to 17%. The liquid limits were high (95–113) and linear shrinkage was 19–24% in this depth range. X-ray diffraction showed kaolinite and montmorillonite as the clay minerals present, with montmorillonite dominant at 4.0 metres.

These results show that movement is very likely to occur in these clays with varying moisture content. This expansion and contraction in the clays will produce movement in the house foundations producing cracking.

### **Further Investigations**

It was proposed that the next step in the investigation was to test the moisture content seasonally. The best way to do this would be to drill another hole close to the original hole at the end of winter and re-test the clays. A second set of holes drilled in autumn would give a complete year's record.

If this could be done at all four affected houses along Beach Road it would strengthen the existing hypothesis that the cracking in these houses is due to soil expansion and contraction rather than landslide movement. In the meantime monitoring of the cracks by the Department would continue.

The proposed redrilling of the holes did not proceed because of the lack of winter rains. It was thought that there was little point in re-drilling and measuring the moisture content until the clays become saturated. The rainfall difference between the 1981 and 1982 winters is very apparent from the following figures:

<i>Rainfall Launceston</i>	<i>July</i>	<i>August</i>	<i>September</i>
1981	92 mm	163 mm	30 mm
1982	29 mm	13 mm	61 mm

[20 October 1982]

## APPENDIX 1

### Monitoring of ground movements

Long term monitoring of ground movements conducted by the Department of Mines at 47–53 Beach Road, Legana, shows that from October 1983 to September 1984 there was a horizontal downslope movement with a maximum of 15 mm ( $\pm 3$  mm survey error) on the survey line on Beach Road. This horizontal downslope movement cannot be eliminated by survey error and is small (5 mm) on the peg on the road in front of 49 Beach Road.

There has also been vertical movement on all four houses as well as our level datum peg located downhill from 47 Beach Road between the above dates. The direction of this vertical movement is not known but this movement cannot be eliminated by survey error.

To date the monitoring has not been able to establish if these movements are the result of landslide, movement in the expansive clay which is known to underlie all four houses, or soil creep or a combination of these three types of movements.

Tables of analytical data and graphs from the Beach Road survey are included in Moore (1983).

#### Reference

MOORE, W. R. 1983. Subsurface geological investigation of cracked houses in the Mowbray area, Launceston. *Unpublished Report Department of Mines Tasmania 1983/24.*

[11 October 1984]