

**TASMANIA DEPARTMENT OF MINES
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Investigation of house cracking at Nobelius Drive, Legana

by W. R. Moore

Cracking of a brick wall and foundations of a house at 3 Nobelius Drive, Legana, was investigated. One auger hole was drilled near the northwest corner of the house where cracking of the brick wall and foundation has occurred. Samples were collected from the drilling for soil laboratory tests (Table 1).

The drilling revealed that the surface gravel is 1.5 m thick and there is a sudden change into clay at this depth. The surface gravel with a silt matrix is exposed in a trench dug below the house foundations for possible underpinning. The clay beneath the gravel continues to the depth drilled of 6.1 m with only varying colour changes.

The clay is highly plastic, with large plasticity index ranges of 81 to 120 and with liquid limits above 100 for the hole's entire depth. The linear shrinkage is also high, with a range of 29% to 23% from the top of clay at 1.5 m to the bottom of the hole at 6.1 metres (fig. 1).

The field moisture content was 40% in the clay immediately below the gravel, falling to 30% at 3.4 m and increasing to 36% at the bottom of the hole. XRD testing of the clay samples showed the expansive montmorillonite clay to be present in varying amounts in all samples.

The soil laboratory results show that the clay has a considerable potential to produce differential vertical movement in the foundations of the house, given that fluctuations occur in the moisture content within the clay through the overlying gravel. Such movement would be accentuated by the drought of 1982/1983, particularly with trees surrounding the house. There appears little doubt that movement in the expansive clay underlying 1.5 m of gravel is causing the cracking.

As with other cracked houses on expansive clay soils in Legana preventing the cracking continuing is a far more difficult problem than finding the cause of the movement. Ad hoc remedial measures, such as underpinning often recommended by builders, can be costly and ineffective and may even make the situation worse.

Because of their high permeability, and with a slope down towards the River Tamar, the surface gravels should be free draining and drainage should not be a problem under the house. Underpinning in the gravel will only make the footings stronger where the underpinning has been done and it may impede the natural drainage; it will certainly not stop the movement in the clay. To underpin into the clay to the level where the moisture content becomes unaffected by seasonal fluctuations would be a costly project.

It is suggested that reference be made to a publication by J. R. Holland (*The design, performance and repair of housing foundations*; Swinburne College Press, distributed by the Swinburne Student Bookshop Co-operative Limited, John Street, Hawthorn, Victoria, 3122). The section on trees and their effect and Chapter 6 on foundation repair all appear to be applicable to this situation. It must be appreciated that the depth of seasonal heave has not been established in Legana and the effect of the severe drought in 1982/1983 appears to be of a considerable significance in the cracking of houses in the Legana area.

[10 August 1983]

Table 1
Laboratory results, 3 Nobelius Drive, Legana

Sample No.	Depth (m)	Field moisture content (%)	Plastic Limit	Liquid Limit	Plasticity Index	Linear Shrinkage (%)	XRD	
1	0.6	Not tested	Gravel with a silt matrix					
2	1.5	40	35	155	120	29	Kaolinite (moderate) Montmorillonite (mod.)	
3	2.4	31	27	128	101	24	Kaolinite (moderate) Montmorillonite (weak)	
4	3.4	30	28	112	84	22		
5	4.3	34	31	103	72	22	Kaolinite (moderate) Montmorillonite (weak)	
6	5.2	35	30	114	84	23		
7	6.1	36	28	109	81	23	Kaolinite (moderate) Montmorillonite (weak)	

Sample 3, 2.4 m $\phi'_r = 16^\circ$
 $c'_r = 5.5$ kPa

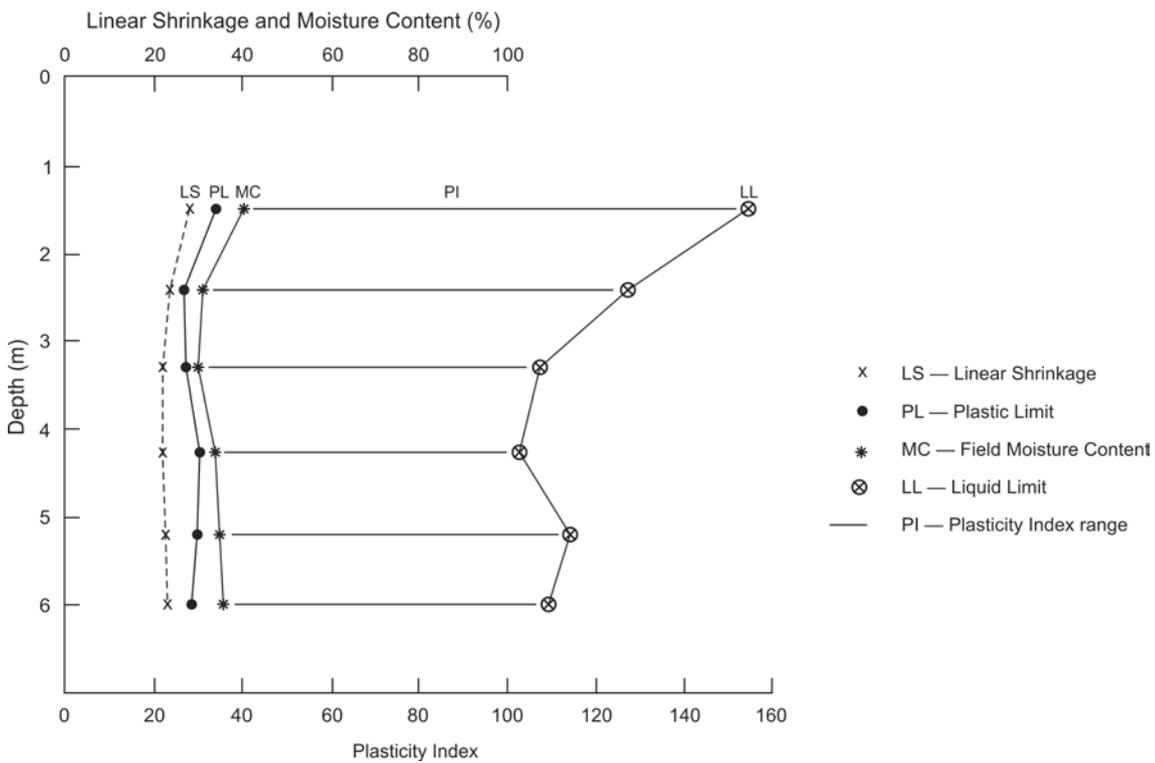


Figure 1

Soil laboratory testing, 3 Nobelius Drive, Legana

ENGINEERING LOG – BOREHOLE

borehole no. 1
sheet 1 of 1

penetration		support	water	notes	metres	graphic log	classification	material	moisture	consistency	hand	structure, geology
1 2 3				samples, tests	R.L. depth		symbol	soil type: plasticity or particle characteristics, colour, secondary and minor components.	condition	density index	penetrator kPa	
		NONE	NONE				GP	GRAVEL AND SILT Gravel, rounded quartz pebbles Fine 1-3 mm	D	D		TERRACE RIVER GRAVELS
				PL35 LL155	1		ML	Silt grey, coarse matrix with some sand				
							CH	Sharp transition CLAY - orange-brown	M	F		CLAY
				PL27 LL128	2			Clay, grey with red streaks				OF THE
								Clay, grey-yellow		S		LAUNCESTON
				PL28 LL112	3			Clay, grey-red		S		BEDS
								Clay, dominantly red		F		
				PL31 LL103	4			Clay, red - hard to drill because of stickiness of clay - rubble.		S		
				PL30 LL114	5							
				PL28 LL109	6							
								DRILL STOPPED AT REQUIRED DEPTH.				