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FINE SEDIMENTS FROM THE MURRAY RIVER REGION BETWEEN MILDURA AND RENMARK, AUSTRALIA—POSSIBLE TECHNIQUES FOR IDENTIFICATION

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In this study of fine textured sediments which may be characteristic of alluvial or lacustrine deposits (as encountered widely in the proposed Chowilla Dam inundation area) it is not an easy matter to identify and/or to differentiate between some of the strata. The normal visual and tactile observations available to the geologist or pedologist are relatively insensitive to changes of clay content or of type of clay mineral within groups of materials dominated by the clay fraction.

During a brief excursion to the region in company with Mr E. D. Gill, it was noted that a great deal of observational and deductive effort was required to define the clayey members of the stratigraphic sequence at various exposure sites. No simple techniques appeared to be available to characterize such strata. It was suggested, therefore, that there could be some possible value in the adaptation for this purpose of some of the simple identification tests used by engineers in the characterization of clays, particularly expansive clays.

Two separate samples were provided by Mr Gill for comparative study, viz. 1: Mottled Blanchetown clay from Murray R. cliff at Yelta, Victoria; 2: Olive gray Blanchetown clay from section at turn in Murray R. c. 800 m. N. of Moorna Station homestead, W. of Wentworth, N.S.W. Both samples were subjected to a limited range of tests defining firstly composition in terms of particle size and nature of clay mineral; and secondly 'index' properties as expressed by plasticity and sorptivity tests. The test data are recorded in Table 1 and 2 below.

Table 1—Compositional Data

Sample	Yelta Cliff (Vic.)	Moorna Station (N.S.W.)
Description	Red Sandy Clay	Gray Sandy Clay
Size Fractions	%	%
Sand (> 20μ)	35	5
Silt (2μ to 20μ)	8	4
Clay (< 2μ)	57	91
Clay Minerals in < 2μ fractions		
Dominant Mineral	Montmorillonite	Montmorillonite
Sub-dominant	Kaolinite	Kaolinite
Trace	Illite	Illite

Table 2—Index Tests

Sample	Yelta Cliff	Moorna Station
Description	Red Sandy Clay	Gray Sandy Clay
Atterberg Limits		
Liquid Limit	45	91
Plastic Limit	20	35
Plasticity Index	25	56
Sorption Limit (Water content at 20% relative humidity)	2·70	4·61

Although the size fractions in Table 1 indicate a significant difference between the two samples, it is not suggested that a particle size analysis would provide a sensitive basis for differentiation. Such an analysis, in any material dominated by the montmorillonite clay mineral, is highly susceptible to errors arising from slight variations of technique. Furthermore, any such type of analysis in such materials tends to be unduly sophisticated if regarded merely as a means of sample identification.

The Atterberg Limits given in Table 2 involve simpler techniques and are somewhat less susceptible to serious errors. Such index test values, when plotted as in Figure 1, do provide a moderately sensitive means of characterization of a material. Highly active clays tend to

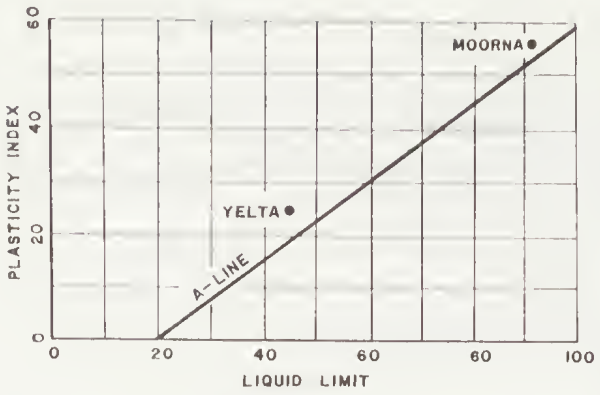

Figure 1

SORPTION LIMIT	<1	1-2	2-3	3-4	4-5	75
TYPE OF CLAY SOIL	RELATIVELY UNREACTIVE	LOW-MODERATE REACTIVITY		HIGH-VERY HIGH REACTIVITY		EXTREMELY REACTIVE
TEST VALUES			2·70 YELTA		4·61 MOORNA	

* The Sorption Limit is the Water Content (expressed as a percentage of the oven dry weight of the soil) retained in equilibrium with an atmospheric relative humidity of 20 per cent.

Figure 2

plot above the A-line in Figure 1 while less reactive clays fall on or below the A-line. The data of Figure 1 suggest that both clays are of a similar highly reactive type. The Moorna sample has a much greater overall reactivity due presumably to a higher clay content.

The Sorption Limits also given in Table 2 tend to provide a remarkably sensitive and extraordinarily simple means of characterization of clays. Figure 2 reflects the normal spectrum of values of the Sorption Limit. Within this spectrum the Moorna Station clay is shown to have a value approaching the upper limit of the range of activity while the Yelta cliff clay appears as a much less active material.

It is suggested, therefore, that the Sorption Limit test may be of value in the identification of fine textured materials. Although the test cannot be performed in the field, the simplicity of both apparatus and procedure should permit its adoption in any geologic or pedologic laboratory.