APPENDIX VI - METHODS OF LAND SYSTEM DESCRIPTION

Climate

Rainfall. Annual average and range were estimated by constructing isohyets for stations within and adjacent to the catchment, based on unpublished data of the Bureau of Meteorology.

Temperature: Annual average and range were estimated by constructing an isotherm map based on data for stations within and adjacent to the catchment, obtained from the Bureau of Meteorology. Some interpolations between stations in mountainous areas were made using a formula linking temperature and elevation (Rowe 1967).

Potential evapotranspiration: Data on rainfall, temperature and latitude were applied to the formula of Thornthwaite (1948) as modified by Leeper (1950).

Geology

Age and lithology: Details were obtained from the 1:250000 geological maps St Arnaud, SJ 54.4 and Ballarat, SJ 54.8 (Department of Minerals and Energy), and confirmed by inspection in the field.

Physiography

Elevation: Elevation was read to the nearest contour line on 1:100000 topographic maps.

Relative relief: Relative relief was estimated on 1:100000 topographic maps by noting the range in elevation to the nearest 5 m for each 1sq. km grid.

Drainage pattern: First, second and third order drainage lines were drawn stereoscopically on 1: 80 000 aerial photographs and were then classified according to standard drainage pattern charts (Thornbury 1969).

Drainage density: The total length of drainage lines indicated as perennial or intermittent streams or by the shape of the contour lines on 1: 100 000 topographic survey maps was measured and divided by the total area of that land system.

Land form: Land form was classified according to the definitions in Gary *et al.* (1974).

Position on landform: The components of each land system were classed according to their position in the landscape.

Slope gradient: Estimates were made from the distance between contours on 1:100000 topographic survey maps and field measurement.

Slope shape: Field observations were made to classify slopes as convex, concave or linear.

Native Vegetation

Structure: Height and projected foliage cover were estimated in the field and related to the structural forms of Specht (1970).

Dominant species: Species occurring in each land component were identified in the field and listed in order of their proportions.

Soils

Parent material: Determined by field observation with prior reference to 1: 250 000 geological maps of the area (Department of Minerals and Energy).

Description: Soil profiles were described in general terms compatible with Northcote's (1979) categories based on textural change with depth. A generalised Munsell name was used to describe the dominant colour of the B horizon in its moist state. Additional terms were used for many soils:

Shallow - less than 0. 5 m to rock impenetrable to auger.
Stony - the A horizon contains more than 10% stone. Calcareous - carbonates detectable with 0- 1 M HCl (Northcote 1979).
Sodic - sodium more than 5% of exchangeable metal cations.
Coarsely structured - B horizon with blocky peds more than 2 cM diameter.

***Classification**:* The Northcote (1979) classification was used with an extension developed by the New South Wales Soil Conservation Service (Charman 1978). The three figures refer respectively to texture of the upper 5 cm, structure of the upper 5 cm and depth of the A horizon.

***Surface texture**:* Northcote's (1979) texture grades were used.

Surface consistence: Field observations of the A horizon based on the U.S.D.A. (1951) scheme were arranged into four categories as follows:

Term	Dry state	Moist state
Soft	Loose Soft	Loose Very friable
Slightly hard	Slightly hard	Friable
Hard	Hard	Firm
Very hard	Very hard	Very hard
	Extremely hard	Extremely firm

Depth: Soil depth is defined as the modal depth to material impenetrable to the hand auger. In addition to augering, depth was estimated from road or other cuttings, or by geomorphic evidence.

Nutrient status: The A, horizons and the B horizons from 30 to 60 cm listed in Appendix 1 were rated for the sum of exchangeable calcium, magnesium and potassium as a guide to the availability of nutrients in general. The ratings appear to be consistent with fertiliser requirements for agriculture.

	Ca + Mg + K **Milliequivalents per 100 g**
Very low	0-3.9
Low	4-7.9
Moderate	8-17.9
High	>18

Available soil water capacity: The broad relation between texture and available soil water capacity was used to rate topsoils and subsoils together with depth functions for modal soils from each land component. Using values from Soil Taxonomy (U.S.D.A. 1975), and converting U.S.D.A. textures to equivalent Australian soil textures, the relations shown in the table below were formed.

Perviousness to water: Perviousness refers to the potential of a soil to transmit water internally as deduced from physical characteristics such as soil texture, structure, rooting density, size and number of continuous pores and the presence or absence of massive or cemented layers (U.S.D.A. unpublished data). Perviousness of a soil is governed by the least pervious layer. Three categories were used - slow, moderate and rapid.

Soil drainage: Factors such as slope, landscape position, depth of water table, rainfall frequency and the presence of slowly pervious layers were used to estimate site drainage (U.S.D.A. 1951). Seven categories were used - very poorly, poorly, somewhat poorly, moderately well, well, somewhat excessively and excessively drained.

Exposed stone: During detailed profile descriptions of selected sites together with random field observations, the following ratings of surface stone were made according to the guidelines in 'The Australian Soil and Land Survey Handbook' Draft 1.

Rating	**Percentage surface stone**
Nil	< 1
Slight	1-5
Common	6-15
Moderate	16-35
Abundant	>36

Dispersibility and slaking tendency: The B horizons of soils were given a simple field test by dropping a dry, pea-sized soil aggregate into a phial of distilled water and allowing the phial to stand for 2-3 minutes to determine whether the soil dispersed or slaked. Dispersion and slaking were then rated as nil, low, moderate or high.

Soil texture	Available water capacity cm water/cm depth of soil		Rating
Sand	0·06	0	Low
Loamy sand Clayey sand	0·08	0·1	
Sandy loam Loam	0·13		Moderate
Sandy clay Silty clay	0·14		
Clay		0·15	
Silty loam, silt Silty clay loam	0·15		
Clay loam Sandy clay loam	0·16		High