APPENDIX 2: Physical Characteristics used in Land Component Capability Assessment

1.0 Type of data used:

The physical attributed used to key out components into land classes are shown in Table A below. Within the available time and resources of the study, it has been considered that, where warranted, these criteria are sufficient to distinguish between land systems at the chosen scale of 1: 50 000.

If detailed assessment is required at a later stage, some additional physical data which would enhance the existing scheme are as follows: soil stoniness, soil gravel content, soil water holding capacity, plant nutrient levels in the soil, erodibility, cation exchange capacity of the soil, seasonal groundwater table movements, and a more detailed assessment of a range of soil engineering performance characteristics.

The class limits listed here and in each of the three keys (Tables I(a), II(a), and III(a)) are designed to apply to land in the vicinity of the study area only. Some modification of the suggested class limits and the introduction of a different set of criteria would possibly be needed in another region.

Table A: Physical Attributed Considered in the Land Class Keys

Physical Characteristic	Urban	Rurban	Agricultural
Gradient	●	●	●
Flood frequency	●	●	●
Site drainage	●	●	●
Soil depth	●	●	●
Topsoil texture	●	●	●
Soil stability	●	●	●
Soil structure	●	●	●
Soil aggregate stability	●	●	●
Profile permeability	●	●	●
Available water	●	●	●
Plant growing season	●	●	●

2.0 Class Limit Details

The manner in which physical data is interpreted for use in keying out land classes is described below.

The criteria are intended to be applied to the components of land systems described at a mapping scale of 1:50 000. The ratings are designed to be used primarily for predictive rather than specific purposes and the land system should not be expected to convey precise site specific data. Where such detailed information is required, field inspection will probably be warranted. The data indicated by the rating systems will, however, provide a considerably restricted framework, limiting the range of conditions which can be expected at a given site.

2.1 Gradient

Expressed as a percentage. Generally, the upper and lower limits within a component are given. An average is shown in cases where a particular gradient is dominant, and this figure or alternatively, an arithmetic average, is considered for the purpose of the key.

2.2 Flood frequency

For most flood prone areas within the land system, accurate data relating to frequency is not available. The flooding characteristics of the Yarra Floodplain land system (Yaf) are fairly well defined, however other riverine, stream line and drainage line components have had to be subjectively assessed on the basis of stream grade, geometry and runoff characteristics of catchments and amount of head for free drainage. Local experience has also been used in determining frequency and extent of flooding.

2.3 Site drainage

Drainage class definitions are given below representing the net hydrologic considerations of each component. Drainage of the earthen soil material is considered in 2.9. Profile permeability.

Drainage class	Definition
Good	Water drains from area quickly by runoff or by soil infiltration. Water table may rise in the soil for short periods following prolonged rainfall but does not pond at the surface.
Moderate	Water is moderately to slowly removed from the site; the soil profile is waterlogged for less than one week at a time; water is ponded at the surface for less than two days at a time.
Poor	Free water occurs on the area for up to one month at a time; some water tolerant plant species are present.
Very poor	Free water is ponded for longer than one month at a time; water tolerant plant species from the dominant vegetation.

2.4 Effective soil depth

Generally, this has been determined from hand augered soil profile examinations and from roadside cutting exposures in land components. Depth is taken to a hard layer which could be expected to restrict excavation by standard equipment in the case of the Urban rating system or else restrict plant root penetration in the cases of the "Rurban" and Agriculture rating systems.

2.5 Topsoil texture

Soil surface texture has been classified using Northcote's (1974) criteria as follows:

Class	Group	Texture Grades
1.	Sands	Sand; loamy sand; clayey sand
2	Sandy loams	Sandy loam; fine sandy loam; light sandy clay loam
3	Loams	Loam; silty loam; sandy clay loam
4	Clay loams	Clay loam; silty clay loam; fine sandy clay loam
5	Light clays	Sandy clay; silty clay; light clay; light medium clay
6	Medium-heavy clays	Medium clay; heavy clay

Note: The texture of the upper soil profile is considered, since it can be correlated with a number of performance characteristics such as sensitivity to disturbance, erosion by water or wind, water holding capacity and susceptibility to compaction.

Particle size distribution in the texture grades is also covered in Northcote (1974), particles being defined thus:

Particle Name	Particle Size Range
Sand	2 mm to 0.02 mm (2000 μ to 20μ)
Silt	0.02 mm to 0.002 mm (20 μ to 2 μ)
Clay	Smaller than 0.002 mm (<2 μ)

2.6 Soil stability

Refers to any performance feature of the soil profile which can lead to a change in volume or mass movement either under load or following an alteration in local environmental conditions.

2.6.1 Seasonal volume change

This is commonly indicated by cracks in the soil surface during dry weather. Expansion or contraction following a change in soil moisture conditions can influence the performance of building foundations, rigid pavement, piped services and septic tanks. In general, soil with a high proportion of clay are prone to this condition.

2.6.2 Particular foundation problem

Extreme seasonal cracking is recognised by the existence of more severe cracking than specified in 2.6.1- Seasonal volume change, or by the presence of obvious gilgai. Other problems in this category exist where soils have low bearing capacities or else contain seepage areas, are highly organic, or possess high proportion of silt-sized particles.

2.6.3 Unstable slopes

The criteria used for classifying soil structure have been adapted from those of Northcote (1974) and are listed below.

Class	Grade	Definition
0	Structureless	No observable aggregation; soil is massive.
1	Weak	Some peds are discernible and when disturbed, less than one third of soil material is found to consist of peds.
2	Moderate	Peds clearly seen and when disturbed, one third to two thirds of the soil material is found to consist of peds.
3	Strong	Peds clearly seen and when disturbed more than two thirds of soil material is found to consist of peds.

Note: Structure of the upper soil profile influences the degree of disturbance which a soil can withstand. For instance soils with strongly structured surface horizons can generally resist erosive forces better than soils with poorer structure.

2.8 Soil aggregate stability

This criterion is based upon a modification of the classes proposed by Emerson (1967), which categorise soil aggregates upon their tendency to disperse following different treatments carried out in the field. The classes considered for the purpose of the keys are given below.

Aggregate Stability (AS) Class		Definition
Class 1	Highly dispersible	Total dispersion following immersion of dry aggregate in distilled water.
Class 2	Moderately dispersible	Partial dispersion following immersion of dry aggregates in distilled water
Class 3	Slightly dispersible	Dispersion of aggregates after 30 seconds working with spatula if not dispersion partially
Class 4	Not dispersible	No dispersion of aggregates following vigorous shaking in distilled water.

Note: Aggregate stability generally indicates ability of a soil to withstand disturbance. Soil which disperse readily, e.g. AS Class 1, are difficult to manage when excavated or exposed in batters and when cultivation is attempted.

2.9 Profile permeability

This is to indicate the ability of a soil to transmit or absorb water applied to it. Profile permeability is considered separately from site drainage (2.3) since it is a measure of the performance of the soil material alone.

The permeability classes are at present rather subjective and may require further refinement. The types of conditions leading to a particular rate of permeability and the resulting consequences are listed on the following page.

Permeability Class	Usual Site Conditions	Consequences
Very slow	Soils usually with high clay content and very coarse structure; seasonal high ground water table	Septic tank failures; water logging vegetation; seasonal poor trafficability
Slow	Soils usually with moderate to high clay content and moderate or weaker medium structural development.	Seasonal poor septic tank performance.
Moderate	Medium to light textured soils, usually with some structural development. Deep or moderately so. Impeding layers absent.	Generally favourable performance for a wide range of uses.
Rapid	In general medium textured soils or clayey soils with medium to fine strong structural development,.	Low degree of hazard other than perhaps poor water retention by earthen embankments.
Excessive	Very sandy, gravelly, or stony soils.	Septic tank overflow may seep to water bodies before biological activity can act to reduce bacterial potency; soils may be droughty during dry periods.

2.10 Available supplementary water

This factor is generally external to the physical land characteristics described in the land system tables. It has been included because the availability of supplementary water can overcome the problem of seasonal water deficiency on land which could otherwise be cropped intensively.

2.11 Abnormal climatic conditions

These include intermittent snowfalls and excessive exposure to cold, factors which drastically reduce the growing period of plants. The rating system for agriculture incorporates this factor to distinguish between potential Class 3 land (grazing only) and land which could be used for cropping if this limitation was absent.

Throughout the study area, average annual rainfall was considered to be adequate for plant growth other than some intensive crops on short rotations (Refer 2.10 – Supplementary water).

Unusual climatic conditions have not been incorporated into the rating systems for the other two land uses although land systems whee this may be a limitation have been indicated in the land capability summaries set out in Tables IV and V.