APPENDIX 26 – Glossary

(after Houghton and Charman, 1986)

Acid: See pH Trend

Alkaline: See pH Trend

Apedal: Describes a soil in which none of the soil material occurs in the form of peds in the moist state. Such a soil is without apparent structure and is typically massive or single grained. When disturbed it separates into primary particles or fragments.

Bleaching: The near-white colouration of an A_2 horizon which has been subject to chemical depletion as a result of soil forming processes including leaching. Conspicuous Bleaching means that 80% or more of the horizon is bleached, whereas Sporadic Bleaching means that less than 80% of the horizon is bleached, with affected portions appearing irregularly through the horizon.

Buckshot: A local term to describe small (from 2 mm up to 15 mm diameter) spheroidal (pea-like) nodules composed of iron and manganese oxides and having an orange, red or brown colour.

Calcareous: Refers to materials, containing significant amounts of calcium carbonate (i.e. limestone).

Cemented: Describes soil materials having a hard, brittle consistency because the particles are held together by cementing substances such as humus, calcium carbonate, or the oxides of silicon, iron and aluminium. The hardness and brittleness persist even when the soil is wet.

Colluvial: Describes material transported largely by gravity.

Colluvium: Unconsolidated soil and rock material, moved largely by gravity, deposited on lower slopes and/or at the base of a slope.

Concretions (also called Nodules – if rounded): A small segregated mass of material that has accumulated in the soil because of the concentration of one or more particular constituents usually by chemical or biological action. Nodules vary widely in size, shape, hardness and colour, and may be composed of iron or manganese compounds or other materials.

Consistence: Consistence comprises the attributes of soil material that are expressed by the degree and kind of cohesion and adhesion or by the resistance to deformation or rupture.

Consistence may be measured by the force require to break down a small lump of soil of about 2 cm diameter between thumb and finger as:

(1) very small force (very weak)
(2) small but significant force (weak)
(3) moderate force (firm)
(4) strong force but within the power of the thumb and finger (very firm)
(5) very strong force, beyond the power of the thumb and finger (rigid)

The moisture state of the soil lump should be stated. The dry state is preferred for standardisation.

Crumb Structure: A soil structural condition in which most of the soil aggregates are soft, porous and more or less rounded units from 1 to 5 mm in diameter. The typical surface condition of medium-textured soils recently cultivated after a period of well-managed pasture.

Crusts: A surface crus is a thin surface soil layer, typically less than 1 cm thick which, when dry, separates from, and may be lifted off, the soil below. Crusts can hinder water infiltration into the soil as well as seedling emergence.

Dispersion: A structurally unstable soil which readily disperses into its constituent particles (clay, silt, sand) in water. Highly dispersible soils are normally highly erodible and are likely to give problems related to field and earthwork tunnelling.

Drainage – Internal (Profile Drainage): The rate of downward movement of water through the soil governed by both soil and site characteristics. It is assessed in terms of soil water status and the length of time horizons remain wet. It can be difficult to assess in the field and cannot be based solely on soil profile morphology. Vegetation and topography may be useful guides. Soil permeability, groundwater level and seepage are also important. The presence of mottling often, but not always, reflects poor drainage.

Categories are as follows:

Very poorly drained: Free water remains at or near the surface for most of the year. Typically a level or depressed site and/or a clayey soil.

Poorly drained: All soil horizons remain wet for several months each year. Soils are usually strongly mottled and/or have orange or rusty linings of root channels.

Imperfectly drained: Some soil horizons remain wet for periods of several weeks. Subsoils are often mottled and may have orange or rusty linings of root channels.

Moderately well drained: Some soil horizons may remain wet for a week after water addition. Soils are often whole-coloured but may be mottled at depth and of medium to clayey texture.

Well drained: No horizon remains wet for more than a few hours after water addition. Soils are usually of medium texture and not mottled.

Rapidly drained: No horizon remains wet except shortly after water addition. Soils are usually of coarse texture or shallow, or both, and are not mottled.

Gilgai: Surface relief associated with some clayey soils, consisting of hummocks and/or hollows of varying size, shape and frequency. This phenomenon is a continuing long-term process due to the shrinking and swelling of deep subsoils with changes in moisture content. It is usually associated with the occurrence of swelling soils.

Normal gilgai are irregularly spaced and have circular depressions of usually less than 300 mm depth, and spaced apart from usually 3 – 10 m. They are mostly associated with flat or gently sloping terrain.

Hardsetting: The condition of a dry surface soil when a compact, hard and apparently apedal condition prevails. Because of this characteristic such soils tend to give rise to high rates of runoff compared with better structured soils. Clods formed by the tillage of hardsetting soils usually retain the condition until completely broken down by further tillage operations.

The majority of soil throughout the wet-dry climatic zones of Australia set hard in the dry season. Soils which do not set hard are pedal in the dry, as well as in the moist state (clay loams, clays), or are loose, single-grained (sands).

Hydrophobic Soils: A general term used to describe the capacity of the soil to take in water at its surface depending largely on surface texture and structure.

Infiltration Capacity: A general term used to describe the capacity of the soil to take in water at its surface depending largely on surface texture and structure.

Massive: Refers to that condition of a soil layer in which the layer appears as a coherent, or solid, mass which is largely devoid of peds.

Moisture Holding Capacity: This characterizes a soils' ability to retain water against drainage for later plant use. A soils' moisture holding capacity is related mainly to texture – with the greater the moisture holding capacity the finer the soils' texture – but also to organic matter content and soil structure.

Mottling: The presence of more than one soil colour in the same soil horizon, not including different nodule or concretion colours. The sub-dominant colours normally occur as scattered blobs or blotches which have definable differences in hue value or chroma from the dominant colour. Mottling is often indicative of slow internal drainage but may also be a result of parent material weathering.

Neutral: See pH Trend

Pans (Hardpans): A hardened compacted and/or cemented horizon or part thereof in the soil profile. Such pans frequently reduce soil permeability and root penetration and thus may give rise to plant growth and drainage problems.

The hardness is caused by mechanical compaction or cementation of soil particles with materials such as iron or aluminium oxides. The hardness does not change appreciably with changes in moisture content.

Peds: A ped is an individual, natural soil aggregate, not caused by ploughing or rupture of the soil (these other aggregates are called either 'clods' or 'fragments').

Pedal: Describes a soil in which some or all of the soil material occurs in the form of peds in the moist state. Strongly pedal soils have two thirds or more of their soil material in the form of peds, and weakly pedal soils have less than one third of their soil material in the form of peds.

pH Trend: Soil Reaction Trends in the Northcote soil classification system used for this report bring out the general direction of the pH changes down the soil profile, that is the change in pH with depth. Four soil reaction trends, termed strongly acid, acid, neutral and alkaline, respectively, are recognised. The four soil reaction trends are defined in terms of pH as follows:

Strongly acid trend – the surface soil has a pH value higher than p 7.0 and the deep subsoil has a pH value less than pH 6.5.
Acid trend – the surface soil has a pH value lower than pH 7.0 and the deep subsoil has a pH value less than pH 6.5.
Neutral trend – the surface soil has a pH value between pH 5.0 and pH 8.0 and the deep subsoil has a pH value between pH 6.5 and pH 8.0.
Alkaline trend – the surface soil has a pH value higher than pH 5.0 and the deep subsoil has a pH value higher than pH 8.0.

Profile Development (Pedological Development): Refers to the extent of development of soil horizons, soil structure, organic matter accumulation at the surface, colour differences within the soil profile, and texture changes in the soil profile.

Self-Mulching: The condition of a well-aggregated soil in which the surface layer forms a shallow mulch of soil aggregates when dry. Such soils typically have high clay contents and high swelling-shrinking characteristics in response to moisture changes. The surface mulch may disappear when the soil is wet, but it will reform upon drying.

Slaking: The partial breakdown of soil aggregates in water due to either the swelling of clay or to the destructive effects of entrapped air. This breakdown contributes to the formation of soil crusts and to soil erosion.

Soil Aeration: The process by which air in the soil is replenished by air from the atmosphere. In a well-aerated soil the soil air is similar in composition to the atmosphere above the soil. Poorly aerated soils usually contain a much higher percentage of carbon dioxide and a correspondingly lower percentage of oxygen.

Soil Aggregates: An aggregate is a unit of soil structure consisting of primary soil particles held together by cohesive factors or by secondary soil materials such as iron oxides or organic matter. Aggregates may be natural, such as peds, or formed by tillage such as clods.

Soil Colour: The colour of soil material as determined by comparison with a standard Munsell soil colour chart (Munsell Colour Company, 1990) or its equivalent.

Soil colour is determined on a freshly broken aggregate of both dry and moist soil material to ensure complete documentation of colour. Since soil's colour may vary, depending on soil moisture content, the moist soil colour provides a base for comparison with other soil samples.

A whole-coloured soil is one in which less than 10% of the soil mass is affected by mottling. Its colour would be specified as a single colour, whereas mottled soils would be described in terms of the dominant colour and the sub-dominant colour of the mottles.

Soil Consistence: The resistance of soil material to deformation or rupture. Terms used for describing consistence of soil materials at various soil moisture contents and degrees of cementation are:

Wet – non-sticky, slightly sticky, sticky, very sticky, non-plastic, loose, very friable, friable, firm, very firm and extremely firm.
Dry – loose, soft, slightly hard, hard, very hard and extremely hard.
Cementation – weakly cemented, strong cemented and indurated.

Soil Horizon: A layer of soil material within the soil profile with distinct characteristics and properties which are produced by soil forming processes, and which are different from those of the layers below and/or above. Generally, horizons are more or less parallel to the land surface.

The boundary between soil horizons defines the nature of the change from one horizon to another. It is specified by the width of the transition zone and the shape as expressed in vertical section.

Width of boundary may be expressed as:

Sharp = boundary is less than 2 cm wide
Clear = boundary is 2 to 5 cm wide
Gradual = boundary is 5 to 10 cm wide
Diffuse = boundary is more than 10 cm wide.

Soil Profile: A vertical cross-sectional exposure of a soil, extending downwards from the soil surface to the parent material or for the practical purposes to a depth of one metre where the parent material cannot be differentiated. It is generally composed of three major layers designated A, B and C horizons. The A and B horizons are layers that have been modified by weathering and soil development and comprise the solum. The C horizon is weathered parent material which has not, as yet been significantly altered by biological soil forming processes. A surface organic (O) and/or a sub-solum (D) horizon may also occur.

O Horizon - A surface layer of plant materials in varying stages of decomposition not significantly mixed with the mineral soil. Often not present or only poorly developed in Australian soil except in some forests.

A Horizon - This is the original top layer of mineral soil. It can be divided into two parts:

A_1 Horizon – is the surface soil and generally referred to as topsoil. Relative to other horizons it has a high content of organic matter, a dark colour and maximum biological activity. This is the most useful part of the soil for revegetation and plant growth. It is typically from 5 to 30 cm thick.

A_2 Horizon – is a layer of soil of similar texture to the A_1 horizon but is paler in colour, poorer in structure, and less fertile. A white or grey colouration, known as bleaching is often caused by poor soil drainage and/or leaching. The A_2 horizon is typically from 5 to 70 cm thick, but does not always occur.

B Horizon – the layer of soil below the A horizon. It is usually finer in texture (i.e. more clayey), denser and stronger in colour. In most cases it is a poor medium for plant growth. Thickness ranges from 10 cm to over 2 metres.

C Horizon – layers below the B horizon which may be weathered, consolidated or unconsolidated parent material little affected by biological soil forming processes.

Soil Structure: The combination or spatial arrangement of primary soil particles (clay, silt, sand, gravel) into aggregates such as peds or clods and their stability to deformation. Structure may be described in terms of the grade, class and form of the soil aggregates, as follows:

Grade – expresses the degree and strength of soil aggregation determined on moist soil. The grades range from weak, if there is no observable aggregation, to strong, where more than two-thirds of the soil is aggregated.

Class – expresses the main size range of the aggregates. The classes range from fine where the aggregates are very small, to coarse where the aggregates are very large.

Form – expresses the shape of the individual aggregates as crumb, granular, sub-angular blocky, angular blocky, prismatic, columnar or platy.

Soil structure is an important property with respect to the stability, porosity and infiltration characteristics of the soil. Well-structured soils tend to be more resistant to erosion due to their ability to absorb rainfall more freely and over longer periods, and because of the resistance of their aggregates to detachment and transport by raindrop splash and/or overland flow. They also have good soil/water/air relationships for the growth of plants. Poorly-structured soil have unstable aggregates and low infiltration rates. The tend to break down quickly under heavy rainfall which leads to soil detachment and erosion. Under certain conditions, surface sealing occurs and this gives rise to rapid and excessive runoff.

Soil Texture: The coarseness or fineness of soil material as it affects the behaviour of a moist ball of soil when presses between the thumb and forefinger. It is generally related to the proportion of soil particles of differing sizes (sand, silt, clay and gravel) in a soil, but is also influenced by organic matter content and clay type. Six main soil texture groups are recognised:

Texture Group	Approximate clay content	
1. Sands 2. Sandy loams	<5% 10-15%	Coarse
3. Loams 4. Clay loams	20-25% 30%	Medium
5. Light clays 6. Heavy clays	35-40% >45%	Fine

For field identification of these main groups, take a small handful of soil and knead with water until a homogeneous soil ball (or bolus) is obtained. Large pieces of grit and organic material should be discarded. Small clay peds should be crushed and worked in with the rest of the soil. The feel, behaviour and resistance of the soil to manipulation during this process is important. The bolus should be kept moist so that it just fails to stick to the fingers. The six main texture groups should be apparent as follows:

1. Sands – have very little or no coherence and can not be rolled into a stable ball. Individual sand grains adhere to the fingers.

2. Sandy Loams – have some coherence and can be rolled into a stable ball, but not a thread. Sand grains can be felt during manipulation.

3. Loams – can be rolled into a thick thread, but this will break up before it is 3 – 4 mm thick. The soil ball is easy to manipulate and has a smooth spongy feel with no obvious sandiness.

4. Clay Loams – can be easily rolled to a thread 3 – 4 mm thick, but it will have a number of fractures along its length. Soil becoming plastic, capable of being moulded into a stable shape.

5. Light Clays – can be rolled to a thread 3 – 4 mm thick without fracture. Plastic behaviour evident: smooth feel with some resistance to rolling out.

6. Heavy Clays – can be rolled to a thread 3 – 4 mm thick and formed into a ring in the palm of the hand without fracture. Smooth and very plastic, with moderate-strong resistance to rolling out.

Waterlogging: The condition of a soil which is saturated with water and in which most or all of the soil air has been replaced. The condition, which is detrimental to most plant growth, may be caused by excessive rainfall, irrigation or seepage and is exacerbated by inadequate site or internal drainage.