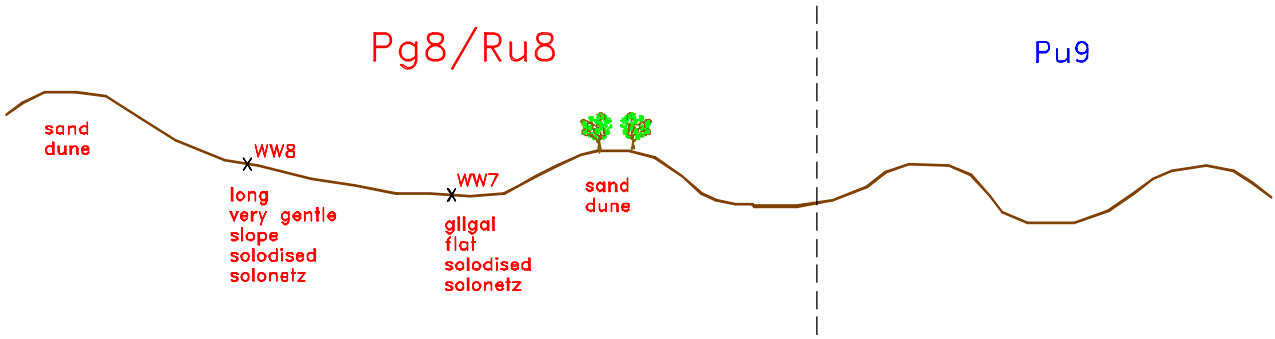
6.2.8 LITTLE DESERT TRANSITION - 8 LAND SYSTEM
Map units Pg8, Ru8



Landscape
This land system consists mainly of gently undulating plains (Pg8), forming a transition north of the Little Desert-9 land system. The landscape consists of low sand rises, long gentle slopes and depressions (with gilgai micro-relief) between rises.

There are some undulating rises dissecting the land systems, and one in particular has been mapped out (Ru8).

Plate 15 Gentle slopes of a sand rise (WW8) leading to lower slopes that support Bulokes (WW7)

Native Vegetation
Mallee eucalypts are the common tree species on this unit, although Bulokes also occur on the clayier, wetter depressions.

Soil types
The low sand rises can have up to one metre of sand above the clay. The gentle slopes of the sandy rises have a light textured topsoil over large columns of clay (solodised solonetz) (WW8). There is often a thin hardsetting bleached sand capping over the clay columns. The hardsetting nature of the

capping and the clay makes deep root penetration difficult into the clay. The most accessible root pathway is between the columns (see Plate 16)

The sandy topsoils are hydrophobic, meaning they repel water when dry, therefore the summer rains and first autumn rains do not immediately penetrate the soil profile and the rain water remains inaccessible to deep rooted plants.

Plate 16 Hardsetting bleached sand capping over columns of clay

The depressions between the sandy rises and slopes have darker soils, indicating poor drainage (WW7) (see Plate 17). The presence of manganese flecks deep in the profile also indicates impeded drainage or a seasonally perched watertable. The soil type found in the depressions is similar to those found on the slopes, although generally the bleached capping is not as defined. There is also a high percentage of calcium carbonates at around 50 cm depth.

Current land Use

Due to the hydrophobic nature of the soil, land use on the sandier country is commonly limited to grazing. Claying (spreading of clay on the surface) of the rises and slopes has allowed a more diverse range of crops and pastures to be grown. On the clayier depressions and slopes, crops and pasture species are also sown.

Representative soil type for land unit

Although land suitability ratings have been conducted for two major soil types in this land unit (the lower slopes (WW8) and depressions (WW7)), the lower slopes' (WW8) description is regarded as the most appropriate soil type to represent the unit.

Plate17 Darker coloured soil and hardsetting columns of clay occur in the depressions

REPRESENTATIVE SOIL TYPE FOR THE LITTLE DESERT TRANSITION - 8 - Pg8/Ru8 LAND UNITS

MAP UNIT: Pg8, Ru8 **Site No.:** WW8

Position in Landscape: Lower slope **Grid Ref:** 516 801 E, 5964 926N ***Aust. Soil Class.:*** Hypercalcic, Mottled-Hypernatric, Yellow SODOSOL (medium sandy surface)
Northcote Factual Key: Dy5.43 ***Great Soil Group:*** solodised solonetz

General Landscape Description:

This soil description is on a long gentle slope below a sand rise with over 1.5 metres of sand. This soil type occurs on the most common land element on these units, therefore it is regard as the most appropriate soil type to represent both the Little Desert Transition - 8 Gently undulating plains (Pg8) and the Undulating rises (Ru8) land units. The depth of sand decreases down the slope. A hardsetting capping occurs on top of large columns, which can be an impediment to plant roots.

Soil Profile Morphology:

Topsoil

1A1 0-10 cm Very dark greyish brown (10YR3/2) *loamy sand*; structureless, loose consistence when dry. pH 5.5. Abrupt transition to:

1A2 10-25 cm Pink (7.5YR7/4) *sand*; conspicuously bleached (7.5YR8/2), structureless, loose consistence when dry, very few ferruginised iron nodules. pH 6.6. Below this horizon there is a 2 mm capping on top of the clay columns. Sharp transition to:

Subsoil

1B21 25-40 cm Light yellowish brown (10YR6/4) *medium heavy clay*; coarse faint brownish yellow mottles are abundant, strong columnar structure, (peds >200 mm), very strong consistence when dry. Some areas under columns have strong prismatic structure, (peds 20-50 mm), breaking down to moderate blocky structure, peds 10-20 mm, complete dispersion. pH 8.1. Gradual but wavy transition to:

1B22 40-70 cm Light yellowish brown (10YR6/4) *medium heavy clay*; moderate prismatic structure, (peds 20-50 mm), breaking to moderate blocky structure, (peds 10-20 mm), complete dispersion. pH 9.0.

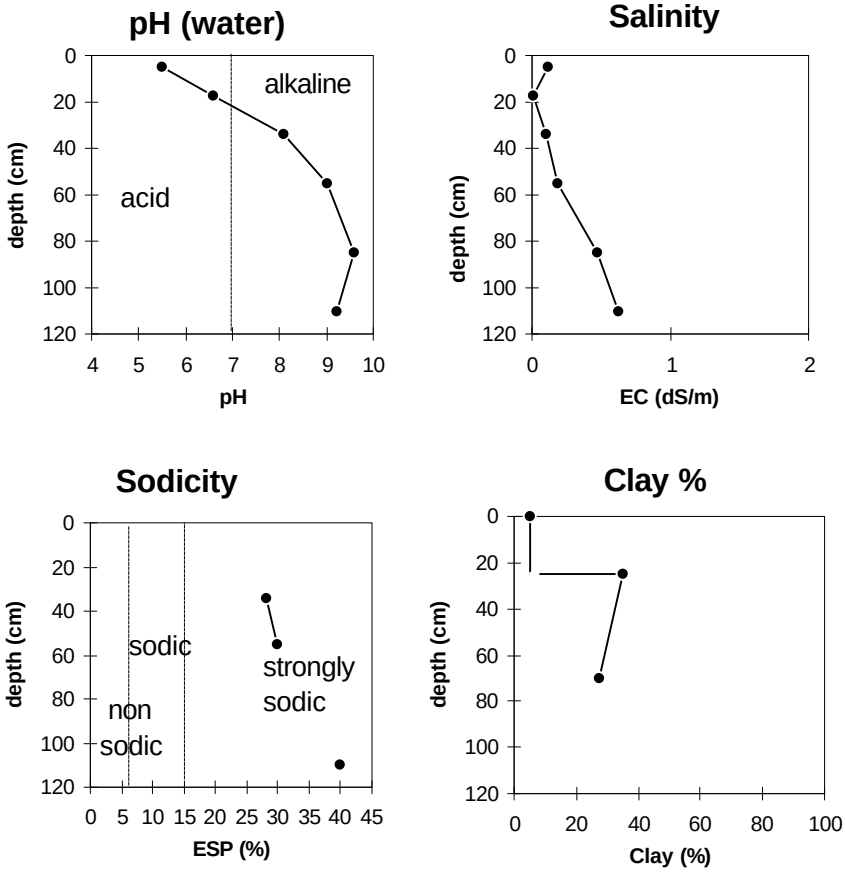
BC 70-110 cm White (2.5Y8/2) *light sandy loam*; very coarse prominent red and distinct yellow mottles are abundant, structureless, very weak consistence when dry. pH 9.6. Weathered sandstone with an older surface underneath

2B2 110-200 cm+ Light grey (2.5Y7/2) *medium heavy clay*; very coarse prominent red and brownish yellow mottles are abundant although decreasing with depth, strong polyhedral structure (peds 20-50 mm) breaking to strong lenticular structure (peds 5-10 mm), some slickensides and smooth fabric. pH 9.2.

Soil Profile Characteristics:

Horizon	pH	Salinity	Sodicity	Dispersion	Internal Drainage	Hydro-phobicity
Surface (A1 horizon)	strongly acid	low	non-sodic	-		severe
Subsoil (B21 horizon)	moderately alkaline	low	strongly sodic	complete	imperfectly drained#	
Deeper subsoil (at 1 metre)	extremely alkaline	low-medium	strongly sodic	complete		

most impeding horizon of the profile



Key Profile Features:

- Hydrophobic topsoil
- Strong textural contrast between topsoil and subsoil
- Bleached A2 horizon and hardsetting capping on top of columns
- Strongly sodic subsoil
- Large columnar structure in subsoil
- Heavy mottling in subsoil
- Acid topsoil
- Alkaline subsoil
- Dispersive subsoil
- Plant Available Water Capacity (PAWC) is considered to be very low (estimated at 30 mm) for this site profile based on an Effective Rooting Depth (ERD) of 25 cm. Rooting depth will be restricted by subsoil conditions, such as; strongly sodic (Exchangeable Sodium Percentage >20%), high soluble salt levels (Chloride >0.1%), poor structure (eg. massive or very coarse, columnar or Prismatic), very high carbonate (lime) content (not applicable to all plant species) or hard rock.
- Low nutrient status of surface soil

Soil Restrictions and Management Prescriptions

Feature	Result	Management Prescription
Hydrophobic topsoil	Poor infiltration of water into the soil. Increased risk of water erosion. Poor seed germination.	Maintenance of surface vegetative cover. Claying.
Strong textural contrast between topsoil and subsoil (duplex)	Strong texture and structure difference between the topsoil and the subsoil. Can result in impeded internal drainage and restricted root growth	Improve organic matter through maintenance of vegetative cover and growing green manure crops. Reduce tillage. Optimise plant growth through regular balanced fertiliser programme. Consider sub-surface drainage (if appropriate).
Bleached A_2 horizon	Indication of waterlogged condition (impeded internal drainage) within the topsoil. Poor soil structure (often massive). Low organic matter, water holding capacity and nutrition within the horizon.	*Dryland cropping* - include deep rooted crops in the rotation, minimum tillage and stubble retention. Apply gypsum if the topsoil is sodic. Optimise plant growth through a regular and balanced fertiliser programme.
Sodic clay subsoil	Poor water and air movement into the subsoil resulting in waterlogging (impeded internal drainage). Poor root growth into the subsoil reducing the volume of the soil able to be exploited.	Gypsum applications if the subsoil is close to the surface and topsoil textures are light. *Dryland cropping* - include deep rooted crops in the rotation, minimum tillage and stubble retention.
Columnar or prismatic subsoil structure	Indication of sodic clay subsoil. Poor water and air movement into the subsoil resulting in waterlogging (impeded internal drainage). Poor root growth into	Apply gypsum if the subsoil is close to the surface and topsoil textures are light. *Dryland cropping* - include deep rooted crops in the rotation, minimum tillage and stubble retention. These soil are difficult to manage, not suitable for high levels of production unless substantial modification can be

	the subsoil reducing the volume of the soil able to be exploited. Very difficult to cultivate particularly if topsoil is shallow.	achieved.
Mottled subsoil	Indication of periodic waterlogging, particularly if grey and yellow mottles predominate.	Consider sub-surface drainage (if appropriate). Apply gypsum if subsoil is sodic and close to the surface.
Acidic topsoil	Potential nutrient imbalance. Unsuitable for acid intolerant plants.	Apply lime.
Alkaline subsoil	Potential nutrient imbalance. Unsuitable for alkaline intolerant plants. May indicate subsoil sodicity.	Grow shallow rooted species. Grow alkaline tolerant plants.
Dispersion (dry soil)	Indication of soil sodicity. Soil structure collapses following wetting resulting in poor soil structure that reduces water movement and plant root growth (see sodic subsoil). Increases water erosion hazard.	*Dryland cropping* - apply gypsum, include deep rooted crops in the rotation, minimum tillage and stubble retention.
Very low and low Plant Available Water Holding Capacity (PAWC)	Poor plant available water holding capacity. Indication of light soil texture or shallow effective plant rooting depth (ie presence of restrictive layers, salinity, pH or structure).	Improve organic matter through maintenance of vegetative cover and growing green manure crops. Increase effective rooting depth by reducing the effect of the restrictive layer.

Land Suitability Rating Table

LAND USE	SUITABILITY CLASS	MAJOR LIMITING COMPONENT
Wheat	2	Climate, landscape, soil
Canola	2	Climate, landscape, soil
Chickpeas	3	Soil
Lentils	3	Soil
White clover seed	2	Climate, landscape, soil
Lucerne for seed production	3	Soil
Viticulture	3	Soil
Apples	3	Soil
Potatoes	3	Soil
Carrots	3	Soil
Onions	3	Soil
Sweet corn	3	Soil
Radiata Pine	3	Climate
Blue Gum	3	Climate

Land Suitability Assessment and Primary Limitations

Wheat	*Climate*	2*	High frost risk for most of the land unit
	Landscape	2	Water and wind erosion hazard
	Soil	2	Slightly impeded internal drainage, hydrophobicity, slightly alkaline subsoil pH
Canola	*Climate*	2*	High frost risk for most of the land unit
	Landscape	2	Water and wind erosion hazard
	Soil	2	Slightly impeded internal drainage, hydrophobicity, slightly alkaline subsoil pH
Chickpeas	*Climate*	2*	High frost risk for most of the land unit, slightly high rainfall
	Landscape	2	Wind and water erosion hazard
	Soil	3	Sandy topsoil texture, impeded internal drainage
Lentils	*Climate*	2*	High frost risk for most of the land unit
	Landscape	2	Wind and water erosion hazard
	Soil	3	Sandy topsoil texture, impeded internal drainage
White clover seed	*Climate*	2	Moderate frost risk
	Landscape	2	Wind and water erosion hazard

	Soil	2	Slightly alkaline subsoil pH, soil salinity, slightly impeded internal drainage, hydrophobicity
Lucerne for seed production	*Climate*	2	Moderate frost risk
	Landscape	2	Water and water erosion hazard
	Soil	3	Impeded internal drainage
Viticulture	*Climate*	2*	High frost risk for most of the land unit
	Landscape	2	Water erosion hazard
	Soil	3	Impeded internal drainage
Apples	*Climate*	2*	High frost risk for most of the land unit, slightly high mean maximum January temperature
	Landscape	2	Water erosion hazard
	Soil	3	Alkaline subsoil pH
Potatoes	*Climate*	2	Slightly high mean maximum January temperature
	Landscape	2	Wind and water erosion hazard
	Soil	3	Impeded internal drainage
Carrots	*Climate*	1	No major limitation
	Landscape	2	Water and wind erosion hazard
	Soil	3	Shallow depth of topsoil, impeded internal drainage
Onions	*Climate*	2	Moderate frost risk
	Landscape	2	Water and wind erosion hazard
	Soil	3	Impeded internal drainage
Sweet corn	*Climate*	1	No major limitation
	Landscape	2	Water and wind erosion hazard
	Soil	3	Sandy topsoil texture
Radiata Pine	*Climate*	3	Low rainfall
	Landscape	2	Water erosion hazard, wind erosion hazard
	Soil	2	Slightly alkaline subsoil pH, slightly impeded internal drainage, hydrophobicity
Blue Gum	*Climate*	3	Low rainfall
	Landscape	2	Water erosion hazard, wind erosion hazard
	Soil	2	Slightly alkaline subsoil pH, slightly impeded internal drainage, hydrophobicity

* Some areas may be higher frost risk therefore they may be potentially unsuitable. Obtain local knowledge on frost prior to investment

ASSOCIATED SOIL TYPE FOR THE LITTLE DESERT TRANSITION - 8 - Pg8/Ru8 LAND UNITS

MAP UNIT: Pg8, Ru8 **Site No.:** WW7

Position in Landscape: Plain **Grid Ref:**516 982 E, 5964 613 N;
Aust. Soil Class.: Hypercalcic Mottled-Submetric, Grey SODOSOL
Northcote Factual Key: Dy3.43 ***Great Soil Group:*** solodised solonetz

General Landscape Description:

This description represents the soils on the lower slope. The major land element on these land units are long gentle slopes off the sand rises, therefore WW8 is regarded as being the dominant soil type and this description is an associated soil type. Gilgai micro-relief has formed because of the shrinking and swelling of subsoil during wetting and drying cycles.

Soil Profile Morphology:

Topsoil

A1 0-10 cm Very dark greyish brown (10YR3/2) *light fine sandy loam*. pH 6.1.

A2 10-12 cm Conspicuously bleached hardsetting *sand* that tends to occur in patches, as a dome capping on top of subsoil column structure.

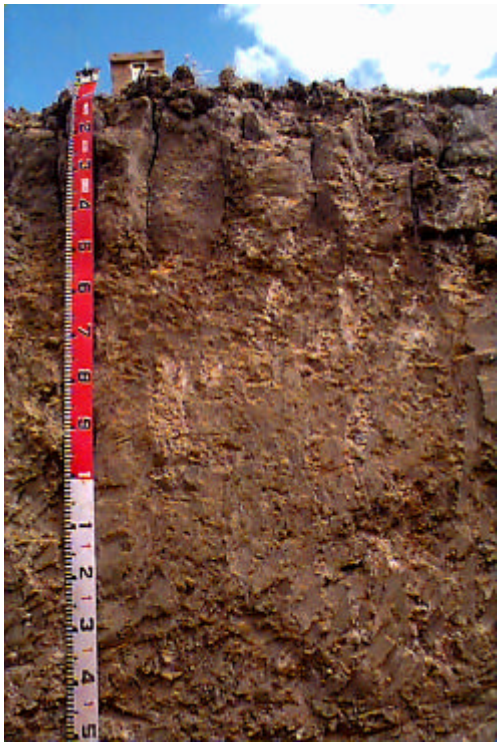
Subsoil

B21 12-30 cm Light greyish brown (10YR6/2) *medium clay (sandy)*; a few faint brownish yellow mottles, strong columnar structure (peds >200 mm), very strong consistence when dry, completely dispersive. pH 8.6.

B22 30-50 cm Very pale brown (10YR7/3) *medium clay (sandy)*; a few faint yellow mottles, structure similar to above, strongly dispersive. pH9.3.

B23 50-100 cm Very pale brown (10YR7/3) *medium clay (sandy)*; yellow and reddish yellow mottles, many (20-50%) soft calcium carbonate segregations and very few hard calcium carbonate nodules, completely dispersive. pH 10.

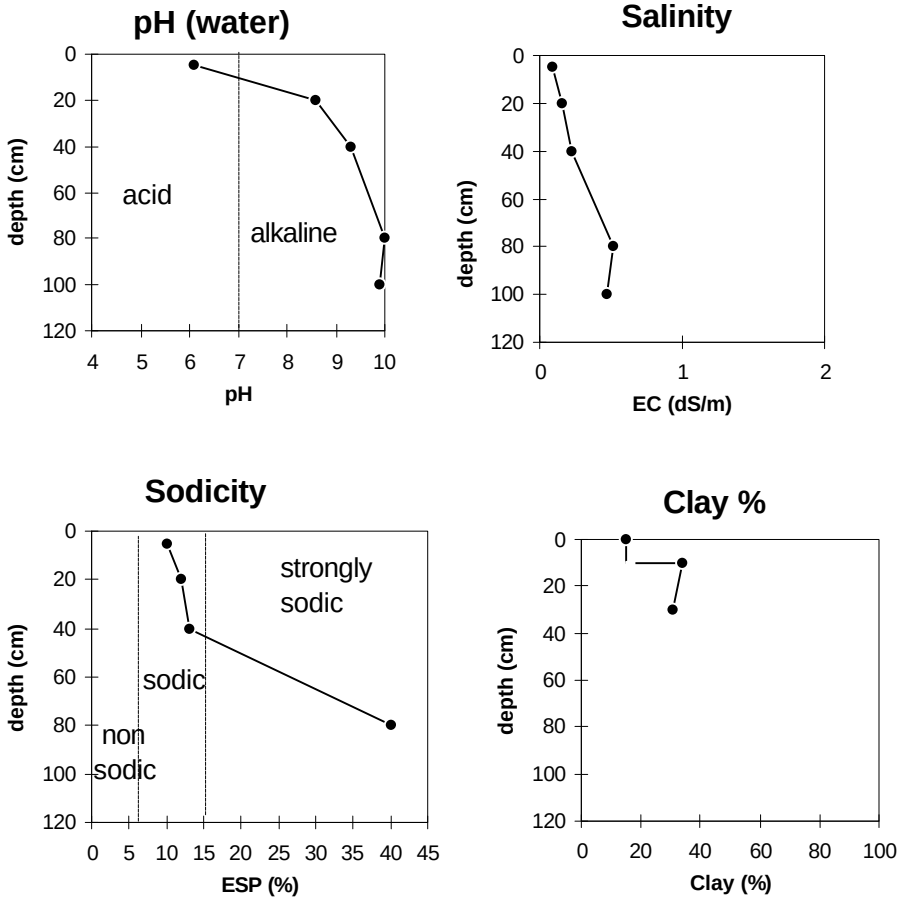
B24 100-190 cm+ Light grey (5Y7/2) *medium clay (sandy)*; moderate polyhedral structure, (peds 20-50 mm), smooth fabric, a few (2-5%) soft and hard calcium carbonate segregations, manganese flecks occur at depth. pH 9.9.



Soil Profile Characteristics:

Horizon	pH	Salinity	Sodicity	Dispersion	Internal Drainage	Hydro-phobicity
Surface (A1 horizon)	slightly acid	very low	sodic	-		nil
Subsoil (B21 horizon)	strongly alkaline	low	sodic	complete	imperfectly drained#	
Deeper subsoil (at 1 metre)	extremely alkaline	low-medium	strongly sodic	complete		

most impeding horizon of the profile that may affect plant growth



Key Profile Features:

- Strong texture contrast between topsoil and subsoil
- Shallow topsoil
- Bleached A2 horizon
- B21 and B22 horizons have large hardsetting columnar structure
- Sodic subsoil
- Strongly dispersive subsoil
- Mottled subsoil
- Acidic topsoil and highly alkaline subsoil
- Plant Available Water Capacity (PAWC) is considered to be very low (estimated at 15 mm) for this site profile based on an Effective Rooting Depth (ERD) of 12 cm. Rooting depth will be restricted by subsoil conditions, such as; strongly sodic (Exchangeable Sodium Percentage >20%), high soluble salt levels (Chloride >0.1%), poor structure (eg. massive or very coarse, columnar or Prismatic), very high carbonate (lime) content (not applicable to all plant species) or hard rock.
- Soil cracks when dry

Soil Restrictions and Management Prescriptions

Feature	Result	Management Prescription
Strong textural contrast between topsoil and subsoil (duplex)	Strong texture and structure difference between the topsoil and the subsoil. Can result in impeded internal drainage and restricted root growth	Improve organic matter through maintenance of vegetative cover and growing green manure crops. Reduce tillage. Optimise plant growth through regular balanced fertiliser programme. Consider sub-surface drainage (if appropriate).
Shallow topsoil depth	Reduced water and nutrient holding capacity. Reduced root growth. Potential for waterlogging.	Improve organic matter through maintenance of vegetative cover and growing green manure crops. Reduce tillage to protect against water and wind erosion. Optimise plant growth through a regular and balanced fertiliser programme. Consider sub-surface drainage (if appropriate).
Bleached A_2 horizon	Indication of waterlogged condition (impeded internal drainage) within the topsoil. Poor soil structure (often massive). Low organic matter, water holding capacity and nutrition within the horizon.	*Dryland cropping* - include deep rooted crops in the rotation, minimum tillage and stubble retention. Apply gypsum if the topsoil is sodic. Optimise plant growth through a regular and balanced fertiliser programme.
Columnar or prismatic subsoil structure	Indication of sodic clay subsoil. Poor water and air movement into the subsoil resulting in waterlogging (impeded internal drainage). Poor root growth into the subsoil reducing the volume of the soil able to be exploited. Very difficult to cultivate particularly if topsoil is shallow.	Apply gypsum if the subsoil is close to the surface and topsoil textures are light. *Dryland cropping* - include deep rooted crops in the rotation, minimum tillage and stubble retention. These soil are difficult to manage, not suitable for high levels of production unless substantial modification can be achieved.

Sodic clay subsoil	Poor water and air movement into the subsoil resulting in waterlogging (impeded internal drainage). Poor root growth into the subsoil reducing the volume of the soil able to be exploited.	Gypsum applications if the subsoil is close to the surface and topsoil textures are light. *Dryland cropping* - include deep rooted crops in the rotation, minimum tillage and stubble retention.
Dispersion (dry soil)	Indication of soil sodicity. Soil structure collapses following wetting resulting in poor soil structure that reduces water movement and plant root growth (see sodic subsoil). Increases water erosion hazard.	*Dryland cropping* - apply gypsum, include deep rooted crops in the rotation, minimum tillage and stubble retention.
Mottled subsoil	Indication of periodic waterlogging, particularly if grey and yellow mottles predominate.	Consider sub-surface drainage (if appropriate). Apply gypsum if subsoil is sodic and close to the surface.
Acidic topsoil	Potential nutrient imbalance. Unsuitable for acid intolerant plants.	Apply lime.
Alkaline subsoil	Potential nutrient imbalance. Unsuitable for alkaline intolerant plants. May indicate subsoil sodicity.	Grow shallow rooted species. Grow alkaline tolerant plants.
Very low and low Plant Available Water Holding Capacity (PAWC)	Poor plant available water holding capacity. Indication of light soil texture or shallow effective plant rooting depth (ie presence of restrictive layers, salinity, pH or structure).	Improve organic matter through maintenance of vegetative cover and growing green manure crops. Increase effective rooting depth by reducing the effect of the restrictive layer.

Land Suitability Rating Table

LAND USE	SUITABILITY CLASS	MAJOR LIMITING COMPONENT
Wheat	2	Climate, landscape, soil
Canola	2	Climate, landscape, soil
Chickpeas	3	Soil
Lentils	3	Soil
White clover seed	2	Climate, landscape, soil
Lucerne for seed production	3	Soil
Viticulture	3	Soil
Apples	3	Soil
Potatoes	3	Soil
Carrots	3	Soil
Onions	3	Soil
Sweet corn	3	Soil
Radiata Pine	3	Climate, soil
Blue Gum	3	Climate, soil

Land Suitability Assessment and Primary Limitations

Wheat	*Climate*	2*	High frost risk for most of the land unit
	Landscape	2	Water erosion hazard
	Soil	2#	Slightly alkaline subsoil pH, slightly impeded internal drainage,
Canola	*Climate*	2*	High frost risk for most of the land unit
	Landscape	2	Water erosion hazard
	Soil	2#	Depth of topsoil, slightly alkaline subsoil pH, slightly impeded internal drainage, soil salinity
Chickpeas	*Climate*	2*	High frost risk for most of the land unit, slightly high rainfall
	Landscape	2	Wind and water erosion hazard
	Soil	3	Impeded internal drainage
Lentils	*Climate*	2*	High frost risk for most of the land unit
	Landscape	2	Wind and water erosion hazard
	Soil	3	Impeded internal drainage
White clover seed	*Climate*	2	Moderate frost risk
	Landscape	2	Water erosion hazard
	Soil	2#	Topsoil depth, slightly alkaline subsoil pH, slightly impeded internal drainage

Lucerne for seed production	*Climate*	2	Moderate frost risk
	Landscape	2	Water erosion hazard
	Soil	3	Soil salinity, impeded internal drainage
Viticulture	*Climate*	2*	High frost risk for most of the land unit
	Landscape	2	Water erosion hazard
	Soil	3	Soil salinity, impeded internal drainage
Apples	*Climate*	2*	High frost risk for most of the land unit, slightly high mean maximum January temperature
	Landscape	2	Water erosion
	Soil	3	Soil salinity, alkaline subsoil pH
Potatoes	*Climate*	2	Slightly high mean maximum January temperature
	Landscape	2	Wind and water erosion hazard
	Soil	3	Depth of topsoil, impeded internal drainage
Carrots	*Climate*	1	No major limitation
	Landscape	2	Wind and water erosion hazard
	Soil	3	Depth of topsoil, impeded internal drainage
Onions	*Climate*	2	Moderate frost risk
	Landscape	2	Wind and water erosion hazard
	Soil	3	Depth of topsoil, impeded internal drainage
Sweet corn	*Climate*	1	No major limitation
	Landscape	2	Water erosion hazard
	Soil	3	Depth of topsoil, impeded internal drainage
Radiata Pine	*Climate*	3	Low rainfall
	Landscape	1	No major limitation
	Soil	3	Alkaline subsoil pH
Blue Gum	*Climate*	3	Low rainfall
	Landscape	1	No major limitation
	Soil	3	Alkaline subsoil pH

* Some areas may be higher frost risk therefore they may be potentially unsuitable. Obtain local knowledge on frost prior to investment

\# Surface sodicity may limit germination and seedling growth