

## SECTION 5 - SOIL TYPES

In this section, a summary of each soil type is given prior to its detailed description. Soil types are dealt with in the order of their predominance on the map (with the exception of Kalkee clay grey profile). Definitions of terms used are given in Appendix I.

The profile features given in each case are reasonable representative of the particular soil type. Additional information about the profiles is given in Appendix III. A list of minor variations, which have been observed and recorded in the field, is given beneath the detailed description of each main type.

Three minor soil types are described, with reference to their occurrence, in the last part of the section. They occupy relatively small areas. Representative profiles are included and are described in Appendix III and sites have been indicated on the map by the symbols MT-1 to MT-3.

### 5.1 Kalkee Clay Microscale Complex – Kc

The soil type is a grey calcareous cracking clay soil and is a microscale complex of subsoils which vary over very short distances in most localities, under a surface soil which is uniform over relatively large areas.

**Surface soil** – Colour ranges from yellowish grey to grey-brown and texture varies from light to medium clay. Structure is invariably of the crumb form and consistency is commonly friable. The boundary between surface soil and subsoil is sharp and irregular so that surface depth varies from 5 to 15 cm.

**Subsoil**- The degree of mottling varies with clay colour. The subsoil cracks widely when dry and the cracks are typically infilled with surface material.

The five main components of the Kalkee clay microscale complex and their distinguished features are listed below.

#### 5.1.1 Kalkee Clay – Soil 1 (Kc-1)

##### **Surface soil**

A 0 to 5/15cm yellowish or brownish grey to grey-brown light or very light clay; moderate medium to coarse sub-angular blocky or crumb structure; smooth or rough faced peds; soft dry, very friable moist, plastic and slightly sticky wet, sharply separated by an irregular boundary from:

##### **Subsoil**

B 5/15 to 60/95 cm diffusely mottled yellowish or brownish grey and grey-brown light to heavy clay; weak to moderate medium to coarse angular and/or sub-angular blocky structure; smooth faced peds; hard dry, friable moist plastic and slightly sticky wet; gradually separated by an irregular boundary from:

60/95 to 210 cm pale yellow-grey or diffusely mottled pale dull yellow-brown and yellow-grey, sometimes with darker and/or browner colours at depth, medium or heavy clay; weak medium angular and/or sub-angular blocky structure; smooth faced peds; hard dry, friable moist, plastic and sticky wet.

**Calcium carbonate**-Nodules of hard calcium carbonate are scattered on the surface. Within the top 30cm of the profile there may be none or only trace amounts of hard and/or soft calcium carbonate. Below 30 cm amounts may increase from slight to light or moderate at about 70cm.

### 5.1.2 *Kalkee clay – Soil 2 (Kc-2)*

#### *Surface Soil*

- A 0 to 10/15 cm grey brown light or very light clay; weak medium to coarse subangular blocky or crumb structure; smooth or rough faced peds; soft dry, friable moist, plastic and slightly sticky wet; sharply separated by an irregular boundary from:

#### *Subsoil*

- B 10/15 to 30/110 cm moderately mottled dull yellow-brown or yellowish greyish brown, sometimes pale brown and greyish brown, light clay; weak medium to coarse sub-angular blocky structure; smooth faced peds; slightly hard dry, friable moist, plastic and slightly sticky wet; gradually changes with an irregular boundary into:

30/110 to 210 cm moderately mottled dull yellow-brown or yellowish greyish brown, sometimes bright brown, and pale yellow-grey, grey or brown, medium or heavy clay; weak to moderate medium to coarse angular and/or sub-angular blocky structure; smooth faced peds; hard dry, slightly friable moist, plastic and sticky wet.

*Calcium carbonates*-Nodules of hard calcium carbonate are scattered on the surface. Light to moderate amounts of soft calcium carbonate occur between 10 and 45 cm.

### 5.1.3 *Kalkee Clay – Soil 3 (Kc-3)*

#### *Surface soil*

- A 0 to 10/15 cm grey to grey-brown light to very light clay, sometimes with very fine sand; moderate medium sub-angular blocky and/or crumb structure; smooth and/or rough faced peds; soft to slightly hard dry, friable moist, plastic and slightly sticky wet; sharply separated by an irregular boundary from:

#### *Subsoil*

- B 10/15 to 25/33 cm moderately mottled reddish or dull reddish brown and grey to grey-brown light clay; strong medium to coarse angular or sub-angular blocky structure; smooth faced peds; hard to extremely hard dry, slightly friable to non-friable moist, plastic and sticky wet; grades into;

25/33 to 75/140 cm brown to pale brown or moderately mottled pale brown and grey-brown passing to diffusely mottled pale yellow-brown and brown at depth, medium to heavy clay; moderate medium to coarse angular and/or sub-angular blocky structure; smooth faced peds; hard dry, slightly friable moist, plastic and sticky wet; grades into:

75/140 to 210 cm diffusely mottled yellow-grey and yellowish grey or brown heavy clay; weak medium to coarse sub-angular blocky structure; smooth faced peds; hard dry, slightly friable moist, plastic and sticky wet.

*Calcium carbonate*-Nodules of hard calcium carbonate are scattered on the surface. Trace amounts occur throughout the profile.

#### 5.1.4 *Kalkee clay – Soil 4 (Kc-4)*

(Kalkee clay – grey profile (Kc-gp))

##### *Surface Soil*

**A**     0 to 8/15 cm     grey to grey-brown light clay; weak to moderate fine to medium sub-angular blocky and/or crumb structure; smooth and/or rough faced peds; soft to slightly hard dry, friable moist, plastic and slightly sticky wet; sharply separated by an irregular boundary from:

##### *Subsoil*

**B**     8/15 to 85/100cm     grey or slightly yellowish grey to dark grey light to heavy clay; moderate to strong medium to coarse angular or sub-angular blocky structure; smooth faced peds; slightly hard to very hard dry, friable to non-friable moist, plastic and sticky wet; grades into:

85/100 to 120/210 cm     as for above but slightly mottled yellowish or yellow-grey and pale yellowish grey or yellowish brown heavy clay.

**Calcium carbonate**-Nodules of hard calcium carbonate may be scattered on the surface. Within the top 35 cm of the profile there may be none or only trace amounts of hard and/or soft calcium carbonate. Trace to light amounts may occur in the deep subsoil.

**NB:** Where this soil covers more than 60% of an area of four hectares or more, it has been separated on the soil map and indicated by the symbol Kc-gp; smaller areas are scattered throughout the survey

#### 5.1.5 *Kalkee clay – Soil 5 (Kc-5)*

##### *Surface soil*

**A<sub>1</sub>**     0 to 10/15 cm     brownish grey to grey-brown light clay; weak medium to coarse sub-angular blocky or crumb structure; smooth or rough faced peds; slightly hard to hard dry, friable moist, plastic and slightly sticky wet; sharply separated by an irregular boundary from:

**A<sub>2</sub>**     10/15 to 20/25 cm     sporadically bleached and slightly mottled pale yellowish grey or pale yellowish brown and grey or brownish grey light clay to sandy clay loam; unaggregated massive; slightly hard to hard dry, moderately friable moist, slightly plastic to non-plastic and slightly sticky wet; sharply separated by an irregular boundary from:

##### *Subsoil*

**B**     20/25 to 50/70 cm     brownish grey to moderately mottled yellow-grey and yellow-brown light to heavy clay (sometimes with sand); moderate medium to coarse sub-angular blocky structure; smooth faced peds; slightly hard to hard dry, moderately friable to non-friable moist, plastic and sticky wet; diffusely passes to:

50/70 to 85/100cm     moderately mottled yellow-grey, greyish brown (or brown) and brownish yellowish grey (or grey) medium or heavy clay; weak medium to coarse sub-angular blocky structure; smooth faced peds; slightly hard to hard dry, moderately friable to non-friable moist, plastic and sticky wet; grades into:

85/100 to 210 cm     brownish yellow grey heavy clay passes to diffusely mottled pale brown, brown and reddish brown heavy clay at depth; weak to moderate medium to coarse angular to sub-angular blocky structure; smooth faced peds; hard dry, slightly friable to non-friable moist, plastic and sticky wet.

**Calcium carbonate**-Nodules of hard calcium carbonate are scattered on the surface and light amounts of soft calcium carbonate occur at about 65 cm. Sometimes trace amounts of hard and/or soft calcium carbonate have been recorded throughout the profile.

### 5.1.6 Minor Variations

The following is a list of the minor variations in the Kalkee clay microscale complex which have been recorded in this survey:

1. Surface depth is occasionally greater than 20 cm.
2. Surface soil consistency is occasionally hard dry and moderately friable moist, instead of the usual soft to slightly hard dry and friable moist.
3. Surface texture is occasionally heavy clay instead of the usual light clay.
4. The upper part of the subsoil and/or surface textures are occasionally sandy clay instead of the usual clay.
5. Subsoil texture is occasionally very light to light clay changing gradually to medium clay at about 100cm.
6. Subsoil structure is occasionally angular blocky throughout, instead of the usual sub-angular blocky or the compound angular and sub-angular blocky structure.
7. On a few occasions, hard pans of sandstone or calcium carbonate have been found at about 170 cm depth.

## 5.2 Murra Warra Clay Complex – MW c

The soil type is a brown calcareous cracking clay soil and, as a mapping unit and at the scale used, it must be regarded as a complex in which the subsoils vary. The main variations are listed below:

1. The degree of redness of the clay particularly in the top 30 cm of the subsoil.
2. The shape and arrangement of the structural units. Variability is less than in the Kalkee clay soil type.

**Surface soil**- Colour ranges from dull brown to grey-brown and texture from light to very light clay and structure from crumb to weak medium sub-angular blocky rough or smooth faced peds. Consistency is usually friable. The boundary between surface soil and subsoil is sharp and wavy so that surface depth varies from 10 to 20 cm.

**Subsoil**- Colour ranges from greyish brown to red-brown and texture from medium to heavy clay. Other characteristic features include moderate to strong medium or coarse angular blocky structure, smooth faced ped fabric, and a very hard dry, moderately friable moist, plastic and sticky wet consistency. Various degrees of mottling occur in the lower subsoil.

The main distinguishing features of the two soils which occur as part of the Murra Warra clay complex are as follows:

### 5.2.1 Murra Warra Clay – Soil 1 (MWC-1)

#### **Surface soil:**

- A 0 to 10/20 cm greyish brown to grey-brown light to very light clay; weak to moderate medium to coarse sub-angular blocky to crumb structure; smooth or rough faced peds; soft to slightly hard dry, friable moist, plastic and slightly sticky wet; sharply separated with a wavy boundary from:

#### **Subsoil:**

- B 10/20 to 25/45cm dull reddish brown to slightly reddish greyish brown light to heavy clay; moderate to strong medium to coarse angular blocky structure; smooth faced peds; hard to very hard dry, friable to slightly friable moist, plastic and sticky wet; changes gradually with a wavy boundary to:

25/45 to 90/120cm brown to greyish yellowish brown light to heavy clay; weak to moderate fine to coarse sub-angular blocky structure; smooth faced peds; hard dry, friable moist, plastic and sticky wet; changes gradually with a wavy boundary to:

90/120 to 210cm slightly mottled yellow-grey and some brown heavy clay; weak to moderate medium to coarse angular and/or sub-angular blocky structure; smooth faced peds; hard to extremely hard dry, non friable moist, plastic and very sticky wet.

**Calcium carbonate** – Nodules of hard calcium carbonate are occasionally scattered on the surface. Trace or slight amounts of hard and/or soft calcium carbonate occur from about 40cm. Below 60 cm amounts may increase to moderate. At about 100cm amounts decrease to traces.

### 5.2.2. *Murra Warra Clay – soil 2 (Mwc-2)*

#### *Surface soil*

A 0 to 10/20 cm dull brown to grey-brown light to very light clay sometimes with fine sand; weak to moderate medium to coarse sub-angular blocky to crumb structure; smooth or rough faced peds; soft to slightly hard dry, friable to moderately friable moist, plastic and slightly sticky wet; sharply separated with a wavy boundary from;

#### *Subsoil*

B 10/20 to 40/70 cm reddish brown or red-brown medium or heavy clay; moderate to strong angular or sub-angular blocky structure; smooth faced peds; hard dry, slightly friable moist, plastic and sticky wet; changes gradually with a wavy boundary to:

40/70 to 100/140cm diffusely mottled brown and yellowish brown or reddish brown sometimes with some grey-brown medium to heavy clay; weak medium to coarse sub-angular blocky structure; smooth faced peds, hard to extremely hard dry, slightly friable to non-friable moist, plastic and very sticky wet; passes gradually to:

100/140 to 210 cm as for above but slightly mottled pale yellow-grey and some dark brown, some-times with some brownish yellow colours.

**Calcium carbonate**-Trace or slight amounts of soft calcium carbonate occur below 30 cm (occasionally as deep as 75 cm) and may increase to light amounts of depth.

### 5.2.3 *Minor Variations*

Minor variations in Murra Warra clay complex, which have been recorded, as follows:

1. Surface depth is occasionally less than 10 cm, sometimes as shallow as 2 cm.
2. Surface brown is occasionally reddish brown or red-brown, instead of the usual greyish brown to grey-brown.
3. Surface structure is occasionally angular blocky, instead of the usual sub-angular or crumb structure.
4. Surface texture is occasionally medium clay, instead of the usual light clay.
5. The upper part of the subsoil and/or surface textures are occasionally sandy clay, instead of the usual clay.
6. The upper part of the subsoil is occasionally mottled, instead of the usual whole coloured.
7. The upper part of the subsoil is occasionally weak crumb or sub-angular blocky, instead of the usual moderate to strong angular or sub-angular blocky structure.
8. Calcium carbonate is occasionally present in the top 30 cm of the profile.
9. The deep subsoil is occasionally sandy clay, instead of the usual light to heavy clay.
10. Bright red-brown deep subsoil colour, instead of the usual dull mottle, was occasionally recorded as deep as 200 cm.

On a few occasions ferruginized sandstone and/or hard pans of sandstone or calcium carbonate have been found at about 165 cm depth.

### 5.3 Murra Warra Duplex Soils

Murra Warra sandy loam ( $M^Wsl$ ) and Murra Warra sandy clay loam ( $M^Wslc$ ) belong to the red-brown earths Great Soil Group (Stace et al., 1968). Having light-textured surfaces (sandy loam and sandy clay loam), overlying medium or heavy clay subsoil types are mapped, although their occurrence is not shown where the area concerned is less than four hectares. Both soil types are more common north of the survey area. The main distinguishing features are outlined below.

#### 5.3.1 Murra Warra Sandy Loam ( $M^Wsl$ )

##### *Surface soil*

**A** 0 to 13/30cm brownish grey to greyish brown sandy loam; unaggregated massive; hard dry, slightly friable moist, non plastic and slightly sticky to non-sticky wet; sharply separated by an irregular boundary from:

##### *Subsoil*

**B** 13/30 to 120cm diffusely mottled greyish brown to red-brown, with a decrease in the degree of redness at depth, medium or heavy clay; moderate to strong medium to coarse sub-angular and/or angular blocky structure; rough and/or smooth faced peds; hard to extremely hard dry, slightly to moderately friable moist, plastic and sticky wet.

**Calcium carbonate**-Trace or slight amounts of hard and/or soft calcium carbonate occur from about 50 cm, sometimes amounts increase to moderate in the deep subsoil.

#### 5.3.2 Murra Warra Sandy Clay Loam ( $M^Wslc$ )

##### *Surface Soil*

**A or A<sub>1</sub>** 0 to 8/15 cm slightly reddish brown to grey-brown clay loam with sand to sandy clay loam; usually unaggregated massive; hard dry, slightly friable to non-friable moist, slightly plastic to non-plastic and slightly sticky to non sticky wet; sharply separated (either directly or with a sporadically bleached thin A<sub>2</sub> horizon) from:

##### *Subsoil*

**B** 8/15 to 22/40cm red-brown to greyish reddish brown medium or heavy clay occasionally with sand; moderate to strong medium and coarse sub-angular and/or angular blocky structure; rough and/or smooth faced peds; hard dry, friable to moderately friable moist, plastic and sticky wet; changes gradually into:

22/40 to 120 cm brown to yellow-brown (sometimes diffusely mottled with yellow-grey or grey-brown) light or medium clay; weak medium to coarse sub-angular blocky structure; rough faced peds; hard to very hard dry, moderately friable moist, plastic and sticky to very sticky wet.

**Calcium carbonate**-Trace of soft calcium carbonate at about 25 cm increasing to slight or light amounts at about 70 cm.

#### 5.3.3 Minor Variations

The total area of the Murra Warra duplex soils was relatively small and only one minor variation was recorded. In this variation the subsoil was brownish yellow-grey, instead of the usual redder or browner colours.

## 5.4 Minor Soil Types

### 5.4.1 *Minor Soil Type 1 (MT-1)*

#### *Surface Soil*

A 0 to 5/15 cm grey-brown sandy clay to medium clay; unaggregated massive to weak very coarse sub-angular blocky structure; rough or smooth faced peds; hard to extremely hard dry, non-friable moist, plastic and slightly sticky wet; sharply separated with an irregular boundary from;

#### *Subsoil:*

B 5/15 to 30/55 cm dark brownish grey to grey-brown heavy clay; strong very coarse prismatic structure, units breaking into fine to coarse angular blocky smooth faced peds; hard to very hard dry, non-friable moist, plastic and sticky wet; changes clearly to:

30/55 to 85/100 cm slightly yellowish greyish brown to yellowish grey-brown or slightly mottled yellowish grey, grey brown and/or grey heavy clay; moderate medium to coarse sub-angular blocky structure; smooth faced peds; slightly hard dry, moderately friable moist, plastic and sticky wet; changes gradually with a wavy boundary to:

30/45 to 65/75 cm brown to dull brown medium or heavy clay; weak or moderate medium to coarse sub-angular blocky structure; smooth faced peds; slightly hard to hard dry, slightly friable to moderately friable moist, plastic and sticky wet; passes gradually into:

65/75 to 120 cm as for above but yellowish brown or slightly mottled yellow-brown and brown. Usually yellow-grey or brownish yellow-grey at depth.

**Calcium carbonate**-Trace to slight amounts of soft and/or hard calcium carbonate occur below 40 cm and may increase to light amounts at depth.

**Occurrence**-Typically in the ridges and low rises landscape unit and mainly in the Murra Warra soil association unit.

### 5.4.3 *Minor soil Type 3 (MT-3)*

#### *Surface soil*

A<sub>1</sub> 0 to 8/16 cm greyish brown to grey-brown light to medium clay (sometimes sandy); moderate medium to coarse sub-angular blocky structure; smooth faced peds; slightly to moderately hard dry, friable to moderately friable moist, plastic and slightly sticky wet; sharply separated with a wavy boundary from:

A<sub>2</sub> 8/16 to 18/23 cm pale dull yellow-brown to yellow-grey loamy sand to sandy loam; unaggregated massive; hard to moderately hard dry, friable to non-friable moist, non plastic and non-sticky wet; sharply separated with a wavy boundary from:

#### *Subsoil*

B 18/23 to 62/70 cm red-brown to reddish brown medium or heavy clay; moderate medium to coarse sub-angular blocky structure; smooth faced peds; hard to slightly hard dry, moderately friable to non-friable moist, plastic and sticky wet; passes gradually to:

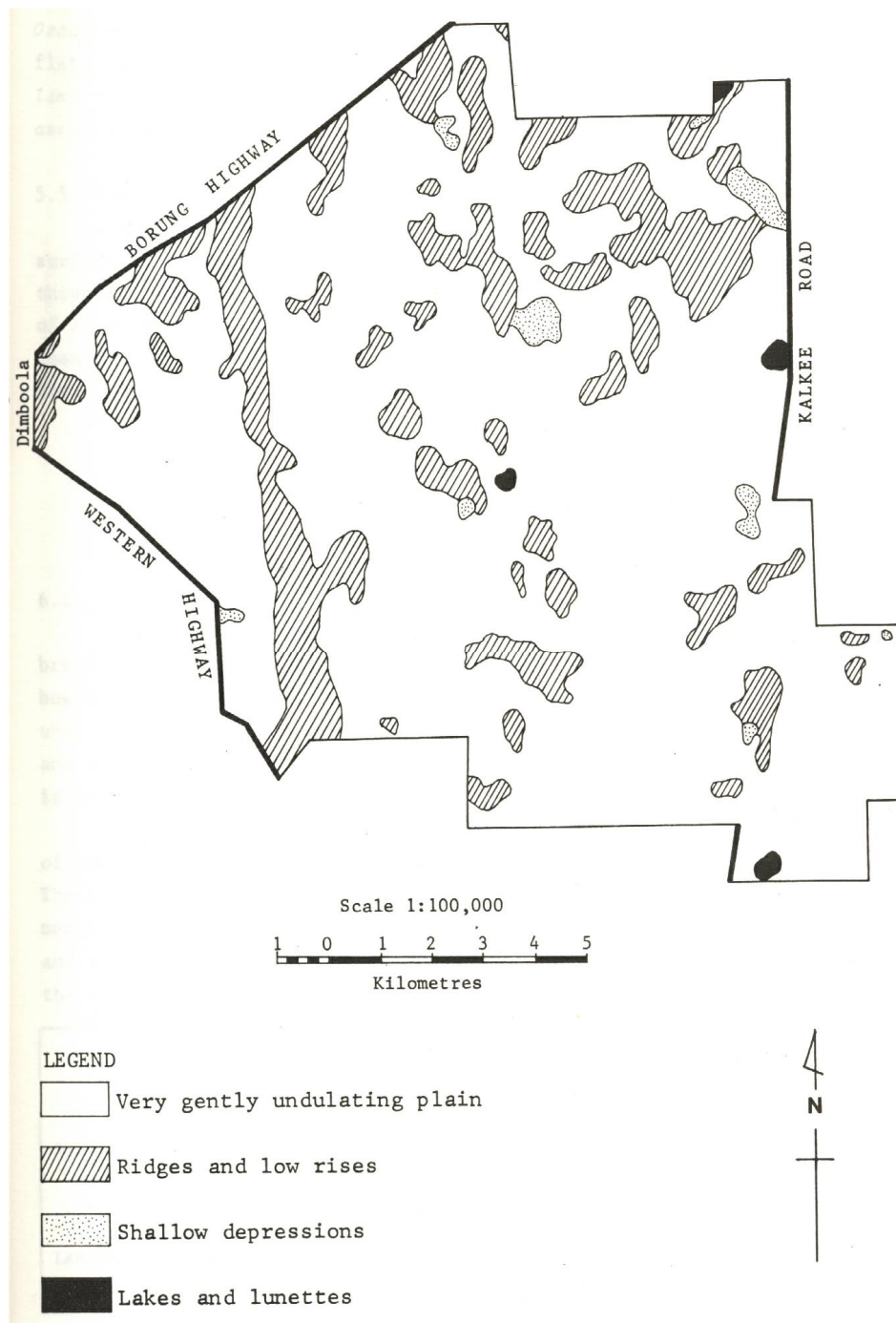
62/70 to 120 cm as above except for the colour which is slightly yellowish brown to moderately mottled yellowish (or yellow) brown and yellowish grey.

**Calcium carbonate**-Trace to slight amounts of soft calcium carbonate at about 60 cm. Below 85 cm amounts increase to moderate. At about 100 cm amounts may decrease to trace.

**Occurrence**-This minor soil type occurs either on the flats or on the rises in the gently undulating plain landscape unit, mainly in the Murra Warra soil association unit.

### 5.5 Transitional Profiles

A small number of clay profiles characterised by surface and upper subsoils (A + B 1 horizons), similar to those of Kalkee clay and lower subsoils similar to those of Murra Warra clay, were recorded. Such profiles have been recognised as 'Kalkee clay transitional to Murra Warra Clay' soils.



**Figure 3 – Landscape units in the Kalkee area**