

## Appendix 5

### Radiocarbon method and results

#### NOTES

It is our policy to publish all dates from this laboratory in *Radiocarbon* approximately 2 years after they are released. This is one of the conditions which applies to all samples we accept for dating (*Australian Quaternary Newsletter* no. 15, p 2-5, July 1980). We therefore ask you to complete a sentence or two on the SIGNIFICANCE OF THE RESULT and return a copy within 6 months. You may update your comments later if you wish. References to publications in which you use or discuss this sample or date may be included.

The SUA- number should always be quoted with the radiocarbon age and its statistical uncertainty.

By international agreement, CONVENTIONAL RADIOCARBON AGES are calculated using the Libby half life of 5568 years and 0.95 times the activity of NBS Oxalic acid as the modern standard. In fact, our modern standard value is obtained by measuring a secondary standard (ANU Sucrose), applying an isotopic correction and using the conversion factor of Currie & Polach (*Radiocarbon* 22, p 933- 5, 1980). Results which reflect the post- A. D. 1955 rise in atmospheric  $^{14}\text{C}$  ( due to nuclear weapons testing ) are reported as ratios of the modern standard value.

AGES b. p. are radiocarbon years before 1950 A. D., and the statistical uncertainty is one standard deviation derived from the counting statistics of sample, background, standard and diluent activities, and the uncertainties associated with  $\delta^{13}\text{C}$  and small instrumental corrections. Ages are normalised to  $\delta^{13}\text{C} = -25\text{‰}$ , but no corrections are made for reservoir or past variations in atmospheric  $^{14}\text{C}$  concentration. For a full explanation of terms and procedures, see M. Stuiver & H. A. Polach, *Radiocarbon* 19, p 355- 63, 1977. This laboratory also follows the British practice of using LOWER CASE LETTERS b. p. for conventional radiocarbon dates, and upper case B. P. for absolute or calibrated ages.

In some instances, it may be desirable to apply a RESERVOIR CORRECTION to offset the lower initial  $^{14}\text{C}$  concentrations of surface ocean water. For pre-1955 A. D. marine shells from the Australian coast, the current best estimate is  $-450 \pm 35$  years ( see R. Gillespie & H. A. Polach, p 404 - 21 *in*: Radiocarbon Dating, Proceedings of the Ninth International Conference, R. Berger & H. E. Suess, eds.; University of California Press, 1979 ).

For certain applications it may be necessary to correct for past variations in ATMOSPHERIC  $^{14}\text{C}$  CONCENTRATION so that events can be compared on a linear time - scale. For the last 7240 radiocarbon years, the calibration curve of J. Klein, J. C. Lerman, P. E. Damon and E. K. Ralph, 1982, ( CALIBRATION OF RADIOCARBON DATES : Tables based on the consensus data of the Workshop on Calibrating the Radiocarbon Time Scale: *Radiocarbon*, v 24, No. 2, p 103 - 150 ) can be used. A rough guide to atmospheric  $^{14}\text{C}$  concentrations before 7240 b. p. is given by M. Barbetti ( *Radiocarbon*, v 22, p 191 - 9, 1980 ) ; early Holocene conventional radiocarbon dates are likely to be around 800 years too young.





THE N.W.G. MACINTOSH CENTRE FOR QUATERNARY DATING

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RADIOCARBON AGE REPORT

Please read the definitions and notes on the back.

Please write a sentence or two on the significance of  
the result and send us a copy within six months.

|  |                           |
|--|---------------------------|
| SUBMITTER: Mr. Bernard Powell  | SAMPLE CODE: Profile No.2 |
| INSTITUTION: Land Resources Branch,DPI, Meiers Road,<br>INDOOROPILLY Q4068 | COLLECTOR: B. Powell      |
| MATERIAL: Soil   | DATE: Aug. 1983           |
| GEOGRAPHIC   |                           |
| LOCATION: Lockyer valley, South-East Queensland.                           |                           |

PRETREATMENT: THE SAMPLE WAS

|   |     |
|---|-----|
| ETCHED IN DILUTE HYDROCHLORIC ACID                            | NO  |
| TREATED WITH 2: 1 BENZENE : ETHANOL, THEN ETHANOL, THEN WATER | NO  |
| BOILED IN DILUTE HYDROCHLORIC ACID AND FILTERED               | YES |
| SOAKED/BOILED IN DILUTE ALKALI-PYROPHOSPHATE AND FILTERED     | NO  |
| BOILED IN DILUTE HYDROCHLORIC ACID AND FILTERED               | NO  |

SUA: 2262      CONVENTIONAL RADIOCARBON AGE: 21,770 ± 280 yr b.p.

ESTIMATED/~~MEASURED~~  $\delta^{13}C$  WRT THE PDB STANDARD: -25 ± 2‰

PROPORTION OF SAMPLE IN BENZENE FOR COUNTING: 59.0%

COUNTING TIME: 5100 minutes

SIGNATURE: 

DATE RELEASED: 4 September 1985

SIGNIFICANCE OF RESULT: (FOR PUBLICATION IN RADIOCARBON)

Result is the weighted mean of measurements in two counters.



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RADIOCARBON AGE REPORT

Please read the definitions and notes on the back.

Please write a sentence or two on the significance of  
the result and send us a copy within six months.

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|              |   |              |              |
|--------------|---|--------------|--------------|
| SUBMITTER:   | Mr. Bernard Powell  | SAMPLE CODE: | Profile No.3 |
| INSTITUTION: | Land Resources Branch, DPI, Meiers Road,<br>INDOOROOPILLY | COLLECTOR:   | B. Powell    |
| MATERIAL:    | Soil  | DATE:        | Aug. 1983    |
| GEOGRAPHIC   |   |              |              |
| LOCATION:    | Lockyer valley, South-East Queensland.                    |              |              |


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PRETREATMENT: THE SAMPLE WAS

|  |     |
|--|-----|
| ETCHED IN DILUTE HYDROCHLORIC ACID                           | NO  |
| TREATED WITH 2:1 BENZENE : ETHANOL, THEN ETHANOL, THEN WATER | NO  |
| BOILED IN DILUTE HYDROCHLORIC ACID AND FILTERED              | YES |
| SOAKED/BOILED IN DILUTE ALKALI-PYROPHOSPHATE AND FILTERED    | NO  |
| BOILED IN DILUTE HYDROCHLORIC ACID AND FILTERED              | NO  |

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SUA: 2263 R      CONVENTIONAL RADIOCARBON AGE: 19,360 ± 280 yr b.p.

|  |                                |
|--|--------------------------------|
| ESTIMATED/MEASURED <del>MEASURED</del> $\delta^{13}\text{C}$ WRT THE PDB STANDARD:             | -25 ± 2‰                       |
| PROPORTION OF SAMPLE IN BENZENE FOR COUNTING:  | 67.8% of 1 ml                  |
| COUNTING TIME:   | 5020 minutes                   |
| SIGNATURE:  | DATE RELEASED: 3 December 1985 |

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SIGNIFICANCE OF RESULT: (FOR PUBLICATION IN RADIOCARBON)

Result is the weighted mean of measurements in two counters.

## **Appendix 6**

### **Detailed descriptions of soil profile classes**

## 1. Soils of the major stream floodplains and levees

### **Robinson soil profile class.**

*Occurrence:* This soil is associated with channel benches, point bar and splay deposits of downstream reaches and the floodplains of the trunkstream upper reaches and tributaries.

*Differentiating characteristics:* It is differentiated from other soils by its shallow depth (less than 0.4 m) over bedload layers of sand, gravel, cobbles or stones or over buried soils (Plate VI-I).

*Modal profile:* Robinson has a soft powdery surface when dry which may crust and tend to set hard on cultivation. The A horizon is dark (7.5YR - 5YR 3/1, 3/2, 2/2) with sandy loam to loam (rarely clayloam) texture and weak coarse granular to medium angular blocky structure or structureless and massive. At 0.1-0.4 m the A horizon clearly or gradually overlies brown (7.5YR 3/3, 4/3) or dark (7.5YR 3/1, 3/2) buried layers of variable texture (sand to light clay), or buried soils, or gravel cobble or stone layers. Soil reaction trend is neutral. The coarser buried bed load materials occur in upstream locations of the narrow tributary floodplains, while buried soils are found under downstream floodplains and breached levees.

*Phases:* A stony surface phase is commonly associated with the upstream tributary floodplains.

*Classification:* This soil usually has the properties of the alluvial soil great soil group but in some cases it has a degree of soil development towards a prairie soil. Such soils have been termed minimal prairie soils by some workers.

PPF's are Um6.11, Uc6.11 and Um6.21

*Land use:* usually used as native pastures in upstream reaches because of its high stone component. In other areas however it is commonly cultivated, despite the risk of flooding. Its freely draining profile makes it suitable to a wide range of crops.



Plate VI-I. Robinson soil profile class (stony phase).



Plate VI-II. Lockyer soil profile class (site 1).

Soil Profile Class: Robinson Map Unit: Ro Site No.: E12  
 Great Soil Group: Alluvial Soil FAO: Fluventic Haplustoll Soil Taxonomy: Fluventic Haplustoll P.P.F.: Um6.21  
 Parent Material: Recent alluvium A.M.G. Ref.: Zone 56, 422700 mE, 6929800 mN  
 Topography: Flat, narrow flood plain with slight stony rises Air Photo Ref: South Moreton District Flood (1974) Run 9, Photo 5322, 110 mmE, 43 mmN  
 Vegetation: Cleared and cultivated. Formerly eucalypt open forest. Location: 3.75 km south of Mt Sylvia

Profile Morphology: Surface condition: Loose, soft, cultivated.  
 Ap 0 - 0.14 m Brownish black (7.5YR3/2); sandy clay loam; weak fine clods; soft moist; few fine roots. Clear to -  
 A12 0.14 - 0.30 m As above but with moderate medium subangular blocky structure. Clear to -  
 AC 0.30 - 0.50 m Dark brown (7.5YR3/3); fine sandy clay loam; massive; soft moist; few very fine roots. Gradual to -  
 C 0.50 - 0.65 m Brown (7.5YR4/3) loam, fine sandy; massive; soft moist; few very fine roots. Abrupt to -  
 D1 0.65 - 0.80 m As above but dark brown (7.5YR3/3) and loose moist. Clear to -  
 D2 0.80 - 1.10 m Dark brown (7.5YR3/3); loamy fine sand; single grain; loose moist. Clear to -  
 D3 1.10 - 1.20 m Dark brown (7.5YR3/3); gravelly sandy loam; massive; 15-50% rounded basaltic gravel. Clear to -  
 D4 1.20 - Basaltic cobble and gravel.

Laboratory Data:

| Lab No. | Depth m | pH 1:5 | E.C. (1:5) mScm <sup>-1</sup> | Cl %  | Dispersion Ratio (R <sup>1</sup> ) | C.S. Particle Size % | F.S. C | Si | C  | C.E.C. Exch. Cations cmol(p <sup>+</sup> ) kg <sup>-1</sup> | Ca <sup>++</sup> | Mg <sup>++</sup> | Na <sup>+</sup> | K <sup>+</sup> | P | K | S | Moisture % |      |     |     |
|---------|---------|--------|-------------------------------|-------|------------------------------------|----------------------|--------|----|----|---|------------------|------------------|-----------------|----------------|---|---|---|------------|------|-----|-----|
|         |         |        |                               |       |                                    |                      |        |    |    |   |                  |                  |                 |                |   |   |   |            | A.D. | bar | bar |
| 208M    | 0-0.1   | 7.2    | 0.04                          | 0.001 | 0.72                               | 30                   | 37     | 14 | 20 | 35  | 17               | 11               | 0.42            | 1.1            |   |   |   |            | 3.8  |     |     |
| 210M    | 0.2-0.3 | 7.5    | 0.03                          | 0.001 | 0.72                               | 28                   | 49     | 17 | 20 | 33  | 18               | 11               | 0.70            | 0.57           |   |   |   |            | 4.5  |     |     |
| 213M    | 0.5-0.6 | 7.4    | 0.03                          | 0.001 | 0.57                               | 24                   | 49     | 14 | 16 | 37  | 19               | 13               | 0.65            | 0.26           |   |   |   |            | 4.6  |     |     |
| 216M    | 0.8-0.9 | 7.0    | 0.12                          | 0.006 | 0.45                               | 47                   | 35     | 7  | 10 | 34  | 18               | 10               | 0.55            | 0.37           |   |   |   |            | 4.4  |     |     |
| 219M    | 1.1-1.2 | 7.1    | 0.18                          | 0.015 |                                    | 43                   | 40     | 9  | 9  | 29  | 17               | 10               | 0.39            | 0.34           |   |   |   |            | 3.9  |     |     |

| Lab No. | Depth m | Org. C % | Tot. N % | Acid Extr. P ppm | Eicarb P ppm | Repl. K cmol(p <sup>+</sup> ) kg <sup>-1</sup> | Fe D.T.P.A. Extra. ppm | Mn | Cu  | Zn  | B |
|---------|---------|----------|----------|------------------|--------------|--|------------------------|----|-----|-----|---|
| 207M    | BO-0.1  |          |          | 891              | 104          | 1.3  | 25                     | 12 | 0.7 | 0.9 |   |
| 208M    | O-0.1   | 0.8      | 0.06     | 810              | 100          |  |                        |    |     |     |   |



**Lockyer soil profile class.**

*Occurrence:* This soil occurs usually on the narrow 20-40 m levee banks of Lockyer Creek and the lower reaches of Tenthill Creek, and also on the narrow floodplain on 1st terrace in the upstream reaches of major streams.

*Differentiating characteristics:* The major differentiating criteria are their loam to light-clay texture, moderate soil structure and the absence of carbonate at depth in the profile (see Plate VI-II).

*Modal profile:* The Lockyer surface is hardsetting, crusting and cloddy when cultivated. The A1 horizon is a dark (7.5YR3/1-2), loam to light clay with moderate medium granular or blocky structure which becomes structureless and massive under cultivation. The A1 horizon clearly or gradually overlies at 0.25 to 0.5 m a dark (5YR3/1) or brown (7.5YR3/3), clay loam to light clay B horizon which may be moderate medium to very coarse angular blocky or structureless and massive. At 0.4 to 0.9 m the B horizon clearly overlies buried soils or brown (7.5YR4/3) prismatic layers of variable texture or layers of bedload cobbles and stones. Soil reaction trend is neutral to moderately alkaline. The coarser layers are found under soils of the upstream floodplains while the buried soils and brown layers are found under the downstream levee bank soils (Plate VI-II)

*Variants and phases:* Stony variant: these soils carry a 5 to 30% cover of stones and cobbles on their surface and occur on the upper reach floodplains of Tenthill, Creek and its tributaries.

*Classification:* This soil belongs to the prairie soil great soil group; some profiles with weaker structure could be termed minimal prairie soils.

The main PPF's are Um6.11 and Uf6.32.

*Land use:* Lockyer is intensively cropped with a wide range of horticultural and agricultural crops. Fast drainage and low stickiness make field operations easier on this soil profile class. In some flood free locations tree crops such as avocados and pecan nuts are grown but the main crops are fresh market vegetables. Upstream way areas remain as native pastures.

**Cavendish soil profile class.**

*Occurrence:* This soil is often intimately associated with and is similar to the Lockyer SPC. Distribution

of Cavendish however is limited to levees banks and backslopes of the lower reaches of Tenthill Creek and downstream of Lockyer Creek.

*Distinguishing characteristics:* Cavendish is distinguished by its heavier soil texture and presence of carbonate at depth in the profile.

*Modal profile:* Cavendish is similar to Lockyer in most respects except that the subsoil is consistently light to medium clay in texture, medium angular blocky in structure and contains trace to moderate amounts of powdery or concretionary carbonate. It overlies buried soils and brown layers at a depth of 0.6-1.0 m. Soil reaction trend is weakly to moderately alkaline.

*Classification:* This soil classifies as a Chernozem great soil group.

Its PPF's include Gn3.43 and Uf6.32.

*Land use:* Cultivated for a wide range of horticultural and grain crops.

## **2. Soils of the major stream terrace-plains**

### **Lawes soil profile class.**

*Occurrence:* This soil occurs in extensive areas on the Lockyer Creek alluvial plain and to a lesser extent on the Lower Tenthill Creek Terrace. It is usually aligned adjacent to the prior stream levees and infilled channels of the Lockyer Creek and Tenthill Creek terrace. Lawes has a dark, strongly self mulching, seasonally cracking surface (Plate VI-III). The upper horizons are dark medium clays which grade to brown medium clay overlying brown friable silty clay loam to fine sandy clay loam layers at about 1 m depth (Plate VI-IV). Lawes is distinguished from other soil profile classes in having a medium clay A and B horizon to a depth of 0.8 to 1.4 m over brown lighter textured substrate material.

*Modal profile:* The surface is strongly self mulching, granular and seasonally cracking. The Ap horizon is dark (10YR - 7.5YR 3/1-2) medium clay with coarse angular blocky structure or structureless and cloddy under cultivation. This overlies a dark (10YR - 5YR 3/1-2) medium to heavy clay, B horizon with strong fine to medium blocky or lenticular structure. At 0.7 to 1.1 m, the subsoil becomes grey brown (7.5YR - 10YR 4/1-2) or brown (7.5YR - 5YR 4/3) with carbonate accumulations increasing in abundance at its base.

At 0.8 to 1.4 m the B horizon grades to brown moderate to strong prismatic or angular blocky structured friable sandy clay loam to light clay layers. Carbonate may accumulate at the boundary between the B horizon and the brown layers below but usually declines in amount with depth. Soil reaction trend is strongly alkaline.

*Variants:* Stony substrate variant may be found where Lawes overlies a relict stream bed.

*Classification:* Lawes is a black earth (Stace *et al.* 1968) with a PPF of Ug5.15.

*Land use:* This soil is widely cultivated for a wide range of field crops and vegetables which include onions, pumpkins, lucerne, winter and summer cereals, soybeans and crucifers. It is too sticky for some crops such as potatoes.



Plate VI-III. Lawes soil profile class - self mulching surface.



Plate VI-IV. Lawes soil profile class (site 2).

Soil Profile Class: Lawes Map Unit: Lw  
Great Soil Group: Black earth FAO: Fellic Vertisol Site No.: 780  
Parent Material: Quaternary alluvium P.P.F.: Ug 5.1  
Topography: Level alluvial plain of Laidley Creek A.M.G. Ref.: Zone 56, 436925 mE, 6938200 mN  
Air Photo Ref: South Moreton District Flood (1974) Run 7, Photo 5219  
166 mmE, 120mmN  
Vegetation: Cleared and cultivated Location: 5 km SW of Laidley, 0.5 km E of Laidley Ck

Profile Morphology: Surface condition: self mulching, periodic cracking  
 Ap 0 - 0.20 m Brownish black (10YR3/1); medium clay; strong fine blocky; hard slightly moist. Gradual to -  
 B21 0.20 - 0.60 m As above but medium heavy clay and strong fine lenticular. Clear to -  
 B22k 0.60 - 1.2 m Brownish black (5YR3/1); medium clay; strong fine angular blocky; hard slightly moist; small amounts of concretionary carbonate. Gradual to -  
 B31k 1.2 - 1.35 m Brownish black (7.5YR3/2); light medium clay; strong fine angular blocky; slight hard dry; small amounts of concretionary carbonate. Gradual to -  
 2B32 1.35 - 1.5 m Brown (7.5YR4/3); clay loam; moderate coarse prismatic; slightly hard dry.

Laboratory Data:

| Lab No. | Depth<br>m | pH  | E.C. (1:5)<br>mScm <sup>-1</sup> | Cl<br>% | Dispersion<br>Ratio (R <sup>1</sup> ) | C.S. | F.S. | Si | C  | C.E.C. | Ca++ | Mg++ | Na+ | K+   | P    | K   | S     | Moisture %    |   |                       |
|---------|------------|-----|----------------------------------|---------|---------------------------------------|------|------|----|----|--------|------|------|-----|------|------|-----|-------|---------------|---|-----------------------|
|         |            |     |                                  |         |                                       |      |      |    |    |        |      |      |     |      |      |     |       | Exch. Cations | cmol(p <sup>+</sup> ) kg <sup>-1</sup> O.D. | kg <sup>-1</sup> O.D. |
| 5649K   | 0-0.1      | 7.8 | 0.11                             | 0.010   | 0.65                                  | 3    | 10   | 29 | 62 | 63     | 27   | 29   | 1.7 | 0.87 | 0.23 | 1.1 | 0.022 | 7.9           | 52  | 31                    |
| 5651K   | 0.2-0.3    | 7.9 | 0.22                             | 0.024   | 0.66                                  | 3    | 10   | 26 | 70 | 69     | 30   | 29   | 2.6 | 0.47 | 0.21 | 1.0 | 0.021 | 8.2           | 59  | 36                    |
| 5654K   | 0.5-0.6    | 7.8 | 0.77                             | 0.093   | 0.63                                  | 3    | 6    | 27 | 70 | 68     | 27   | 36   | 3.4 | 0.46 | 0.20 | 1.0 | 0.018 | 7.8           | 58  | 36                    |
| 5657K   | 0.8-0.9    | 8.1 | 0.94                             | 0.128   | 0.64                                  | 1    | 13   | 30 | 66 | 67     | 28   | 37   | 4.4 | 0.32 | 0.19 | 0.9 | 0.018 | 7.9           | 56  | 34                    |
| 5660K   | 1.1-1.2    | 8.3 | 0.88                             | 0.102   | 0.70                                  | 1    | 11   | 33 | 61 | 63     | 25   | 37   | 5.1 | 0.25 | 0.18 | 0.9 | 0.010 | 7.5           |   |                       |
| 5663K   | 1.4-1.5    | 8.5 | 0.62                             | 0.072   | 0.70                                  | 3    | 40   | 30 | 33 | 51     | 18   | 29   | 5.1 | 0.23 | 0.21 | 1.0 | 0.006 | 6.3           | 44  | 24                    |

| Lab No. | Depth<br>m | Org. C<br>% | Tot. N | Acid<br>Extr. P ppm | Bicarb<br>ppm | Repl. K<br>cmol(p <sup>+</sup> ) kg <sup>-1</sup> | Fe | Mn | Cu  | Zn  | B | D.T.P.A. Extra. ppm |    |
|---------|------------|-------------|--------|---------------------|---------------|---|----|----|-----|-----|---|---------------------|----|
|         |            |             |        |                     |               |   |    |    |     |     |   | 51                  | 16 |
| 5648    | B0-0.1     | 1.8         | 0.15   | 1050                | 138           | 0.63  | 51 | 16 | 1.9 | 1.7 |   |                     |    |

**Blenheim soil profile class.**

*Occurrence:* This soil is found in extensive areas on the back slopes of the Lockyer Creek alluvial plain, which is a terraced plain.

*Differentiating characteristics:* Blenheim is a dark periodically cracking clay with a moderate to strongly self mulching surface (Plate VI-V). A weak surface crust is commonly found with cultivation.

The soil profile is characterised by medium to heavy clay to at least 1.4 m, and commonly several metres deep (Plate VI-VI). In some places, the upper horizons overlie buried soils of similar texture.

*Modal profile:* The surface is strongly self mulching and seasonally cracking and may be indistinguishable from the Lawes surface. Depth of the self mulching layer varies with condition of cultivation. Some profiles have a tendency to weak crusting under cultivation.

The Ap horizon consists of dark (7.5YR 3/1-2 to 10YR 2/1-2, 3/1-2), medium to heavy clay with coarse angular blocky structure or is structureless cloddy when cultivated. This clearly overlies a dark (7.5YR - 10YR 3/1-2) medium to heavy clay B horizon with moderate medium to coarse angular blocky structure grading to moderate medium to coarse lenticular by 0.6 m. The dark clay may extend to below 1.5 m but commonly overlies grey brown (10YR - 7.5YR 4-5/1-2) or brown (7.5YR 4/3-4) medium to heavy clay. B horizons contain small to moderate amounts of carbonate. Small amounts of manganese concretions may occur in the B horizon, usually below 0.3 m.

Profile soil reaction trend is strongly alkaline.

*Variants and phases:* One variant and several phases of Blenheim have been identified: The Blenheim light variant is in fact a composite soil where a shallow (<0.4 m) layer of light to light-medium clay has been deposited over a typical Blenheim profile or deep Lawes profile to provide a clay profile greater than 1.4 m deep. This soil tends to be weakly crusting and cloddy when cultivated although it commonly becomes weakly self mulching on drying. This variant is usually found on the backslopes of current and prior stream levees of the Lockyer Creek alluvial plain.

In this complex, tongues of grey-brown or brown carbonate rich B horizons extend to the surface the gilgai mound. The depressions have deep dark B horizons, often low in carbonate.

Blenheim - gilgai complex: This complex can only be positively identified in the areas where gilgai microrelief has not been removed by cultivation. The equivalent in cultivated areas is tentatively identified by the abundance of carbonate nodules (>10%) on the surface. It is inferred that the carbonate rich gilgai mounds have been spread out across the surface with levelling by cultivation or other practices.

Blenheim - depression phase: this phase is distinguished by its association with broad shallow depressions on the Lockyer Creek alluvial plain. The surface horizon of this phase may be marked by a degree of brown (rusty) fine mottling in a black matrix colour.

*Classification:* Blenheim is classified as a black earth with PPF's of Ug5.11, Ug5.15 and Ug5.17.

*Land use:* This is widely cultivated for crops which can handle imperfect drainage such as winter and summer cereal grains, soybeans, cotton, beetroot and crucifers.



Plate VI-V. Blenheim surface cracks.



Plate VI-VI. Blenheim soil profile class - gilgai depression.



Soil Profile Class: Blenheim Map Unit: B1 Site No.: A19  
 Great Soil Group: Black earth FAO: Pellic Vertisol Soil Taxonomy: Udic Pellustert P.P.F.: Ug 5.15  
 Parent Material: Quaternary alluvium A.M.G. Ref.: 436 660 mE, 6 947 950 mN  
 Topography: Alluvial plain Air Photo Ref: Southern Moreton District Flood (1974), Run 4, Photo 3412, 143 mmE, 109 mmN  
 Location: Forest Hill - Fern vale Road, 0.3 km NE of Forest Hill

Vegetation:

Profile Morphology: Surface condition: self mulching, periodic cracking

- Ap 0 - 0.2 m Brownish-black (10YR3/1); medium-heavy clay; moderate, medium subangular blocky; hard moist; trace of concretionary carbonate; few very fine roots. Gradual to -
- B21 0.2 - 0.55 m Brownish black (10YR2/1) with 40% medium distinct grey mottle; medium-heavy clay; strong very coarse lenticular breaking to strong very fine lenticular; soft moist; common medium roots. Diffuse to -
- B22 0.55 - 0.75 m Brownish black (10YR3/1) with 10% fine faint dark mottle; medium clay; strong coarse lenticular breadding to strong fine lenticular; soft moist; trace of concretionary carbonate; common medium roots.
- B23k 0.75 - 1.4 m Brown (10YR4/3) with 5% fine prominent dark mottle; medium clay; strong coarse lenticular breaking to strong medium angular blocky; soft moist; moderate amounts of soft and concretionary carbonate; few fine roots. Clear to -
- B31 1.4 - 1.45 m Brown (10YR4/3); silty clay; strong coarse angular blocky breaking to strong medium angular blocky; soft slightly moist; small amounts of soft manganese. Clear to -
- 2B32k 1.45 - 1.8 m Brown (10YR4/3); light-medium clay; strong coarse prismatic breaking to strong medium angular blocky; soft slightly moist; moderate amounts of soft and concretionary carbonate.

Laboratory Data:

| Lab No. | Depth    | pH                 | E.C. (1:5) | Cl                      | Dispersion    | C.S.   | F.S.          | Si                     | C                | C.E.C. | Ca++   | Mg++ | Na+  | K+   | P     | K    | S     | Moisture % |    |    |
|---------|----------|--------------------|------------|-------------------------|---------------|--------|---------------|------------------------|------------------|--------|--------|------|------|------|-------|------|-------|------------|----|----|
| m       | 1:5      | mScm <sup>-1</sup> | %          | Ratio (R <sup>1</sup> ) | Particle Size | % O.D. | Exch. Cations | cmol (p <sup>+</sup> ) | kg <sup>-1</sup> | O.D.   | % O.D. | 1/3  | A.D. | bar  | bar   | bar  | bar   |            |    |    |
| 1574L   | 0-0.1    | 8.5                | 0.09       | 0.002                   | 0.78          | 8      | 18            | 20                     | 58               | 53     | 25     | 27   | 2.6  | 0.84 | 0.096 | 0.78 | 0.025 | 8.0        | 52 | 26 |
| 1576L   | 0.2-0.3  | 8.3                | 0.37       | 0.019                   | 0.64          | 6      | 21            | 18                     | 61               | 59     | 26     | 31   | 3.5  | 0.44 | 0.099 | 0.71 | 0.025 | 9.6        | 56 | 29 |
| 1579L   | 0.55-0.6 | 7.7                | 0.66       | 0.052                   | 0.66          | 3      | 12            | 21                     | 60               | 55     | 17     | 34   | 4.5  | 0.40 | 0.089 | 0.78 | 0.019 | 7.6        | 57 | 29 |
| 1582L   | 0.8-0.9  | 8.5                | 0.72       | 0.057                   | 0.74          | 4      | 17            | 31                     | 49               | 53     | 13     | 37   | 4.5  | 0.24 | 0.108 | 0.71 | 0.013 | 6.2        | 47 | 25 |
| 1585L   | 1.1-1.2  | 8.7                | 0.70       | 0.060                   |               | 2      | 18            | 35                     | 46               | 53     | 11     | 40   | 4.6  | 0.22 | 0.108 | 0.81 | 0.011 | 7.6        |    |    |
| 1588L   | 1.45-1.5 | 8.8                | 0.79       | 0.085                   |               | 2      | 20            | 40                     | 51               | 55     | 9.5    | 42   | 5.5  | 0.22 |       |      |       | 9.9        |    |    |

| Lab No. | Depth  | Org. C % | Tot. N | Acid Extr. P ppm                        | Bicarb | Repl. K | Fe              | Mn  | Cu  | Zn  | B   |
|---------|--------|----------|--------|---|--------|---------|-----------------|-----|-----|-----|-----|
| m       |        |          |        | cmol (p <sup>+</sup> ) kg <sup>-1</sup> | ppm    | ppm     | D.T.P.A. Extra. | ppm | ppm | ppm | ppm |
| 1573L   | B0-0.1 |          |        | 204                                     | 90     | 0.99    | 16              | 71  | 1.5 | 1.2 |     |

Soil Profile Class: Blenheim Map Unit: B1 Site No.: A20  
 Great Soil Group: Black earth FAO: Pellic Vertisol Soil Taxonomy: Udic Pellustert P.P.F.: Ug 5.16  
 Parent Material: Quaternary alluvia A.M.G. Ref.: Zone 56, 435600 mE, 6945950 mN  
 Topography: Level (< 1%) Back plain of terraced alluvial plain of Air Photo Ref.: South Moreton Flood (1974), Run 4, Photo 342, 107mmE, 11mmN  
 Location: Forest Hill, Lockyer Valley, South-east Queensland

Vegetation: Cleared, cultivated

Profile Morphology: Surface: strongly periodically cracking, self mulching

- Ap 0 - 0.15 m Brownish black (7.5YR3/1), medium heavy clay, moderate medium blocky breaking to moderate very fine blocky, very weak moist, few 1-2 mm roots. Clear smooth to -
- B1 0.15 - 0.30 m Brownish black (7.5YR3/1) with 5% 5-15 mm faint grey mottle, medium-heavy clay, strong medium blocky breaking to strong fine blocky, very weak moist, few 1-2 mm roots. Gradual to -
- B21 0.30 - 1.1 m Brownish black (10YR3/1), heavy clay, very weak moist, strong medium lenticular breaking to strong very fine lenticular, few 1-2 mm roots. Gradual to -
- B22k 1.1 - 1.5 m Greyish brown (7.5YR4/2) with 10%, 15-30 mm distinct dark mottle, medium heavy clay, strong coarse lenticular breaking to moderate fine blocky, very weak moist, few 1-2 mm roots, small amounts of concretionary carbonate.

Laboratory Data:

| Lab No. | Depth<br>m | pH  | E.C. (1:5)<br>mScm <sup>-1</sup> | Cl %  | Dispersion<br>Ratio (R <sup>1</sup> ) | C.S. | F.S. | Si | C  | C.E.C. | Ca++ | Mg++ | Na+  | K+   | P     | K    | S     | Moisture %           |   |        |
|---------|------------|-----|----------------------------------|-------|---------------------------------------|------|------|----|----|--------|------|------|------|------|-------|------|-------|----------------------|---|--------|
|         |            |     |                                  |       |                                       |      |      |    |    |        |      |      |      |      |       |      |       | Particle Size % O.D. | Exch. Cations cmol(p <sup>+</sup> ) kg <sup>-1</sup> O.D. | % O.D. |
| 1591L   | 0-0.1      | 8.1 | 0.14                             | 0.009 | 0.64                                  | 6    | 11   | 23 | 62 | 65     | 31   | 33   | 1.3  | 1.5  | 0.105 | 0.82 | 0.036 | 10.1                 | 60  | 31     |
| 1593L   | 0.2-0.3    | 8.1 | 0.23                             | 0.024 | 0.61                                  | 5    | 12   | 20 | 65 | 65     | 32   | 33   | 1.5  | 1.0  | 0.095 | 0.82 | 0.030 | 9.5                  | 59  | 30     |
| 1596L   | 0.5-0.6    | 8.0 | 0.41                             | 0.052 | 0.65                                  | 2    | 9    | 15 | 74 | 71     | 31   | 38   | 0.90 | 0.43 | 0.052 | 0.67 | 0.018 | 12.2                 | 61  | 33     |
| 1599L   | 0.8-0.9    | 8.2 | 0.44                             | 0.051 | 0.70                                  | 3    | 12   | 19 | 70 | 65     | 20   | 41   | 3.5  | 0.44 | 0.054 | 0.75 | 0.020 | 8.5                  | 59  | 31     |
| 1602L   | 1.1-1.2    | 8.5 | 0.53                             | 0.056 |                                       | 3    | 18   | 21 | 61 | 54     | 12   | 37   | 5.6  | 0.37 | 0.072 | 0.79 | 0.015 | 8.1                  |   |        |
| 1605L   | 1.4-1.5    | 9.0 | 0.60                             | 0.068 |                                       | 3    | 18   | 22 | 61 | 54     | 7.0  | 37   | 8.8  | 0.46 |       |      |       | 7.3                  |   |        |

| Lab No. | Depth<br>m | Org. C % | Tot. N % | Acid Extr. P ppm | Bicarb Extr. P ppm | Repl. K cmol(p <sup>+</sup> ) kg <sup>-1</sup> | Fe D.T.P.A. Extra. ppm | Mn  | Cu | Zn |
|---------|------------|----------|----------|------------------|--------------------|--|------------------------|-----|----|----|
|         |            |          |          |                  |                    |  |                        |     |    |    |
| 1590    | B0-0.1     | 244      | 111      | 1.3              | 17                 | 100  | 2.1                    | 0.8 |    |    |



Soil Profile Class: Blenheim - light variant      Map Unit: Lo      Site No.: 781  
 Great Soil Group: Chernozem FA0: Haplic Phaeozem      Soil Taxonomy: Pachic Haplustoll      P.P.F.: Uf 6.32  
 Parent Material: Quaternary alluvium      A.M.G. Ref.: Zone 56, 437050 mE, 6935140 mN  
 Topography: Narrow flood plain (terrace 2) of Laidley Creek      Air Photo Ref: South Moreton District Flood (1974), Run 8, Photo 5278, 82 mmE, 123 mmN  
 Location: 2.7 km N of Mulgowie, 0.25 km east of Laidley Creek

Vegetation: Cleared and cropped

Profile Morphology: Surface condition: recently cultivated, cloddy

- Ap 0 - 0.20 m Brownish black (5YR3/1); silty clay; fragments and clods; soft slightly moist. Clear to -
- B21 0.20 - 0.60 m Brownish black (5YR3/1); light-medium clay; strong fine angular blocky; soft slight moist. Diffuse to -
- B22 0.60 - 1.2 m Brownish black (5YR3/1); medium clay; strong fine lenticular; slightly hard slightly moist. Diffuse to -
- B23 1.2 - 1.4 m Dark reddish brown (5YR3/2); light medium clay; moderate medium prismatic; soft slightly moist. Gradual to -
- B3k 1.4 - 1.6 m Dark reddish brown (5YR3/2); silty clay; moderate medium prismatic; soft slightly moist; trace amounts of soft carbonate.

Laboratory Data:

| Lab No. | Depth<br>m | pH  | E.C. (1:5)<br>mScm <sup>-1</sup> | Cl<br>% | Dispersion<br>Ratio (R <sup>1</sup> ) | C.S. | F.S. | Si | C  | C.E.C.<br>Exch. Cations cmol(p <sup>+</sup> ) kg <sup>-1</sup> O.D. | Ca <sup>++</sup> | Mg <sup>++</sup> | Na <sup>+</sup> | K <sup>+</sup> | P    | K   | S     | Moisture %           |        |      |
|---------|------------|-----|----------------------------------|---------|---------------------------------------|------|------|----|----|---|------------------|------------------|-----------------|----------------|------|-----|-------|----------------------|--------|------|
|         |            |     |                                  |         |                                       |      |      |    |    |   |                  |                  |                 |                |      |     |       | Particle Size % O.D. | % O.D. | A.D. |
| 5665K   | 0-0.10     | 8.1 | 0.11                             | 0.003   | 0.63                                  | 2    | 35   | 29 | 40 | 50  | 26               | 21               | 1.1             | 0.52           | 0.25 | 1.2 | 0.024 | 5.8                  | 40     | 22   |
| 5667K   | 0.20-0.30  | 7.8 | 0.17                             | 0.013   | 0.69                                  | 1    | 38   | 31 | 40 | 49  | 26               | 19               | 1.2             | 0.38           | 0.25 | 1.2 | 0.021 | 5.3                  | 39     | 22   |
| 5670K   | 0.50-0.60  | 7.8 | 0.17                             | 0.013   | 0.67                                  | 1    | 28   | 35 | 46 | 50  | 29               | 20               | 1.3             | 0.39           | 0.23 | 1.2 | 0.015 | 5.7                  | 44     | 25   |
| 5673K   | 0.80-0.90  | 7.8 | 0.26                             | 0.027   | 0.61                                  | 1    | 20   | 32 | 51 | 52  | 31               | 21               | 1.4             | 0.44           | 0.21 | 1.1 | 0.012 | 5.7                  | 47     | 28   |
| 5675K   | 1.1 -1.20  | 7.6 | 0.32                             | 0.035   |                                       | 1    | 27   | 28 | 51 | 57  | 28               | 23               | 1.5             | 0.41           | 0.22 | 1.0 | 0.013 | 6.0                  |        |      |
| 5679K   | 1.4 -1.50  | 7.8 | 0.31                             | 0.032   | 0.58                                  | 1    | 40   | 28 | 41 | 53  | 30               | 20               | 1.4             | 0.29           | 0.21 | 1.0 | 0.011 | 6.7                  | 43     | 23   |

| Lab No. | Depth<br>m | Org. C<br>% | Tot. N<br>% | Acid<br>Extr. P ppm | Bicarb<br>cmol(p <sup>+</sup> ) kg <sup>-1</sup> | Repl. K<br>cmol(p <sup>+</sup> ) kg <sup>-1</sup> | Fe<br>D.T.P.A. Extra. ppm | Mn | Cu  | Zn  | B<br>ppm |
|---------|------------|-------------|-------------|---------------------|--|---|---------------------------|----|-----|-----|----------|
| 5664K   | B0-0.1     | 1.9         | 0.14        | 1174                | 180  | 0.39  | 29                        | 9  | 0.9 | 1.6 |          |

**Flagstone soil profile class.**

*Occurrence:* This soil is associated with back slopes of the alluvial plain adjacent to the surrounding sandstone uplands. It also occurs as the dominant soil of the alluvial plain in the middle reaches of Deep Gully and is a minor component of some local flats out of lower Marburg beds. Flagstone is often found where fans derived from lower Marburg beds have deposited alluvium on the trunk team alluvial plains.

*Differentiating characteristics:* It is distinguished by a weakly crusting, selfmulching dark to grey clay shallow surface soil over grey or yellow-brown alkaline subsoils containing manganese and carbonate segregations. Characteristically the soil is found on the plains under an open forest community of silver-leaved ironbark (*E. melanophloia*), Moreton Bay ash (*E. tessellaris*) and bluegum (*E. tereticornis*).

*Modal profile:* The surface is moderately to strongly self-mulching and seasonally cracking. Soils commonly tend to be crusting under cultivation.

The A horizon consists of dark (10YR 3/1-2) or grey (7.5YR-10YR 4/1-2) light medium to medium clay with moderate medium angular blocky structure. Under cultivation, the immediate surface may be medium to strong medium granular (Ap1) overlying a coarse angular blocky Ap2 horizon. At 0.1 to 0.25 m this clearly or abruptly overlies a grey (7.5YR 4/1, 10YR 4/2, 5/2, 2.5Y 4-5/1-2) or yellow brown (10YR 5/3-4) B horizon with medium to heavy clay texture and moderate to strong medium to coarse blocky structure grading to strong medium to coarse lenticular structure at depth. Yellow or brown mottles are common.

Segregations of carbonate and manganese either occur in trace to small amounts throughout the B horizon or may occur below 0.6 m only. Soil reaction trend of the soil profile is strongly alkaline (pH 8.5 - 9.0).

*Variants:* Flagstone light textured variant: A light textured variant occurs with clay loam to light clay texture which is structureless to cloddy when cultivated. The surface tends to develop a strong crust on drying. This variant is found mainly on the Deep Gully alluvial plain.

Flagstone brown substrate variant: below 0.9-1.2 m a brown (7.5YR 4/3) substrate of coarse sand to sandy clay may be found.

*Classification:* This soil belongs to the grey, brown and red clays great soil group.

Its PPF's include Ug5.24 and Ug5.28.

*Land use:* Soils are used for growing winter and summer cereal grains, soybeans and crucifers.

**Clarendon soil profile class.**

*Occurrence:* Clarendon occurs in the back swamp depression areas on the alluvial plain terraces, particularly along the margins of the alluvia with the uplands.

*Differentiating characteristics:* This soil is distinguished by its clay texture to depth (>1.4 m), its landscape position, and the presence of mottles in the profile in a grey or black matrix (Plate VI-VII). Subsoils are dark to grey and neutral to alkaline.

The land surface is characterised by moderate to strong gilgai microrelief, reeds, standing water and a blue gum (*Eucalyptus tereticornis*) open forest.

*Modal profile:* The surface is covered by a fibrous mat of vegetation up to 5 cm thick which seasonally cracks. Any drained, cleared and cultivated areas of this soil show strong self-mulching with a weak surface crust.

The A1 horizon is dark (10YR 3/1) to grey (10YR 4/1) usually with a distinct fine brown mottling, medium to heavy clay texture and moderate medium to coarse angular blocky structure occasionally overlying a sporadically bleached A2 horizon at 0.05 to 0.2 m.

The A1 or A2 horizons are abruptly or clearly underlain by dark (7.5YR - 10YR 2/1, 3/1, 3/2) or grey (7.5YR - 10YR 4/1-2, 2.5Y 4-5/1), medium to heavy clay with moderate to strong medium to coarse lenticular structure. If the subsoil is dark in colour, it usually overlies lenticular grey clay by 0.5-0.8 m. Subsoils are commonly yellow or brown mottled in small amounts (5-10%) and usually extend to greater than 1.5 m deep.

Manganese and ferromangiferous segregations occur in trace to small amounts, often throughout the whole profile, and usually in the upper horizons. Carbonate may occur in trace to small amounts below 0.4 m. Soil reaction is moderately to slightly acid (pH 6.0-6.5) in the surface, becoming either neutral (pH 7.0-8.0) in carbonate free subsoils, or strongly alkaline (pH 8.5 - 9.0) in subsoils containing carbonate. There are no consistent profile differences between gilgai mounds and depressions.

*Variants:* A shallow variant is found. This soil overlies a mottled brown or grey brown substrate of sandy clay loam to sandy clay at about 1 m. The solum usually has a neutral soil reaction trend and is carbonate

free.

*Classification:* This soil profile class ranges in morphology from a wiesenboden (mottled dark clay) to a grey clay. The current concepts of these two great soil groups are not adequate in this situation.

PPF's are Ug5.16 and Ug5.24.

*Land use:* Clarendon is mainly used as native pasture land. It has a high moisture retention and poor site drainage which means that pastures will persist on it well into the dry season. Clarendon cannot be safely cultivated unless drainage works are implemented.

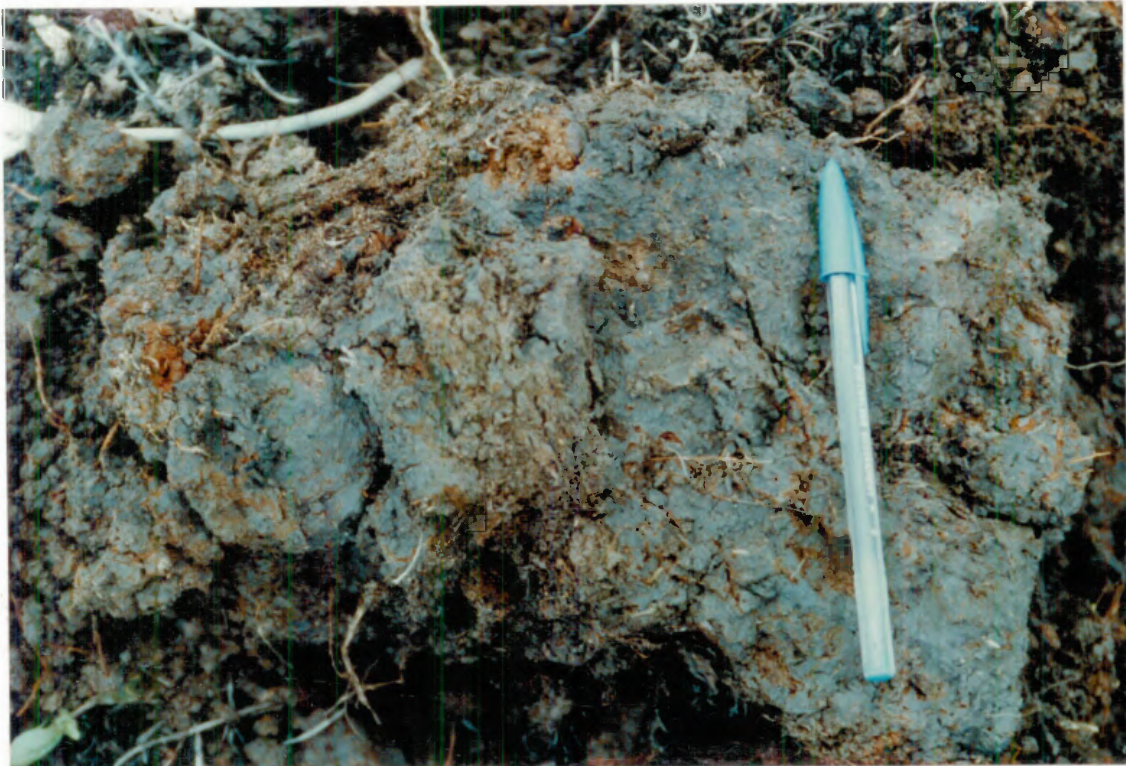


Plate VI-VII. Clarendon soil profile class - characteristic surface mottle.

Soil Profile Class: Clarendon Map Unit: C1  
 Great Soil Group: Wiesenboden Soil Taxonomy: Udothentic Chromustert  
 Parent Material: Quaternary alluvium A.M.G. Ref.:  
 Topography: Broad back swamp depression of alluvial plain (<0.5%) Air Photo Ref:  
 Location: Approx. 1 km SW of Lawes siding (now Fitzgerald's dam site)

Vegetation: Open forest of bluegums with dense grown cover dominated by paspalum, blue grasses and water sedges.

Profile Morphology: Surface: moderate nuram  $\alpha$  gilgai - moundsite; periodic cracking.

A1 0 - 0.1 m Greyish brown (7.5YR4/2) with 20% fine brown mottle; medium clay; moderate fine subangular blocky; slightly hard moist. Clear to -

B21 0.1 - 0.43 m Brownish black (7.5YR3/1) with 2% faint brown mottle; medium clay; strong coarse blocky breaking to fine blocky; slightly hard moist; trace of soft manganese. Gradual to -

B22 0.43 - 0.70 m Greyish yellow brown (10YR4/2) with 5% faint brown mottle; medium clay; moderate coarse lenticular breaking to fine lenticular; slightly hard moist; trace of concretionary manganese. Diffuse to -

B23k 0.70 - 1.3 m Yellowish grey (2.5YR4/1); medium clay; moderate coarse lenticular; slightly hard moist; moderate amounts of concretionary carbonate. Diffuse to -

B24kn 1.3 - 1.7 m Greyish yellow brown (10YR4/2) with 5% faint brown mottle; medium clay; strong coarse lenticular breaking of fine lenticular; slightly hard moist; moderate amounts of concretionary carbonate and small amounts of concretionary manganese.

Laboratory Data:

| Lab No. | Depth m | pH 1:5 | E.C. (1:5) mScm <sup>-1</sup> | Cl % | Dispersion Ratio (R <sup>1</sup> ) | C.S. Particle Size % O.D. | F.S. Particle Size % O.D. | Si | C  | C.E.C. Exch. Cations cmol(p <sup>+</sup> ) kg <sup>-1</sup> O.D. | Ca++ | Mg++ | Na+ K+ | P    | K     | S    | Moisture % 1/3 bar | 15 bar |    |    |
|---------|---------|--------|-------------------------------|------|------------------------------------|---------------------------|---------------------------|----|----|--|------|------|--------|------|-------|------|--------------------|--------|----|----|
| 1655L   | 0-0.1   | 5.4    | 0.13                          | 90   | 0.56                               | 9                         | 2                         | 24 | 61 | 44   | 8.5  | 11   | 2.6    | 0.70 | 0.053 | 0.97 | 0.05               | 5.6    | 54 | 28 |
| 1657L   | 0.2-0.3 | 5.5    | 0.21                          | 270  | 0.99                               | 4                         | 8                         | 24 | 51 | 37   | 7.0  | 9.7  | 3.9    | 0.34 | 0.04  | 0.86 | 0.02               | 4.3    | 42 | 22 |
| 1660L   | 0.5-0.6 | 5.9    | 0.61                          | 910  | 0.99                               | 9                         | 7                         | 4  | 57 | 8.2  | 8.2  | 13   | 8.9    | 0.27 | 0.02  | 0.78 | 0.01               | 5.0    | 50 | 24 |
| 1663L   | 0.8-0.9 | 8.0    | 0.57                          | 950  | 0.99                               | 5                         | 5                         | 16 | 63 | 57   | 14   | 28   | 15     | 0.36 | 0.03  | 0.73 | 0.01               | 6.9    | 61 | 31 |
| 1666L   | 1.1-1.2 | 9.3    | 0.64                          | 760  | 0.90                               | 10                        | 5                         | 19 | 62 | 50   | 12   | 25   | 13     | 0.47 | 0.03  | 0.87 | 0.01               | 5.4    |    |    |
| 1669L   | 1.4-1.5 | 8.3    | 0.44                          | 600  | 0.90                               | 6                         | 5                         | 21 | 65 | 47   | 12   | 21   | 13     | 0.47 | 0.04  | 0.95 | 0.01               | 6.0    | 58 | 27 |

| Lab No. | Depth m | Org. C % | Tot. N % | Acid Extr. P ppm | Bicarb P ppm | Repl. K cmol(p <sup>+</sup> ) kg <sup>-1</sup> | Fe D.T.P.A. Extra. ppm | Mn  | Cu  | Zn  | B ppm |
|---------|---------|----------|----------|------------------|--------------|--|------------------------|-----|-----|-----|-------|
| 1655L   | 0-0.1   |          | 0.32     | 6                | 30           | 0.53   | 342                    | 118 | 1.7 | 3.0 |       |
| 1656L   | 0.1-0.2 | 2.3      | 0.32     | 2                | 11           | 0.35   |                        |     |     |     |       |



**Sippel soil profile class.**

*Occurrence:* This soil is mainly found on the terraced plain of the Deep Gully tributary of Tenthill Creek.

*Differentiating characteristics:* It is distinguished by a fine sandy loam to sandy clay loam surface texture and a sharp break at 0.15-0.3 m to a brown to grey-brown clay subsoil of strong prismatic structure.

*Modal profile:* The surface is hardsetting. The A1 horizon is a dark (7.5YR - 5YR 3/1-2) fine sandy loam to sandy clay loam with weak fine granular structure which becomes grey brown (7.5YR 4/2) massive and cloddy on cultivation. This clearly or gradually overlies at 0.1 to 0.2 m a massive brown (7.5YR 4/3-4) A2 horizon of clayey sand to sandy clay loam. A sporadic bleach occasionally occurs at the base of the A2 horizon.

At 0.15 to 0.45 m the A2 horizon is abruptly or clearly underlain by a brown to grey brown (5YR 4/4, 7.5YR 4/2, 4/3, 5/3) occasionally mottled light-medium clay to medium-heavy clay with strong prismatic structure. Trace amounts of concretionary manganese commonly occur in the lower B horizon. At 0.6 m or deeper, the B horizon is underlain by buried soils or layers of contrasting texture and colour.

Profile soil reaction trend is neutral (pH 6.7-7.3) to weakly alkaline (pH 7.5-8.0).

*Variants:* Surface texture may be sandy loam.

Carbonate may occur in alkaline (pH 8.2-8.7) lower B horizon.

*Classification:* This soil does not clearly fit into any of the great soil groups but does have strong affinities with the red-brown earths.

*Land use:* Sippel is used for limited dryland cultivation and native pasture. It has not been greatly cropped because of the absence of underground water of suitable quality for irrigated agriculture.

Soil Profile Class: Sippel Map Unit: Si Site No.: A26  
 Great Soil Group: Affinities with red-brown earth Soil Taxonomy: Aquic Paleustalf P.P.F.: Db2.12  
 Parent Material: Quaternary alluvium A.M.G. Ref.: Zone 56, 425650 mE, 6945050 mN  
 Topography: Flat alluvial plain Air Photo Ref.: South Moreton District Flood 1974, Run 5, Photo 3538, 45 mmE, 118 mmN  
Location: 30 m east of Deep Gully, east of Ropely Road - Deep Gully connection road intersection  
 Vegetation: Open forest of Moreton Bay ash, silver-leaved ironbark and bluegum

Profile Morphology: Surface condition: hardsetting

- A1 0 - 0.2 m Brownish black (7.5YR3/2); fine sandy loam, weak fine granular; slightly hard slightly moist; common fine roots. Gradual to -
- A2 0.2 - 0.42 m Brown (7.5YR4/3); clayey sand; massive; slightly hard slightly moist; few fine roots. Abrupt to -
- B2t 0.42 - 1.22 m Brown (7.5YR4/3) with 30% medium faint grey mottle; fine sandy light-medium clay; strong coarse prismatic breaking to moderate medium blocky; slightly hard slightly moist; trace of soft manganese; patchy argillans. Abrupt to -
- D1 1.22 - 1.36 m Brown (7.5YR4/4); clayey sand; single grain; soft slightly moist; few fine roots; trace of soft manganese. Abrupt to -
- D2 1.36 - 1.47 m Brown (7.5YR4/3); fine sandy clay; moderate medium angular blocky; extremely hard dry; few fine roots; trace of soft manganese. Gradual to -
- 4Ab 1.47 - 1.8 m Brownish black (10YR3/1) with 2% fine faint brown mottle; light-medium clay; strong coarse prismatic; very hard dry; few fine roots.

Laboratory Data:

| Lab No. | Depth<br>m | pH  | E.C. (1:5)<br>mScm <sup>-1</sup> | Cl %  | Dispersion<br>Ratio (R <sup>1</sup> ) | C.S. Particle Size % | F.S. Particle Size % | Si | C  | C.E.C. Exch. Cations | Ca++ | Mg++ | Na+ K+ | P   | K     | S    | Moisture % |     |    |    |  |
|---------|------------|-----|----------------------------------|-------|---------------------------------------|----------------------|----------------------|----|----|----------------------|------|------|--------|-----|-------|------|------------|-----|----|----|--|
|         |            |     |                                  |       |                                       |                      |                      |    |    |                      |      |      |        |     |       |      | 1/3        | 15  |    |    |  |
| 01688L  | 0-0.1      | 6.0 | 0.03                             | 0.001 | 0.39                                  | 29                   | 40                   | 15 | 15 | 16                   | 7    | 3    | 0.1    | 0.8 | 0.053 | 1.06 | 0.022      | 1.9 | 24 | 8  |  |
| 01690L  | 0.2-0.3    | 6.1 | 0.01                             | 0.001 | 0.91                                  | 36                   | 39                   | 10 | 12 | 8                    | 5    | 2    | 0.1    | 0.4 | 0.036 | 1.07 | 0.010      | 1.2 | 16 | 5  |  |
| 01693L  | 0.5-0.6    | 7.1 | 0.02                             | 0.001 | 0.63                                  | 23                   | 30                   | 10 | 33 | 24                   | 15   | 7    | 0.2    | 0.6 | 0.081 | 1.15 | 0.012      | 3.7 | 29 | 15 |  |
| 01696L  | 0.8-0.9    | 7.6 | 0.02                             | 0.002 | 0.66                                  | 26                   | 32                   | 10 | 27 | 23                   | 13   | 8    | 0.2    | 0.4 | 0.059 | 1.15 | 0.009      | 3.3 | 26 | 12 |  |
| 01699L  | 1.1-1.2    | 7.8 | 0.02                             | 0.001 |                                       | 38                   | 30                   | 9  | 19 | 19                   | 11   | 7    | 0.1    | 0.4 | 0.054 | 1.04 | 0.008      | 2.8 |    |    |  |
| 01701L  | 1.47-1.5   | 7.9 | 0.03                             | 0.001 |                                       |                      |                      |    |    |                      |      |      |        |     |       |      |            |     |    |    |  |

| Lab No. | Depth<br>m | Org. C % | Tot. N % | Acid Extr. P ppm | Bicarb P ppm | Repl. K cmol(p <sup>+</sup> ) kg <sup>-1</sup> | Fe D.T.P.A. | Mn Extra. | Cu ppm | Zn ppm | B ppm | 43   |    |
|---------|------------|----------|----------|------------------|--------------|--|-------------|-----------|--------|--------|-------|------|----|
|         |            |          |          |                  |              |  |             |           |        |        |       | 0.78 | 71 |
| 01687L  | B0-0.1     |          |          | 60               |              | 43   | 0.78        | 71        | 75     | 1.0    | 5.4   |      |    |

**Tenthill soil profile class.**

*Occurrence:* Tenthill is the major upstream soil on the main terrace of Tenthill creek and its major tributaries and downstream occurs on the relict levees of prior streams on the Lockyer Creek alluvial plain.

*Differentiating characteristics:* It is distinguished as a shallow gradational soil profile <70 cm deep (Plate VI-VIII) with a cloddy dark to brown surface under cultivation, and a brown friable to weakly self mulching horizon (Plate VI-IX) It is usually light to light-medium clay texture at the surface grading to a medium clay subsoil.

*Modal profile:* This soil has a crusting, cloddy to weakly self- mulching surface. The Ap horizon consists of dark (7.5YR 3/1-2) to brown (7.5YR 3/3), cloddy light to light-medium clay which overlies a moderate to strong medium lenticular or angular blocky, brown (7.5YR 3/3 - 4/3) medium clay B horizon, usually with trace to small amounts of carbonate at its base. At 0.4-0.7 m the solum grades to brown (7.5 YR 4/3 - 4/4), silty clay loam or fine sandy clay loam layers of prismatic structure and friable (slightly hard) consistence when slightly moist. Textures of the layers may vary from clay loams to light clays and be fine sandy loam at depth. Gravel layers may also be encountered below the solum. Soil reaction trend is to moderately alkaline conditions at depth.

*Phases and variants:* Stony phase: In upstream tributary reaches, a stony surface phase of Tenthill is commonly encountered. Two variants have been observed:

Tenthill - light variant: where the surface texture is clay loam and extremely cloddy under cultivation and clearly overlies a red brown medium clay subsoil, i.e. it is a texture contrast soil. This variant is found on the prior stream levees downstream of Gatton.

Tenthill - heavy variant: where the surface texture is medium to heavy clay and surface condition is strongly self mulching and cracking when dry. This variant is located on relict levees on the backslopes of the lower Tenthill Creek alluvial plain or on the second terrace of the middle reaches of Tenthill Creek.



Plate VI-VIII. Tenthill soil profile class - light textured variant (site 3).



Plate VI-IX. Tenthill soil profile class - surface crust.

Soil Profile Class: Tenthill Map Unit: Te Site No.: E10  
 Great Soil Group: Black earth - chernozem integrate Soil Taxonomy: Vertic Haplustoll P.P.F.: Ug 5.15  
 Parent Material: Quaternary alluvium FAO: Haplic Chernozem A.M.G. Ref.: Zone 56, 422950 mE, 6942825 mN  
 Topography: Level terrace Air Photo Ref: South Moreton District Flood 1974, Run 5, Photo 3540, 99 mmE, 25 mmN

Location: 0.68 km east of Lower Tenthill

Vegetation: Cleared and cultivated; formerly Eucalypt open forest.

Profile Morphology: Surface condition: cultivated and cloddy, periodically cracking

Ap 0 - 0.20 m Dark reddish brown (5YR3/2); light-medium clay; cloddy and massive; soft moist; few very fine roots. Abrupt way to -  
 B21 0.20 - 0.50 m Dark reddish brown (5YR3/3); light-medium clay; strong fine blocky; soft moist; few very fine roots. Gradual to -  
 B22 0.50 - 0.65 m As above but silty clay. Gradual to -  
 B3k 0.65 - 0.75 m Brown (7.5YR4/3); silty clay; massive; soft moist; trace amounts of concretionary and soft carbonate. Gradual to -  
 D1 0.75 - 0.90 m As above but no carbonate. Gradual to -  
 D2 0.90 - 1.0 m As above but blocky structure. Gradual to -  
 D31 1.0 - 1.3 m As above but massive. Gradual to -  
 D32 1.3 - 1.45 m As above but silty clayloam. Clear to -  
 D4 1.45 - 1.5 m As above but fine sandy loam.

Laboratory Data:

| Lab No. | Depth<br>m | pH  | E.C. (1:5)<br>mScm <sup>-1</sup> | Cl    | Dispersion              | C.S.          | F.S. | Si   | C             | C.E.C.                | Ca++             | Mg++ | Na+  | K+   | P | K | S | Moisture %<br>A.D. bar |
|---------|------------|-----|----------------------------------|-------|-------------------------|---------------|------|------|---------------|-----------------------|------------------|------|------|------|---|---|---|------------------------|
|         |            | 1:5 |                                  | %     | Ratio (R <sup>1</sup> ) | Particle Size | %    | O.D. | Exch. Cations | cmol(p <sup>+</sup> ) | kg <sup>-1</sup> | O.D. | %    | O.D. |   |   |   |                        |
| 176M    | 0-0.1      | 7.0 | 0.24                             | 0.025 | 0.34                    | 4             | 22   | 23   | 48            | 42                    | 19               | 14   | 0.63 | 2.6  |   |   |   | 4.9                    |
| 178M    | 0.2-0.3    | 7.0 | 0.32                             | 0.034 | 0.23                    | 2             | 23   | 27   | 55            | 54                    | 26               | 19   | 0.85 | 1.5  |   |   |   | 6.6                    |
| 181M    | 0.5-0.6    | 7.3 | 0.23                             | 0.018 | 0.32                    | 1             | 27   | 32   | 45            | 56                    | 29               | 18   | 0.94 | 1.3  |   |   |   | 7.0                    |
| 184M    | 0.8-0.9    | 7.4 | 0.21                             |       | 0.59                    | 3             | 47   | 25   | 31            | 52                    | 27               | 17   | 0.95 | 0.95 |   |   |   | 6.4                    |
| 187M    | 1.1-1.2    | 7.6 | 0.21                             |       |                         | <1            | 47   | 30   | 30            | 48                    | 26               | 16   | 0.85 | 0.77 |   |   |   | 6.2                    |
| 190M    | 1.45-1.5   | 7.6 | 0.12                             |       | 0.31                    | 13            | 61   | 14   | 16            | 45                    | 25               | 15   | 0.95 | 1.0  |   |   |   | 5.4                    |

| Lab No. | Depth<br>m | Org. C<br>% | Tot. N<br>% | Acid<br>Extr. P | Bicarb<br>ppm | Repl. K<br>cmol(p <sup>+</sup> ) | kg <sup>-1</sup> | Fe  | Mn  | Cu  | Zn | B<br>ppm |
|---------|------------|-------------|-------------|-----------------|---------------|----------------------------------|------------------|-----|-----|-----|----|----------|
|         |            |             |             |                 |               | D.T.P.A. Extra.                  |                  | ppm |     |     |    |          |
| 175M    | B0-0.1     |             |             | 819             | 270           | 2.2                              | 43               | 22  | 2.3 | 2.3 |    |          |
| 176M    | 0.0.1      | 1.4         | 0.11        | 900             | 305           | 2.3                              |                  |     |     |     |    |          |

Soil Profile Class: Tenthill Map Unit: Te Site No.: CAC 55  
Great Soil Group: Black earth FAO: Chromic Vertisol Soil Taxonomy: Udic Chromustert P.P.F.: Ug 5.15  
Parent Material: Quaternary alluvium A.M.G. Ref.: Zone 56, 433000 mE, 695175 mN  
Topography: Gently sloping (1%) relic levee on extensive alluvial plain of Lockyer Creek Air Photo Ref: South Moreton District Flood (1974) Run 3, Photo 3393, 37 mNE, 129 mmN  
Vegetation: Cleared, with a few Moreton Bay ash trees remaining. Location: Eastern end of Soutter Block, Queensland Agricultural College

Profile Morphology: Surface: weakly crusting, moderately self mulching, periodic cracking.

- Ap 0 - 0.17 m Brownish black (7.5YR2/2) with 15% coarse brown mottle; medium clay; massive, cloddy; hard moist. Clear to -
- B 0.17 - 0.60 m Dark brown (7.5YR3/4) with 10% moderate dark mottle; medium clay; strong coarse lenticular breaking to moderate medium blocky; macropores common on ped surfaces; soft moist. Gradual to -
- D1k 0.60 - 1.40 m Brown (7.5YR4/3); fine sandy clay; strong coarse prismatic; discontinuous dark to dark brown argillans; macropores common through peds; soft moist; small amounts of concretionary carbonate. Gradual to -
- D2 1.40 - 1.50 m+ Brown (7.5YR4/3); fine sandy clay; strong coarse prismatic; soft (moist); small amounts of rounded basaltic gravel.

Laboratory Data:

| Lab No. | Depth m | pH 1:5 | E.C. (1:5) mScm <sup>-1</sup> | Cl % | Dispersion Ratio (R <sup>1</sup> ) | C.S. Particle Size % O.D. | F.S. Si C | C.E.C. Ca++ | Mg++ | Na+ K+ | P  | K    | S    | Moisture % 1/3 A.D. bar | 15 bar |       |     |
|---------|---------|--------|-------------------------------|------|------------------------------------|---------------------------|-----------|-------------|------|--------|----|------|------|-------------------------|--------|-------|-----|
| 6857L   | 0-0.1   | 7.4    | 0.10                          | 60   | 0.53                               | 9                         | 30        | 16          | 49   | 31     | 15 | 0.90 | 0.67 | 0.111                   | 0.91   | 0.021 | 4.8 |
| 6859L   | 0.2-0.3 | 6.9    | 0.09                          | 80   | 0.54                               | 9                         | 24        | 13          | 57   | 43     | 16 | 1.3  | 0.48 | 0.083                   | 0.88   | 0.017 | 7.4 |
| 6862L   | 0.5-0.6 | 7.8    | 0.10                          | 70   | 0.50                               | 10                        | 32        | 14          | 48   | 41     | 21 | 1.6  | 0.41 | 0.097                   | 0.75   | 0.016 | 6.7 |
| 6865L   | 0.8-0.9 | 8.1    | 0.08                          | 70   | 0.47                               | 6                         | 55        | 13          | 28   | 41     | 21 | 1.7  | 0.50 | 0.119                   | 0.85   | 0.011 | 6.1 |
| 6868L   | 1.1-1.2 | 8.1    | 0.12                          | 110  |                                    | 12                        | 51        | 14          | 26   | 38     | 20 | 1.6  | 0.61 | 0.112                   | 0.88   | 0.009 | 5.0 |
| 6871L   | 1.4-1.5 | 8.0    | 0.12                          | 150  | 0.74                               | 44                        | 28        | 9           | 21   | 28     | 14 | 1.0  | 1.7  | 0.116                   | 0.75   | 0.006 | 4.4 |

| Lab No. | Depth m | Org. C % | Tot. N % | Acid Extr. P ppm | Bicarb ppm | Repl. K cmol(p <sup>+</sup> ) kg <sup>-1</sup> | Fe D.T.P.A. | Mn Extra. | Cu ppm | Zn ppm | B ppm |
|---------|---------|----------|----------|------------------|------------|--|-------------|-----------|--------|--------|-------|
| 6857L   | 0-0.1   | 1.1      | 0.08     | 201              | 157        | 0.61   | 47          | 9         | 1.4    | 1.3    |       |
| 6858L   | 0.1-0.2 | 1.0      | 0.08     | 196              | 125        | 0.46   |             |           |        |        |       |

**Hooper soil profile class.**

*Occurrence:* This is a weakly crusting, self mulching (Plate VI-X) dark (7.5YR 3/1-2) to dark brown (7.5YR 3/3) clay associated with prior stream and relict levee deposits on the wide alluvial plain.

*Differentiating characteristics:* It is distinguished from other soils by its light to light medium clay texture profile to about 1 m over a lighter textured friable brown substrate.

*Modal profile:* This soil is characterised by weakly crusting self mulching surface (cultivated) with dark (7.5YR 3/1-2) to dark brown (7.5YR 3/3) light to light-medium to medium clay cloddy Ap horizon over moderate fine to medium angular blocky or lenticular structured B horizon. The lower B horizon contains trace to small amounts of carbonate, clearly overlying at 0.8 to 1.3 m brown (7.5YR 4/3, 5YR 4/2) fine sandy clay loam to light clay with moderate to strong medium prismatic or blocky structure. Soil reaction trend is moderately to strongly alkaline.

*Classification:* This soil classifies at an intergrade between the black earth and chernozem great soil groups. It is generally too lightly textured and weakly cracking and self-mulching for a black earth. However it is also too heavy a texture to be a typical chernozem.

PPF's for Hooper include Ug5.15 and Uf6.31.

*Land use:* This soil is widely cropped as it is well drained yet has a high plant available water capacity. Crops grown include all the common crops of the district.



Plate VI-X. Hooper soil profile class - surface crust.



### 3. Soils of the major stream elevated terraces, fans and pediments

#### **Leschke soil profile class.**

*Occurrence:* This soil is found in small areas associated with minor drainage lines which occur at the margins of the extensive Lockyer Creek alluvial plain (equivalent to the main terrace). Its position is slightly elevated (0.5-1.0 m) above the alluvial plain and it gently slopes (<2%) down to the alluvial plain.

*Differentiating characteristics:* It is distinguished from other grey clays by its crusting, weakly self mulching surface marginal cracking behaviour and lack of stones or cobbles.

*Modal profile:* Soils are typically gilgaied with the mounds occupying a greater area than the depressions, but no significant differences in morphology are observed between mound and depression profiles.

The A1 horizon has a dark (10YR 3/1, 3/2) or grey (7.5YR 4/1-2) colour, light-medium to medium clay texture and moderate medium to coarse blocky structure. This clearly overlies a grey (10YR 4/2, 5/2, 6/2, 6/1, 6/3) medium to heavy clay B horizon which has moderate coarse angular blocky structure grading to moderate very coarse lenticular structure and strong slickenside development with depth. B horizons extend to greater than 1.5 m deep. Fine yellow or brown mottling may occur in the B horizons and trace to small amounts of concretionary manganese are common in the B horizon. Trace to small amounts of carbonate are also common as are small amounts of rose quartz sand and gravel.

Lenses of very fine rose quartz sandy may be found on slickenside faces in the lower B horizon. Soil reaction trends are strongly alkaline to 1 m deep but may become neutral by 1.5 m.

*Classification:* This soil belongs to the grey, brown and red clays great soil group. However its cracking surface behaviour is less than typical of this group. The PPF's include Ug5.24 and Uf6.33.

*Land use:* This soil is of limited area and is only used for native pasture.

Soil Profile Class: Leshke Site No.: A23  
Great Soil Group: Grey clay FAO: Chromic Vertisol  
Parent Material: Old alluvia Soil Taxonomy: Udothentic Chromustert  
P.P.F.: Ug 5.2  
A.M.G. Ref.: Zone 56 439500 mE, 6950450 mN  
Topography: 0.5% slope. Narrow slightly elevated area at interface of uplands and alluvial plain. Microrelief of nuram B gilgai (mount > depression) with 0.4 m vertical interval and 8 m wavelength Air Photo Ref.: South Moreton Flood (1974), Run 3, photo 3389, 145 mmE 111 mmN  
Vegetation: Low (< 1 m) regrowth of brigalow (Acacia harpophylla) Location: 200 m SE of Forest-Hill - Glenore Grove Road, 0.7 km of Warrego Highway

Profile Morphology: Surface: hardsetting, crusting and occasional cracking (1 per 1-2 m<sup>2</sup>); gilgai mound site  
**A1** 0 - 0.13 m Brownish black (10YR3/1), light-medium clay, moderate medium to coarse blocky; hard, slightly moist, many 2-5 mm roots. Clear way to -  
**B21** 0.13 - 0.70 m Greyish yellow brown (10YR5/2); medium clay; moderate coarse blocky; very hard slightly moist; many 2-5 mm roots. Gradual smooth to -  
**B22** 0.70 - 0.90 m Greyish yellow brown (10YR6/2) with 2% fine distinct yellow mottle; medium clay; moderate very coarse blocky and lenticular; strong slickenside development; very hard slightly moist; 2-15% round quartz gravel; common < 1 mm roots. Gradual smooth to -  
**B23n** 0.90 - 1.80 m Brownish grey (10YR6/1); medium clay; lenses of a very fine quartzitic sand; moderate very coarse lenticular breaking to moderate coarse blocky; strong slickenside development; hard slightly moist; small amounts of concretionary manganese; 2-15% round quartz gravel, few < 1 mm roots.

Laboratory Data:

| Lab No. | Depth<br>m | pH  | E.C. (1:5)<br>mScm <sup>-1</sup> | Cl<br>% | Dispersion<br>Ratio (R <sup>1</sup> ) | C.S. | F.S. | Si | C  | C.E.C. | Ca++ | Mg++ | Na+  | K+  | P     | K    | S     | Moisture %    |        |
|---------|------------|-----|----------------------------------|---------|---------------------------------------|------|------|----|----|--------|------|------|------|-----|-------|------|-------|---------------|--------|
|         |            |     |                                  |         |                                       |      |      |    |    |        |      |      |      |     |       |      |       | Particle Size | % O.D. |
| 1639L   | 0-0.1      | 6.2 | 0.24                             | 0.031   | 0.54                                  | 21   | 23   | 21 | 33 | 21     | 11.0 | 8.2  | 1.2  | 2.2 | 0.05  | 0.91 | 0.041 | 3.5           | 32     |
| 1641L   | 0.2-0.3    | 8.3 | 0.90                             | 0.131   | 0.96                                  | 20   | 23   | 17 | 40 | 28     | 9.0  | 12   | 0.60 | 5.8 | 0.023 | 0.83 | 0.019 | 3.7           | 34     |
| 1644L   | 0.5-0.6    | 7.6 | 1.5                              | 2.23    | 0.99                                  | 15   | 18   | 17 | 46 | 28     | 6.1  | 13   | 0.69 | 8.1 | 0.013 | 0.85 | 0.014 | 3.7           | 18     |
| 1647L   | 0.8-0.9    | 6.6 | 1.3                              | 2.18    | 0.97                                  | 15   | 19   | 20 | 46 | 28     | 4.4  | 14   | 0.66 | 9.0 | 0.014 | 0.84 | 0.012 | 4.0           | 36     |
| 1650L   | 1.1-1.2    | 7.1 | 1.2                              | 1.85    |                                       | 20   | 20   | 17 | 39 | 25     | 3.0  | 12   | 0.63 | 8.7 | 0.017 | 0.84 | 0.011 | 3.3           | 18     |
| 1653L   | 1.4-1.5    | 7.3 | 1.2                              | 1.90    |                                       | 21   | 22   | 14 | 40 | 25     | 2.5  | 12   | 0.59 | 8.8 |       |      |       |               |        |

| Lab No. | Depth<br>m | Org. C<br>% | Tot. N | Acid<br>Extr. P ppm | Bicarb<br>ppm | Repl. K<br>cmol(p <sup>+</sup> ) kg <sup>-1</sup> | Fe | Mn | Cu  | Zn  | B | D.T.P.A. Extra. ppm |     |
|---------|------------|-------------|--------|---------------------|---------------|---|----|----|-----|-----|---|---------------------|-----|
|         |            |             |        |                     |               |   |    |    |     |     |   | ppm                 | ppm |
| 1638L   | BO-0.1     |             |        | 41                  | 31            | 0.72  | 27 | 20 | 0.6 | 0.8 |   |                     |     |

**Woodbine soil profile class.**

*Occurrence:* Woodbine occurs along the margins of Tenthill Creek or its tributaries as elevated terraces, fans and pediments (5-10% slopes) which may be strongly dissected.

*Differentiating characteristics:* It has a cobbly or stony surface, and strongly self mulching dark clay surface over grey clay subsoil over cobbly brown layers at variable depth (Plate VI-XI).

A high positioned variant of Woodbine lies directly over sandstone and has no buried brown cobbly layer.

*Modal profile:* The surface of this soil shows moderate to strong self mulching characteristics and has seasonal cracking. Gilgai patterns are incipient with a relative relief or less than 0.2 m. Woodbine usually has a cobble or stone component on its surface.

The A1 horizon consists of dark (10YR 3/1 - 3/2) or grey (10YR 4/1) medium clay over moderate medium blocky structure if undisturbed or is cloddy and fragmented if cultivated. This is clearly underlain at 0.1 - 0.35 m by a grey (10YR 4/2, 5/2, 5/3, 2.5Y 6/2) medium to heavy clay B horizon with moderate medium angular blocky structure, which gradually becomes moderate coarse lenticular with strong slickenside development at depth. A degree of yellow mottling is common below 0.6 m. Carbonate and manganese are common in trace to small amounts in the lower B horizon. At 1 m or deeper the grey clay B horizon is clearly underlain by a brown (7.5YR 4/3) clay layer which rapidly becomes cobbly with depth. Soil reaction trend for the profile is strongly alkaline.

*Variants:* Woodbine - shallow variant: these soils clearly overlie weathered sandstone/shale at 1.1 to 1.5 m and have no buried brown overlie layer. They occur on gentler sloping elevated crests and upland margins (<5%) upslope of the typical Woodbine soils.

*Classification:* Woodbine is a grey clay member of the grey, brown and red clay great soil group.

PPF's include Ug5.28, Ug5.24.

*Land use:* This soil is cropped with cereal grain crops, soubeans, pumpkins and sunflower. On stony areas or on steep slopes, land use is as native pastures.



Plate VI-XI. Woodbine soil profile class -.



**Thornton soil profile class.**

*Occurrence:* Thornton occurs on fans and elevated dissected terraces derived largely from basalt.

*Differentiating characteristics:* It is characterised by cobble or stony layers 0.5 m or below in the profile, and a dark self mulching light to medium clay surface.

*Modal profile:* The surface of this soil is moderately self mulching and seasonally cracking and contains cobbles. The Ap or A1 horizon consists of dark (7.5YR - 10YR 2/1 - 3/1-2) light to medium clay with moderate medium to coarse angular blocky structure or has structureless clods. The Ap or A1 horizon is clearly underlain at 0.15 m to 0.3 m by dark (7.5YR - 10YR 3/1-2) or brown (7.5YR 3-4/3) medium to heavy clay B horizons with moderate medium and coarse angular blocky and lenticular structure. The dark upper B horizon extends to 0.5-0.8 m where it clearly overlies a brown (7.5YR 3-4/3) medium clay lower B horizon containing trace to small amounts of powdery or concretionary carbonate. At 0.5 to 1.3 m, the B horizons are clearly underlain by layers of either brown (7.5YR 3 - 4/3) to red brown (5YR 3 - 4/3), sandy clay loam to light clay with moderate medium prismatic to blocky structure or stone and cobble layers.

The soil reaction trend of the profile is strongly alkaline.

*Variant:* Thornton - grey-brown variant: this soil is similar in all respects to the central concept except that it has an A1 and/or B horizon of grey brown colour (5YR 4/2).

*Classification:* Thornton ranges from a black earth great soil group to a brown clay member of the grey, brown and red clays great soil group. Colour differences cannot be ascribed to gilgai microrelief as such phenomena are not apparent.

The most common PPF's are Ug5.1, Ug5.15 and Ug5.16.

*Land use:* This soil is used for cereal crops, lucerne, soybean and sunflower.

**Townson soil profile class.**

*Occurrence:* Townson occurs on basalt derived fans feeding into the upper tributary reaches of Tenthill and Laidley Creeks. It may also be found on an elevated isolated dissected terrace 30 m above the valley floors between Tenthill Creek and Deep Gully.

*Differentiating characteristics:* This soil is distinguished by its dark self mulching medium to heavy clay surface over a clay subsoil greater than 1.5 m deep.

*Modal profile:* The surface of this soil shows moderate to strong self mulching under cultivation and cracks seasonally. Surface stones and cobbles may be common. The A1 horizon is a dark (7.5YR - 10YR 2/1-2, 3/1- 2), medium to heavy clay with moderate medium to coarse angular blocky structure, or when cultivated it may have a structureless cloddy nature. At 0.15-0.3 m the A1 horizon is clearly underlain by a B horizon of dark (7.5YR 3/1-2, 2/1), brown (7.5YR 3-4/3) red brown (5YR 3-4/4) or grey (5YR - 7.5YR - 10YR 4/2) medium to heavy clay to greater than 1.5 m deep.

The lower B horizon contains small to large amounts of concretionary or powdery carbonate and occasionally small amounts of manganese nodules.

*Classification:* Townson's morphology indicates that it may classify as a black earth and also as a brown clay member of the grey, brown and red clays great soil group.

PPF's include Ug5.1, Ug5.15 and Ug5.16.

*Land use:* This soil is used for cereal grain crops, lucerne, soybeans, sunflowers and pumpkins.

**Ryan soil profile class.**

*Occurrence:* This soil occurs in minor amounts on the 6- 10% mid slopes of peripediments out of Upper Marburg sandstones.

*Differentiating characteristics:* It is distinguished by its loamy sand to sandy clay loam red brown surface texture over acid to neutral massive red brown sandy clay loam to sandy clay subsoil.

*Modal profile:* Ryan has a hardsetting surface and a red brown (5YR 4/3) to brown (7.5YR 3/3) A1 horizon of loamy sand to sandy clay loam texture which is weak fine granular in the virgin state but structureless and massive when cultivated. This is clearly overlain at 0.15 to 0.20 m by a red brown (5YR 4/6, 5/6)

sandy clay loam to sandy clay B horizon which is structureless and massive. A sporadically bleached A2 horizon may occur at the boundary of the A1 and B horizons. Soil reaction trend is weakly acid to neutral (pH 6.5-7.0).

*Classification:* This soil is close to a red earth great soil group except that it has a neutral soil reaction trend

PPF's include Gn2.12, Gn 2.15

*Land use:* Ryan is used only for native pasture.



#### 4. Soils of alluvial fans derived from basalt (upper reach tributaries)

##### **Peacock soil profile class.**

*Occurrence:* Peacock occurs on 3-15% sloping fans out of basalt.

*Differentiating characteristics:* Peacock has a stony or cobbly surface and generally has a loam to light-medium clay texture profile.

*Modal profile:* The surface may be crusting and hardsetting under cultivation but is soft in the undisturbed state. Surface cobbles and stones occur in small to medium amounts (20-50%).

The A1 horizon consists of dark (7.5YR-10YR 2/1, 3/1, 3/2) loam to light clay with moderate medium to fine granular structure to 0.1 to 0.3 m. The A1 clearly or gradually overlies a B horizon of the similar or slightly browner colour (up to 7.5YR 3/3, 5YR 3/2), similar of slightly heavier texture (up to light-medium clay) and moderate to strong fine to medium angular blocky structure. Small amounts (2-15%) of gravel are common and carbonate is absent. At 0.4 to 1 m, the B horizon is clearly or abruptly underlain by coarse gravel, cobble or stone, or brown (7.5YR 3-4/3) layers of variable texture (loamy sands to light clays). Soil reaction trend is neutral to moderately alkaline.

*Variants:* Peacock - heavy textured variant: textures throughout the profile is light-medium clay.

*Classification:* Peacock classifies as a prairie soil great soil group.

PPF's include Um6.11, Uf6.31 and Uf6.32.

*Land use:* This soil is cropped in places where stone and cobble are minimal. Crops grown are usually fresh market vegetables such as tomatoes, lettuce, cucurbits and crucifers. However most of Peacock is used as native pasture.

**Spellman soil profile class.**

*Occurrence:* This soil is found on the 5-10% sloping fans out of basalt and sometimes with a Heifer Creek sandstone component.

*Differentiating characteristics:* Spellman is characterised by stone and cobble patches through the profile and a hardsetting dark clay loam to light clay surface which overlies a medium to heavy clay subsoil.

*Modal profile:* This soil has a hardsetting surface with a small to medium (20-50%) abundance of cobbles.

The A1 horizon consists of dark (7.5YR 3/1-2), grey brown (7.5YR 4/2) or brown (7.5YR 3/3) clay-loam to light clay with moderate medium granular structure to 0.15 to 0.30 m. The A1 clearly overlies a B horizon of dark brown (7.5YR 3/3) medium to medium heavy clay with moderate medium angular blocky structure. Trace to small amounts of carbonate may occur in the lower B horizon. This is clearly overlain at 0.5-1 m by brown (7.5YR 3-4/3), clayloam to light medium clay layers, which may contain gravel or by layers of stone and cobble.

Sheet erosion of the A1 horizon resulting in exposure of the heavier textured B horizon, may produce a self mulching cracking clay surface.

Soil reaction trend for the profile is moderately to strongly alkaline.

*Variants:* Spellman eroded variant has a surface texture of medium clay which cracks on drying.

*Classification:* Spellman includes carbonate free profiles which classify as prairie soils and as chernozems.

PPF's include Uf6.32, Gn3.43 with Ug5.15 and Ug5.16 on eroded variants.

*Land use:* This soil is used for cereal grains, fresh market vegetables and soybeans where irrigation is available. In many upper reach tributaries where irrigation water is not available, Spellman is used as native pasture.



Plate VI-XII. Spellman soil profile class.

Soil Profile Class: Spellman Map Unit: Sp Site No.: 782  
Great Soil Group: Chernozem FA0: Luvic Chernozem Soil Taxonomy: Vertic Paleustoll P.P.F.: Gn3.43  
Parent Material: Quaternary alluvium - colluvium A.M.G. Ref.: Zone 56, 438610 mmE, 6927500 mN  
Topography: 7% midslope of coalescing alluvial fans Air Photo Ref.: South Moreton District Flood (1974), Run 10, Photo 5349  
 104 mmE, 103 mmN  
Location: 300 m NNW of intersection of Peters Road and  
 Mulgowie-Townson Road, Upper Laidley Creek catchment

Vegetation: Cleared, cultivated

Profile Morphology: Surface condition: 1-5% stone cover, weakly self mulching, weakly seasonally cracking (< 1 per m<sup>2</sup>)

- Ap 0 - 0.15 m Brownish black (7.5YR3/1); heavy clayloam; strong fine granular; soft moist. Gradual to -  
 B21t 0.15 - 0.40 m Brownish black (7.5YR3/1); medium-heavy clay; moderate medium blocky; slightly hard, moist; 2-15% irregular basaltic gravel.  
 Clear to -  
 B22t 0.40 - 0.55 m Brownish (7.5YR4/3); medium clay; moderate medium blocky; slightly hard, moist; 2-15% irregular basaltic gravel. Gradual to -  
 B23t 0.55 - 0.65 m As above but with light-medium clay and 15-50% irregular basaltic gravel. Gradual to -  
 B24tk 0.65 - 0.90 m As for B22 but with small amounts of soft carbonate. Abrupt to -  
 D 0.90 m Basaltic cobbles and stones.

Laboratory Data:

| Lab No. | Depth<br>m | pH  | E.C. (1:5)<br>mScm <sup>-1</sup> | Cl<br>% | Dispersion<br>Ratio (R <sup>1</sup> ) | C.S.          | F.S.   | Si            | C                                      | C.E.C. | Ca++             | Mg++ | Na+              | K+               | P                | K                | S                | Moisture %<br>A.D. bar |    |    |
|---------|------------|-----|----------------------------------|---------|---------------------------------------|---------------|--------|---------------|--|--------|------------------|------|------------------|------------------|------------------|------------------|------------------|------------------------|----|----|
|         |            | 1:5 |                                  |         |                                       | Particle Size | % O.D. | Exch. Cations | cmol(p <sup>+</sup> ) kg <sup>-1</sup> | O.D.   | kg <sup>-1</sup> | O.D. | kg <sup>-1</sup> | kg <sup>-1</sup> | kg <sup>-1</sup> | kg <sup>-1</sup> | kg <sup>-1</sup> | 1/3 bar                |    |    |
| 5681K   | 0-0.1      | 6.1 | 0.05                             | 0.001   | 0.41                                  | 15            | 23     | 31            | 33                                     | 40     | 12               | 9.1  | 0.1              | 1.8              | 0.22             | 1.25             | 0.047            | 5.5                    | 39 | 20 |
| 5683K   | 0.2-0.3    | 6.9 | 0.04                             | 0.001   | 0.55                                  | 8             | 19     | 18            | 60                                     | 52     | 23               | 19   | 1.0              | 0.76             | 0.15             | 0.84             | 0.21             | 6.1                    | 47 | 27 |
| 5686K   | 0.55-0.6   | 8.2 | 0.17                             | 0.018   | 0.66                                  | 14            | 28     | 20            | 41                                     | 52     | 28               | 23   | 2.5              | 0.23             | 0.15             | 0.77             | 0.013            | 6.2                    | 41 | 23 |
| 5689K   | 0.8-0.9    | 8.4 | 0.42                             | 0.054   | 0.69                                  | 9             | 22     | 25            | 48                                     | 53     | 29               | 23   | 3.2              | 0.32             | 0.18             | 0.99             | 0.011            | 5.9                    | 45 | 26 |

| Lab No. | Depth<br>m | Org. C<br>% | Tot. N | Acid<br>Extr. P ppm | Bicarb<br>ppm | Repl. K<br>cmol(p <sup>+</sup> ) kg <sup>-1</sup> | Fe<br>D.T.P.A. Extra. ppm | Mn | Cu  | Zn  | B<br>ppm |
|---------|------------|-------------|--------|---------------------|---------------|---|---------------------------|----|-----|-----|----------|
| 5680K   | B0-0.1     | 3.1         | 0.26   | 574                 | 112           | 1.6   | 293                       | 27 | 2.1 | 5.8 |          |

**5. Soils of alluvial fans and flats derived from Upper Marburg beds  
(middle reach tributaries)**

**Sutton soil profile class.**

*Occurrence:* This soil is found on 2-8% sloping fans derived largely from Heifer Creek sandstone. Sutton mainly occurs on fans adjacent to Tenthill Creek.

*Differentiating characteristics:* Sutton is distinguished by a brown cloddy sandy clay loam surface soil clearly overlying a red brown coloured subsoil and manganese is commonly present. Buried layers below the solum may be alkaline in pH.

*Modal profile:* The cultivated surface of Sutton is hardsetting and cloddy. The A<sub>1</sub> horizon consists of a red brown (5YR 2/3, 3/3, 4/3) or greybrown (7.5YR 4/2), or brown (7.5YR 3/3, 4/3) light sandy clay loam to sandy clay loam and which is structureless and massive to 0.15-0.3 m. A pale A<sub>2</sub> horizon with a sporadic bleach may occur at the base of the A<sub>1</sub> horizon. This clearly overlies a red brown (5YR 4/3, 4/4, 5/4) sandy clay loam to sandy medium clay B horizon of weak to moderate medium angular blocky structure. This B horizon is clearly or gradually underlain by buried layers of redbrown colour (5YR 3/3, 4/4, 5/4) and variable texture from clayey sand to sandy clay. Buried layers usually have moderate medium prismatic structure or are structureless and massive.

Soft manganese concretions are common in the lower B horizon and soil reaction trend is weakly to strongly alkaline.

*Classification:* Sutton has many affinities with the red-brown earth great soil groups but neither A<sub>2</sub> horizons nor carbonate B horizons are present. The absence of an A<sub>2</sub> horizon may well be due to their destruction by cultivation as no virgin forms of this soil were found.

Sutton is also similar to the non-calcic brown soils great soil group. However its alkaline subsoil pH and alluvial parent material differs from the typical non-calcic brown soil which has mildly acid to mildly alkaline soil pH in the lower part of the B horizon and also develops *in situ* on subacidic rocks on mid to upper slopes.

PPF's include Dr2.13 and Dr2.32.

*Land use:* Sutton is used for cropping a wide variety of fresh market vegetables and lucerne.



**Abell soil profile class.**

*Occurrence:* Abell is found on 2-6% sloping fans derived from Ma Ma Creek and Heifer Creek sandstone.

*Differentiating characteristics:* Soils are distinguished by cloddy (cultivated) sandy clay surface soils over neutral sandy medium clay subsoils of yellow to brown colour. It is found along all major tributaries.

*Modal profile:* This soil is invariably cultivated resulting in a hardsetting surface. The Ap horizon is a dark (5YR 3/1, 3/2, 7.5YR 3/2) grey brown (7.5YR 4/2) or brown (7.5YR 3/3, 4/3), sandy clay loam to sandy light-medium clay which is structureless, massive and cloddy when cultivated. This clearly overlies at 0.15-0.25 m a B horizon with grey brown colour, sandy clay to sandy medium clay texture, and massive or weak to moderate coarse angular blocky structure. The B horizon commonly contains trace to small amounts of soft manganese nodules. At 0.65 m or deeper the B horizons may be underlain by buried soils or layers of contrasting texture and colour. Profile soil reaction trend is from strongly acid (pH 5.0) to weakly alkaline (pH 8.0).

*Classification:* Abell is classified as belonging to the brown earth great soil group. However Abell profiles with massive subsoils do not appear to fit within the central concept of brown earths.

PPF's include Uf6.31, Uf6.32 and Uf6.33.

*Land use:* This soil is widely cultivated for lucerne and fresh market vegetables.



Soil Profile Class: Abell Site No.: A22  
 Map Unit: Ab P.P.F.: Uf6.33  
 Great Soil Group: Brown earth Soil Taxonomy: Udic Ustochrept  
 Parent Material: Quaternary alluvium FAO: Chromic Cambisol A.M.G. Ref.: Zone 56, 432160 mE, 6938440 mN  
 Topography: 2% local alluvial plain and of Upper Marburg Air Photo Ref.: South Moreton District Flood 1974, Run 7, Photo 5217  
 Location: Pomeroy Property, Abell Creek alluvial plain

Vegetation: Cleared, cultivated

Profile Morphology: Surface condition: crusting, hardsetting

Ap 0 - 0.3 m Brown (7.5YR4/3); sandy clay; weak very coarse clods; slightly hard moist. Clear to -  
 B1 0.3 - 0.4 m Dull brown (7.5YR5/4); sandy clay; weak coarse subangular blocky; slightly hard moist; trace of concretionary manganese.  
 B21 0.4 - 0.6 m Dull yellowish brown (10YR5/3); with 30% medium distinct brown mottle; sandy light-medium clay; moderate coarse and medium angular blocky; slightly hard moist. Gradual to -  
 B22 0.6 - 1.0 m As above but dull reddish brown (5YR4/3) with 20% medium faint grey mottle. Gradual to -  
 B31 1.0 - 1.2 m Brown (7.5YR4/4); gritty sandy clay; moderate coarse angular blocky breaking to moderate fine angular blocky; slightly hard slightly moist; 2-15% rounded ferruginous gravel. Gradual to -  
 B32 1.2 - 1.7 m As above but fine sandy clay with small amounts of soft manganese and no gravel.

Laboratory Data:

| Lab No. | Depth   | pH  | E.C. (1:5)         | Cl    | Dispersion              | C.S.          | F.S. | Si   | C             | C.E.C.                | Ca++             | Mg++ | Na+ | K+   | P     | K    | S     | Moisture % |    |    |
|---------|---------|-----|--------------------|-------|-------------------------|---------------|------|------|---------------|-----------------------|------------------|------|-----|------|-------|------|-------|------------|----|----|
|         | m       | 1:5 | mScm <sup>-1</sup> | %     | Ratio (R <sup>1</sup> ) | Particle Size | %    | O.D. | Exch. Cations | cmol(p <sup>+</sup> ) | kg <sup>-1</sup> | O.D. | %   | O.D. | A.D.  | bar  | bar   | 1/3        | 15 |    |
| 01623L  | 0-0.1   | 6.2 | 0.02               | 0.001 | 0.64                    | 18            | 35   | 12   | 32            | 23                    | 12               | 2.7  | 0.2 | 0.5  | 0.064 | 1.01 | 0.020 | 3.3        | 24 | 12 |
| 01625L  | 0.2-0.3 | 6.2 | 0.03               | 0.001 | 0.65                    | 16            | 34   | 12   | 36            | 22                    | 13               | 2.7  | 0.1 | 0.4  | 0.063 | 1.05 | 0.022 | 3.0        | 27 | 13 |
| 01628L  | 0.5-0.6 | 7.1 | 0.02               | 0.001 | 0.75                    | 21            | 29   | 11   | 36            | 24                    | 17               | 4.0  | 0.2 | 0.2  | 0.021 | 0.97 | 0.011 | 3.8        | 27 | 13 |
| 01631L  | 0.8-0.9 | 7.3 | 0.04               | 0.001 | 0.84                    | 17            | 27   | 16   | 38            | 25                    | 17               | 5.8  | 0.2 | 0.3  | 0.022 | 1.09 | 0.012 | 3.4        | 29 | 15 |
| 01634L  | 1.1-1.2 | 7.4 | 0.03               | 0.001 |                         | 34            | 30   | 10   | 23            | 18                    | 11               | 5.2  | 0.2 | 0.2  | 0.028 | 0.98 | 0.009 | 3.0        |    |    |
| 01637L  | 1.4-1.5 | 7.2 | 0.03               | 0.001 |                         | 15            | 42   | 13   | 29            | 21                    | 13               | 6.6  | 0.3 | 0.3  |       |      |       | 3.1        |    |    |

| Lab No. | Depth  | Org. C | Tot. N | Acid    | Bicarb | Repl. K               | Fe               | Mn       | Cu     | Zn  | B   |
|---------|--------|--------|--------|---------|--------|-----------------------|------------------|----------|--------|-----|-----|
|         | m      | %      | ppm    | Extr. P | ppm    | cmol(p <sup>+</sup> ) | kg <sup>-1</sup> | D.T.P.A. | Extra. | ppm | ppm |
| 01622L  | B0-0.1 |        |        | 43      | 55     | 0.47                  | 57               | 54       | 2      | 7.6 |     |

**Geisemann soil profile class.**

*Occurrence:* Geisemann is found on alluvial flats and fans which are believed to be influenced by rising watertables in the profile.

*Differentiating characteristics:* The soil is characterised by hardsetting sandy clay loam surface over a brown or yellow brown acid to neutral subsoil. Deeper layers have grey mottled and ferromangiferous segregations as a result of seasonal saturation by groundwaters.

*Modal profile:* The Ap horizon has a hardsetting surface and is a dark (7.5YR 3/2), grey brown (7.5YR 4/2), brown (7.5YR 4/3) or red brown (5YR 3/3-4/4) sandy loam to sandy clay loam, which is structureless and cloddy. At 0.15 to 0.3 m the Ap horizon is clearly underlain by yellow-brown (7.5YR - 5YR 5/4), reddish-brown (5YR 3/4, 4/3) or brown (7.5YR 4/3) sandy clay loam to sandy clay which is structureless and massive. Yellow and grey mottles and manganese segregations are occasionally present.

Below 0.7 to 1.0 m are contrasting layers of mottled yellowish-red (5YR 5/6), yellowish-brown (7.5YR 5/4-6), clayey sand to light-medium clay of variable structure. Grey mottling and ferromanganiferous nodules occur, becoming more abundant at depth. Soil reaction trend is acid to neutral (pH 5.7-7.5).

*Variants:*

- loam surface variant
- loamy sand surface variant
- alkaline subsoil variant trend if watertable is saline.

*Classification:* Geisemann is classified as belonging to the brown earth great soil group.

PPF's include Gn2.22, Gn3.91 and Gn4.54.

*Land use:* Geisemann is used for native pasture and for fresh market vegetables.

**Laidley soil profile class.**

*Occurrence:* Laidley is common on lower slope positions of fans and on local alluvial plains. Because of its position where minor streams feed into trunk streams, soils are highly variable, have multistory profiles and are associated with marginal depressions and poor drainage.

*Differentiating characteristics:* This soil is similar to Abell SPC but differs in having alkaline medium to heavy clay subsoils with sandy feel; carbonate commonly occurs below a horizon containing manganiferous segregations.

*Modal profile:* The Laidley soil has a hardsetting surface. The A1 horizon is a dark (5YR 3/1, 7.5YR 3/1-2), grey brown (7.5YR 4/2, 10YR 4/2) or brown (7.5YR 4-5/3, 4/4), sandy clay to sandy medium clay with moderate fine crumb structure in the virgin state which becomes structureless, massive and cloddy under cultivation. At 0.05-0.3 m the A1 horizon is underlain by a dark (7.5YR 3/1, 3/2, 10YR 3/1), grey (10YR 5/2, 7.5YR 4/2, 10YR 4/2), brown (7.5YR 4/3) or yellow (7.5YR 5/3-4) B horizon of sandy light-medium clay to sandy medium clay texture and weak to moderate medium to coarse angular blocky structure.

Red, yellow or brown mottles may occur in the grey, brown or yellow B horizons. The dark upper B horizons grade to grey, brown or yellow lower B horizons by 0.3-0.4 m. A massive conspicuous or sporadically bleached A2 horizon may develop at the base of the A1 horizon. Buried soils and contrasting layers are commonly found below the B horizon at 0.8 m or deeper.

Profiles show strongly alkaline soil reaction trends in the B horizons. Carbonate nodules occur in small to moderate amounts in many profiles. Soft manganese is also common in the B horizons.

*Variant:* Texture contrast variant has a sandy clay loam A1 horizon clearly or abruptly overlying a light-medium to medium clay B horizon.

*Classification:* This soil is not provided for in the great soil group system. Some profiles resemble the solodic soil except that texture changes between A and B horizon are gradational, not abrupt.

PPF's include Uf6.33, Gn3.06, Uf6.32, Uf2 and Uf3.

*Land use:* Laidley is used for native pasture, cereal crops and lucerne.

Soil Profile Class: Laidley Site No.: 779  
 Great Soil Group: Affinities with solodized solonetz P.P.F.: Gn 3.06  
 Parent Material: Quaternary alluvium FAO: Gleyic Luvisol A.M.G. Ref.: Zone 56, 440850 mE, 6943960 mN  
 Topography: Alluvial backplain of Laidley Air Photo Ref: South Moreton District Flood (1974) Run 5, Photo 3532  
169 mE, 76 mN  
 Location: 0.75 km NE of Laidley

Vegetation:

Profile Morphology: Surface condition: loose

- A1 0 - 0.15 m Brownish black (7.5YR3/2); heavy clayloam; moderate medium granular; soft slightly moist. Clear to -
- A2cb 0.15 - 0.25 m Greyish brown (7.5YR5/2 moist), dull orange (7.5YR7/3 dry); heavy clayloam; moderate coarse granular; soft dry. Gradual to -
- B21t 0.25 - 0.40 m Greyish brown (7.5YR4/2); light - medium clay; moderate coarse columnar; hard dry; small amounts of soft manganese and traces of ferruginous segregations. Gradual to -
- B22t 0.40 - 0.60 m Greyish yellow brown (10YR5/3); light - medium clay; moderate coarse lenticular; very hard dry; Small amounts of soft ferruginous segregations and traces of soft manganese. Gradual to -
- B31k 0.6 - 0.9 m Dull yellowish brown (10YR5/3); sandy clay; moderate coarse blocky; very hard dry; small amounts of soft carbonate and traces of soft manganese. Gradual to -
- B32 0.9 - 1.5 m Dull yellowish brown (10YR5/4); sandy clay; moderate coarse blocky; very hard dry; small amount of soft manganese.

Laboratory Data:

| Lab No. | Depth    | pH  | E.C. (1:5)         | Cl    | Dispersion              | C.S.          | F.S.   | Si            | C                                      | C.E.C. | Ca++ | Mg++ | Na+  | K+   | P    | K    | S     | Moisture % |    |    |
|---------|----------|-----|--------------------|-------|-------------------------|---------------|--------|---------------|--|--------|------|------|------|------|------|------|-------|------------|----|----|
| m       |          | 1:5 | mScm <sup>-1</sup> | %     | Ratio (R <sup>1</sup> ) | Particle Size | % O.D. | Exch. Cations | cmol(p <sup>+</sup> ) kg <sup>-1</sup> | O.D.   | O.D. | O.D. | O.D. | O.D. | O.D. | O.D. | O.D.  | A.D. bar   |    |    |
| 5632K   | 0-0.1    | 5.9 | 0.06               | 0.003 | 0.42                    | 16            | 26     | 23            | 39                                     | 32     | 11   | 3.5  | 0.1  | 1.5  | 0.08 | 1.0  | 0.039 | 3.2        | 27 | 17 |
| 5634K   | 0.25-0.3 | 6.7 | 0.03               | 0.002 | 0.55                    | 12            | 26     | 16            | 49                                     | 26     | 13   | 5.0  | 0.9  | 0.31 | 0.03 | 0.92 | 0.015 | 3.4        | 24 | 15 |
| 5637K   | 0.5-0.6  | 8.6 | 0.17               | 0.013 | 0.50                    | 11            | 22     | 17            | 53                                     | 28     | 18   | 7.4  | 2.4  | 0.23 | 0.02 | 0.82 | 0.014 | 3.6        | 32 | 20 |
| 5640K   | 0.8-0.9  | 8.4 | 0.23               | 0.024 | 0.93                    | 29            | 24     | 13            | 36                                     | 20     | 11   | 5.3  | 2.0  | 0.21 | 0.02 | 0.67 | 0.012 | 2.8        | 25 | 14 |
| 5643K   | 1.1-1.2  | 7.9 | 0.15               | 0.019 |                         | 35            | 32     | 7             | 28                                     | 15     | 7.8  | 5.1  | 1.4  | 0.18 | 0.02 | 0.78 | 0.008 | 2.4        |    |    |
| 5646K   | 1.4-1.5  | 6.9 | 0.16               | 0.018 | 0.93                    | 22            | 31     | 14            | 36                                     | 18     | 8.5  | 7.2  | 1.7  | 0.21 | 0.02 | 0.08 | 0.010 | 2.7        | 24 | 13 |

| Lab No. | Depth  | Org. C % | Tot. N | Acid Extr. P ppm | Bicarb | Repl. K cmol(p <sup>+</sup> ) kg <sup>-1</sup> | Fe  | Mn  | Cu  | Zn  | B   |
|---------|--------|----------|--------|------------------|--------|--|-----|-----|-----|-----|-----|
| m       |        |          |        |                  | ppm    | D.T.P.A. Extra. ppm                            | ppm | ppm | ppm | ppm | ppm |
| 5631K   | B0-0.1 | 2.5      | 0.20   | 42               | 54     | 0.77   | 156 | 81  | 1.8 | 9.3 |     |

## **6. Soils of alluvial fans and flats derived from lower Marburg beds**

### **(lower reach tributaries)**

#### **Stockyard soil profile class.**

*Occurrence:* Stockyard is found on local alluvia derived mainly from Winwill Conglomerate and Gatton Sandstone. It may also occur in some areas of the Deep Gully alluvial plain.

*Differentiating characteristics:* These soils are distinguished by their hard setting surface condition, their clay loam surface texture and alkaline soil reaction trend.

*Modal profile* The surface is hardsetting when dry and the A1 horizon consists of dark (10YR-7.5YR 3/1-2) or grey brown (10YR-7.5YR 4/2) clay loam with weak to moderate fine to medium granular structure to 0.5 to 0.20 m. On cultivation the surface horizon becomes structureless, massive and cloddy.

Below the A1 horizon there is variable development of the A2 horizon. In some cases (often as a result of cultivation) it is absent while in others a massive sporadic or conspicuous bleach develops. Textures are similar or slightly coarser than the A1 horizon and moist colours are yellowish grey (10YR - 7.5YR 5/2, 6/2, 5/3, 6/3).

At 0.15 to 0.35 m, the A horizon is abruptly underlain by a commonly mottled brown (7.5YR 4/3), grey brown (7.5YR - 10YR 4/2) or yellowish brown (7.5YR - 10YR 5/2-4) medium clay to heavy clay B horizon with moderate coarse blocky structure. Colours may become olive grey (2.5Y 5/2-4) in the lower B horizon.

Below 0.7 m or deeper the B horizon is underlain by buried soils or sediments of contrasting texture colour and structure. Substrate may vary from gravel to buried grey clay paleosols.

Small to trace amounts of soft manganese segregations are common in the A2 and B horizons. In the lower B horizon, and substrate clays concretionary carbonate may occur in small to trace amounts. Small amounts of rounded quartz gravels are occasionally found in the A2 and upper B horizon.

Soil reaction trend varies from weakly alkaline (pH 7.5-8.0) to strongly alkaline (pH 8.0-9.0).

*Variants:*       grey subsoil variant has grey (7.5YR 4/1, 10YR 6/2) coloured B horizons  
                  light textured variant has a loam surface textures

heavy textured variant has a light clay surface texture

*Classification:* Stockyard belongs to the solodized solonetz and solodic soil great soil group. It has the solodic soil form with blocky subsoil structure.

PPF's vary considerably due to a wide range of B horizon colours and pH's and also variable A<sub>2</sub> horizon development. PPF's include Dy2.13, Dy2.32, Dy2.43, Dy2.33, Db1.43, Db1.33, Dy2.12, Dy3.32, Dy3.43.

*Land use:* This soil is mainly used for native pastures but there is some minor cultivation of fresh market vegetables



**Hattonvale soil profile class.**

*Occurrence:* Hattonvale is found within the local alluvial plains and some small fans out of Winwill Conglomerate and Gatton Sandstone.

*Differentiating characteristics:* The soil is characteristically hardsetting sandy loam to sandy clay loam to 0.15 to 0.45 m over grey brown or yellow brown alkaline clay subsoils (Plate VI-XII).

*Modal profile:* This soil has a hardsetting surface with a grey brown (7.5YR - 10YR 4/1-2) or brown (7.5YR 4/3) sandy loam to sandy clay loam A1 horizon with massive or weak fine crumb structure to 0.1-0.25 m.

Below the A1 horizon there is variable development of the A2 horizon. Under cultivation the A2 horizon is commonly absent but if undisturbed a sporadic or conspicuous bleach is evident. Textures are similar or slightly coarser than the A1 horizon and moist colours are yellowish grey (7.5YR - 10YR 5/2, 6/2) to yellowish brown (7.5YR - 10YR 5/3-4, 6/3-4).

At 0.15 to 0.45 m the A2 horizon is abruptly underlain by commonly mottled grey brown (10YR 4/2) or yellow-brown (7.5YR - 10YR 5/2-6) light clay to medium heavy clay B horizon with strong coarse blocky prismatic or columnar structure.

Below 0.6 m or deeper the B horizon is underlain by buried soils or sediments.

Small to trace amounts of soft or concretionary manganese segregations are common in the B horizon or substrate layers. Small amounts of rounded quartz gravels are occasionally found in the A2 and B horizons.

Soil reaction trend is from neutral (pH 6.8-7.5) to alkaline (pH 8.0 - 9.0).

*Variants:*

- mottled grey (10YR 5/1) B horizon
- loamy sand or loamy coarse sand surface texture
- sandy clay B horizon
- soft or concretionary carbonate may occur in the lower B horizon
- acid soil reaction trend



*Classification:* Hattonvale belongs to the solodized solonetz and solodic soil great soil group with a solodic soil blocky subsoil structure.

PPF's include Dy2.43, Dy2.42, Dy2.33, Dy2.13 and Dy3.42.

*Land use:* This soil is used mainly as native pasture although forage sorghum is grown in some locations.

**Glencairn soil profile class.**

*Occurrence:* This soil occurs on isolated rises on the alluvial flats and also on small fans at the margins of local alluvial flats

*Differentiating characteristics:* It is distinguished by its deep sandy A2 horizon which is conspicuously bleached when dry over acid yellow and grey mottled sandy clay B horizon.

*Modal profile:* The surface may be hardsetting or loose. The A1 horizon is a dark (10YR-7.5YR 3/1-2) or brown (7.5YR 4/3) loamy sand to sandy loam which is structureless massive. At 0.1 to 0.3 m the A1 horizon is clearly underlain by a pale yellow (7.5YR - 10YR 5/3-4, 6/3-4) bleached when dry clayey sand to coarse sand A2 horizon which is structureless and single grain.

The A2 horizon is abruptly underlain by a coarsely mottled yellow (7.5YR 6/6) and grey (7.5YR 6/1, 10YR 6/2, 7/1-2) sandy clay to sandy medium clay with moderate coarse blocky structure. Below 0.8 m buried soils and sediments are common.

Soft or concretionary manganese may occur in the A2 or B horizon in trace to small amounts. Small amounts of rounded quartz gravel may be found in the A2 and B horizons.

Soil reaction trend is acid (pH 5.5-6.5).

*Variants:*

- ferruginous gravel in the A2 horizon
- red mottles in the B horizon
- neutral to alkaline soil reaction trends associated with saline watertables.

*Classification:* Glencairn is classified as belonging to the soloth great soil group. Unpublished data by the Agricultural Laboratory Branch, Department of Primary Industries showed a B horizon sample of this soil to have an ESP of 8 (D Baker personal communication)

PPF's include Dy5.41, Dy3.41, Dy3.81, Dy5.42 and Dg2.41.

*Land use:* This soil is used for native pasture only.

**Whiteway.**

*Occurrence:* This soil occurs on the margins of the terraced alluvial plains where local sandstone derived sediment has moved by soil creep or alluviation onto the alluvial backplains. Sufficient time has elapsed since deposition for a sporadically bleached A2 horizon to develop.

*Differentiating characteristics:* The Whiteway is distinguished by its loam to clay loam surface, sporadically bleached A2 horizon and dark alkaline clay subsoil.

*Modal profile:* This soil has a crusting, hard setting surface and dark (7.5YR - 10YR 2/2, 3/1-2) loam to clay loam A1 horizon with moderate medium granular structure. On cultivation the A horizon becomes cloddy and massive and commonly light clay in texture.

At the base of the A1 horizon, a sporadically bleached A2 horizon overlies a dark (5YR 3/1, 10YR - 7.5YR 2/1-2, 3/1-2) moderate medium angular blocky light-medium to medium clay which becomes strong medium to fine lenticular with depth. Colour may change to brown (7.5YR 3/4, 4/3) at depth.

Concretionary carbonate is present at depth in trace to small amounts. Commonly soft or concretionary manganese segregations are also found in the lower B horizons.

Soil reaction trend is strongly alkaline (pH 8.5-9.0).

*Variants:*

- rounded basaltic gravel in the lower B horizon.
- yellowish-brown (7.5YR - 10YR 5/3-4) or mottled grey brown
- (10YR 4/2) lower B horizons

*Classification:* This soil classifies as a solodic soil member of the solodized solonetz and solodic soil great soil group.

PPF's include Dd1.43, Dd1.33 and Uf3.

*Land use:* Whiteway is used for summer and winter cereal crops, crucifers and soybeans.

## **Appendix 7**

**Particle size and mineralogy of soils on the alluvial landscape**

**Table VII-I. Particle size analysis and clay minerals of downstream reach sites.**

| Depth<br>m   | Particle Size |    |                  |    | Clay minerals |      |                         | I  |
|--|---------------|----|------------------|----|---------------|------|-------------------------|----|
|  | CS            | FS | SI<br>percentage | C  | S             | SI   | K<br>relative abundance |    |
| Lockyer Creek Levee - Lockyer prairie soil (site 1)      |               |    |                  |    |               |      |                         |    |
| 0-0.25   | 26            | 31 | 21               | 23 | +++           |      | ++                      | tr |
| 0.25-0.50  | 28            | 31 | 18               | 23 | ++++          |      | ++                      | tr |
| 0.50-0.70  | 25            | 22 | 14               | 35 | ++++          |      | ++                      | tr |
| 0.70-0.90  | 30            | 24 | 17               | 29 | ++++          |      | ++                      | tr |
| 0.90-1.10  | 20            | 31 | 17               | 30 | ++++          |      | ++                      | tr |
| 1.10-1.20  | 13            | 35 | 17               | 35 | ++++          |      | ++                      | tr |
| 1.20-1.50  | 22            | 30 | 17               | 29 | ++++          |      | ++                      | tr |
| 2.66-2.76  | 2             | 53 | 9                | 36 |               |      |                         |    |
| 3.43-3.53  | 30            | 25 | 30               | 15 |               |      |                         |    |
| 5.33-5.43  | 45            | 30 | 18               | 7  | ++++          |      | +                       | tr |
| 6.63-6.73  | 18            | 11 | 22               | 49 |               |      |                         |    |
| 7.00-7.10  | 18            | 11 | 22               | 49 | ++++          |      | +                       | tr |
| Alluvial plain - Lawes black earth (site 2)              |               |    |                  |    |               |      |                         |    |
| 0-0.30   | 3             | 17 | 27               | 55 |               |      |                         |    |
| 0.30-0.60  | 7             | 20 | 25               | 48 |               | ++++ | ++                      | tr |
| 0.60-0.90  | 7             | 19 | 25               | 50 |               | ++++ | ++                      | tr |
| 0.90-1.00  | 5             | 20 | 24               | 55 |               | ++++ | +                       | tr |
| 1.00-1.15  | 16            | 27 | 18               | 37 | ++++          | +    | tr                      |    |
| 1.15-1.30  | 7             | 32 | 17               | 43 | ++++          | +    | tr                      |    |
| 1.30-1.60  | 2             | 45 | 22               | 34 | ++++          | +    | tr                      |    |
| 3.40-3.50  | 68            | 11 | 7                | 15 |               |      |                         |    |
| 4.00-4.10  | 1             | 49 | 39               | 11 |               |      |                         |    |
| 6.30-6.40  | 4             | 36 | 38               | 25 |               |      |                         |    |
| 6.45-6.55  | 4             | 50 | 30               | 17 | ++++          | +    | tr                      |    |
| 9.40-10.0  | 4             | 65 | 20               | 11 |               |      |                         |    |
| Relict Levee - Tenthill variant red brown earth (site 3) |               |    |                  |    |               |      |                         |    |
| 0-0.23   | 21            | 25 | 19               | 31 |               |      |                         |    |
| 0.23-0.50  | 10            | 19 | 11               | 57 |               | ++++ | ++                      |    |
| 0.50-0.68  | 12            | 20 | 11               | 56 |               | ++++ | ++                      |    |
| 0.68-0.80  | 17            | 26 | 15               | 40 |               | ++++ | ++                      |    |
| 0.80-1.00  | 10            | 33 | 17               | 40 |               |      |                         |    |
| 1.00-1.35  | 10            | 38 | 18               | 34 | ++++          |      | ++                      |    |
| 1.35-1.50  | 14            | 41 | 14               | 26 | ++++          |      | ++                      |    |
| 1.50-1.60  | 15            | 40 | 15               | 29 |               |      |                         |    |
| 3.37-3.47  | 4             | 59 | 27               | 10 |               |      |                         |    |
| 4.45-4.65  | 6             | 43 | 29               | 22 |               |      |                         |    |
| 5.20-5.30  | 8             | 40 | 24               | 28 | ++++          |      | +                       |    |
| 5.35-5.65  | 8             | 36 | 22               | 34 |               |      |                         |    |
| 5.85-5.95  | 5             | 31 | 21               | 43 | ++++          |      | +                       |    |
| 6.80-6.90  |               |    |                  |    | ++++          |      | +                       |    |
| 8.30-8.40  | 20            | 11 | 15               | 54 |               |      |                         |    |

Table VII-II. Particle size analysis and clay minerals of middle reach sites.

| Depth<br>m   | Particle size |    |    |    | Clay minerals |     |     |    |    |    |
|--|---------------|----|----|----|---------------|-----|-----|----|----|----|
|  | CS            | FS | Si | C  | SI            | RIM | K   | I  | C  | Q  |
|  | percentage    |    |    |    |               |     |     |    |    |    |
| Alluvial fan - Sutton red-brown earth (site 5)           |               |    |    |    |               |     |     |    |    |    |
| 0-0.3  | 50            | 27 | 10 | 13 |               | +++ | +++ | +  |    |    |
| 0.56-0.80  | 56            | 18 | 19 | 17 |               | +++ | +++ | +  |    | tr |
| 0.80-0.97  | 38            | 20 | 14 | 28 |               | +++ | +++ | ++ |    |    |
| 0.97-1.28  | 38            | 23 | 13 | 25 | +++           | +++ | ++  | tr |    |    |
| 1.60-1.70  | 39            | 24 | 14 | 23 | +++           |     | ++  | ++ |    | tr |
| Fan-terrace interface-unnamed transitional soil (site 6) |               |    |    |    |               |     |     |    |    |    |
| 0-0.23   | 22            | 25 | 27 | 27 |               | +++ | +++ | ++ | tr | tr |
| 0.23-0.43  | 45            | 26 | 12 | 17 |               | +++ | +++ | +  | tr | tr |
| 0.43-0.63  | 6             | 26 | 40 | 28 |               | +++ | +++ | ++ | tr | tr |
| 1.06-1.34  | 4             | 36 | 24 | 37 | +++           |     | ++  | +  | tr | tr |
| 1.34-1.45  | 26            | 26 | 20 | 28 | +++           |     | +   | tr | tr |    |
| 1.45-1.70  | 29            | 26 | 15 | 31 |               | +++ | +++ | ++ | tr | tr |
| Terrace - Tenthill chernozem (site 7)                    |               |    |    |    |               |     |     |    |    |    |
| 0-0.25   | 2             | 29 | 28 | 40 | ++++          |     | +   | tr |    |    |
| 0.25-0.47  | 1             | 32 | 31 | 36 | ++++          |     | +   | tr |    |    |
| 0.47-0.60  | 13            | 42 | 17 | 28 | ++++          |     | +   | tr |    |    |
| 0.60-0.90  | 3             | 49 | 20 | 27 | ++++          |     | +   | tr |    |    |
| 0.90-1.20  | 5             | 62 | 15 | 18 | ++++          |     | +   | tr |    |    |
| 1.20-1.55  | 7             | 72 | 10 | 10 | ++++          |     | +   | tr |    |    |
| Floodplain - Lockyer prairie soil (site 8)               |               |    |    |    |               |     |     |    |    |    |
| 0-0.25   | 3             | 45 | 24 | 28 | ++++          |     | ++  | tr |    |    |
| 0.25-0.40  | 1             | 53 | 24 | 22 | ++++          |     | +   | tr |    |    |
| 0.65-0.90  | 8             | 52 | 18 | 23 | ++++          |     | +   | tr |    |    |
| 0.90-1.10  | 7             | 43 | 21 | 29 | ++++          |     | +   | tr |    |    |
| 1.10-1.30  | 13            | 47 | 15 | 25 | ++++          |     | +   | tr |    |    |
| 1.30-1.70  | 16            | 49 | 15 | 21 | ++++          |     | +   | tr |    |    |
| 1.70-1.80  | 3             | 57 | 18 | 22 | ++++          |     | +   | tr |    |    |
| Elevated terrace - Townson brown clay (site 10)          |               |    |    |    |               |     |     |    |    |    |
| 0-0.12   | 10            | 18 | 33 | 39 | ++++          |     | +   | tr |    |    |
| 0.12-0.20  | 8             | 17 | 20 | 55 | ++++          |     | +   | tr |    |    |
| 0.70-0.80  |               |    |    |    | ++++          | +   | tr  |    |    |    |
| Buried grey clay palaeosol (site 11)                     |               |    |    |    |               |     |     |    |    |    |
|  | 11            | 19 | 20 | 50 | ++++          |     | ++  | tr |    |    |

Table VII-III. Particle size and clay minerals of upstream reach sites.

| Depth<br>m  | Particle size |    |    |    | S    | Clay minerals |     |    | C   |
|---|---------------|----|----|----|------|---------------|-----|----|-----|
|   | CS            | FS | SI | C  |      | SI            | K   | I  |     |
| Elevated terrace - Woodbine grey clay - stony phase (site 13) |               |    |    |    |      |               |     |    |     |
| 0-0.17  | 3             | 32 | 33 | 32 |      | ++++          | +   | tr |     |
| 0.30-0.67   | 15            | 21 | 18 | 45 |      | ++++          | ++  | +  |     |
| 0.95-1.3  | 13            | 22 | 10 | 55 |      | ++++          | ++  | +  |     |
| Elevated terrace - Woodbine grey clay (site 14)               |               |    |    |    |      |               |     |    |     |
| 0-0.10  | 33            | 12 | 12 | 43 |      | ++++          | +   | tr |     |
| 0.10-0.25   | 32            | 12 | 14 | 40 |      | ++++          | +   | tr |     |
| 0.25-0.70   | 39            | 9  | 11 | 41 |      | ++++          | +   | tr |     |
| 0.70-1.10   | 25            | 11 | 13 | 52 |      | ++++          | +   | tr |     |
| 1.10-1.55   | 18            | 10 | 13 | 60 | ++++ |               | +   | tr |     |
| 1.55-1.80   | 15            | 10 | 14 | 62 | ++++ |               | +   | tr |     |
| 2.05-2.15   | 17            | 10 | 15 | 57 |      |               |     |    |     |
| 3.00-3.25   | 12            | 25 | 17 | 46 | ++++ |               | +   |    |     |
| Terrace - Tenthill black earth (site 15)                      |               |    |    |    |      |               |     |    |     |
| 0-0.20  | 3             | 20 | 30 | 47 |      | ++++          | +   | tr | tr  |
| 0.20-0.40   | 1             | 16 | 38 | 45 |      | ++++          | +   | tr |     |
| 0.40-0.54   | 2             | 22 | 35 | 41 |      | ++++          | +   |    |     |
| 0.54-0.70   | 18            | 37 | 17 | 28 |      | ++++          | +   | tr |     |
| 0.70-0.87   | 25            | 30 | 17 | 28 |      |               | +++ | tr | +++ |
| 1.40-1.50   | 1             | 44 | 36 | 20 |      | ++++          | +   | tr |     |
| 1.50-1.70   | 2             | 42 | 29 | 26 |      | ++++          | +   | tr |     |
| 1.70-1.80   | 1             | 41 | 36 | 18 |      | ++++          | +   | tr |     |
| Floodplain - Robinson alluvial soil (site 16)                 |               |    |    |    |      |               |     |    |     |
| 0-0.20  | 34            | 40 | 16 | 10 |      | ++++          | +   | tr |     |
| 0.20-0.50   | 21            | 56 | 13 | 10 |      | ++++          | +   | tr |     |
| Elevated terrace - Woodbine grey clay (site 22)               |               |    |    |    |      |               |     |    |     |
| 0.05-0.30   | 12            | 24 | 17 | 47 |      | ++++          | ++  | +  |     |
| 0.30-0.80   | 12            | 25 | 16 | 47 |      | ++++          | ++  | +  |     |
| 1.10-1.50   | 11            | 26 | 16 | 46 |      | ++++          | ++  | +  |     |
| 1.50-1.60   | 16            | 22 | 16 | 46 |      | ++++          | ++  | +  |     |
| 1.6-1.8   | 28            | 25 | 16 | 35 |      | ++++          | ++  | +  |     |
| Cobbly brown surface  | 48            | 16 | 11 | 26 |      | ++++          | +   | +  |     |
| Alluvial fan - Spellman prairie soil (site 23)                |               |    |    |    |      |               |     |    |     |
| 0-0.13  | 12            | 28 | 31 | 29 |      | ++++          | +   | tr |     |
| 0.13-0.40   | 3             | 19 | 13 | 55 |      | ++++          | +   | tr |     |
| 0.40-0.75   | 5             | 25 | 22 | 48 |      | ++++          | +   | +  |     |
| 0.75-0.88   | 10            | 32 | 20 | 38 |      | ++++          | +   | tr |     |

**Table VII-IV. Selected fine sand mineral properties of downstream reach sites.**

| Depth<br>m   | Light/Heavy<br>ratio | Heavy minerals |         |                      |            |        |       | Augite/<br>Opaques<br>ratio |
|--|----------------------|----------------|---------|----------------------|------------|--------|-------|-----------------------------|
|  |                      | Augite         | Opaques | Zircon<br>percentage | Tourmaline | Rutile | Other |                             |
| Lockyer Ck. Levee - Lockyer prairie soil (site 1)          |                      |                |         |                      |            |        |       |                             |
| 0.0-0.25   | 5.8                  | 45             | 41      | 1                    | 1          | 7      | 4     | 1.09                        |
| 0.70-0.90  | 8.9                  | 21             | 59      | 1                    | -          | 10     | 9     | 0.36                        |
| 1.10-1.40  | 11.1                 | 16             | 67      | -                    | tr         | 11     | 5     | 0.26                        |
| 2.66-2.76  | 11.4                 | 28             | 48      | -                    | -          | 4      | 20    | 0.58                        |
| 3.43-5.53  | 3.3                  | 38             | 55      | tr                   | -          | 3      | 3     | 0.70                        |
| 7.00-7.10  | 5.5                  | 28             | 67      | 1                    | tr         | 2      | 2     | 0.42                        |
| Alluvial plain - Lawes black earth (site 2)                |                      |                |         |                      |            |        |       |                             |
| 0.30-0.60  | 11.8                 | 11             | 85      | 2                    | -          | 2      | -     | 0.12                        |
| 1.00-1.15  | 18.0                 | 22             | 65      | 1                    | 1          | 7      | 3     | 0.34                        |
| 1.30-1.60  | 8.8                  | 18             | 65      | 2                    | tr         | 10     | 6     | 0.27                        |
| 3.40-3.50  | 44                   | 40             | 38      | 1                    | -          | 7      | 14    | 1.05                        |
| 4.00-4.10  | 18.4                 | 48             | 41      | 2                    | -          | 2      | 8     | 1.17                        |
| 6.33-6.40  | 46                   | 23             | 71      | tr                   | tr         | 2      | 3     | 0.32                        |
| 9.40-10  | 12                   | 34             | 63      | tr                   | -          | 2      | tr    | 0.55                        |
| Relict levee - Tenthill variant - red brown earth (site 3) |                      |                |         |                      |            |        |       |                             |
| 0.23-0.50  | 7.4                  | tr             | 85      | 1                    | 2          | 4      | 8     | <0.01                       |
| 1.00-1.35  | 5.9                  | 16             | 65      | 1                    | 1          | 17     | -     | 0.26                        |
| 1.50-1.60  |                      | 16             | 74      | tr                   | 2          | 7      | -     | 0.10                        |
| 3.37   | 9.3                  | 33             | 56      | tr                   | tr         | 2      | 8     | 0.59                        |
| 4.45-4.65  | 25                   | 41             | 57      | tr                   | 1          | 1      | tr    | 0.72                        |
| 5.20   | 21                   | 24             | 62      | 1                    | tr         | 2      | 10    | 0.38                        |
| 5.85   | 26                   | 20             | 79      | -                    | -          | tr     | tr    | 0.25                        |
| 8.30   | 59                   | 3              | 87      | tr                   | 7          | 3      | -     | 0.03                        |

**Table VII-V. Selected fine sand mineral properties of middle reach sites (Lower Tenthill).**

| Depth<br>m                                     | Light/Heavy<br>ratio | Heavy minerals |         |                      |            |        |       | Augite/<br>Opaques<br>ratio |
|--|----------------------|----------------|---------|----------------------|------------|--------|-------|-----------------------------|
|  |                      | Augite         | Opaques | Zircon<br>percentage | Tourmaline | Rutile | Other |                             |
| Alluvial fan - Sutton red-brown earth (site 5) |                      |                |         |                      |            |        |       |                             |
| 0.0-0.30                                       | 35                   | tr             | 86      | 2                    | -          | -      | 10    | 0.01                        |
| 0.79-0.97                                      | 17                   | tr             | 92      | 1                    | 1          | tr     | 5     | 0.01                        |
| 1.28-1.60                                      | 112                  | tr             | 83      | 1                    | -          | -      | 15    | 0.01                        |
| Terrace - Tenthill chernozem (site 7)          |                      |                |         |                      |            |        |       |                             |
| 0.25-0.40                                      | 42                   | 17             | 77      | tr                   | -          | 1      | 4     | 0.23                        |
| 0.47-0.60                                      | 2582                 | 34             | 52      | tr                   | -          | 2      | 11    | 0.65                        |
| 0.90-1.20                                      | 6.2                  | 53             | 42      | 2                    | -          | 1      | 3     | 1.26                        |
| Floodplain - Lockyer prairie soil (site 8)     |                      |                |         |                      |            |        |       |                             |
| 0.25-0.40                                      | 5.5                  | 42             | 51      | 1                    | -          | 5      | 1     | 0.82                        |
| 0.65-0.90                                      | 3.5                  | 39             | 42      | 1                    | -          | 1      | 15    | 0.92                        |
| 1.30-1.70                                      | 6.6                  | 32             | 52      | tr                   | -          | 1      | 15    | 0.62                        |

**Table VII-VI. Selected fine sand mineral properties of Townson profile (site 10).**

| Depth<br>m | Light/Heavy<br>ratio | Heavy minerals |         |                      |            |        |       | Augite/<br>Opaques<br>ratio |
|------------|----------------------|----------------|---------|----------------------|------------|--------|-------|-----------------------------|
|            |                      | Augite         | Opaques | Zircon<br>percentage | Tourmaline | Rutile | Other |                             |
| 0-0.12     | 11.6                 | 6              | 91      | tr                   | tr         | 2      | 2     | 0.07                        |
| 0.12-0.20  | 17.8                 | 6              | 90      | 1                    |            | 2      | 1     | 0.07                        |
| 0.20-0.30  | 11.2                 | 3              | 85      | 2                    | tr         | 3      | 4     | 0.04                        |
| 0.70-0.90  | 22                   | 5              | 80      | 2                    | 1          | 7      | 5     | 0.06                        |

**Table VII-VII. Selected fine sand mineral properties of upstream reach sites (Mt. Sylvania).**

| Depth<br>m  | Light/Heavy<br>ratio | Heavy minerals |         |                      |            |        |       | Augite/<br>Opaques<br>ratio |
|---|----------------------|----------------|---------|----------------------|------------|--------|-------|-----------------------------|
|   |                      | Augite         | Opaques | Zircon<br>percentage | Tourmaline | Rutile | Other |                             |
| Elevated terrace - Woodbine grey clay - stony phase (site 13) |                      |                |         |                      |            |        |       |                             |
| 0.12-0.30   | 1296                 | 9              | 78      | 3                    | 3          | 2      | 5     | 0.12                        |
| 0.60-0.95   | 1469                 | 2              | 73      | 10                   | 2          | 1      | 13    | 0.03                        |
| 1.67-1.76   | 1570                 | 3              | 59      | 6                    | 2          | 4      | 26    | 0.05                        |
| Elevated terrace - Woodbine grey clay (site 14)               |                      |                |         |                      |            |        |       |                             |
| 0.10-0.25   | 84                   | 10             | 80      | 7                    | 1          | 1      | 1     | 0.13                        |
| 0.70-1.10   | 440                  |                |         |                      |            |        |       |                             |
| 1.55-1.80   | 333                  | 4              | 73      | 6                    | -          | -      | 17    | 0.05                        |
| 2.05  | 470                  | 8              | 84      | 2                    | -          |        | 6     | 0.09                        |
| 3.25  | 9.3                  | 2              | 92      |                      |            | 2      | 4     | 0.02                        |
| Terrace - Tenthill black earth (site 15)                      |                      |                |         |                      |            |        |       |                             |
| 0.20-0.40   | 333                  | 13             | 82      | tr                   | tr         | 1      | 3     | 0.16                        |
| 0.54-0.70   | 2.8                  | 43             | 45      | -                    | -          | 1      | 12    | 0.93                        |
| 1.70-1.80   | 69                   | 35             | 48      | tr                   | tr         | 2      | 12    | 0.74                        |
| Floodplain - Robinson alluvial soil (site 16)                 |                      |                |         |                      |            |        |       |                             |
| 0.0-0.20  | 2.9                  | 47             | 35      | tr                   | -          | 2      | 17    | 1.34                        |
| 0.20-0.50   | 3.07                 | 59             | 37      | 2                    | -          | 2      | -     | 1.59                        |

**Table VII-VIII. Selected fine sand mineral properties of Woodbine grey clay (site 22).**

| Depth<br>m | Light/Heavy<br>ratio | Heavy minerals |         |                      |            |        |       | Augite/<br>Opaques<br>ratio |
|------------|----------------------|----------------|---------|----------------------|------------|--------|-------|-----------------------------|
|            |                      | Augite         | Opaques | Zircon<br>percentage | Tourmaline | Rutile | Other |                             |
| 0.35-0.45  | 1621                 | 6              | 84      | 6                    | 2          | 3      | 7     | 0.07                        |
| 0.90-1.00  | 146                  | 3              | 83      | 5                    | 2          | 4      | 6     | 0.06                        |
| 1.60-1.70  | 10.3                 | 9              | 76      | 1                    | -          | 7      | 6     | 0.12                        |



## Appendix 8

### Structure conversion for detailed transect numerical analysis

(A. B. McBratney, personal communication)

| Structure         | Horizontality | Verticality | Flatness of face | Accommodation |
|-------------------|---------------|-------------|------------------|---------------|
| Platy             | 1             | 0           | 1.00             | 1.0           |
| Lenticular        | 1             | 0           | 0.00             | 1.0           |
| Prismatic         | 0             | 1           | 1.00             | 1.0           |
| Columnar          | 0             | 1           | 0.67             | 1.0           |
| Angular Blocky    | 1             | 1           | 1.00             | 1.0           |
| Subangular Blocky | 1             | 1           | 0.50             | 0.5           |
| Granular          | 1             | 1           | 0.00             | 0.0           |
| Massive           | 0             | 0           | 0.00             | 0.0           |
| Single grain      | 0             | 0           | 0.00             | 0.0           |