SOILS OF THE LOWER BURDEKIN RIVER - ELLIOTT RIVER AREA, NORTH QUEENSLAND

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AGRICULTURAL CHEMISTRY BRANCH
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Agricultural Chemistry Branch
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- ELLIOTT RIVER AREA, N. QLD.

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DEPARTMENT OF PRIMARY INDUSTRIES, QUEENSLAND
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1. INTRODUCTION

1.1. Background

Much of the Lower Burdekin area has been mapped previously in reconnaissance soil and land surveys. The soils, land forms and vegetation of the area were mapped by Skerman (1949), Christian *et al* (1950), Hubble and Thompson (1953), Isbell and Murtha (1970), and van Wijk (1971). Map scales ranged from 1:190 000 to 1:1 000 000.

More detailed soil surveys with mapping at a scale of 1:8 000 had been carried out for irrigation farm design at Clare, Millaroo and Dalbeg on the levee and adjacent flood plain areas of the left bank.

1.2. Purpose and Extent of Survey

The existing information for areas on the right bank was considered to provide inadequate detail for a reliable assessment of the suitability of the area for irrigation. The survey reported here was undertaken at a scale realistic for irrigated land use development to provide more detailed information on the properties, irrigation suitability and distribution of the soils and to assess the areas of various soil classes and the degree of soil variability.

The area covered by this report totals approximately 92 000 hectares on the right bank of the Burdekin River, south-east to the Elliot River. Of this area 44 067 hectares are commandable under the proposals of the Report on Extension of Burdekin River Irrigation Project (1971).

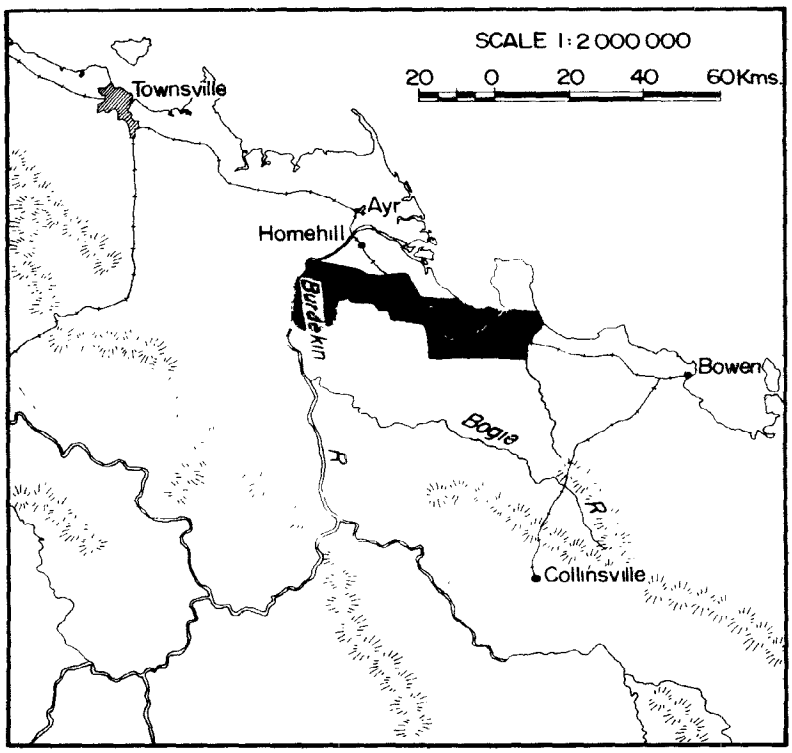


Fig I. Locality Plan

2. SOIL SURVEY METHOD

2.1. General

A reference or sample area technique has been used. Sample areas were chosen to represent all major soil associations as mapped by Hubble and Thompson (1953) and van Wijk (1971).

Within sample areas controlled traverses were run, and sites for description were selected on photopattern, vegetation and land form characteristics. 1:10 000 black and white, and colour photographs were used.

Soils were augered to 150 cm and classified in terms of the Factual Key (Northcote, 1971). Profile characteristics not included in this classification were also recorded and used as a basis for soil grouping. Descriptions of soil structure were made on 10 cm Proline cores or 5 cm Atlas Copco cores.

From 400 detailed descriptions 49 soil profile classes were obtained within the sample areas. The sample areas were then mapped at 1:25 000.

The soil profile classes identified for the sample areas were used as the working legend for the 1:100 000 mapping of the 92 000 hectare area. This area was mapped by air photo interpretation using 1:25 000 black and white photographs. The areas was then extensively checked in the field, resulting in 4 new soil profile classes being identified. A range of miscellaneous mapping units (e.g. hills, sand dunes, marine saline flats and mangroves) not occurring in the sample areas were also identified.

2.2. Soil Profile Class and Mapping Unit Derivations

Soil Profile Class

The basic soil grouping used is the soil profile class (see Glossary).

The system of classification used here is an ascending one in which observed soil profile morphology is the starting point.

The soil profile classes were obtained by grouping profiles of similar morphology into classes, where the difference of certain morphological characteristics within classes is less than that between classes. Emphasis has been given to those profile characteristics considered likely to have greatest significance in irrigated land use.

On the basis of their position in the landscape all soil classes have been given a symbol (1 - 6) to indicate their topographic form.

Each soil profile class is thus designated by an alpha numeric code : a number for the topographic form, the appropriate primary form subdivision symbol (Northcote 1971), and a letter for each separate soil profile class within that primary profile form subdivision. For example in unit 3 Dya, 'Dy' indicates the gross overall morphology and represents the dominant primary profile form subdivision (Northcote, 1971) of the constituent profiles. 'a' denotes a separate soil profile class distinguished on characteristics other than those summarized in the primary profile form subdivision notation (e.g. depth and texture of surface horizons). '3' denotes topographic form 3 (Local Alluvial Plains).

Mapping Units

Two types of mapping units are used. The sample areas mapped at 1:25 000 are mostly simple mapping units, with one soil profile class occupying greater than 70% of each mapping unit area.

At 1:100 000 most mapping units are compound units with two or more soil profile classes, each occupying less than 70% of the mapping unit area.

In the naming of soil mapping units the following guidelines have been used:

(1) At 1:25 000, simple mapping units are identified by the dominant soil profile class, while compound mapping units are identified by the two most common soil profile classes.

(2) At 1:100 000, where all mapping units are compound, the units are named after the soil profile class with the highest percentage occurrence - except where the complexity of soil profile class distribution is likely to cause major land use differences. In this case mapping units are named after the two most common soil profile classes.

3. PHYSICAL ENVIRONMENT

3.1. Climate

3.1.1. General

Comprehensive data and summaries of the climate in the Ayr region have been given in Christian *et al* (1950) and Australian Bureau of Meteorology (1970).

Essentially the area is characterized by warm sub-humid conditions with marked seasonal rainfall patterns and an almost total lack of frosts.

Climatic data are summarized in Figure 2.

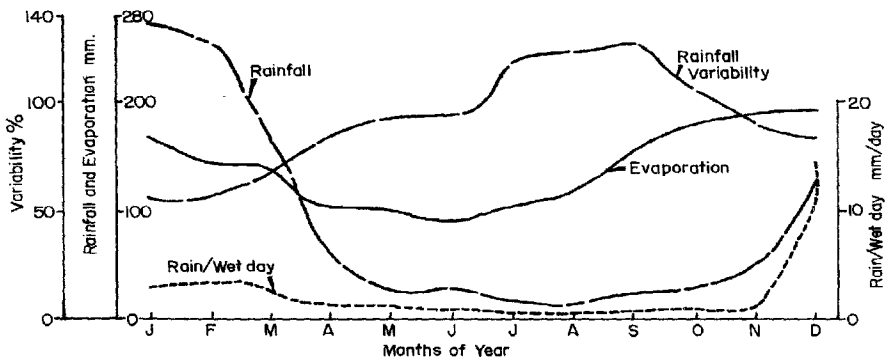


Fig2. Climatic data, Lower Burdekin Valley

3.1.2. *Rainfall Distribution*

Rainfall distribution can be divided into a four month wet season from December to March when 89% of the average annual rainfall falls, and a dry season from April to November.

The start of the wet season is characterized by high variability and intense rainfall in the form of storms. This poses major problems when planning land preparation or harvesting at this time of the year.

3.2. Geology and Geomorphology

The geology of the Burdekin Region has been mapped and described by Paine *et al* (1969) and the geomorphology of certain areas by Hopley (1970).

3.2.1. *General*

The right bank consists of a series of dissected uplands and broad depositional plains.

The uplands and ranges are Upper Carboniferous in age and elevated by between 1 and 30 m above the depositional plains. Sedentary soils have formed on granites, diorites and granodiorites of the Connors Arch structural framework complex (Paine, 1972).

Within the survey area uplands occur as low isolated plateau-like formations or as undulating plains with moderate slopes (1 to 5%). Piedmont plains are poorly developed within the survey area.

Three depositional plains have been identified. A possible fourth exists, but for purposes of soil classification it was not separated. These plains are mostly Pleistocene in age.

Younger Holocene deposits associated with present streams have also been identified.

The parent materials, origins, and relationships to soil profile classes are discussed below and summarized in Table 1.

Figure 3 gives a diagrammatic representation of right bank topographic forms.

3.2.2. *Classification and Description of Topographic Forms*

The relief characteristics of the right bank have been divided into topographic forms on the basis of geomorphological type and influence.

Six topographic forms have been identified and divided into seventeen subdivisions which relate to soil profile class distribution and topographic position.

LOCAL ALLUVIAL-COLLUVIAL PLAINS (TOPOGRAPHIC FORM 1)

Soils: 1 Uga,b,c,d,e; 1 Dya,b,c; 1 Dba,b; 1 Dda

These are plains of low relief incised by creeks, prior streams and channel infill deposits, but with no obvious association with present stream courses or their plains of deposition.

Due to their incision by Holocene stream courses and prior streams, these plains are probably Pleistocene in origin.

Grit is evident in all soils to varying degrees, while low amounts of coarse gravel and stone occur in the soils of more elevated, colluvial situations (1 Uge).

These deposits are most likely associated with the weathering and erosion of nearby hills.

In the lower lying areas black earths and grey clays (1 Uga, b,c,d) dominate. In slightly elevated (<1 m) areas solodic-solodized solonetz soils dominate (1 Dy, 1 Db, 1 Dd). In areas of more relief (1 to 3% slope) linearly gilgaied grey-brown clays (1 Uge) dominate, normally associated with the foothills of Stokes Range and Bobawaba Range.

BURDEKIN RIVER FLOOD PLAIN (TOPOGRAPHIC FORM 2)

Soils: 2 Uga,b,c; 2 Dya; 2 Dba,b.

These plains of low relief are associated with the flood plain deposits of the Burdekin River. On the left bank of the Burdekin River these plains occupy large areas, commonly incised by active and inactive distributary channels and old stream beds. This incision is not a feature of the right bank deposits.

There is no evidence that the Burdekin River bed has occupied a more easterly position than it does at present between Mt. Louisa and The Rocks. Mt. Louisa, Stokes Range and the associated uplands have stopped the easterly and south-easterly migration of the river bed that has been causal in the development of the left bank land form characteristics.

These deposits, and the associated levee and delta of the present stream course of the Burdekin River, along the northern edge of the survey area, mark the limit of major Burdekin River depositional and erosional influence on the physiography of the right bank.

The flood plain deposits are fine textured giving rise to grey clays in low lying areas (2 Uga,b,c), and solodic-solodized solonetz in slightly elevated (<2 m) areas (2 Dya, 2 Dba, 2 Dbb).

LOCAL ALLUVIAL PLAINS (TOPOGRAPHIC FORM 3)

These are plains of very low relief. They are only weakly incised by creeks or prior streams and their major drainage lines are actively developing compared with the depositional nature of the drainage lines on the alluvial-colluvial plains.

Fine textured sediments dominate with a depth of three to seven metres to underlying rock compared with two to four metres for the alluvial-colluvial plains.

The higher clay contents recorded for this group and the lower coarse fraction content may be due in part to difference in sediment origin between the alluvial-colluvial plains and the local alluvial plains.

Two types of deposits occur in this group with widely differing soil profile class composition.

a) Local Alluvial Plains - Low Lying Areas:
Black Earths - Treeless to Sparsely Timbered:
Soils: 3 Uga,b,c,d,e,f,g.

These deposits occur in the Camp and Cassidy Creeks area on Inkerman Stations and the Lakes Plain, and in the Wangaratta Creek and Yellow Gin Creek area

The deposits immediately to the south of Wangaratta Creek, belong to the alluvial-colluvial topographic group.

In the Cassidy Creek area local alluvial deposits (3 Uge) (see Sample Area 1 map) overlie Burdekin River Flood Plain deposits at less than 1.5 m.

Elsewhere the sediments directly overlie the granodiorite which forms the parent material of the uplands on intermediate intrusives (Topographic Form 5). This information was obtained from Irrigation and Water Supply Commission bore logs and deep augering observations.

b) Local Alluvial Plains - Slightly Elevated Areas;
Grey Clays - Boree Scrub;
Soils: 3 Ugh,i,j and 3 Dya.

These deposits occur throughout the area between Wangaratta Creek and Elliot River.

The broad land form characteristics are similar to the above group. They differ in their elevation above all the other depositional plains by 1 to 3 m, and unlike the other deposits small isolated deposits do occur, normally associated with isolated uplands (Bobawaba) or hill outcrop (Red Hill) formations.

The sediments are more strongly weathered than the alluvial-colluvial deposits. Their elevation and distribution indicate a residual land surface much older than either of topographic forms 1 or 2.

CHANNEL INFILLS AND DISSECTED UPLANDS DEVELOPED FROM ACID INTRUSIVES (TOPOGRAPHIC FORM 4)

Two major subdivisions occur within this group.

a) Channel Infills on the Valley Floors:
Soils: 4 Uca, 4 Gna and 4 Dya.

These are infilled channels in the local alluvial-colluvial plains (Topographic Form 1). Although the resultant infilled channels are elevated by up to 1 m above the plains, little levee or flood plain development seems to have occurred.

The channels originate only from Cape and Armstrong Creeks, the only major creeks incising the alluvial-colluvial plains which have not developed obvious levees of their own. All overbank flow has been concentrated into narrow erosional channels of less than 50 m in width across the alluvial-colluvial plains.

The result is a dendritic pattern of distributary channels which have back filled, possibly after the manner postulated by Hopley and Murtha (1975). The deposits only begin to take on a fan formation towards their coastal end, presumably as the velocity of flow decreased.

The 4 Uca soil profile class occurs in the bed of the infilled channel, 4 Gna on the outside of the bed and on the very minor levee formed beside the infilled bed. 4 Dya consists of surface horizons of channel infill origin and subsoils of alluvial-colluvial origin, found in the alluvial fan and sand splay areas.

It is unlikely that these channels mark past beds of Cape or Armstrong Creeks as their size is much less than the present bed and they do not necessarily drain to an obvious outlet - rather they disappear into fan type formations of varying degrees of development.

b) Dissected Uplands on Acid Intrusives:

Soils: 4 Dyc and 4 Dyb.

These are undulating uplands with a range of podzolic and solodized solonetz soils developed (4 Dyc, 4 Dyb). Slopes range from 1 to 4% and are commonly around 2%. This group has limited occurrence in the survey area but is strongly represented in the southern left bank region (Hubble and Thompson 1953).

DISSECTED UPLANDS ON INTERMEDIATE INTRUSIVES (TOPOGRAPHIC FORM 5)

Soils: 5 Dra; 5 Dya,b,c,d; 5 Uga; 5 Dda.

These are maturely dissected uplands on intermediate intrusives. The petrology of the parent materials varies within the intermediate range of rock types from granodiorites and monzonite to dolerite and diorites. Granodiorites tend to dominate.

The uplands are drained by broad based drainage lines on slopes of 1 to 5% (modal 1.5) which feed into erosional gullies and creeks at the base of the slopes.

A catena of soils exists on these slopes with 5 Dra and 5 Dya dominating the upper slope position, 5 Dyb the mid to lower positions, 5 Dyc the lower, with 5 Uga scattered throughout on dolerite or gabbro dyke intrusions. 5 Dyd is found only in areas where colluvial hill slope deposits form part of the parent material. 5 Dda is formed in areas of slumping and tunnel erosion within 5 Dyb soils.

Parent material and ground water hydrology are operative in determining the catena. The wide variation in both these causal factors results in variations of the catenary sequence described above.

An unexpected feature of these uplands is the uniform depth of weathering in all slope positions. Although rock outcrops do occur over less than 1% of the area (mostly upper slope positions) and bedrock can be encountered at less than 1 m in a further 2% of sites, generally 2 to 3 m of weathering is evident. The concentration of ground waters into lower slope positions has resulted in solonization (5 Dyc, 5 Dyb) and an increased thickness of B horizon in the soils.

RECENT ALLUVIAL DEPOSITS (TOPOGRAPHIC FORM 6)

Soils: 6 Ufa,b,c; 6 Uma; 6 Dda; 6 Dba,b;
6 Gna; 6 Uca; 6 Ddb.

These are Holocene deposits associated with the present stream courses.

These deposits encompass a wide range of stream depositional features.

a) Levee and Delta

All major creeks and rivers except those incising the local alluvial plains (Topographic Form 3) and Cape and Armstrong Creeks incising the local alluvial-colluvial plains (Topographic Form 1) have well developed levee deposits. Sandy Creek and Molongle Creek have very small deltaic deposits at their coastal end. The small area of the Burdekin River delta occurring in the mapped area has been excluded from the soil classification system and has been mapped as a miscellaneous topographic form.

b) Alluvial Fan and Prior Stream Deposits

Sandy, Molongle, Rocky Ponds, R.M. Creeks and the Elliot River have an associated pattern of prior streams in the alluvial-colluvial plains (Topographic Form 1). These old stream deposits are slightly elevated (<2 m) above the surrounding plains. However, there seems to be little associated flood plain deposits.

An alluvial fan occurs in the head waters of Camp and Cassidy Creek. The fan is continuing to develop and is extending onto black earths of the local alluvial plains at the rate of 0 to 2 m per year depending on the wet season rainfall.

MISCELLANEOUS TOPOGRAPHIC FORMS

This group includes mangroves, marine saline flats, sand dunes, mountain ranges, low hills, Burdekin River delta and areas of unstable gully erosion.

They are grouped together for convenience.

3.3. Natural Vegetation

3.3.1. General

Vegetation has been systematically recorded for each soil profile class. This vegetation - soil profile class relationship is given in Table 2.

3.3.2. Structural Form

The most common structural form is the low open woodland. In part this reflects the drier, more strongly seasonal climate of the area, compared with areas of open woodland and forest of the wetter coastal regions north of Townsville and south of Bowen.

Exceptions to this occur with dense woodlands and understorey of 3 Ugi and j soils, and the relatively treeless plains of 3 Uga,b,c,d and e soils. In these cases edaphic factors appear to override climatic controls on the structural form of the communities.

3.3.3. Composition

Although there are exceptions, it is generally found that the composition of the structural form varies with soil profile class in the low open to open woodland situation. The dominant tree is normally poplar gum, but is replaced by carbeen on better drained soils and grey bloodwood on those soils with markedly better profile drainage and water retention properties.

Management in the form of over-grazing, burning and clearing seems to have mainly affected the shrub and grass component of the communities.

Species not normally present but which may become dominant under these situations are rubber vine, parkinsonia, mimosa, noogoora burr, chinee apple and grader grass.

Species normally present but which dominate under these conditions are, bunch spear and cane grass.

3.3.4. *Specific Edaphic Considerations*

Certain species have proved indicative of certain soils or soil conditions.

FALSE SANDALWOOD	Strongly sodic-saline, thin surfaced, duplex soils or saline grey clays.
BEEFWOOD	Moderately sodic soils of any primary profile form.
BROADLEAF TEA TREE	Surface and profile waterlogging. On slopes is indicative of lateral movement and accumulations of ground waters.
IRONBARK	Sedentary soils with freely draining profiles (3 Ugh an exception).
RED BLOODWOOD	As for ironbark but rock normally present in the profile.
COCKY APPLE	Soils underlain by water table confined in a washed sand stratum. Also common in sedentary skeletal soil situations along sub-surface seepage lines.
PANDANUS	Deep sands and hence indicative of channel infill situations.
BOREE	Saline grey clays.

3.4. Hydrology

3.4.1. *Surface Hydrology*

(a) Burdekin River to Wangaratta Creek

The surface hydrology of the right bank differs considerably from that of the left bank.

The area between Stokes Range-Mt. Louisa and the Burdekin River is drained by the Burdekin River.

In this area direct flooding of the Burdekin River flood plain area (Topographic Form 2) is a recurrent phenomenon, with associated back up flooding of the local alluvial plains along Cassidy, Stokes, One Mile and Camp Creeks.

Flooding along low lying areas occurs from Arkendeith to Inkerman Station homestead and then to Saltwater Creek.

Localized flooding of short duration occurs over many of the local alluvial treeless plains associated with the very weak relief and lack of surface drainage of these plains. The major problem on the local alluvial plains is unlikely to be flooding, but rather waterlogging problems associated with intense summer rainfall. Susceptible crops will no doubt suffer losses unless adequate, erosion proof flood ways can be provided.

Similar waterlogging problems may be experienced over much of the alluvial-colluvial plains, but, except in isolated areas, there does not seem to be any significant flooding hazard.

(b) Wangaratta Creek to Elliot River

This area is drained by a large number of well incised creeks with limited catchments, short lengths and fast rates of run-off. They are characterized by dry stream beds during the dry season, with fast stream rises, and occasional major over-bank flows during the wet season.

Flooding in the vicinity of the creeks (particularly Rocky Ponds, R.M., Armstrong, Cape and the Sandy Creek-Big Jack Creek complex) can be expected. Short periods of inundation occur. Considerable erosion damage to banks and secondary streams has been observed.

Again the major problem will be wet season water-logging over the depositional plains, particularly in areas where adequate storm water run-off controls are not available.

3.4.2. Sub-surface Hydrology

Little is known of the sub-surface hydrology of the right bank. The results of water samples from wells on the right bank are discussed in section 5.2.6.

. Prior Stream and Channel Infill Areas

The presence of large numbers of prior streams and channel infills in the alluvial-colluvial plains is disturbing, as these have the potential to act as intake beds for ground water tables.

Ground waters sampled from these areas in late 1975 have shown a surprisingly large number of saline waters, with high sodium hazards, at moderate depths.

It would be inadvisable to irrigate these areas until an accurate assessment of the ground water table behaviour and control is made.

. Upland Areas

Lateral movement of water from the slopes of upland areas has been observed under conditions of clearing (uplands on acid intrusives) and cultivation with irrigation (uplands on intermediate intrusives).

The problem is most severe in the uplands on intermediate intrusives, where current studies suggest that interference with natural vegetation, surface run-off and establishment of artificial recharge systems is circumstantially related to the development of saline water tables on the local alluvial plains.

Adequate surface drainage at the break in slope between the uplands on intermediate intrusives and the local alluvial plains, and between the uplands on acid intrusives and the local alluvial-colluvial

plains, will be required to slow down the water input into presently moderate deep (7 to 12 m) water tables.

Seepage losses from open earth channels on these upland areas may also have to be monitored and controlled to ensure that excessive lateral losses and accumulations do not occur. At present the potential for this to occur is unknown.

4. SOILS

4.1. General

51 soil profile have been identified over the total right bank area.

The various depositional plains are dominated by a range of cracking clays interspersed with areas of duplex solodic soils, while the upland regions are dominated by a series of duplex soils representing a wide range of great soil groups.

Table 1 gives the relationship between the topographic forms and soil profile classes and the major distinguishing features between the various soil profile classes.

4.2. Morphology

Table 2 gives detailed descriptions of soil profile class morphology and limits of variation.

4.3. Mapping Units

The derivation of mapping units is discussed in section 2.2.

Table 3 lists mapping units and their composition for the 1:100 000 mapping area. Appendix 5 lists the composition of the mapping units for the 1:25 000 sample areas.

In Table 3 the soil profile classes listed in the associate soil profile class column occupy <70% of the mapped area. Due to heavy reliance on air photo interpretation and field checking of selected photo-patterns it is impossible to accurately predict percentage composition for the 1:100 000 area. In general, the first associate soil profile classes listed occupies approximately 40% of the mapping unit area. The associate soil profile class composition of each mapping unit can vary from area to area (e.g., mapping unit 6 Uma consists predominately of 6 Uma and 6 Gna on the levee of the Burdekin River. On the Elliot River levee the same mapping unit is dominated by 6 Uma and 6 Dba).

4.4. Soil Variability in 1:100 000 Mapping Units

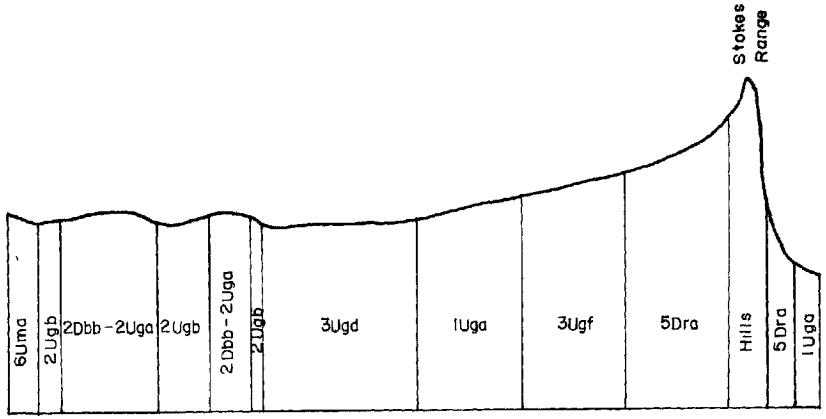
A visual indication of soil variability in the 1:100 000 mapping units can be obtained by comparing the sample area 1:25 000 map with the 1:100 000 map. The sample area maps give an indication of soil profile class distribution within the landscape as described by the 1:100 000 soil profile class association mapping units.

The role that the associate and particularly the minor soil profile classes of the 1:100 000 soil profile class association mapping units (Table 3) play in determining soil variability at the farm level can be seen from the 1:25 000 sample area maps. Appendix 5 shows that even at 1:25 000 variability is such that the 1:25 000 mapping units consist of:

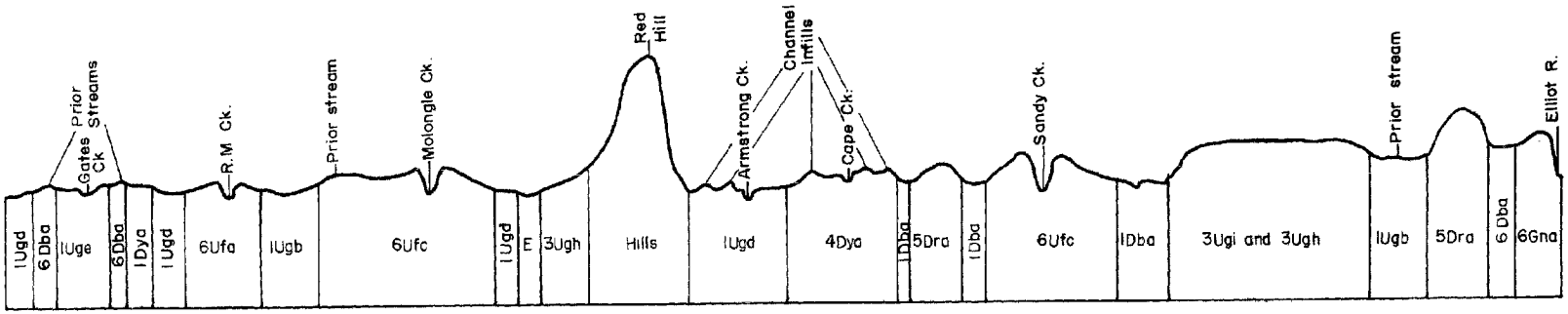
(a) Soil profile class associations (compound mapping units) where the associate soil profile class occurs in roughly equal proportions with the dominant soil profile class, (e.g., 1 Uga - 1 Dba).

(b) Simple mapping units where minor soil profile classes may constitute up to 30% of the unit.

Appendix 5 can thus be used to appraise the variability that is likely in the 1:100 000 mapping units. (e.g., areas of 3 Ugd soil profile class are relatively uniform at 1:100 000 and 1:25 000 while areas of 4 Uca, 4 Gna or 4 Dya are extremely complex at 1:25 000 posing major farm design problems for all areas containing these soil profile classes).



Landscape section, Clare Weir site to Leichhardt Downs homestead



Landscape section, Wakala to Guthalungra

Fig 3. Landscape sections of Right Bank, showing relative positions of mapping units

TABLE 1

MAJOR DISTINGUISHING TOPOGRAPHIC AND MORPHOLOGICAL FEATURES OF THE SOILS

TOPOGRAPHIC FORM	SUBDIVISION	SOIL GROUP	SOIL PROFILE CLASS	MAJOR DISTINGUISHING FEATURES
Local Alluvial-Colluvial Plains. (1)	Low lying areas	Black earths and black earth-grey clay intergrades	1 Uga	Medium to medium heavy clay black earths with lime throughout - weakly self mulching.
			1 Ugb	Light medium to medium clay black earths with lime throughout - moderately self mulching.
			1 Ugc	Medium clay black earths with light clay surface.
			1 Ugd	Medium clay black earth - grey clay intergrades, with weakly mottled surface horizon.
	1-3% slope areas	Linearly gilgaied grey-brown clays	1 Uge	Linearly gilgaied grey-brown clays.
	Slightly elevated areas	Grey and dark-grey solodics and solodized solonetz	1 Dya	5-10 cm clay loam over light medium clay to medium clay.
			1 Dyb	10-15 cm sandy loam to sandy clay loam over light medium clay.
			1 Dyc	5-10 cm clay loam over medium clay to medium heavy clay.
		Grey-brown and brown solodics and solodized solonetz	1 Dba	5-15 cm clay loam over extremely hard medium clay.
			1 Dbb	10-20 cm sandy loam to sandy clay loam over medium clay.
			1 Dbc	5-10 cm sandy clay loam over mottled light medium clay.
		Dark solodics	1 Dda	10-15 cm fine sandy clay loam over dark medium clay.
Burdekin River Flood Plain (2)	Low lying areas	Grey clays - moderately hydromorphic	2 Uga	Grey medium to medium heavy clay with lime at depth; moderately mottled surface
			2 Ugb	Dark grey medium to medium heavy clay; weakly mottled surface.
			2 Ugc	Grey and grey-brown clays with weakly mottled light clay surface.
	Slightly elevated areas	Grey solodics	2 Dya	5-10 cm of fine sandy clay loam over medium clay.
		Brown solodics and solodized solonetz	2 Dba	5-10 cm fine sandy clay loam over brown medium clay.
		Brown solodics	2 Dbb	10-20 cm fine sandy clay loam over medium clay.
Local Alluvial Plains (3)	Low lying areas	Black earths	3 Uga	Black earths with lime throughout.
			3 Ugb	Medium clay black earths.
			3 Ugc	Black earth - grey clay intergrades.
			3 Ugd	Black earths with lime at depth.
			3 Uge	Black earths with weakly structured 'D' horizon.
		Black earth - alluvial soil intergrades	3 Ugf	Black earth - alluvial soil intergrades.
		Grey clays	3 Ugg	Light to medium clay with strong surface mottle.
	Slightly elevated areas	Grey clays	3 Ugh	Weakly gilgaied medium to medium heavy clay.
			3 Ugi	Moderately gilgaied medium to medium heavy clay.
			3 Ugj	Strongly gilgaied medium heavy clay.
		Grey solodic - grey clay intergrades	3 Dya	5-10 cm of clay loam over medium clay. Intergrades to 3 Ugh.

TOPOGRAPHIC FORM	SUBDIVISION	SOIL GROUP	SOIL PROFILE CLASS	MAJOR DISTINGUISHING FEATURES
Channel Infills and Dissected Uplands Developed From Acid Intrusives. (4)	Channel Infills	Deep sands	4 Uca	Uniform deep coarse sands.
			4 Gna	Moderately deep sands grading to sandy clay loam.
		Solodics and solodized solonetz	4 Dya	Coarse sand or sandy loam over sandy clay loam to sandy clay.
	Dissected Uplands	Solodics and solodized solonetz	4 Dyb	Coarse sand with bleach over mottled alkaline medium clay.
		Mottled yellow podzolics	4 Dyc	Coarse sand over mottled neutral medium clay.
Dissected Uplands on Intermediate Intrusives. (5)	Upslope positions	Neutral red duplex soils	5 Dra	Neutral red duplex soils.
		Neutral yellow duplex soils	5 Dya	Neutral yellow duplex soils.
	Mid slope positions	Alkaline yellow duplex soils	5 Dyb	Alkaline yellow duplex soils.
	Lower slope positions	Grey solodics and solodized solonetz	5 Dyc	10-40 cm of sandy clay loam to clay loam over medium clay.
	Lower slope positions (Colluvial)	Grey solodized solonetz	5 Dyd	5-10 cm of clay loam over extremely hard light medium clay.
	Random occurrence	Sedentary black earths	5 Uga	Black earths with grit and rock through profile.
	Slumped & tunnel eroded areas	Acid dark duplex soils	5 Dda	Coarse sandy loam to clay loam over dark clay.
Alluvial Deposits. (6)	Levees	Alluvial soils; non-cracking clays	6 Ufa	Fine sandy light clay, weakly structured, over medium clay, alkaline reaction.
			6 Ufb	Coarse sandy clay, strongly structured, over medium clay, alkaline reaction.
			6 Ufc	Silty clay over light medium clay, neutral reaction.
		Alluvial soils; fine sandy clay-loams	6 Uma	Deep fine sandy clay loams.
		Dark solodics	6 Dda	10-20 cm fine sandy clay loam over medium clay.
		Brown solodics	6 Dba	15-30 cm sandy loam over hard light medium clay.
			6 Dbb	30-40 cm fine sandy clay loam over hard light medium clay.
		Gradational soils	6 Gna	Neutral brown and dark gradational soils with fine sandy clay loam surface.
	Prior stream and alluvial fan areas	Deep sands	6 Uca	Deep sands.
		Dark solodics	6 Dda	10-20 cm fine sandy clay loam over medium clay.
			6 Ddb	Coarse sands overlying cracking medium heavy clay.
		Brown solodics	6 Dba	15-30 cm sandy loam over hard light medium clay.

TABLE 2

A DESCRIPTION OF THE MORPHOLOGY, TOPOGRAPHY AND VEGETATION OF THE SOIL PROFILE CLASSES

SOIL PROFILE CLASS	P.P.F.(S)	SOIL PROFILE CLASS DESCRIPTION	TOPOGRAPHIC FORM	PREDOMINANT VEGETATION
1 Uga	Ug 5.16 Ug 5.15 Ug 5.17 Ug 5.24 Ug 5.28	Black Earths: Weak to moderate gilgai Mound: 1-2 cm weak fine to medium granular self mulch, over black to brownish black, light medium to medium clay, strong medium subangular blocky to blocky, to 10 to 30 cm. Gradual boundary to black to greyish yellow brown, medium to medium heavy clay, strong fine prismatic to medium blocky, to 50 to 100 cm. Clear to gradual boundary to brown to dull yellow orange light medium to medium heavy clay, strong fine lenticular, to >150 cm. Low amounts of grit occur throughout the profile. Manganiferous veins and concretions in low amounts throughout. Concretionary lime in low amounts below 0-30 cm. Normally moderately alkaline below 0-10 cm, medium acid above. Moderately cracking. Depressions: Similar morphology except for slightly darker upper 30 cm and greater depth to lime.	Local alluvial-colluvial plains Flat low lying plains. Slopes normally between 0-0.5%.	Low open woodlands with strongly developed grassland. Poplar gum and cabbage gum dominating with scattered broad leaf tea tree. Grassland of cane grass and various species of blue grass.
1 Ugb	Ug 5.16 Ug 5.24 Ug 5.15 Ug 5.28	Black Earths: Weak to moderate gilgai. Mound: 2 cm of moderate fine subangular blocky breaking to fine granular self mulch, over black to brownish black light medium to medium clay, strong medium subangular blocky to blocky to 20 to 40 cm. Gradual boundary to brownish grey to yellowish grey light medium clay to medium clay, strong fine prismatic to medium subangular blocky, to 85 to 125 cm. Clear to gradual boundary to yellowish brown to greyish yellow medium to medium heavy clay, strong fine prismatic to fine lenticular to >150 cm. (Occasionally weakly mottled). Grit throughout. Manganiferous concretions throughout with lime concretions below 0-30 cm. Normally moderately alkaline below 0-20 cm. Moderately cracking. Depressions: Similar morphology except for greater depth to lime.	Local alluvial-colluvial plains. Flat plains. Slopes normally between 0-0.5%.	Low open woodlands with strongly developed grassland. Poplar gum dominates with willow wattle frequent to rare. Whitewood occurs in a scattered pattern. Blue grass and cane grass.
1 Ugc	Ug 5.16 Ug 5.15	Black Earths: Weak gilgai Mound: Black to brownish black light to light medium clay (fine sand commonly present) to 10 to 30 cm, strong medium subangular blocky. Clear to gradual boundary to black to brownish black medium clay to medium heavy clay, strong medium lenticular breaking to fine lenticular and medium blocky, to 65 to 95 cm. Clear to gradual boundary to brownish grey to dull yellow orange medium heavy clay to heavy clay, strong medium lenticular breaking to fine lenticular and medium blocky, to >150 cm (Occasionally mottled). Grit throughout. Manganiferous concretions occur throughout with concretionary and powdery lime below 80 cm. Moderately alkaline below 30 cm, slightly acid above. Weakly to moderately cracking. Depression: Similar morphology except for greater depth to lime.	Local alluvial-colluvial plains. Flat plains. Slopes of 0-0.5%	Low open woodlands with strongly developed grassland. Poplar gum, cabbage gum and carbeen dominate with willow wattle and broad leaf tea tree frequent to rare. Blue grass and cane grass
1 Ugd	Ug 5.28 Ug 5.24 Ug 5.16	Black Earth-Grey Clay Intergrades: Weak to moderate gilgai. Mound: 2 cm of weak medium granular self mulch normally with high organic matter content over brownish black to greyish yellowish brown weakly mottled light medium clay to medium clay, strong medium prismatic breaking to fine subangular blocky to blocky, to 15-30 cm. Diffuse boundary to brownish black to yellowish grey medium heavy clay, strong medium subangular blocky, to 70-100 cm. Clear to gradual boundary to yellowish grey to greyish yellow light medium to medium heavy clay, occasionally weakly mottled, strong fine subangular blocky breaking to very fine angular blocky to >150 cm. Grit throughout. Ferromanganiferous veins and concretions throughout. Powdery and concretionary lime below 10-20 cm. Moderately alkaline below 30 cm, medium acid above. Moderately cracking. Depression: Similar morphology except for greyer colours and greater depth to lime.	Local alluvial-colluvial plains.	Low open woodlands with strongly developed grassland. Cabbage gum and carbeen in varying frequencies. Associated in various areas are beefwood (better drained areas), broad leaf tea tree (poorly drained areas), whitewood, willow wattle. Well developed grassland of blue grass and cane grass although *Iseilema* sp. may dominate

SOIL PROFILE CLASS	P.P.F.(S)	SOIL PROFILE CLASS DESCRIPTION	TOPOGRAPHIC FORM	PREDOMINANT VEGETATION
1 Uge	Ug 5.28 Ug 5.24 Ug 5.16	Grey Clay and Grey Clay-Brown Clay Intergrades: Linear to reticulate gilgai. Mound: Dark greyish yellow to brownish black light to medium clay, strong medium subangular blocky breaking to fine blocky, to 10-30 cm. Diffuse boundary to brownish black to olive brown medium clay, strong fine prismatic breaking to very fine subangular blocky to blocky, to 60-90 cm. Gradual boundary to yellowish grey to dull yellow medium to medium heavy clay, strong medium subangular blocky breaking to fine blocky, to >150 cm. Grit throughout. Manganiferous concretions throughout. Powdery and concretionary lime below 10 cm. Alkaline below 10 cm, slightly acid to neutral above. Angular gravel and stone on mound surface and occasionally in profile (rarely in depression). Depression: Similar morphology but greater depth to lime. A variant has black fine sandy light clay to 30-60 cm.	Local alluvial-colluvial plains. 1-3% slope areas. Normally in a slightly elevated position relative to 1 Uga and 1 Ugd.	Low open woodlands with strongly developed grassland. Poplar gum and cabbage gum dominate with beefwood associated. Grassland dominated by black spear and blue grass - occasionally cane grass dominates.
1 Dya	Dy 2.33 Dy 2.43 Db 1.33 Db 1.43	Grey and Dark Grey Solodics-Solodized Solonetz: Brownish black to greyish yellow brown sandy clay loam to clay loam, massive, to 5-10 cm. Thin sporadic to conspicuous bleach on top of clay (solodized solonetz), or mixed with clay loam at 5-10 cm (solodics). Sharp boundary to greyish yellow brown to dull yellowish brown light medium clay to medium clay, strong medium columnar to medium prismatic, dry extremely hard, to 50-90 cm. Diffuse boundary to brown to dull yellowish brown medium clay (occasionally weakly mottled), strong fine prismatic breaking to fine and very fine angular blocky and subangular blocky, to >150 cm. Grit throughout. Manganiferous concretions occur throughout clay. Powdery and concretionary lime below 30 cm. Strongly alkaline to very strongly alkaline below 30 cm, medium acid to slightly acid above. (A scalded phase P.P.F. Ug 3.2 occurs).	Local alluvial-colluvial plains. Slightly elevated areas in flat low lying plains. Slope 0-0.5%.	Variety of communities and structural forms occur. Most common are: Low to tall shrublands of false sandalwood and beefwood and low open woodlands of cabbage gum, poplar gum and scattered sandalwood. Grassland poorly developed.
1 Dyb	Dy 2.33 Dy 2.43	Grey and Dark Grey Solodics-Solodized Solonetz: Brownish black to dull yellowish brown sandy loam to sandy clay loam, massive, to 10-15 cm. Sporadic or conspicuous bleach on top of clay or at base of sandy loam. Sharp boundary to greyish yellow brown to brownish grey light to light medium clay strong fine prismatic to subangular blocky, dry extremely hard, to 35-55 cm. Sharp boundary to dull yellowish brown to dull yellow orange sandy clay to sandy clay loam (occasionally light clay, sandy) weak to strong fine subangular blocky to blocky, to >150 cm. Grit throughout. Manganiferous nodules throughout clay. Powdery and concretionary lime below 30 cm. Moderately to strongly alkaline below 30 cm, medium to slightly acid above.	Local alluvial-colluvial plains. Slightly elevated areas in flat low lying plains. Slope 0-0.5%	Low woodland to low open woodlands of cabbage gum, carbeen, poplar gum, beefwood and sandalwood. Moderately developed grassland of black spear and blue grass.
1 Dyc	Dy 2.33 Dy 2.43 Db 1.33	Grey and Dark Grey Solodics-Solodized Solonetz: Brownish black to dull yellow brown clay loam, massive, to 5-10 cm. Sporadic or conspicuous bleach on top of clay. Sharp boundary to brownish grey to dull yellowish brown medium to medium heavy clay, strong fine to medium columnar breaking to fine prismatic to blocky, dry extremely hard, to 40-60 cm. Gradual boundary to greyish yellow brown to dull yellow orange light medium clay to medium clay, strong fine prismatic breaking to very fine and fine blocky, to >150 cm. Grit throughout. Manganiferous nodules throughout clay. Powdery (large amounts) and concretionary lime (lesser amounts) normally below 20 cm. Strongly alkaline below 30 cm, medium acid above.	Local alluvial-colluvial plains. Slightly elevated areas in flat low lying plains. Slope 0-0.5%.	As for 1 Dya except woodland formations more common with scattered broad leaf tea tree. Grassland dominated by blue grasses.

TABLE 2 (continued)

SOIL PROFILE CLASS	P.P.F.(S)	SOIL PROFILE CLASS DESCRIPTION	TOPOGRAPHIC FORM	PREDOMINANT VEGETATION
2 Ugb	Ug 5.15 Ug 5.24	Grey Clays: Incipient gilgai Mound: Weakly mottled brownish black to brownish grey light to light medium clay, strong medium subangular blocky breaking to fine blocky, to 5-10 cm. Gradual boundary to brownish black to brownish grey medium to medium heavy clay, strong medium to coarse subangular blocky and medium lenticular, to 75-100 cm. Sharp to gradual boundary to brown light to medium clay, weak to moderate medium subangular blocky breaking to massive and fine blocky, to >150 cm (D horizon). Manganiferous veins and nodules throughout. Concretionary lime below 30 cm. Gypsum occasionally in brown clay. Slightly acid to 5-10 cm increasing to moderately alkaline below 30 cm. Weakly to moderately cracking. Depression: Similar morphology but with more intense surface mottle and greater depth to lime.	Burdekin River flood plain. Low lying areas.	Low open woodland of poplar gum and carbeen. Broad leaf tea tree is associated. Grassland dominated by cane grass.
2 Ugc	Ug 5.35 Ug 5.24 Ug 3	Grey and Brown Clays: Weak gilgai - irregular shape. Mound: Slightly mottled brownish black fine sandy light clay (occasionally with sporadic bleach), moderate to strong coarse blocky to subangular blocky, to 5-10 cm. Sharp to gradual boundary to dark brown to dull yellow brown medium to medium heavy clay, strong fine prismatic to medium subangular blocky breaking to very fine prismatic to blocky, 60-90 cm. Gradual to diffuse boundary to light brown to weak to moderate medium subangular blocky breaking to massive and fine blocky, to >150 cm. Manganiferous veins and concretions throughout. Concretionary and powdery lime below 40-100 cm. Slightly acid to 10 cm increasing to moderately alkaline below 60 cm. Weakly to moderately cracking. Depression: Similar morphology. Intergrades to 2 Dbb and 2 Dya occasionally occur.	Burdekin River flood plain. Low lying areas.	Low open woodlands dominated by poplar gum with beefwood and broad leaf tea tree associated. Cane grass and blue grass.
2 Dya	Dy 2.33 Dy 3.33	Grey Solodics: Brownish black to dull yellowish brown weakly mottled fine sandy clay loam, massive, to 5-10 cm. Sporadic bleach at base of fine sandy clay loam. Sharp boundary to yellowish brown to greyish yellow brown medium clay to medium heavy clay, occasionally moderately mottled, strong fine prismatic to subangular blocky, dry extremely hard, to 90-100 cm. Gradual boundary to brown sandy clay to light clay, weak to moderate medium subangular blocky breaking to massive and fine blocky, to >150 cm. Manganiferous concretions throughout clay. Concretionary lime below 40 cm. Slight to moderately acid surface horizons; strongly alkaline below 30-40 cm.	Burdekin River flood plain. Slightly elevated areas of flood plain. Slopes of 0-0.5%.	Open woodland dominated by poplar gum and broad leaf tea tree with beefwood associated. Blue grass and kangaroo grass.
2 Dba	Db 1.43 Dy 2.43	Brown Solodics-Solodized Solonetz: Dark brown fine sandy clay loam, massive, to 5-10 cm. Conspicuous bleach on top of clay. Sharp boundary to dark brown to brown medium to medium heavy clay, strong fine columnar to medium subangular blocky, dry extremely hard, to 85-100 cm. Sharp to gradual boundary to brown sandy clay to light clay, weak to moderate medium subangular blocky breaking to massive and fine blocky, to >150 cm. Manganiferous concretions occur throughout the clay. Concretionary lime below 30 cm. Slight to moderately acid surface horizons; strongly alkaline below 30 cm.	Burdekin River flood plain. Slightly elevated areas of flood plain. Slopes 0-0.5%	Low to tall shrublands of false sandalwood with cabbage gum and beefwood associated.
2 Dbb	Db 1.33 Dd 1.33 Db 2.33	Dark Brown and Brown Solodics: Brownish black to brown fine sandy clay loam, massive to weak, very thick platy, to 10-20 cm. Sporadic bleach at base of fine sandy clay loam. Sharp boundary to brownish black to brown medium clay (occasionally light medium clay, rarely medium heavy clay, occasionally mottled), strong fine columnar to medium angular blocky, dry very hard, to 70-90 cm. Gradual boundary to brown sandy clay to light clay, weak to moderate medium subangular blocky breaking to massive and fine blocky, to >150 cm. Manganiferous concretions throughout clay. Concretionary and powdery lime below 60 cm. Slight to moderately acid surface horizons; strongly alkaline below 30-60 cm. Approximately 15% of profile class shows weak cracking.	Burdekin River flood plain. Slightly elevated areas of flood plain. Slopes of 0-0.5%.	Low open woodland dominated by poplar gum and carbeen. Beefwood occurs with occasional mimosa. Moderately developed grassland dominated by *Chloris* sp. and black spear grass.

TABLE 2 (continued)

SOIL PROFILE CLASS	P.P.F.(S)	SOIL PROFILE CLASS DESCRIPTION	TOPOGRAPHIC FORM	PREDOMINANT VEGETATION
2 Ugb	Ug 5.15 Ug 5.24	Grey Clays: Incipient gilgai Mound: Weakly mottled brownish black to brownish grey light to light medium clay, strong medium subangular blocky breaking to fine blocky, to 5-10 cm. Gradual boundary to brownish black to brownish grey medium to medium heavy clay, strong medium to coarse subangular blocky and medium lenticular, to 75-100 cm. Sharp to gradual boundary to brown light to medium clay, weak to moderate medium subangular blocky breaking to massive and fine blocky, to >150 cm (D horizon). Manganiferous veins and nodules throughout. Concretionary lime below 30 cm. Gypsum occasionally in brown clay. Slightly acid to 5-10 cm increasing to moderately alkaline below 30 cm. Weakly to moderately cracking. Depression: Similar morphology but with more intense surface mottle and greater depth to lime.	Burdekin River flood plain. Low lying areas.	Low open woodland of poplar gum and carbeen. Broad leaf tea tree is associated. Grassland dominated by cane grass.
2 Ugc	Ug 5.35 Ug 5.24 Ug 3	Grey and Brown Clays: Weak gilgai - irregular shape. Mound: Slightly mottled brownish black fine sandy light clay (occasionally with sporadic bleach), moderate to strong coarse blocky to subangular blocky, to 5-10 cm. Sharp to gradual boundary to dark brown to dull yellow brown medium to medium heavy clay, strong fine prismatic to medium subangular blocky breaking to very fine prismatic to blocky, 60-90 cm. Gradual to diffuse boundary to light brown to weak to moderate medium subangular blocky breaking to massive and fine blocky, to >150 cm. Manganiferous veins and concretions throughout. Concretionary and powdery lime below 40-100 cm. Slightly acid to 10 cm increasing to moderately alkaline below 60 cm. Weakly to moderately cracking. Depression: Similar morphology. Intergrades to 2 Dbb and 2 Dya occasionally occur.	Burdekin River flood plain. Low lying areas.	Low open woodlands dominated by poplar gum with beefwood and broad leaf tea tree associated. *Cane grass and* blue grass.
2 Dya	Dy 2.33 Dy 3.33	Grey Solodics: Brownish black to dull yellowish brown weakly mottled fine sandy clay loam, massive, to 5-10 cm. Sporadic bleach at base of fine sandy clay loam. Sharp boundary to yellowish brown to greyish yellow brown medium clay to medium heavy clay, occasionally moderately mottled, strong fine prismatic to subangular blocky, dry extremely hard, to 90-100 cm. Gradual boundary to brown sandy clay to light clay, weak to moderate medium subangular blocky breaking to massive and fine blocky, to >150 cm. Manganiferous concretions throughout clay. Concretionary lime below 40 cm. Slight to moderately acid surface horizons; strongly alkaline below 30-40 cm.	Burdekin River flood plain. Slightly elevated areas of flood plain. Slopes of 0-0.5%.	Open woodland dominated by poplar gum and broad leaf tea tree with beefwood associated. Blue grass and kangaroo grass.
2 Dba	Db 1.43 Dy 2.43	Brown Solodics-Solodized Solonetz: Dark brown fine sandy clay loam, massive, to 5-10 cm. Conspicuous bleach on top of clay. Sharp boundary to dark brown to brown medium to medium heavy clay, strong fine columnar to medium subangular blocky, dry extremely hard, to 85-100 cm. Sharp to gradual boundary to brown sandy clay to light clay, weak to moderate medium subangular blocky breaking to massive and fine blocky, to >150 cm. Manganiferous concretions occur throughout the clay. Concretionary lime below 30 cm. Slight to moderately acid surface horizons; strongly alkaline below 30 cm.	Burdekin River flood plain. Slightly elevated areas of flood plain. Slopes 0-0.5%	Low to tall shrublands of false sandalwood with cabbage gum and beefwood associated.
2 Dbb	Db 1.33 Dd 1.33 Db 2.33	Dark Brown and Brown Solodics: Brownish black to brown fine sandy clay loam, massive to weak, very thick platy, to 10-20 cm. Sporadic bleach at base of fine sandy clay loam. Sharp boundary to brownish black to brown medium clay (occasionally light medium clay, rarely medium heavy clay, occasionally mottled), strong fine columnar to medium angular blocky, dry very hard, to 70-90 cm. Gradual boundary to brown sandy clay to light clay, weak to moderate medium subangular blocky breaking to massive and fine blocky, to >150 cm. Manganiferous concretions throughout clay. Concretionary and powdery lime below 60 cm. Slight to moderately acid surface horizons; strongly alkaline below 30-60 cm. Approximately 15% of profile class shows weak cracking.	Burdekin River flood plain. Slightly elevated areas of flood plain. Slopes of 0-0.5%.	Low open woodland dominated by poplar gum and carbeen. Beefwood occurs with occasional mimosa. Moderately developed grassland dominated by *Chloris* sp. and black spear grass.

TABLE 2 (continued)

SOIL PROFILE CLASS	P.P.F.(S)	SOIL PROFILE CLASS DESCRIPTION	TOPOGRAPHIC FORM	PREDOMINANT VEGETATION
3 Uga	Ug 5.16	Black Earths: Weak gilgai Mound: 2 cm of strong self mulch over black medium to medium heavy clay, rarely weakly mottled, strong medium blocky to fine subangular blocky, to 10 cm. Gradual boundary to brownish black to brownish grey medium heavy clay, strong medium blocky to subangular blocky to fine lenticular (occasionally very coarse (>20 cm) long lenticular structure present with large permanent shear planes evident to 80-140 cm). Gradual to diffuse boundary to brownish black to greyish yellow brown heavy clay, strong very coarse lenticular (>20 cm) breaking in stages to fine lenticular, to >150 cm, (rarely mottled). Strongly cracking manganiferous concretions throughout. Concretionary lime normally throughout from surface. Neutral to mildly alkaline surface; mildly to moderately alkaline below 30 cm. Depression: Similar morphology except for slightly lighter textures and greater depths to lime. Variants: Uniform profiles of brownish black heavy clay to 150 cm (common).	Local alluvial plains. Low lying plains.	Treeless, strongly developed grassland of cane and blue grass - invaded in some areas by parkinsonia and mimosa.
3 Ugb	Ug 5.16 Ug 5.24	Black Earths: Weak gilgai. Mound: 2 cm weak self mulch over black light clay to light medium clay, strong fine subangular blocky breaking to fine or medium crumb and granular, to 10-30 cm. Gradual boundary to black to brownish black light medium to medium clay, strong fine subangular blocky breaking to very fine blocky and subangular blocky to 60-90 cm. Diffuse boundary to black to brownish grey medium heavy clay, strong coarse lenticular to weak prismatic breaking to fine blocky, to >150 cm. Moderately cracking. Concretionary lime below 100 cm (occasionally absent). Slightly acid to neutral surface; mildly alkaline below 60 cm increasing to moderately alkaline below 100-150 cm.	Local alluvial plains. Low lying plains.	Low open woodland of carbeen and poplar gum. Strongly developed grassland of blue grasses.
3 Ugc	Ug 5.24 Ug 5.16 Ug 5.28	Black Earths-Grey Clay Intergrades: Weak to moderate gilgai. Mound: 2 cm weak self mulch over black to brownish black medium to medium heavy clay (occasionally mottled), strong medium subangular blocky, to 10-20 cm. Gradual boundary to brownish black to brownish grey (occasionally yellowish grey), medium heavy clay, strong very coarse to coarse lenticular breaking to fine blocky to subangular blocky, to 95-150 cm. Diffuse boundary to yellowish grey heavy clay, strong very coarse to coarse lenticular breaking to very fine lenticular, to >150 cm (rarely absent and rarely weakly mottled). Strongly cracking. Ferromanganiferous concretions throughout. Concretionary lime below 70 cm. Neutral surface horizons; mildly to moderately alkaline below 60 cm. Depression: Similar morphology except for greater depth to lime and darker colour.	Local alluvial plains. Low lying plains.	Treeless, strongly developed grassland of cane and blue grasses - dominated in some areas by para grass.
3 Ugd	Ug 5.16 Ug 5.15 Ug 5.24	Black Earths: Weak gilgai. Mound: 2 to 7 cm coarse self mulch breaking to small granular peds over brownish black to brownish grey medium heavy clay, strong medium blocky to subangular blocky breaking to very fine subangular blocky to fine lenticular, to 60-90 cm. Gradual to diffuse boundary to brownish grey to olive brown heavy clay, (occasionally weakly mottled), strong fine lenticular breaking to fine subangular blocky to blocky, to >150 cm. Strongly cracking. Manganiferous nodules throughout with veins dominating in heavy grey clay. Concretionary lime below 100 cm. Neutral to mildly alkaline above 60 cm, moderately alkaline below. Depression: Similar	Local alluvial plains. Low lying plains.	Treeless, strongly developed grassland of cane grass and blue grass - invaded in some areas by parkinsonia and mimosa. *Iseilema* frequently occurs.

TABLE 2 (continued)

SOIL PROFILE CLASS	P.P.F.(S)	SOIL PROFILE CLASS DESCRIPTION	TOPOGRAPHIC FORM	PREDOMINANT VEGETATION
3 Uge	Ug 5.17 Ug 5.15	Black Earths: Weak gilgai. Mound: 2 cm of weak self mulch over brownish black medium clay, moderately mottled, strong medium blocky to subangular blocky breaking to very fine subangular blocky to blocky, to 10-15 cm. Gradual boundary to brownish black medium heavy clay, strong fine lenticular breaking to fine subangular blocky to blocky, to 80-120 cm. Sharp to gradual boundary to brown light to medium clay, weak to moderate medium subangular blocky breaking to massive and fine blocky, to >150 cm. Moderately cracking. Manganiferous veins and concretions throughout. Concretionary lime just above and throughout boundary at 80-120 cm Neutral to mildly alkaline to 60 cm, moderately alkaline to 80-120 cm, strongly alkaline below. Depression: Similar. Note: Brown clay constitutes a D horizon of same origin as brown clay underlying 2 Ug soils.	Local alluvial plains. Low lying plains. This soil profile class is of limited extent bordering the Burdekin River flood plain.	Treeless, strongly developed grassland of cane grass and blue grass - invaded in some areas by parkinsonia and mimosa. Sedges, nardoo and *Panicum* sp. also occur.
3 Ugf	Ug 5.15 Ug 5.16 Ug 5.28	Black Earth-Alluvial Soil Intergrades: No gilgai. Black silty clay, strong medium subangular blocky, to 10-30 cm. Gradual boundary to brownish black to yellowish grey medium clay strong medium subangular blocky to blocky breaking to very fine blocky, to 80-100 cm. Gradual boundary to dull yellowish brown to bright yellowish brown medium heavy clay strong medium subangular blocky to blocky breaking to very fine blocky, to >150 cm. Manganiferous veins and concretions below 10-30 cm. Concretionary lime below 40-80 cm. Neutral to 10-30 cm, mildly alkaline to 80 cm, moderately alkaline below. Variant: Weakly structured D horizons at 100 cm occasionally occur.	Local alluvial plains. Low lying plains. Commonly found where alluvial deposits of Topographic Form 6 encroach onto the older alluvial deposits of Topographic Form 3.	Low open woodland of carbeen and poplar gum with infrequent grey bloodwoods. Beefwood, cabbage gum, cooky apple and broad leaf tea tree irregularly occur. Well developed grassland of blue grasses, *Chloris sp.*, black spear and cane grass.
3 Ugg	Ug 5.28 Ug 5.16 Ug 5.28	Grey Clays: Weak gilgai. Mound: Brownish black to greyish yellow brown light clay to light medium clay, strongly mottled, rarely conspicuously bleached, strongly structured to 5-10 cm. Gradual boundary to brownish grey to yellowish grey light medium clay, strongly structured to 70-90 cm. Gradual to diffuse boundary to dark greyish yellow to yellowish brown light clay to light medium clay, moderately mottled, strongly structured, to >150 cm. Weakly cracking. Manganiferous concretions throughout. Concretionary lime below 30 cm. Slightly acid surface horizons; moderately alkaline below 30 cm. Depression: Similar. Variant: Weakly structured sandy clay D horizon at 100 cm.	Local alluvial plains. Low lying plains.	Low open woodlands of poplar gum with broad leaf tea tree and beefwood present. Strongly developed grasslands of blue grass and sedges.
3 Ugh	Ug 5.24 Ug 5.28 Ug 2	Grey Clays: Weak gilgai to no gilgai Mound: Brownish grey to greyish yellowish brown light clay to light medium clay, strong medium blocky breaking to fine blocky breaking to very fine blocky, to 10-20 cm (rarely conspicuous bleach and weakly mottled). Gradual boundary to yellowish grey to yellowish brown medium to medium heavy clay, strong fine lenticular and medium blocky breaking to fine blocky, to 85-100 cm. Gradual boundary to yellowish grey to greyish yellow medium heavy to heavy clay, strong fine lenticular breaking to fine subangular blocky and blocky to >150 cm. Weakly cracking. Manganiferous veins and concretions throughout. Moderate brown mottling is present where pH decreases at depth. Concretionary and powdery lime below 40-70 cm. Slightly acid to neutral to 30 cm, strongly alkaline to 90 cm, mildly alkaline to neutral below. Variant: Slightly mottled profiles with medium acid pH profiles throughout except for 30 cm alkaline pH below 30 cm. Depression: Commonly bleached, and acid throughout.	Local alluvial plains. Slightly elevated plains - sharp break in topography between these and local alluvial-colluvial plains.	Low open to low woodlands of grey ironbark with bauhinia infrequently present. Beefwood and broad leaf tea tree occur with false sandalwood associated. Poorly developed grassland.

TABLE 2 (continued)

SOIL PROFILE CLASS	P.P.F.(S)	SOIL PROFILE DESCRIPTION	TOPOGRAPHIC FORM	PREDOMINANT VEGETATION
3 Ugi	Ug 5.28 Ug 5.24	Grey Clays: Moderate gilgai. Mound: Greyish yellow brown to brownish grey medium heavy clay, strong medium angular blocky to medium lenticular breaking to fine subangular blocky to blocky to 30-100 cm. Gradual boundary to greyish yellow medium heavy clay, strong medium lenticular breaking to fine lenticular and subangular blocky to >150 cm (occasionally with a weak mottle). Moderately cracking. Manganiferous veins and concretions throughout and present as brown mottling where subsoil pH decreases. Lime normally not observed in profile. pH profile varies between slightly acid to neutral throughout and moderately alkaline upper horizons decreasing in pH at depths below 100 cm. Depression: Similar except that profiles usually more acid.	Local alluvial plains. Slightly elevated plains - sharp break in topography between these and local alluvial-colluvial plains.	Layered low open to open woodland with well developed open shrub formation in understorey. Woodland consists of boree with rare bauhinia. Shrub formation dominated by false sandalwood, yellow wood, currant bush, beefwood and rubber vine.
3 Ugj	Ug 5.28	Grey Clays: Strong gilgai. Mound: Greyish yellow brown to dark greyish yellow light medium clay, strong medium to fine blocky, to 20-40 cm. Gradual boundary to dark greyish yellow to yellowish brown medium to medium heavy clay, strong medium lenticular breaking to fine blocky and subangular blocky, to 40-80 cm. Gradual to diffuse boundary to dark greyish yellow to greyish yellow heavy clay, strong medium to coarse lenticular breaking to fine lenticular breaking to very fine blocky with moderate mottle to >150 cm. Moderately cracking. Manganiferous veins and concretions occur throughout, and present as moderate brown mottle where subsoil pH decreases. Slightly acid to neutral to 30 cm, moderately to strongly alkaline to 90 cm may be slightly acid to neutral below. Depression: Similar morphology.	Local alluvial plains. Slightly elevated plains - sharp break in topography between these and local alluvial-colluvial plains.	As for 3 Ugi but with denser understorey.
3 Dya	Dy 2.33 Dy 3.33 Dd 1.33 Dy 2.43	Grey Solodics-Grey Clay Intergrades: Brownish grey to greyish yellow brown fine sandy clay loam to clay loam, massive, to 5-10 cm. Sporadic, (occasionally conspicuous) bleach at base of clay loam. Sharp boundary to brownish black to dark greyish brown light medium clay to medium clay (occasionally moderately mottled), strong fine prismatic to medium subangular blocky, extremely hard, to 40-60 cm. Gradual boundary to yellowish grey medium clay, strong medium lenticular breaking to fine blocky to subangular blocky to 90-100 cm. Gradual boundary to brown to greyish yellow medium to heavy clay, strong fine lenticular breaking to fine subangular blocky and blocky, slightly to moderately or strongly mottled, to >150 cm. Manganiferous concretions throughout clay. Concretionary lime below 30 cm. Slightly acid to neutral surface horizons; moderately to strongly alkaline below 60 cm. This profile class intergrades to 3 Ugh.	Local alluvial plains. Slightly elevated plains - sharp break in topography between these and local alluvial-colluvial plains.	Low open woodlands to low scrublands of variable composition. Cabbage gum, beefwood (better drained areas). False sandalwood, broad leaf tea tree, poplar gum (poorly drained areas).
4 Uca 4 Gna 4 Dya		These three profile classes intergrade in the following manner: 4 Uca --- 4 Gna --- 4 Dya. The three classes are separated on the basis of texture profiles, fabric and pH profiles -		
4 Uca	Uc 5.23 Gn 2.84	Uniform Sands: Brownish black coarse sands to 15-40 cm. Gradual boundary to greyish yellow brown to dull yellow orange coarse sand to coarse sandy loam, coherent, with sandy to earthy fabric to 75-120 cm. Gradual boundary to greyish yellow brown to dull yellow orange coarse sand to sandy clay loam, moderate coarse mottle, coherent, earthy fabric, to >150 cm. Manganiferous concretions at depth. Neutral to slightly acid throughout.	Granitic channel infills on local alluvial-colluvial plains.	Low open to low woodland of tea tree, pandanus, prickly pine, quinine bush and Burdekin plum.

SOIL PROFILE CLASS	P.P.F.(S)	SOIL PROFILE DESCRIPTION	TOPOGRAPHIC FORM	PREDOMINANT VEGETATION
4 Gna	Gn 2.95 Gn 2.92 Gn 2.85	Gradational Sands to Earths: Greyish yellow brown coarse sand to coarse sandy loam, massive to 5-10 cm. Gradual boundary to conspicuously bleached (occasionally sporadically bleached or greyish yellow brown) coarse sand to coarse sandy loam, massive, to 30-60 cm. Gradual boundary to greyish yellow to dull yellow orange coarse sandy clay loam, coherent, with earthy fabric (occasionally moderately mottled) to 80-100 cm. Gradual boundary to light yellow coarse sandy clay loam, coherent, with earthy fabric, strongly mottled (occasionally whole coloured) to >150 cm. Manganiferous nodules at depth. Slightly to medium acid to 60 cm, neutral to moderately alkaline below.	Granitic channel infills on local alluvial-colluvial plains.	Low woodland of poplar gum and grey bloodwood. Open understorey of cocky apple and occasionally pandanus. Grasses dominated by black and giant spear - occasionally kangaroo grass.
4 Dya	Dy 3.43	Grey Solodics-Solodized Solonetz: Greyish yellow brown coarse sand to coarse sandy loam, massive, to 5-15 cm. Clear to gradual boundary to conspicuously bleached coarse sand to 10-45 cm. Sharp boundary to dark greyish yellow, light to light medium clay, strong medium prismatic breaking to fine blocky and subangular blocky, to >150 cm. Moderate mottles common below 45 cm. Thin sand bands occur through clay - less than 2 cm in width. Manganiferous nodules common below 45 cm - particularly in mottled profiles. Lime rarely present. Slightly acid to 45 cm, moderately alkaline below. Variants: 1. Up to 60 cm of coarse sand is occasionally deposited on the top of the above soil. 2. Slightly acid to neutral profiles occur (Dy 3.42).	Granitic channel infills on local alluvial-colluvial plains.	Low open woodlands of poplar gum, carbeen and grey ironbark. Understorey of broad leaf tea tree and beefwood.
4 Dyb	Dy 3.43 Dy 3.33 Dy 2.43 Dy 2.33	Mottled Yellow Grey Solodics-Solodized Solonetz: Brownish black coarse sands to coarse sandy loams, massive, to 10-15 cm. Gradual to sharp boundary to conspicuously bleached (occasionally sporadic) coarse sandy loam, massive, to 15-30 cm. Sharp boundary to greyish yellow brown to dull yellowish brown sandy clay to light medium clay, dry extremely hard, strong medium to coarse columnar, strongly mottled, occasionally whole coloured, to 80-150 cm. Gradual boundary to dull yellowish brown gritty medium clay, medium blocky, weakly mottled, to >150 cm. Manganiferous veins and concretions throughout clay. Concretionary lime below 80 cm. Slightly to medium acid to 15-40 cm, moderately alkaline below 60 cm.	Uplands on acid intrusives. Sedentary soils.	Low open woodlands of grey ironbark and poplar gum. Understorey of broad leaf tea tree. Grassland dominated by black and giant spear. Low to tall shrublands of bull oak occur in the Wakala area with broad leaf tea tree associated.
4 Dyc	Dy 3.22 Dy 3.12	Mottled Yellow Podzolics: Brownish black coarse sand to coarse sandy loam, massive to 10 cm. Gradual boundary to dull yellowish brown coarse sand to coarse sandy loam, massive, to 30-40 cm. Sharp boundary to yellowish brown light medium to medium clay, moderate red-yellow mottle, slightly hard to hard, moderate to strong medium blocky to subangular blocky breaking to fine subangular blocky to blocky to 70-90 cm. Gradual boundary to yellowish brown gritty sandy clay loam to gritty coarse sandy clay with broken rock inclusions to >150 cm. Manganiferous veins and concretions throughout clay. Neutral to slightly acid throughout.	Uplands on acid intrusives. Sedentary soils.	Low open woodlands of broad leaf tea tree and beefwood. Cocky apple is scattered throughout. Grassland dominated by black and giant spear and *Chloris* sp.
5 Dra	Dr 2.12 Dr 2.11 Dr 3.12 Gn 3.72 Gn 3.11	Neutral Red Duplex Soils: clay Very dark brown to dark brown fine sandy loam (occasionally clay loam), weak medium blocky to subangular blocky, breaking to massive, to 15-25 cm. Gradual to sharp boundary to orange to bright reddish brown light medium to medium clay, strong very coarse blocky to subangular blocky breaking to medium subangular blocky to blocky breaking to fine blocky, dry slightly hard, to 60-130 cm, (commonly to 90cm) rarely weakly mottled. Sharp to gradual boundary to yellowish white, fine sandy, to greenish white, gritty, decomposing mealy parent material of variable textures (sandy clay loam to light medium clay), massive, over fractured rock at >150 cm. Rock occasionally encountered in the profile with <1% surface rock cover. <5% of area has bed rock and boulders at less than 70 cm. Soils mainly duplex. Gradational types do occur with light clay at 10 cm. Slightly acid to neutral throughout. Manganiferous concretions throughout clay and meal. A weakly mottled variant rarely occurs.	Dissected uplands on intermediate intrusives. Sedentary soils.	Low open to low woodlands of grey ironbark and red bloodwood. Grey bloodwood and poplar gum associated. Strongly developed grassland of black and giant spear with kangaroo grass.

TABLE 2 (continued)

SOIL PROFILE CLASS	P.P.F.(S)	SOIL PROFILE DESCRIPTION	TOPOGRAPHIC FORM	PREDOMINANT VEGETATION
5 Dya	Dy 2.11 Dy 2.12	Neutral Yellow Duplex Soils: Dark brown fine sandy clay loam, weak medium blocky to subangular blocky breaking to massive, to 20-25 cm. Sharp boundary to dull yellowish brown light medium to medium clay, strong medium to fine blocky to subangular blocky, dry slightly hard, to 60-90 cm. Gradual to diffuse boundary to bright brown light medium clay to medium clay, strong medium to fine subangular blocky to 70-100 cm. Sharp to gradual boundary to yellow and white fine sandy clay loam mealy decomposing parent material, massive, to >150 cm. Medium acid to neutral throughout. Manganiferous concretions throughout clay and meal.	Dissected uplands on intermediate intrusives. Sedentary soils.	Similar to 5 Dra. Occasionally pure stands of grey ironbark occur.
5 Dyb	Dy 2.13 Gn 3.73	Alkaline Yellow Duplex Soils: Black clay loam (occasionally fine sandy clay loam), weak medium blocky to subangular blocky, breaking to massive, to 20-25 cm. Sharp to gradual boundary to bright yellowish brown to orange light medium to medium clay, strong medium to fine blocky and subangular blocky, dry slightly hard, to 60-80 cm. Gradual boundary to yellowish brown medium to medium heavy clay, strong medium subangular blocky breaking to medium subangular blocky, slightly hard to hard, to 90-130 cm. Gradual boundary to yellow and white, to grey and white, fine sandy to gritty, decomposing, mealy parent material of variable clay content (sandy clay loam to light clay), massive, to >150 cm. Slightly acid to neutral to 90 cm, mildly to moderately alkaline below. Manganiferous concretions throughout clay and meal.	Dissected uplands on intermediate intrusives. Sedentary soils.	Low open to low woodlands of poplar gum and grey bloodwood with scattered beefwood associated. Strongly developed grassland of black and giant spear grass with kangaroo grass.
5 Dyc	Dy 2.43 Dy 2.33 Dy 3.43 Dy 3.33	Grey Solodics-Solodized Solonetz: Black to brownish black sandy clay loam, massive to weak, medium blocky to subangular blocky breaking to massive, to 10-40 cm. Sharp to gradual boundary to conspicuously bleached (occasionally sporadic) sandy clay loam to clay loam to 15-55 cm. Sharp boundary to dark greyish yellow to brownish grey medium clay to medium heavy clay, strong, medium columnar to prismatic breaking to medium blocky and subangular blocky, dry hard, to 40-120 cm. Gradual boundary to yellowish brown medium clay, strong medium blocky and subangular blocky to 80-150 cm. Sharp to gradual boundary to decomposing mealy parent material, massive, to >150 cm. Weak mottles occasionally occur throughout clay with moderate grey mottles at sites in downslope positions at depths >100 cm. Manganiferous concretions throughout clay. Concretionary lime below 50-80 cm. Slightly acid to 15-60 cm, medium to strongly alkaline below.	Dissected uplands on intermediate intrusives. Sedentary soils.	Low open woodland of poplar gum, carbeen and cabbage gum, with beefwood associated. Moderate grassland of love grass, wire grasses, spear grasses.
5 Dyd	Dy 2.43 Dy 2.33	Grey Solodized Solonetz: Brownish black to greyish yellow brown sandy clay loam to fine sandy clay loam, massive, to 5-10 cm. Thin (<2 cm) conspicuous or sporadic bleach at base of sandy clay loam. Sharp boundary to greyish yellow brown light medium clay, strong, medium columnar, dry extremely hard, to 70-120 cm. Clear boundary to dark greyish yellow light clay, moderate strong fine subangular blocky to blocky to >150 cm. Moderate to very high amounts of gravel to 70-120 cm, particularly at 5-10 cm. Manganiferous concretions below 10 cm with concretionary lime below 20 cm. Normally slightly acid to 15 cm and strongly alkaline below.	Dissected uplands on intermediate to acid intrusives. Sedentary soils. This soil profile class commonly occurs on colluvial mixed deposits in lower slope positions.	Low shrubland to low open shrublands of false sandalwood and beefwood. Grassland poorly developed.
5 Uga	Ug 5.12	Black Earths: Weak self mulch over black medium to medium clay, strong medium to fine blocky to subangular blocky, to 40-60 cm. Gradual boundary to black medium heavy clay with fractured rock material to 60-100 cm. Bed rock below. Grit and rock throughout profile Slightly acid in clay changing to mildly alkaline near the bed rock.	Dissected uplands on intermediate intrusives. Sedentary soils.	Grassland of blue grasses, cane grass, *Chloris* sp. and sedges.

TABLE 2 (continued)

SOIL PROFILE CLASS	P.P.F.(S)	SOIL PROFILE DESCRIPTION	TOPOGRAPHIC FORM	PREDOMINANT VEGETATION
5 Dda	Dd 2.11 Dy 2.11	Acid Dark Duplex Soils: Black gritty to coarse sandy loams to clay loams, massive, to 10-30 cm. Gradual boundary to black gritty to coarse sandy clay loam, massive, to 40-100 cm. Sharp boundary to brownish black to yellowish brown sandy clay to medium clay, moderately to strongly structured to >150 cm. Manganiferous concretions throughout. Normally slightly acid to medium acid throughout occasionally strongly alkaline throughout.	Dissected uplands on intermediate intrusives. Slumped and tunnel eroded areas.	Low open to low woodland of poplar gum and grey bloodwood with scattered beefwood associated. Extensive poplar gum and ironbark regrowth. Strongly developed grassland of black and giant spear grass, with kangaroo grass.
6 Ufa	Uf 6.32 Uf 6.31 Gn 3.33 Uf 3	Alluvial Soils - Non-Cracking Clays: Dark brown to brownish black fine sandy light clay to coarse sandy clay, weakly structured, to 10-30 cm. Sharp to gradual boundary to black to brownish black light medium to medium clay, strong fine prismatic to medium blocky to subangular blocky, to 55-100 cm. Gradual boundary to brownish black to brown gritty light medium to medium clay, occasionally moderately mottled, fine lenticular to medium subangular blocky, to >150 cm. Occasionally underlain by sandy clay loams to clay loams. Concretionary and powdery lime below 60 cm. Mildly acid to neutral to 30 cm, mildly alkaline to moderately alkaline below 30 cm. Sporadic bleach occasionally at 10-30 cm.	Recent alluvial deposits. Levee.	Low open woodlands of carbeen, poplar gum and beefwood. Strongly developed grassland of *Chloris* sp., black spear grass and blue grasses.
6 Ufb	Uf 6.31	Alluvial Soils - Non-Cracking Clays: Brownish black to greyish yellow brown sandy clay to light clay with coarse sand inclusions, strong fine lenticular to medium subangular blocky, to 10-30 cm. Gradual boundary to greyish yellow brown to dull yellowish brown light medium to medium clay, strongly structured, to 80-100 cm. Gradual boundary to dull yellowish brown light clay to light medium clay, weakly to moderately mottled, strongly structured, to >150 cm. Manganiferous concretions throughout. Lime concretions below 10-30 cm. Neutral to 30 cm, mildly to moderately alkaline below.	Recent alluvial deposits. Levee.	As for 6 Ufa.
6 Ufc	Uf 6.31 Uf 6.32	Alluvial Soils - Non-Cracking Clays: Black to brownish black silty clay to light clay, weak to moderate fine subangular blocky to blocky, to 30-50 cm. Gradual boundary to brownish black to brown light to light medium clay, strong fine subangular blocky, to 80-120 cm. Gradual to diffuse boundary to dark brown to yellowish brown light clay to light medium clay, strong fine subangular blocky, to 130-150 cm. Normally underlain by brownish grey sandy clay loam at 130 to >150 cm. Mildly alkaline to neutral throughout. Variant: Uniform brownish black, weakly structured to massive sandy clay loam profiles occur (Um 5.52).	Recent alluvial deposits. Levee and delta areas.	Low open to low woodlands of carbeen coral tree, Leichhardt tree, grey bloodwood and cocky apple. Well developed grassland of giant and black spear grass and brown sorghum.
6 Uma	Um 5.52 Gn 2.41 Uc 5.21	Alluvial Soils-Deep Fine Sandy Clay Loams (Intergrades to 6 Gna): Brownish black fine sandy loam to fine sandy clay loam, weak coarse blocky, earthy to sandy fabric, to 15-40 cm. Diffuse boundary to brown fine sandy loam to fine sandy clay loam massive to weak very coarse subangular blocky breaking to fine prismatic or massive, sandy to earthy fabric, to 70-100 cm. Gradual boundary to brown fine sand to fine sandy loam, massive coherent to >150 cm. Weakly acid to neutral throughout.	Recent alluvial deposits. Burdekin levee.	Woodland of carbeen, poplar gum, Burdekin plum and cocky apple. Strongly developed grassland of bunch and giant spear grasses and blue grasses.
6 Dda	Dd 1.33 Dd 1.43	Dark Solodics: Dark brown to brown fine sandy clay loam to clay loam, massive to weak medium blocky to subangular blocky, to 10-20 cm. Sporadic or conspicuous bleach at base of clay loam. Sharp boundary to brownish black light medium to medium clay, strong fine prismatic to medium subangular blocky, dry hard, to 70-80 cm. Gradual boundary to dark brown sandy clay loam to sandy clay, to >150 cm. Concretionary and powdery lime below 60 cm. Slightly acid to 30 cm, moderately alkaline below.	Recent alluvial deposits. Prior stream and levee areas.	Low open woodlands of carbeen, poplar gum and beefwood. Strongly developed grassland of *Chloris* sp., black spear grass and blue grasses.

TABLE 2 (continued)

SOIL PROFILE CLASS	P.P.F.(S)	SOIL PROFILE DESCRIPTION	TOPOGRAPHIC FORM	PREDOMINANT VEGETATION
6 Dba	Db 1.33 Db 1.13 Db 2.33 Dd 1.33 Dy 2.33	Brown Solodics: Dark brown sandy loam to sandy clay loam, massive, to 15-30 cm. Sporadic bleach at base of sandy loam. Sharp boundary to dark greyish yellow to brown light medium to medium clay, strong medium columnar to prismatic, dry hard, occasionally weakly to moderately mottled, to 80-100 cm. Gradual boundary to brown to greyish yellow light medium to medium clay, strong medium blocky to subangular blocky, frequently weakly to moderately mottled, to >150 cm. Manganiferous veins and concretions in low amounts throughout the clay. Powdery and concretionary lime below 30-60 cm. Slightly acid to neutral to 40 cm, medium alkaline below.	Recent alluvial deposits. Prior stream areas. Alluvial fan areas.	Low open to low woodlands of carbeen, grey bloodwood and poplar gum with whitewood associated. Grassland of black spear and *Chloris* sp.
6 Dbb	Db 1.33 Dd 1.33	Brown Solodics: Brownish black fine sandy clay loam, massive, to 10-20 cm over sporadic bleach to 30-40 cm. Sharp boundary to brownish black to dark brown light medium clay, strong coarse prismatic breaking in stages to very fine blocky, dry hard to 60-100 cm. Sharp to clear boundary to brownish black light clay, moderate to strong coarse prismatic breaking to fine blocky, to 110-115 cm. Clear boundary to brown fine sandy loam, massive to >150 cm. Manganiferous nodules below 40 cm. Concretionary and powdery lime below 60 cm. Neutral to 50 cm, moderately alkaline below.	Recent alluvial deposits. Burdekin levee.	Woodland of carbeen, poplar gum, Burdekin plum and cocky apple. Scattered beefwood and cabbage gum associated. Strongly developed grassland of bunch and giant spear grasses and blue grasses.
6 Gna	Gn 3.22 Db 1.13 Db 1.12 Dd 1.13 Uf 6.31	Alluvial soils - Neutral Brown and Dark Gradational and Duplex Soils: Black fine sandy clay loam (rarely silty clay), massive to weak coarse blocky to subangular blocky breaking to massive, to 20-35 cm. A gradual to sharp change to black to brown fine sandy light medium to medium clay, strong medium blocky to very fine blocky, to 90-120 cm, changing gradually to brown sandy clay loam to sandy clay, weak fine to medium blocky and subangular blocky to >150 cm. Slightly acid to neutral to 30 cm, neutral to mildly alkaline below.	Recent alluvial deposits. Levee.	Low open to low woodlands of carbeen, coral tree, Leichhardt tree, grey bloodwood and cocky apple. Well developed grassland of giant and black spear grass and brown sorghum.
6 Uca	Uc 5.11 Uc 5.21	Deep Sands: Brownish black coarse sand to sandy loam to 10-30 cm. Gradual boundary to brown to yellowish brown coarse sand to sandy loam to 80-100 cm. Gradual boundary to coarse sand with weak mottles containing seasonal water tables to >150 cm. Massive throughout. Slightly acid throughout.	Recent alluvial deposits. Alluvial fan areas.	Low open to low woodlands of pandanus and tea tree.
6 Ddb	Dd 1.43 Dy 2.33	Dark Grey Solodics: Brownish black coarse sands to sandy loams to 10-20 cm. Sharp boundary to conspicuously or sporadically bleached coarse sand to 15-30 cm. Sharp boundary to brownish black to brownish grey medium clay to medium heavy clay, strongly structured, to >150 cm. Sand lenses common in clay. Medium acid in sand. Moderately alkaline in clay.	Recent alluvial deposits. Alluvial fan areas.	Low open woodlands of poplar gum, carbeen and beefwood. Blue grasses and spear grass.

DESCRIPTIVE TERMINOLOGY IN TABLE 2

(a) Principal Profile Forms (PPF) are listed in order of frequency of occurrence. In general the first listed occupies >50% of the soil profile class.

(b) Colours are those of the Revised Standard Soil Colour Charts (Oyama and Takehara, 1967).

(c) Self mulch:

Weak	=	<1 cm of poorly developed self mulch.
Moderate	=	1 - 2 cm of discrete aggregates breaking to granular peds.
Strong	=	>1 - 2 cm of discrete aggregates breaking to granular peds.

(d) Mottling:

Weak	=	<10%
Moderate	=	10 - 25%
Strong	=	>25%

(e) Gilgai:

Incipient	=	<5 cm vertical interval.
Weak	=	5 - 10 cm vertical interval.
Moderate	=	10 - 30 cm vertical interval.
Strong	=	>30 cm vertical interval.

(f) Structure: As in Soil Survey Manual (Soil Survey Staff, 1951). Lenticular size categories defined as for prismatic.

(g) Vegetation: As in Specht (1970).

(h) Bleach: For duplex soils:

".... at base of ...." - bleach most evident in basal 2 cm of the A horizon.

".... on top of ...." - bleach most evident as greyish colour on top of the B horizon with only a thin band of bleach at the base of the A.

Bleach described as a separate horizon if >2 cm, thick and conspicuous.

TABLE 3

1:100 000 Mapping Unit Composition

Mapping Unit	Associate Soil (<70%) Profile Class (>30%)*	Minor Soil Profile Class (<30%	Area (hectares)
1 Uga	1 Uga, 1 Ugc, 1 Dyc	1 Ugb, 1 Uge, 1 Dya, 1 Dba, 1 Dbc, 1 Dda,	2620
1 Ugb	1 Ugb, 1 Ugd	1 Dya, 1 Dba, 1 Uge	2180
1 Ugc	1 Ugc, 1 Uga	1 Dya, 1 Dyc, 1 Uge	1480
1 Ugd	1 Ugd, 1 Ugc, 1 Ugb	1 Uga, 1 Dya, 1 Dyc, 1 Uge, 1 Dba, 1 Dda, 4 Uca, 4 Gna, 4 Dya, 6 Dba, 6 Uca.	6870
1 Uge	1 Uge, 1 Dyc	1 Uga, 1 Ugb, 1 Ugd, 1 Dya 1 Dbb, 1 Dba, 6 Dba	1780
1 Dya	1 Dya, 1 Dyc, 1 Dba	1 Dbc, 1 Dda, 1 Ugd, 1 Ugc	20
1 Dyc	1 Dyc, 1 Uga	1 Dba, 1 Dbc, 1 Dya	650
1 Dda	1 Dda, 1 Uga	1 Dba, 1 Dya, 1 Dyb, 1 Dyc 1 Ugd	730
1 Dba	1 Dba, 1 Dda	1 Dya, 1 Dbb, 1 Uga, 1 Ugd 3 Ugg, 3 Dya, 4 Uca, 4 Dya, 4 Gna, 6 Ufa, 6 Ufb	2840
1 Dbb	1 Dbb, 1 Dba	1 Dya, 1 Uge	90
1 Dbc	1 Dbc, 1 Dba	1 Dya, 1 Dyc, 4 Uca, 4 Gna, 4 Dya	195
2 Uga	2 Uga, 2 Dya, 2 Ugc	2 Ugb, 2 Dbb	220
2 Ugb	2 Ubc, 2 Uga, 2 Ugc	3 Ugd, 3 Uga	580
2 Ugc	2 Ugc, 2 Dbb, 2 Uga	2 Dbb, 2 Dya	220
2 Dbb	2 Dbb, 2 Ugc	2 Uga, 2 Ugb, 2 Dba, 2 Dya	805
2 Dbb-2 Uga	2 Dbb, 2 Uga	2 Ugc, 2 Ugb	790
3 Ugb	3 Ugb, 3 Ugd	3 Ugf, 3 Uga, 6 Ufa	1635
3 Ugd	3 Ugd, 3 Uga	1 Uga, 3 Ugc, 3 Uge, 3 Ugf	4610
3 Ugf	3 Ugf, 3 Ugb, 6 Ufa	5 Dyc, 6 Ufc, 6 Dda, 6 Uca	1300
3 Ugh	3 Ugh, 3 Ugi	3 Ugj, 3 Dya	3820
3 Ugi	2 Ugi, 3 Ugj	3 Ugh, 3 Dya	3905
3 Dya	3 Dya, 1 Dba, 1 Dda	3 Ugi, 1 Ugc, 1 Dbc, 1 Dbb, 1 Dyb, 6 Dda	790
4 Uca	4 Uca	4 Dya	15
4 Dya	4 Dya, 4 Gna	4 Uca, 1 Dba, 1 Dbc, 1 Dya 1 Dyb, 3 Ugg	1120
4 Dyb	4 Dyb, 4 Dya	4 Uca, 4 Gna, 1 Dbc, 1 Dba, 1 Dda	1610
4 Dyc	4 Dyc	5 Dra, 5 Dya, 5 Dyb	195
5 Dra	5 Dra, 5 Dyb	5 Dya, 5 Dyc, 5 Uga, 5 Dda	14425
5 Dya	5 Dya, 5 Dra	5 Dyb, 5 Dyc	270
5 Dyb	5 Dyb, 5 Dyc	5 Uga, 5 Dda, 5 Dra	1985
5 Dyd	5 Dyd	5 Dyc	45
5 Uga	5 Uga, 5 Dra	5 Dyb, 6 Ufb, 6 Ufa, 3 Ugb	710
5 Dra-5 Uga	5 Dra, 5 Uga	5 Dya, 5 Dyb, 6 Ufa	1820
6 Ufa	6 Ufa, 6 Dda	1 Dda, 1 Ugd, 6 Dba, 6 Uca 6 Ufb	1610

* The dominant soil is listed first

TABLE 3 - Continued

Mapping Unit	Associate Soil (<70%) Profile Class (>30%)	Minor Soil Profile Class (<30%)	Area (hectares)
6 Ufc	6 Ufc, 6 Ufa	3 Ugf, 6 Dda, 6 Dba, 6 Uca	5200
6 Uma	6 Uma, 6 Dba, 6 Gna	6 Uca, 6 Dbb	600
6 Gna	6 Gna, 6 Dbb	6 Dda, 6 Uca, 6 Uma	800
6 Uca	6 Uca	6 Dba	170
6 Dda	6 Dda, 6 Dba	1 Dba, 1 Uga, 6 Uca, 6 Ufa	670
6 Ddb	6 Ddb, 3 Ugb	6 Ufa, 6 Uca, 6 Dba	80
6 Dba	6 Dba, 6 Dda	6 Ufa, 6 Uca, 6 Dbb	1400
6 Dbb	6 Dbb, 6 Gna	6 Uma, 6 Uca	770
		Sub Total	71625

Miscellaneous Mapping Units

Mapping Unit	Associate Soil (<70%) Profile Class (>30%)	Minor Soil Profile Class (<30%)	Area (hectares)
E - 1 Ugb	Areas of unstable gully erosion	1 Ugb soil profile class	110
E - 1 Ugd	Areas of unstable gully erosion	1 Ugd	50
E - 1 Uge	Areas of unstable gully erosion	1 Uge	20
E - 1 Dba	Areas of unstable gully erosion	1 Dba	40
E - 2 Ugb	Areas of unstable gully erosion	2 Ugb	20
E - 3 Ugd	Areas of unstable gully erosion	3 Ugd	50
E - 3 Ugh	Areas of unstable gully erosion	3 Ugh	110
E - 3 Dya	Areas of unstable gully erosion	3 Dya	40
E - 4 Dyb	Areas of unstable gully erosion	4 Dyb	370
E - 4 Dyc	Areas of unstable gully erosion	4 Dyc	40
E - 5 Dra	Areas of unstable gully erosion	5 Dra	50
E - 6 Dba	Areas of unstable gully erosion	6 Dba	60
R	Areas of rock outcrop or soils with excessive amounts of stone, rock and boulders		60
H	Hills - including local mountain ranges		6820
S	Sand dunes		2060
SF	Marine saline flats		4830
M	Mangroves		1920
D	Burdekin deltaic deposits		3580
		Grand Total	91855

5. CHEMICAL AND PHYSICAL PROPERTIES OF THE SOILS

- *D. Baker*

For the Lower Burdekin Right Bank survey area, 66 profiles were sampled in 10 cm increments to 150 cm. Where a horizon change occurred within a 10 cm increment the sample was split at the horizon change, the upper part being sampled. In the majority of cases only one profile was sampled for each soil profile class.

Profiles were characterised by analysing samples from the depths suggested by McDonald (1975). Complete profile data are given in Appendix 3. Methods of analysis are given in Appendix 2. For discussion and interpretation of analytical results the soils have been grouped on the basis of similarity of profile morphology. The groupings are shown in Table 4.1.

TABLE 4.1

Groups of Soil Profile Classes

Number of Profiles	Soil Profile Class Group	Soil Profile Classes
	CRACKING CLAYS	
11	1 Ug black earths and black earth - grey clay intergrades	1 Uga, b, c, d, e
4	2 Ug grey clays	2 Uga, b, c
6	3 Ug black earths	3 Uga, b, c, d, e
5	3 Ug gilgaied grey clays	3 Ugh, i, j
	DUPLEX SOILS	
8	1 D solodics-solodized solonetz	1 Dya, b, c; 1 Dba, b, c; 1 Dda
2	2 D solodics-solodized solonetz	2 Dya; 2 Dbb
1	3 D solodics-solodized solonetz	3 Dya
2	6 D solodics	6 Dba, 6 Dda
4	5 D neutral red and yellow duplex soils	5 Dra, 5 Dya
2	5 D alkaline duplex soils	5 Dyb

For various attributes, mean values at each horizon for major soil groups have been used to plot profile trends (Figures 4 - 10).

5.1. pH

Although there is considerable variation within and between groups the general tendency is for surface soils to be slightly acid to neutral. Alkaline surface soils occur on the mounds of gilgais. The median pH for all surface soils is 6.6 (S.D. = 0.6, n = 65).

Most groups become moderately to strongly alkaline at depth (pH 8.2 to 8.7 at 150 cm). Exceptions are the 5 D neutral red and yellow duplex soils and the 3 Ug grey clays. Figure 4a and 4b show the mean pH trend down the profile for major soil groups.

Cracking clays

The surface soils of the 1 Ug gilgaied clays range in pH from slightly acid (pH 6.2) for gilgai depressions to a maximum of 8.5 on the gilgai mounds. Mound profiles are more alkaline than depression profiles to a considerable depth. The 1 Ug sub-soils are the most strongly alkaline of the clay groups.

The mean pH of 6.2 for surface horizons of the 2 Ug gilgaied grey clays is lower than that of other clay groups but these profiles become alkaline below about 60 cm and are strongly alkaline below 100 cm. The 3 Ug black earths are similar. The 3 Ug grey clays are mildly to moderately alkaline in upper horizons but are distinguished from other groups by becoming neutral to slightly acid below about 70 cm. Similar results were reported by Reeve, Hubble and Thompson (1960) for soils of the Tolgai series.

Duplex soils

Surface (0-10 cm) pH values of the duplex soils are mainly slightly acid to neutral with a pH range of 5.9 to 6.6.

Below 60 cm the 1 D and 2D and 3 D solodics-solodized solonetz soils and the 6 D solodics and 5 D alkaline yellow duplex soils become strongly alkaline (pH >8.5) whereas the 5 D red and yellow duplex soils are neutral.

Figure 4b shows that subsoils of 1 D, and 6 D solodic groups are more strongly alkaline than those of the cracking clays

The 1 D group with pH values greater than 9.0 below 100 cm are somewhat more strongly alkaline than the 2 D and 6 D groups. The neutral reaction trend of the 5 Dra soils is similar to that reported by Crack and Isbell (1971) for the Bobawaba site of a group of neutral red duplex soils. However the related Dalrymple series soils reported by Reeve, Hubble and Thompson (1960) are mildly alkaline in deeper subsoils.

5.2. Salinity

Salinity is low in the surface 0-10 cm of all soils.

According to the criteria of Northcote and Skene (1972) all soils would be classed as non-saline in the upper metre of the profile. However, the salinity of the 3 Ug gilgaied grey clays and 1 D, 2D, 3 D solodic-solodized solonetz groups is considered to be relatively high below 40 cm.

For all groups, figures 5a, b, 6a, b show that the profile trends for chloride are similar to those for E.C. About 90% of the E.C. can be accounted for by chloride with small amounts of gypsum and carbonates present in the subsoils of the cracking clays. Subsequent discussion is based on the chloride data.

Figures 6a, b show that all soils except 5 D neutral red and yellow duplex and 5 D alkaline yellow duplex soils increase in chloride with depth.

Cracking clays

The mean values for the 1 Ug profiles show low chloride content to about 60 cm. Chloride increases below that depth to a maximum of .14% at 150 cm.

Chloride in the 2 Ug profiles examined is low to 90 cm and reaches a maximum of about .04% Cl at 120 cm.

Chloride content of the 3 Ug black earth profiles is also low to about 90 cm, but below that depth increases to a maximum of about 0.12% at 140 cm. Higher chloride content throughout the profile is a feature of the 3 Ug gilgaied grey clays. While chloride content is low in the top 30 cm, there is a rapid increase with depth to a mean value of 0.15% Cl at 60 cm. Values increase more slowly beyond that depth to a maximum of .20% at 120 cm.

Studies in the Emerald Irrigation Area and on Burdekin soils show downward movement of chloride in clay soils under irrigation. These studies suggest that salinity should not be a problem in the 1 Ug, 2 Ug and black earth 3 Ug soils provided that a rising water table does not occur.

However the high chloride content of the 3 Ug grey clays at relatively shallow depth indicates a salinity hazard with these soils.

Duplex soils

The highest levels of chloride in the profiles of the duplex soils are in the solodics-solodized solonetz 1 D and 2 D groups.

A notable feature of these soils is the chloride peak around 60-80 cm. This chloride peak together with the pH and exchangeable sodium peaks at similar depth is suggested by McCown *et al* (1976) as indicating the normal wetting front of these soils.

The 6 D solodics show much lower chloride levels with the peak deeper in the profile.

Both the 5 D neutral red and yellow and 5 D alkaline yellow duplex soils of the uplands have negligible amounts of chloride to 150 cm.

5.3. Sodicity

Figures 4a, b, 5a, b, 6a, b, 7a, b, 8a, b representing pH, salinity (chloride and E.C.), sodicity (E.S.P. and Exchangeable sodium) should be considered together. These properties relate to soil permeability and crop performance under irrigation.

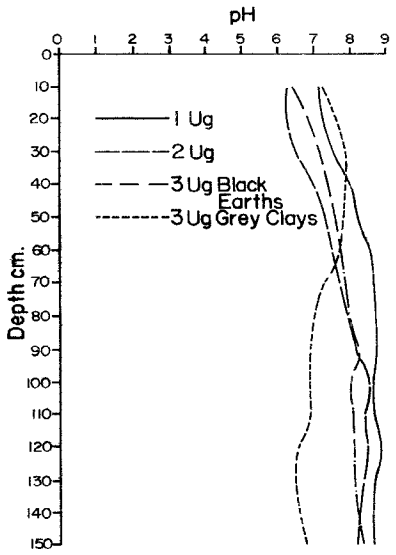


Fig 4 a.

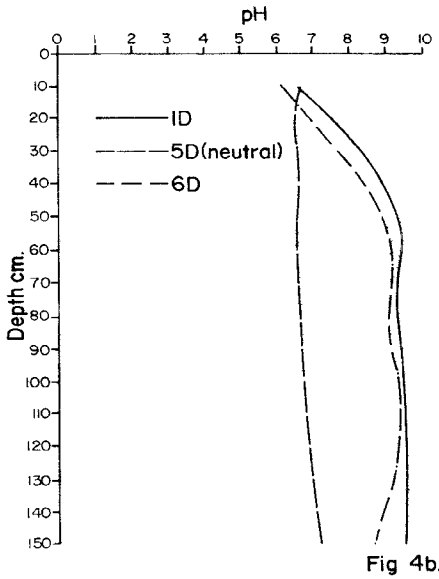


Fig 4b.

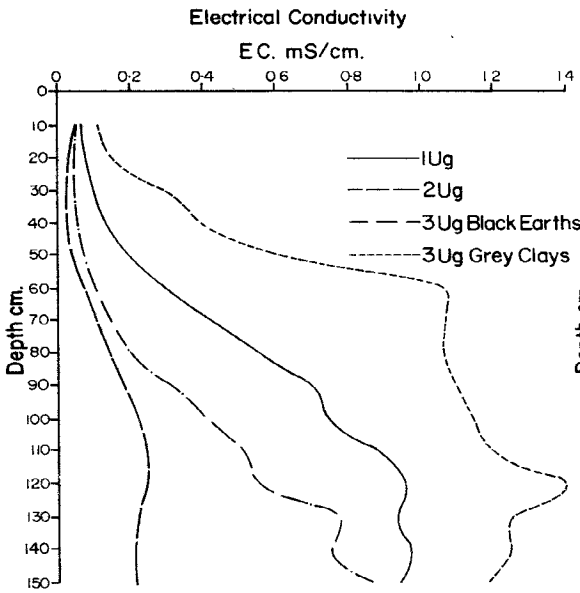


Fig 5a.

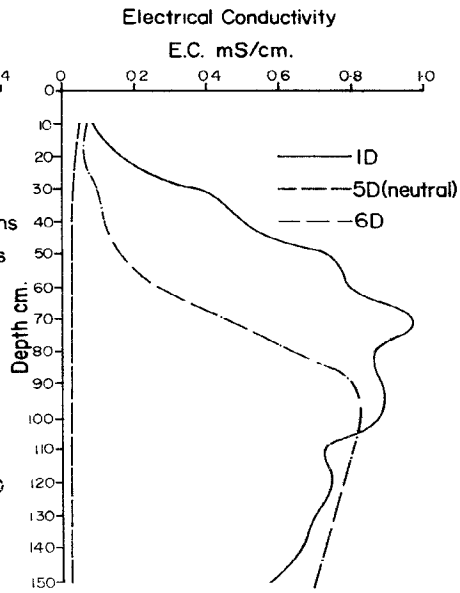


Fig 5b.

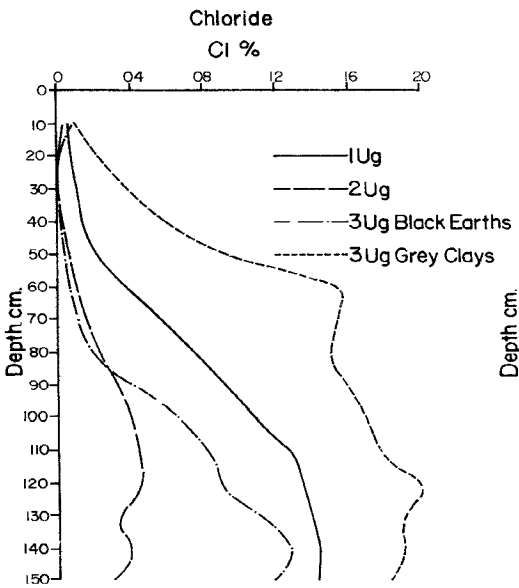


Fig 6a.

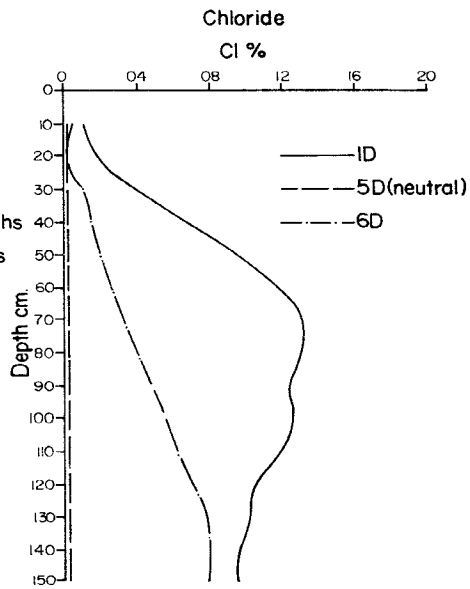


Fig 6b.

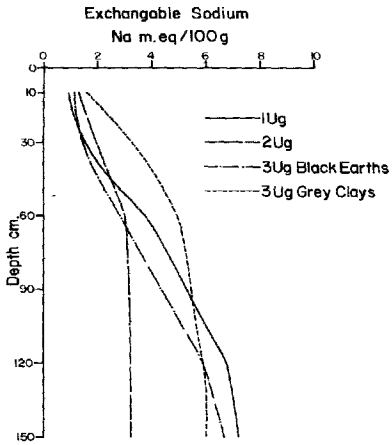


Fig 7a.

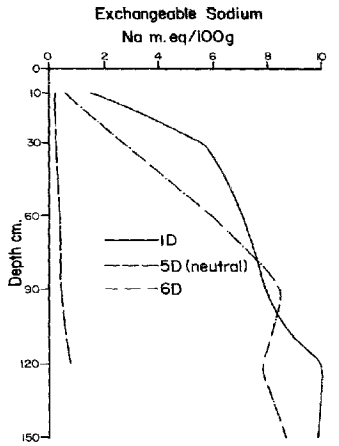


Fig 7b.

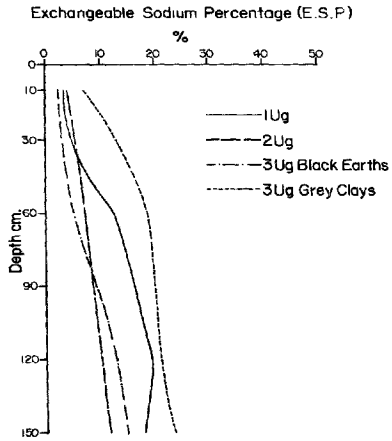


Fig 8a.

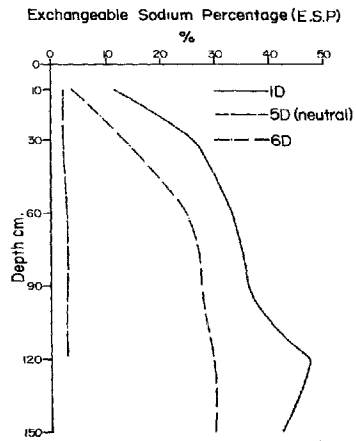


Fig 8b

Sodicity is expressed as exchangeable sodium percentage (E.S.P.). Sodicity as defined by Northcote and Skene (1972) is as follows:

(i)	non sodic	E.S.P. less than 6
(ii)	sodic	E.S.P. 6 - 14
(iii)	strongly sodic	E.S.P. 15 or more

Using these criteria the solodics-solodized solonetz 1 D and 3 D soils and the 3 Ug gilgaied grey clays are classified as sodic in the upper 20 cm of the profile. All soils are sodic at depth except the 5 D neutral red and yellow duplex soils.

Trends down the profile for exchangeable sodium and E.S.P. are similar (see Fig's 7a, b and 8a, b).

Cracking clays

The least sodic of the cracking clays are the 2 Ug grey clays and 3 Ug black earths. They are non sodic in the upper 60 cm of the profile with the 3 Ug black earths becoming strongly sodic at 150 cm.

The 1 Ug black earths and grey clays intergrades become strongly sodic below 60 cm. The 3 Ug gilgaied grey clays are strongly sodic below 30 cm and E.S.P. is greater than 20 at 90 cm (Fig. 8a).

Duplex soils

The 1 D, solodics-solodized solonetz soils are sodic in the surface 0-10 cm becoming strongly sodic below this depth. E.S.P. levels exceed 20% at 30 cm and exceed 35% deeper in the profiles.

The 6 D solodics become strongly sodic below 30 cm, with an E.S.P. of 13 at 30 cm and 25 at 60 cm but these levels are much lower than those of the 1 D, 2 D and 3 D solodics-solodized solonetz soils. Both 2 D and 6 D duplex soils have been cropped successfully. However no successful cropping has been carried out on nearby areas of the more strongly sodic 1 D soils.

The 5 D neutral red and yellow duplex soils have very low E.S.P. levels throughout the profile while the 5 D alkaline yellow duplex soils are just sodic by 100 cm.

5.4. Cation Exchange Capacity (C.E.C.)

Graphical presentation of soil cation exchange capacity is given in Figures 9a, b.

The 3 Ug black earths have the highest C.E.C. with values in excess of 45 m. equiv. per 100 g for most of the profile. The lowest C.E.C. values were found for the 3 Ug gilgaied grey clays with 25 m. equiv. per 100 g at the surface and little change to 150 cm.

Most solodic and solodized solonetz soils show a sharp increase in C.E.C. in the B horizon but this is not evident in the 5 D neutral red and yellow or 5 D alkaline yellow duplex soils.

5.5. Exchangeable Calcium and Magnesium

In most of the cracking clay soils exchangeable calcium and magnesium are co-dominant in the top 30 cm of the profile. In the 1 Ug black earths and the 3 Ug gilgaied grey clays magnesium is the dominant cation in the subsoil. In the 1 D, 2 D and 3 D solodic-solodized solonetz groups magnesium is dominant throughout most profiles although in some cases sodium becomes the dominant cation at depth. The high magnesium associated with high exchangeable sodium can be expected to contribute to clay dispersion as suggested by Emerson and Bakker (1973). Table 4.2 shows mean values for exchangeable cations for major soil groups at selected depths.

TABLE 4.2

Exchangeable Cations and Saturation Percentages for soil groups at two depths

Soil Group	Depth	Exch.[1] Ca	Ca/CEC[2]	Exch.[1] Mg	Mg/CEC[2]	Exch.[1] Na	Na/CEC[2]
1 Ug black earth and black earth -grey clay intergrades	0-10	11	41	11	38	0.9	4
	50-60	11	34	17	51	3.8	13
2 Ug grey clays	0-10	12	33	12	33	1.3	4
	50-60	17	41	17	40	40	7
3 Ug black earths	0-10	21	46	17	40	1.0	2
	50-60	23	48	20	42	2.7	6
3 Ug gilgaied grey clays	0-10	8	33	10	39	1.5	6
	50-60	9	30	12	44	4.9	18
1 D solodics solodized solonetz	0-10	3.2	24	4.1	30	1.5	12
	50-60	3.6	17	9.1	43	7.0	32
2 D solodics solodized solonetz	0-10	4.4	18	6.7	28	1.2	8
	50-60	9.7	31	13.8	45	10	33
3 D solodics solodized solonetz	0-10	5.2	24	5.1	24	2.4	11
	50-60	5.8	21	9.8	35	13	46
6 D solodics	0-10	3.1	27	3.2	28	0.5	4
	50-60	5.7	24	10.5	46	6.0	25
5 D neutral	0-10	8	80	4	31	.2	2
	50-60	7	50	6	40	.3	2
5 D alkaline	0-10	7	43	4	25	.1	2
	50-60	10	50	5	24	.3	2

1. meq/100 g soil
2. per cent

5.6. Particle Size Analysis

Figures 10a, b, show clay profiles for cracking clay and duplex soil groups.

The 1 Ug black earths and 3 Ug gilgaied grey clays have appreciably lower clay content than the 3 Ug black earths which show high values in the range of 70-80% clay.

As would be expected, the duplex soils with texture change occurring between 10 cm and 30 cm show marked clay increase in subsoils.

The mean C.E.C. to clay ratio for all soils is 0.6 with a range of 0.5 - 0.7. The highest ratios are found for the 3 Ug black earths. The values for duplex groups suggest that montmorillonite is a significant clay mineral in the texture contrast subsoils as well as for the cracking clays.

The non-clay fraction of 1 D soils shows a much greater proportion of coarse sand than that of the 2 D group, reflecting the different parent material origin and deposition. This higher proportion of coarse sand is also evident for the 1 Ug profiles compared with 2 Ug and 3 Ug groups.

5.7. Available Water

Available water was determined in the laboratory as the difference between water held at $^1/_3$ and 15 bar tensions using the pressure plate apparatus.

The range of available water for all surface (0-10 cm) soils is 9-24%. Table 4.3 shows the mean available water content of selected horizons for some cracking clay and duplex soil groups.

The cracking clays have a fairly constant amount of available water through the profile for each group. The 3 Ug black earths have the highest available water content.

A lower available water regime is characteristic of surface horizons of the duplex soils. The 5 D soils have relatively low available water levels throughout the profile.

TABLE 4.3

Mean Available Water Content for Major Soil Groups
(% Gravimetric)

Soil Group	Depth 0-10 cm	50-60 cm	80-90 cm
1 Ug black earths black earth-grey clay intergrades	15	15	16
2 Ug grey clays	19	19	19
3 Ug black earths	22	24	24
3 Ug gilgaied grey clays	14	17	16
1 D, 2 D and 3 D solodics	12	15	16
5 D red and yellow duplex	11	13	12

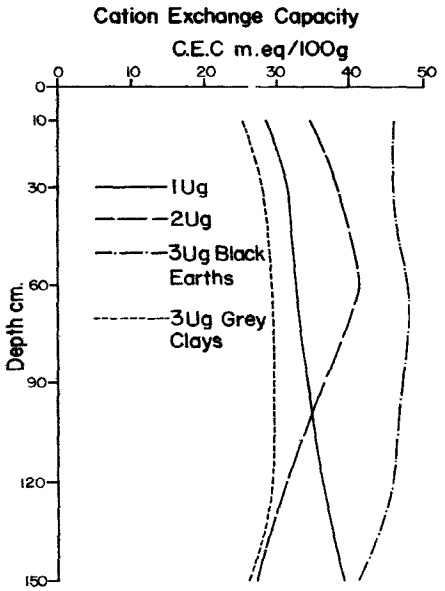


Fig 9a.

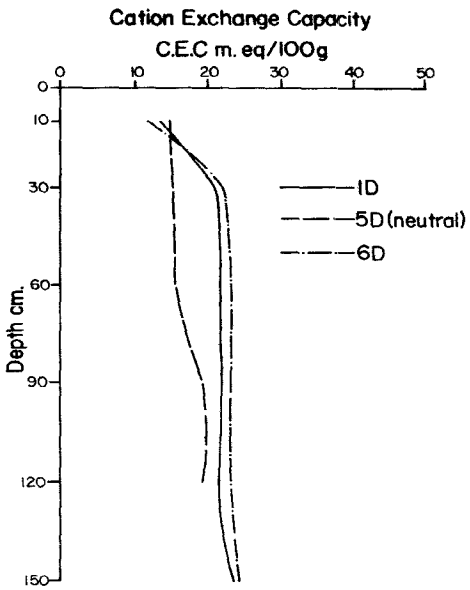


Fig 9b.

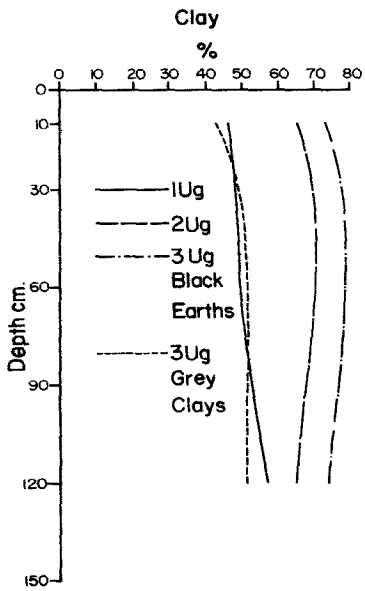


Fig 10a.

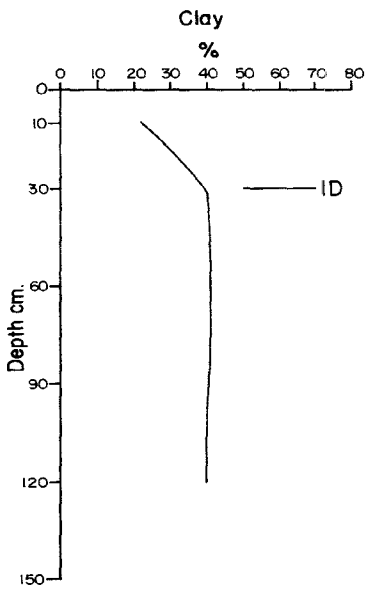


Fig 10b.

5.8. Dispersion Ratio

A rating for clay and silt dispersion was made using the method described in Appendix 2. Values are shown in Table 4.4.

The 3 Ug gilgaied grey clays show a relatively high dispersion ratio in the surface horizon and both these and the 1 Ug clays are highly dispersed below 90 cm. The 3 Ug black earths have the lowest dispersion ratios, being stable in surface horizons and only moderately dispersible in the subsoil.

The 1 D, 2 D and 3 D solodic, solodized solonetz soils have high dispersion ratios at shallow depth (20-30 cm) and deeper subsoils are also highly dispersible. High dispersion ratios for the 6 D solodics occur in the deeper subsoils. The red and yellow duplex soils show low to moderate dispersion, with subsoils being less dispersible than surface soils.

TABLE 4.4

Dispersion Ratio R_1 for the major soil groups at selected depths

Soil Group	Depth		
	0-10 cm	20-30 cm	80-90 cm
1 Ug - black earths black earth - grey clay intergrades	0.60	0.74	0.90
2 Ug - grey clays	0.56	0.68	0.65
3 Ug - black earths	0.57	0.61	0.72
3 Ug - gilgaied grey clays	0.77	0.92	0.98
1 D - solodics - solodized solonetz	0.77	0.96	0.97
2 D - solodics-solodized solonetz	0.73	0.93	0.99
6 D solodics	0.68	0.77	0.93
5 D neutral	0.70	0.64	0.57
5 D alkaline	0.60	0.51	0.57

5.9. Phosphorus

On all profiles 0-10 cm and 10-20 cm depths were analysed for extractable phosphorus by two procedures:-

(i) .01 N Sulphuric Acid extractable phosphorus (acid-P) Kerr and Von Stieglitz (1938).

(ii) .5 M Sodium Bicarbonate extractable phosphorus (bicarb-P) Colwell (1963).

By both methods extractable P is generally low for all soils. In all cases the 10-20 cm depth has lower P status than the 0-10 cm sample.

The mean extractable P for all samples except the younger alluvial 6 Ufc, , 6 Uma and 6 Gna soils are shown together with ranges and standard deviations (S.D.) in Table 4.5.

TABLE 4.5

Mean, S.D., Range, of Extractable P over all sites

	Acid-P ppm		Bicarb-P ppm	
	0-10 cm	10-20 cm	0-10 cm	10-20 cm
Mean	9	5	9	4
S.D.	7	5	8	4
Range	2 - 25	<2 - 25	<2 - 44	<2 - 25

The mean acid-P and bicarb-P for all 0-10 cm samples is low while the 10-20 cm samples are rated as very low.

The means and ranges for extractable phosphorus are shown in Table 4.6 (at selected depths) for major soil groups.

The 3 Ug black earths with a mean acid P of 16 ppm are similar to the neutral red and yellow and alkaline yellow duplex soils mean of 16 ppm while the 1 D solodics-solodized solonetz groups are very low in acid extractable-P (5 ppm).

TABLE 4.6

Means and Ranges of Extractable-P for selected soil groups

Soil Group		Acid-P ppm		Bicarb-P ppm	
		0-10	10-20	0-10	10-20
1 Ug black earths and black earth grey clay intergrades	MEAN	8	5	8	5
	RANGE	<2-21	<2-19	<2-32	<2-25
3 Ug black earths	MEAN	16	12	22	12
	RANGE	10-25	5-21	7-44	3-24
1 D solodics-solodized solonetz	MEAN	5	2	5	3
	RANGE	2 - 6	<2-4	2-7	<2-4
5 D neutral red and yellow duplex soils	MEAN	16	4	14	6
	RANGE	7 -24	2 - 6	10-18	5-7

Bicarbonate extractable-P and acid-P values follow similar trends. Much higher levels of extractable-P were found in the younger alluvial soils (6 Ufc, 6 Uma, 6 Gna).

Total phosphorus (total-P) levels were determined by X-ray fluorescence spectroscopy.

Of the cracking clays the 2 Ug grey clays and 3 Ug black earths have the highest levels of total-P. These soils also increase in total-P below 60 cm.

The 1 Ug clays and 3 Ug gilgaied grey clays have lower levels of total-P than the other cracking clays and levels do not increase with depth. The marked increase in total-P below 60 cm in the sedentary 5 Dr, 5 Dy groups is due to the increasing presence of weathered parent material. Probert (1975) showed for some neutral red duplex soils of north eastern Queensland that coarse grains of apatite were present in these soils. Experiments conducted by Probert showed that the high acid extractable-P in the C horizon of these soils was not plant available.

For all soils the percentage of total-P in the extractable form rarely exceeds 5%.

5.10. Potassium

20% of the surface 0-10 cm samples analysed for exchangeable potassium are below the commonly accepted threshold value of 0.2 m. equiv. per 100 g (Williams and Lipsett 1950; Piper and DeVries 1960).

Cracking clays

Exchangeable potassium is moderate to high in the surface 10 cm of the cracking clays but decreases rapidly with depth.

The 2 Ug grey clays and 3 Ug black earths have the highest levels of exchangeable potassium in the surface 10 cm. Mean levels for the 2 Ug clays are 0.73 m. equiv per 100 g and for the 3 Ug black earths 0.83 m. equiv. per 100 g.

Surface (0-10 cm) mean potassium levels for the 1 Ug clays and 3 Ug gilgaied grey clays are fair but are low in the 10-20 cm depth and low to very low at 150 cm. Piper and de Vries (1960) have shown that soils of heavy texture may appear to have adequate levels of exchangeable potassium but, they suggest that site testing would still have to be carried out to determine site response.

Duplex soils

The duplex soils have lower levels of exchangeable potassium than the cracking clays.

The 1 D, 2 D and 3 D solodics-solodized solonetz groups have very fair to high exchangeable potassium in the top 10 cm which drops to a low to very low level in the 10-20 cm depth and remains so to 150 cm. The 5 D neutral and alkaline duplex soils have variable exchangeable potassium in the surface (mean .18 m. equiv. per 100 g) with very low levels in the 10-20 cm depth (.08 m. equiv. per 100 g) and the levels remain very low throughout the profile.

The percentage exchangeable potassium of the total potassium in the surface 10 cm is 1.7. The 3 Ug black earths have the highest levels of 2.7% and the 6 D solodics the lowest of 0.6%.

5.11. Organic Carbon, Total Nitrogen and Total Sulphur

Organic carbon (uncorrected Walkley and Black) levels in the surface 10 cm for all soils are low, and decrease in the 10-20 cm depth. Means for organic carbon in the 0-10 cm and 10-20 cm depth are 1.1% and 0.8%.

Total nitrogen is also low for all soils, with means of 0.07% for 0-10 cm and 0.05% for 10-20 cm.

Table 4.7 lists organic carbon, total nitrogen and C/N ratio for soil groups.

TABLE 4.7

Organic Carbon, Total Nitrogen and C/N Ratio at 0-10 cm, 10-20 cm for soil groups

Soil Groups	No.	% Organic Carbon		% Total Nitrogen		Range C/N Ratio
		0-10 cm	10-20 cm	0-10 cm	10-20 cm	0-10 cm
1 Ug black earths and black earth grey clay intergrades	10	0.95	0.75	.07	.05	10-16
2 Ug grey clays	4	1.0	0.75	.06	.05	17-20
3 Ug black earths	6	1.2	0.70	.08	.05	15-20
3 Ug gilgaied clays	5	0.6	0.5	.05	.04	10-12
1 D, 2 D and 3 D solodics-solodized solonetz	11	1.1	0.7	.08	.06	10-16
5 D neutral red and yellow	4	1.1	0.7	.08	.07	14-20

The range of C/N ratios for all soils is 10-20 with the 3 Ug gilgaied grey clays having the lowest mean value of 11.

Total sulphur content of the surface (0-10 cm) of all soils ranges from 0.009% to 0.18%. All the cracking clays except the 3 Ug gilgaied grey clays decrease in total sulphur with depth. The increase in the 3 Ug grey clay subsoils is due to the presence of gypsum.

In all duplex soils analysed total sulphur is very low throughout the 150 cm of profile sampled. The slightly higher level of sulphur in the surface is likely to be present in the organic form.

Table 4.8 shows the C:N:S ratios for some of the cracking clay and duplex soil groups.

TABLE 4.8

C:N:S ratios 0-10 cm for some soil groups

Soil Group	C:N:S
1 Ug black earths and grey clays	143:10:2.7
2 Ug grey clays	181:10:1.6
3 Ug black earths	150:10:1.5
3 Ug grey clays	112:10:3.2
1 D, 2 D, 3 D solodic, solodized solonetz	135:10:1.8
5 D neutral red and yellow duplex	148:10:1.3

6. LAND USE

6.1. Present Land Use

6.1.1. Irrigated

Present irrigated land use on the right bank area is restricted to small areas of sugar cane and small crops on the Burdekin River levee (6 Uma, 6 Gna, 6 Dbb), and small crops on the Elliot River and Molongle Creek levees (6 Uma, 6 Ufc, 6 Ufa).

The expansion of irrigation in these areas is limited by available water supplies and conditions of land tenure and ownership.

Outside these mapping units no suitable aquifers occur which could support irrigated cropping.

6.1.2. Dryland

A small dryland sorghum industry is established on the right bank. The area planted varies with the seasonal conditions. However, up to 1 600 hectares are cropped, with 10% of this area planted to dolichos or sunflower. The major soil profile classes used are 3 Uga,b,d; 1 Ugb,d and 5 Uga with lesser areas of 5 Dra, 6 Dba, 6 Dbb, 6 Dda, 6 Ufc, and 6 Ufa.

Preference has been given to the black earths (3 Uga,b,d; 5 Uga; 1 Ugb) because of their better water storage properties. Emergence has proved a problem, while erosion (5 Uga) and waterlogging (1 Ugb) have also caused crop losses.

The sodic duplex soils of the alluvial-colluvial plains are not used due to poor seedbed, water infiltration and storage properties. The only sodic duplex soils in use are the deeper surface horizon profiles associated with prior stream and levee areas (6 Dba,b; 6 Dda).

Any expansion in dryland areas is limited by:

- Low yields associated with varietal problems (particularly sorghum).
- Seasonal variability. Management strategies can partially alleviate the problem.
- Lack of farmer experience and suitable machinery for handling large areas of cracking clays.
- Fauna problems. Particularly wild pigs and brolgas (especially in sorghum).
- Disease problems (particularly in sorghum and wet season maize).

6.2. Aspects of Irrigated Land Use

The provision of adequate irrigation facilities would have the following effects on land use patterns on the right bank:

- Allow crops to be grown over the dry season.
- Give stability to wet season crops due to supplementary irrigation (particularly in the case of soybeans).
- Allow introduction of crops not presently grown (e.g., sugar cane and rice).

. Increase yields of present crops.

The suitability of the area for irrigation development is dependant on climate, soils, topography, drainage and crop management requirements.

6.2.1. *Land Capability Classification*

Table 5 lists the land limitation sub-class and land classes for each of the mapping units, while the diagnostic criteria for the sub-classes and land classes are given in Appendix 4.

The limitation sub-class refers only to the limitations of the first named soil profile class in Table 3. Other soil profile classes are components of each mapping unit. Their limiting criteria are not specified except in their effect on soil variability (sub-classes pd 3 and pd 4).

Of the mapped area 22% is class 2, 27% is class 3, 33% is class 4 and 18% is class 5.

Class 2 and 3 lands (44 885 hectares) are classified as suitable for development to a range of crops if the necessary inputs are used to overcome the deficiencies.

A further 30 320 hectares are rated class 4 and are suited only to special purposes.

An example of these Class 4 lands is the 1 Dyc mapping unit which is suited only to rice (Table 7) unless very major inputs are used to overcome the impermeability of the subsoil and soil variability limitations.

Mapping units with impermeable soils and slope of .5% or less (t1) can be considered as high quality rice soils.

Areas of Each Land Class are:

Class 1	nil	
Class 2	20,135 ha	22% of total
Class 3	24,750 ha	27% of total
Class 4	30,320 ha	33% of total
Class 5	16,650 ha	18% of total

6.2.2. *Climatic factors in Irrigated Land Use*

Climate will affect land use in the following ways:

. The intense nature of the summer rainfall will require adequate storm water drains to remove excess surface waters from the various depositional plains (particularly the local alluvial plains - Topographic Form 3).

. Sloping areas (uplands on acid and intermediate intrusives) will require adequate erosion control measures over the intense wet season.

. Failure of available varieties of sorghum and sunflower to realize full production levels in this climate.

TABLE 5

Land Capability Classification of Mapping Units

Mapping Unit	Limitation Sub-Class	Land Class
1 Uga	t1, g2, w2	2
1 Ugb	t1, g2, w2	2
1 Ugc	t1, g2, w2	2
1 Ugd	t1, g2, w3, f2	3
1 Uge	t3, g2, e2, r3, sa3	3
1 Dya	pb4, pc3, pd4, sa3, so3, t1, g1	4
1 Dyc	pb4, pc3, pd4, sa3, so3, t1, g1	4
1 Dda	pb3, pc3, pd4, sa3, so3, t1, g1	4
1 Dba	pb3, pc3, pd4, so4, t1	4
1 Dbb	pb2, pc3, pd4, so4, t2	4
1 Dbc	pb3, pc3, so3, t2	4
2 Uga	t1, g2, w2, f3	3
2 Ugb	t1, g2, w2, f3	3
2 Ugc	t1, g2, w2, f3	3
2 Dbb	pb2, pc3, sa3, so4, t1, f3	4
2 Dbb-2 Uga	pb2, pc3, so4, t1, g2, w2, f3, pd3	4
3 Ugb	t1, g2, w2, f2	2
3 Ugd	t1, g2, w2, f2	2
3 Ugf	pc3, t1, f3	3
3 Ugh	sa3, so3, t1, g1	4
3 Ugi	sa3, so3, t1, g3	4
3 Dya	pb4, pc3, sa3, so3, t1, g1	4
4 Uca	pd4, pt3, f2	4
4 Dya	pb2, pc2, pd4, so2, t1, f2	4
4 Dyb	pb2, pc2, sa3, so2, t3, e3	3
4 Dyc	t3, r3, e3	3
5 Dra	pc2, t3, r3, e3	3
5 Dya	pc2, t3, r3, e3	3
5 Dyb	pc2, pd3, t3, r2, e3	3
5 Dyd	pb4, pc3, sa3, so4, t3, r4, e3	4
5 Uga	pd3, t3, r3, g1, w2, e2	3
5 Dra-5 Uga	pc2, g1, e2, pd3, r3, t3, w2	3
6 Ufa	pc2, f2	2
6 Ufc	pc2, f2	2
6 Uma	pc2, pt2, f3	3
6 Gna	pc2, f2	2
6 Uca	pd3, pt3, f2	3
6 Dda	pb1, pc2, pd3, t2, so2	3
6 Ddb	pb1, pc2, pd4, t2, f2	4
6 Dba	pb1, pc2, pd3, t2, so2	3
6 Dbb	pb2, pc2, f2	3

. Interaction between management strategy and rainfall variability.

(1), (2) and (3) will be discussed in later sections.

The interaction between management strategy and rainfall variability has been mathematically analysed by van Beek ("An analysis of five management strategies towards yield risk and gross margins in the rice industry in the Burdekin" 1975 unpublished). Many of his findings would be directly related to other crops with similar planting and harvesting dates, and cropping systems.

An example from his work of the effects of this interaction and yield risks is given below.

Percentage changes of yield risks have been calculated from twenty years of daily rainfall data.

Rice Yield Risk and Gross Margins in the Burdekin

	Chance of Losing Some Part of Crop (%)					Mathematically Calculated Gross Margin/Hectare*
	% of Crop Lost	10	22-25	44-50	72	
1	Cultivated Area 2 Crops/Year	-	40	7	3	$410.00
1	Cultivated Area 1 Crop/Year (Wet Season)	-	7	3		$250.00
1	Cultivated Area 1 Crop/Year (Dry Season)	-	-	3		$300.00
1	Cultivated Area 50% Wet and 50% Dry Season Crops	7	3			$300.00
1	Cultivated Area Two-Thirds Wet Season Crop One-Third Fallow Two-Thirds Dry Season Crop One-Third Fallow	7	3			$400.00

* At April 1975 costs and price of $100/tone paddy.

The farmer's personal attitude will determine what balance between gross margin and yield risk he prefers. The results are sufficient to indicate that climate over the wet season can have a major influence on crop yields, and that cropping systems or management strategies will have to be devised to reduce this yield risk.

Similar management adjustments will be required for all wet season crops - particularly where a monoculture crop system such as rice is being considered.

6.2.3. *Soil Suitability*

By far the most difficult soils of the right bank are the sodic duplex group (solodics and solodized solonetz) and the saline grey clays (3 Ugh, i and j). The experiences and studies quoted below are testimony to their management problems. Loveday (1964) has established correlations between up to nine (9) soil properties, including high ESP,

and crop yield. Edaphic work conducted on similar lines on a range of right bank soils has shown that infiltration rates and plant available water are lower by up to 50% for the sodic duplex group of soils compared with the cracking clay group (Gardner, personal communications). Pilot farm cropping in the Emerald Irrigation Area has shown the difficulty of obtaining consistent economic yield of cotton, over 9 years, on a complex distribution of cracking clays and sodic duplex soils. A monitored commercial scale seed bean crop on the right bank has shown a 40% yield reduction on the moderately sodic duplex 5 Dyc compared with the neutral red (5 Dra) and alkaline yellow (5 Dyb) duplex soils. A water stress factor was involved.

For the sodic duplex groups 1 Db, 1 Dd, 1 Dy, 2 Db, 3 Dy yield reductions due to a combination of low plant available water and adverse nutritional effects can be expected. Exchangeable sodium percentages from 20-40 are recorded for these soils at 30 to 60 cm. Other factors weighing against the sodic duplex group are their shallow surface horizons (1 Db, 1 Dy, 1 Dd, 2 Dba, 3 Dya) and high levels of subsoil salinity (>0.8 mS cm^{-1} electrical conductivity for 1:5 soil water suspensions at 60 cm) in nearly all of these soil profile classes.

The long term use of these soils for rice can be questioned, because of their high levels of subsoil salinity and the lack of detailed ground water table investigations. The possibility exists that the initial downward movement of salts under a rice crop could well be reversed by later upward movement of ground water tables.

With the exception of 3 Ugh, i,j and 1 Uge, the cracking clay group of soils are generally non-sodic (ESP <6) and have a low salinity (<0.4 mS cm^{-1}) in the top 60 to 100 cm of the profile.

Salinity levels in 3 Ugh, i and j and the possibility of fluctuating water tables make these soils of very doubtful suitability for any irrigation development. Given that ground water tables could be controlled and the salt leached out, the high levels of exchangeable sodium may make these clays unsuitable for crops other than rice.

Exchangeable sodium levels in 1 Uge (15%) may make this an unattractive soil, while sorghum emergence on this soil was the worst of 16 soils studied in small plot edaphic work.

The remainder of the cracking clay soils 1 Uga, b,c,d; 2 Uga,b,c; 3 Uga,b,c,d,e,f can be recommended for a range of crops. Some of these have been irrigated successfully (3 Ugd, 2 Uga, 2 Ugb, 2 Ugc) at the Fort Site and Millaroo Research Station under a range of crops.

No specific problems are expected for soils of the uplands on intermediate intrusives (Topographic Form 5) from a water relations, sodicity or salinity view point.

The major problems will be soil variability, ground water movement, stoniness and slope.

Those areas of soils associated with the channel infills from the acid intrusives (Topographic Form 4) are generally insignificant in area. However, their importance as a source of soil variability plays a major role in limiting the potential of areas in the Armstrong and Cape Creek region.

As a group they cannot be recommended for other than specialist uses (e.g., mangoes on 4 Uca areas), and they present problems with ground water stability.

It is unlikely that specific soil problems will arise on the alluvial soils of Topographic Form 6. Lower infiltration rates will be experienced on 6 Dba, 6 Dbb, 6 Dda and 6 Ufa. Complexes of 6 Dbb, 6 Gna and 6 Uma on the right bank of the Burdekin River up river from The Rocks have given differential small crop growth associated with over-

watering and/or underwatering of the duplex soils, and different fertilizer responses.

6.2.4. *Soil Variability*

Apart from specific soil disabilities, soil variability on a complex distribution of sodic duplex soils on Pilot Farm 2 at Emerald has given management problems.

On the local alluvial-colluvial plains, in mapping units 1 Dyc, 1 Dda and 1 Dba, similar complexity occurs. Because of specific soil limitations in the sodic duplex group and this complexity, these mapping units cannot be recommended for crops other than rice.

Soil variability in the mapping units 4 Uca, 4 Dya and 6 Dba is greater than in the local alluvial-colluvial plains, due to the frequency with which deep sands occur in these areas. Rice could not be considered a proposition in these areas. Indeed any form of irrigation in these prior stream and channel infill areas may well create large scale ground water table problems.

Soil variability in the uplands on the intermediate intrusives (Topographic Form 5) poses problems for crops that are particularly sensitive to water stress and water logging (e.g., seed beans). In mapping unit 5 Dra-5 Uga, areas of 5 Uga soils range from 5 m^2 to 5 hectares. 5 Dyc normally occurs in the lower slope positions. However, it is closely associated with 5 Dyb soils in the 5 Dyb mapping units in the mid to lower slope positions. There are small areas of 5 Dda which would normally occupy <5% of the 5 Dyb mapping units. Localized occurrences of up to 30% in small areas occur in the Fort Site and Stokes Range area.

At the present time seed beans seem to be the only crop strongly affected by the variability in Topographic Form 5, but similar problems could be faced with many of the vegetable crops.

The two remaining sources of soil variability are those attributable to microrelief and the inherent variability in sodic duplex soils.

With the levelling of gilgaied clays initial crop growth is normally variable and associated with the removal of the fertile surface of the mounds.

Small plot studies on undisturbed gilgaied relief also indicate quite marked but inconsistent differences in crop growth, water intake and infiltration rate (Smith, personal communications; Gardner, personal communications). Whatever the cause, this variation normally disappears within a few seasons of uniform fertilization and irrigation.

With the sodic duplex soils initial variability in crop growth that is inconsistent with morphological variation is a common occurrence (Richards 1954). In the Burdekin cane areas, levelling of soils similar to 2 Dbb and 4 Dya has been taken to the extreme of removing the surface horizons, ripping and levelling the sodic subsoils, and replacing the surface horizons. This is claimed to give uniformity of crop growth, and this in turn has been attributed to uniform water penetration into the subsoil.

6.2.4. *Topographic Limitations*

Farm Design: Traditionally slope has been considered primarily as an index of erodibility. In the Burdekin where rice is a potential crop, generally uniform slopes of <.5% are suitable for rice bays. This gives minimum manageable bay width of 15 m, with the maximum manageable fall across the bay of 7.5 cm. For this report the following criteria are used:

<.5% - uniform slope - highly suited to rice with minimal levelling required (Land Capability Sub-Class t1).

.5 to .75% - uniform slope - suited to rice only with considerable levelling to obtain manageable bay widths and falls.

.5 to .75% - variable slope - unsuited due to unacceptable and irregular bay falls and bay widths.

>.75% - unsuited due to unacceptable bay falls and bay widths.

As slopes increase over .5% the percentage of the irrigated area taken up by banks and roadways begins to exceed 25%. In the existing industry very few areas are commercially cropped above slopes of .5%.

The relationship between irrigable farm area and slope for rice would require detailed study prior to farm sub-division.

Even in those areas where uniform slopes of <.5% occur some initial levelling will be required on all soils to remove slight surface irregularities. The irregularities give rise to ponded areas in the crop that encourage bird life, and result in irregular crop stands.

Of the soils considered suitable for rice (1 Uga,b,c,d, 1 Dy, 1 Db, 1 Dd, 2 Ug, 2 Db, 2 Dy, 3 Uga,b,c,d and e) slopes are normally of the order 0 to .5%. Within the mapping units containing these soils slope can vary, so that certain unmappable areas of non-uniform slopes or slopes greater than .5% occur.

Erosion: There are three major areas of concern from the erosion view point:

(1) The uplands with slopes of between 1 and 5%

(2) Creek bank and headwater erosion

(3) Tunnel erosion in the uplands on intermediate intrusives

Areas of gully erosion in an unvegetative unstable condition have been mapped out as 'E' units.

At considerable cost some of these areas would be reclaimable, but all would be potentially aggravated by any dryland or irrigation development in their vicinity.

Sheet and rill erosion is found on the uplands on intermediate intrusives (Topographic Form 5). Gullying is normally associated with unstable drainage lines or depression areas associated with tunnel erosion.

Tunnel erosion is restricted to mid and lower slope positions where 5 Dyc, 5 Dyb and or 5 Uga soils occur. Erosion is initiated in areas with this soil complexity and proceeds both downslope and upslope into 5 Dyb areas. Although it is limited in extent, it is significant as a source of soil variability. Its behaviour under irrigation is unknown. The incidence has been reduced in southern areas by even watering on the slope and continual cultivation (Colclough, 1971; Floyd, 1974). Where contour banks are formed from susceptible soils some instability can be expected.

On the uplands on acid intrusives, gully erosion is likely to be more severe due to the more sodic subsoil of the 4 Dyb soils. Minor wind erosion has been observed on 4 Dyb and 4 Dya soils.

It is recommended that all irrigation in the uplands be on a contour or graded bank system to reduce the erosion danger over the wet season. Particular importance must be placed on the early grassing and stabilization of any drains or waterways installed.

In the soils of other topographic forms the major erosion hazards will be due to careless management. It is recommended that all major creeks and their secondary streams be left uncleared with buffer zones.

All waterways and drains installed on the depositional plains (Topographic Forms 1, 2 and 3) will require adequate grassing to prevent erosion over the wet season. This is particularly important where the installation of floodways is concerned.

6.2.5. Stoniness

Stoniness is likely to be a problem in the following mapping units: 5 Dra, 5 Dya, 5 Dyb, 5 Dyc, 5 Dyd, 5 Uga, 5 Dra-Uga and 1 Uge. Normally <5% of any of these units possesses unworkable amounts of stone. The remaining 95% will require from one to four stone pickings in the early developmental stages and periodic picking thereafter depending on the crop grown and type of harvester used (e.g., stones are a bigger problem with seed beans than with maize because of the differing harvesting conditions).

The 5 Dra and 5 Uga mapping units in the headwaters of Arrow Creek, Bobawaba, have the highest surface area coverage of stone (40%). This area would be marginal for development.

The occurrence of stone is most severe in the vicinity of the small isolated areas of 5 Uga soils. In these areas the doleritic dykes supporting the 5 Uga soil are less weathered and the rock occurs closer to the surface.

6.2.6. Drainage

Drainage forms an integral part of any irrigation scheme. The ability to remove excess surface and sub-surface water plays an important role in both short and long term stability of irrigation schemes.

An assessment of both surface and sub-surface drainage requirements is a necessary pre-requisite to any large scale irrigation scheme. Areas of particular concern are discussed below.

Surface Drainage: As discussed previously natural drainage on the three major depositional plains is poor over much of the wet season. Except in isolated areas frequent flooding is not a problem. However, waterlogging and run off control measures will be required to offset the intense nature of the wet season rainfall component.

At the farm level accurate hilling, levelling and adequate rates of fall will be required to ensure that row crops are not subjected to waterlogging.

Sub-Surface Drainge: The occurrence of shallow saline ground water tables, and the failure to make adequate provisions for controlling them has been a major problem of large scale irrigation schemes (Langford-Smith and Rutherford, 1966).

Important aspects of ground water hydrology are the depth to the water table, water quality, and long term behaviour of these parameters.

A reconnaissance survey of ground waters, where depth and water quality were determined shows that there are four major areas of possible concern:

(a) Prior stream and channel infill areas

(b) Soils with highly saline subsoils

(c) Marine saline flats - depositional plain interfaces

(d) Upland areas.

Table 6 is a summary of ground water quality and depths for the right bank areas.

(a) Prior Stream and Channel Infill Areas

These two land forms are components of Topographic Form 6 and 4 respectively.

Both occur in the alluvial-colluvial depositional plains (Topographic Form 1). In these areas a sharp discontinuity exists in land form, vegetation and soils between the alluvial-colluvial plains, prior streams and channel infills. If the aquifers associated with these channels are connected to those of the depositional plains, then the more permeable soils (6 Uca, 4 Gna, 4 Uca) of these channels will act as intake beds for the depositional plain aquifers.

This situation is further aggravated by the importance some of these prior streams and channel infills are likely to have under irrigation. Their elevation above the plains by approximately 1 m makes them suitable for reticulation purposes. The installation of main or secondary reticulation canals on these prior streams and channel infills would be ill advised until more is known of their hydrology and possible long term behaviour.

Table 6 shows there is quite a large variation in depth and water quality beneath these prior streams and channel infills.

Although insufficient samples are available to adequately characterise the quality of water tables on the right bank, it is significant that all waters sampled rate high or very high (C_3 or C_4) in salinity, four of the seven samples have SAR values higher than 10 and RSC figures much higher than 2.5 meq/l taken as acceptable for irrigation purposes.

No other waters were found on Topographic Form 4. On Topographic Form 6 a large number of wells occurred in levee areas. Although the majority of these waters had high or very high (C_3 or C_4) salinity they had lower SAR levels than the prior stream and channel infill areas and no residual sodium carbonate (except sample 5 with RSC of 3.7).

(b) Soils with Highly Saline Subsoils

Certain right bank soil profile classes have high levels of subsoil salinity within 60 cm of the surface (1 Dya,c, 3 Ugh,i,j).

Assuming an initial downward displacement, these salts would only be of significance if at a later stage perched water tables develop, or deeper water tables rise.

In certain soils it may well prove difficult to obtain the necessary leaching requirement to remove excess salts from the root zone.

TABLE 6

Ground Water Quality, Right Bank

Topographic Form	Notes on Topographic Form	Site	Conductivity ps/cm	SAR	Na^+ meq/l	RSC	Rating	Depth (m)	Date Sampled
6	Prior Streams	W 1	1950	10.51	15.6	6.6	C3S3	6.0	11.74
6	Prior Streams	W 3	3590	17.31	33.3	8.7	C4S4	12.0	11.74
6	Prior Streams	W 6	4950	6.47	25.4	0	C4S2	10.0	11.74
6	Prior Streams	W 22	2290	1.85	5.8	0	C4S1	10.0	11.74
6	Alluvial Fan	11	611	.80	1.3	.5	C2S1	12.4	11.74
6	Levee Areas	2	659	3.30	3.9	.6	C2S1	12.4	11.74
6	Levee Areas	5	1470	7.08	11.3	3.7	C3S2	10.0	11.74
6	Levee Areas	14	2800	4.33	12.5	0	C4S2	7.2	11.74
6	Levee Areas	7	2200	3.78	10.1	0	C3S1	8.0	11.74
6	Levee Areas	8	311	.54	.6	0	C2S1	6.4	11.74
6	Levee Areas	18	1540	2.60	6.3	0	C3S1	6.0	11.74
6	Levee Areas	21	3900	7.71	24.7	0	C4S2	10.0	11.74
5	Upslope Areas	16	1640	5.90	11.5	4.1	C3S2	4.4	11.74
5	Upslope Areas	17	765	2.23	3.7	1.0	C3S1	1.2	11.74
5	Upslope Areas	12000248	830	2.61	4.0	2.2	C3S1	10.3	3.75
5	Uplands - Depositional Plain Interfaces	9	1325	2.41	5.4	0	C3S1	6.4	11.74
5	Uplands - Depositional Plain Interfaces	13	1550	2.54	6.3	0	C3S1	6.0	11.74
5	Uplands - Depositional Plain Interfaces	27	4050	9.19	35.1	6.8	C4S3	5.5	11.74
5	Uplands - Depositional Plain Interfaces	12000251	1950	3.69	8.5	0	C3S1	6.5	3.75

Channel Infills	26	3550	15.9	32.4	4.8	C4S4
Channel Infills	25	1450	3.58	7.6	0	C3S1
Channel Infills	12100123	4300	17.7	33.7	3.7	C4S4
Local Alluvial Plains	10	1550	3.11	7.3	0	C3S1
Local Alluvial Plains	15	1350	2.67	5.9	0	C3S1
Local Alluvial Plains	24	1510	2.37	5.4	0	C3S1
Local Alluvial Plains	12000243	1750	2.8	6.5	0	C3S1
Older Saline Local Alluvial Plains	20	1300	4.0	8.0	2.8	C3S1
Older Saline Local Alluvial Plains	28	3000	4.18	13.4	0	C4S2
Older Saline Local Alluvial Plains	29	10000	4.73	31.4	0	C4S4
Burdekin Flood Plain	12	7340	18.56	39.6	4.0	C4S4
Alluvial-Colluvial Plains	4	1225	1.27	2.8	0	C3S1
Alluvial-Colluvial Plains	12100115	4600	8.76	26.9	0	C4S3
Alluvial-Colluvial Plains	12000247	900	4.84	6.0	.2	C3S1
Marine Saline Flats	19	2820	9.76	20.8	0	C4S3
Interface with	23	6800	8.95	38.7	0	C4S4
Depositional Plains	1200113B	29000	33.6	221.8	0	C4S4
	1200113A	200103	104.5	1609	0	C4S4
	30	15550	24.8	126	0	C4S4

$$\frac{Na^{+}}{(Ca^{++} + Mg^{++})/2}$$

RSC = Residual Sodium Carbonate

$= (CO_3^{--} + HCO_3^{-}) - (Ca^{++} + Mg^{++})$ meq/l.

As in USDA Handbook Number 60. "Diagnosis and
nt of Saline and Alkali Soils", Page 80.

The high levels of exchangeable sodium in the 1 D soils and 3 Ugi and j would gradually reduce the saturated hydraulic conductivity as more and more salts are removed.

The water tables that underlie Topographic Forms 1 and 3 at depth of 1.5 to 15.5 m are highly or very highly saline but generally have low SAR and RSC values (Table 6).

(c) Marine Saline Flats - Depositional Plain Interfaces

The location of this present interface is along the boundary of miscellaneous mapping unit SF.

There is sufficient evidence to show that past interfaces have been much further inland associated with higher sea levels 8,000 years BP (Thom and Chappel, 1975). Residual stranded Pleistocene sand dunes are found up to 8 km inland from the present coastline (Hopley 1970). Under these circumstances it would not be surprising to find marine sediments underlying some of these depositional plain areas in the vicinity of this interface. Irrigated cane in the vicinity of the Pleistocene dune at Inkerman suffers from saline water tables in the root zone.

The results of water samples taken from this interface area are given in Table 6.

The behaviour of these shallow water tables in this interface area will need assessment before this area can be considered suitable for irrigation development. At this stage it is recommended that the area between Inkerman and Guthulungra in the vicinity of the coastal side of the Bruce Highway be left as a buffer zone until the dynamics of the areas hydrology is better understood.

(d) Upland Areas

Lateral movement of ground water down slope has played a major role in the genesis of the soils of the uplands on intermediate intrusives. The lower catenary position of 5 Dyb and 5 Dyc soils is related to this movement, the geology and the influence that rock bars and depressional areas have on this water movement.

Salt accession downslope has also been observed, possibly associated with this ground water movement. Movement of ground waters downslope has been observed and measured with piezometers at the Fort Site and Piva's Farm.

The resultant water tables that occur at the interface between the uplands and the depositional plains are normally moderately deep and of high salinity (Table 6).

In an area where uplands on intermediate intrusives have been irrigated to cane, and there is poor surface drainage at the base of the slope, the water table has risen to the surface on the depositional plains and lower slope positions of the uplands, within 20 years.

On the uplands on acid and intermediate intrusives it would seem unwise to use water reticulation or irrigation practices that would add excessive amounts of water to this lateral downslope accumulation.

The use of unlined channels for reticulation or irrigation purposes in these upland areas could add a significant seepage component and will require monitoring to determine the overall effect on ground water stability.

6.2.7. *Crop Management Problems*

Crop management on right bank soils will be determined by many of the features discussed above. It is possible to indicate soils on which specific management problems or risk are associated with certain crops.

Table 7 summarizes crop suitability, soil limitations and management problems. Specific aspects of the more important soil groups are discussed below.

Specific Soil-Crop Management Considerations

The sodic duplex group of soils have generally been considered suitable only for rice. Areas not recommended for any development at this stage are the saline grey clays, prior stream and channel infill affected areas, and regions where depositional plains and marine saline areas interface.

Of the remaining soils the groups that occupy the largest commandable areas are:

(a) Black earths of the local alluvial plains (3 Uga,b,c,d, e and f).

(b) Black earths and grey clays of the alluvial-colluvial plains (1 Uga,b,c,d and e).

(c) Sedentary soils of the uplands on intermediate intrusives (5 Dra and 5 Dyb).

The tentative crop suitability of these soils is specified in Table 7.

The black earths and grey clays all possess some degree of surface self mulch. Management practices will have to be devised to obtain optimum and consistent emergence on these soils.

These soils also possess low surface relief so that water logging is a potential danger. For row crops at Millaroo Research Station adequate hilling, levelling and drainage has overcome much of these problems.

The rice industry is likely to be attracted to these soils because of their lack of slope. There is sufficient evidence to suggest that deep drainage losses on the alluvial black earth soils (3 Ug) could lead to water use inefficiencies. Deep drainage losses on these soils have been roughly measured on a commercial area as .5 cm/day.

It would seem advisable to confine rice to the sodic duplex areas in the first instance, as this will lead to higher efficiencies of water use, and overcome some of the soil variability problems found in these areas. Until a reasonably accurate saturated hydraulic conductivity is obtained for the black earths of the local alluvial plains it is difficult to accurately assess their suitability to rice.

The sedentary soils of the uplands have a wide range of crop suitability. Preliminary results indicate that these soils have a reasonable available water range, while possessing saturated hydraulic conductivities almost twice that of the black earths.

On these freely draining soils care will have to be taken with water reticulation and irrigation systems to control any excessive deep drainage that could accelerate the development of ground water tables at the base of the slope.

TABLE 7

Soil limitations, Crop suitability and Management problems

Soil Group	Soil Limitations		Crop Suitability	Likely Specific Management Problems
	Physical	Chemical		
1 Uga, 1 Ugb, 1 Ugc.	Weakly developed gilgai. Soil variability in certain areas. Water logging.	Low general fertility. Medium to high salinity below 100 cm	Sugar Cane, Kenaf and Elephant Grass	Wet season harvesting
			Rice	Wet season harvesting. Slope in certain areas.
			Soybean. Cereals and Oilseeds	Emergence. Emergence.
1 Ugd	As above but some areas may be subject to minor flooding.	As above but with medium to high salinity below 70 cm	As above.	As above.
1 Uge	Stoniness in certain areas. Slope and erosion. Moderate gilgai. Soil variability between mound and depression.	Low general fertility. Medium to high salinity below 70 cm. High sodicity below 60 cm.	Sugar Cane, Kenaf and Elephant Grass.	As above.
			Cereals and Oilseeds. Soybean.	Emergence.
1 Dya, 1 Dyc, 1 Dba, 1 Dbc, 1 Dda, 3 Dya, 5 Dyd, 2 Dba, 2 Dya	Sheet erosion. Impermeable Upper B horizon. Surface crusting. Soil variability. Flooding (2 Dya).	Low general fertility. Medium to high salinity below 30 to 70 cm	Rice	Salinity and alkalinity.
			Sugar Cane, Kenaf and Elephant Grass only after deep ripping gypsum treatment.	Restricted rooting depth and plant available water. Soils not recommended for crops other than rice.

1 Dyb, 1 Dbb, 2 Dbb.	Surface crusting, soil variability. Impermeable upper B. Flooding (2 Dbb).	Low general fertility. Medium to high salinity and sodicity below 70 cm.	Sugar Cane, Kenaf, Elephant Grass and Rice.	Wet season harvesting.
			Cereals and Oilseeds. Soybean.	Emergence. Soil variability.
2 Uga, 2 Ugb, 2 Ugc.	Flooding. Water logging - lack of slope.	Low general fertility. Medium to high salinity below 70 cm.	Sugar Cane, Kenaf, Elephant Grass and Rice.	Wet season harvesting.
			Cereals, Oilseeds and Soybean.	Water logging and emergence.
3 Uga, 3 Ugb, 3 Ugc, 3 Ugd, 3 Uge.	Minor flooding. Water logging - lack of slope. Weakly developed gilgai.	Low general fertility. Medium to high salinity below 90 cm.	Sugar Cane, Kenaf and Elephant Grass	Wet season harvesting
			Rice.	Wet season harvesting. Deep drainage.
			Cereals, Oilseed and Soybean.	Emergence and water logging.
3 Ugf.	No major problems	No major problems.	Most crops except rice.	Surface crusting if overworked. Deep drainage for rice.
3 Ugh, 3 Ugi, 3 Ugj.	Heavily timbered and gilgaied. Low infiltration rates.	Low general fertility. Medium to high salinity below 40 cm.	None recommended.	Not recommended for any crop until commercial evaluation studies are carried out.
4 Uca, 4 Gna.	Low water retention properties. Rapid internal drainage. Complex distribution patterns.	Low general fertility	Tree crops only.	

TABLE 7 (continued)

Soil Group	Soil Limitations		Crop Suitability	Likely Specific Management Problems
	Physical	Chemical		
4 Dya, 4 Dyb.	Erosion. Low water retention of A horizons. Impermeable upper B horizons. Downslope seepage (4 Dyb). Slope (4 Dyb). Soil variability (4 Dya).	Low general fertility. Medium salinity below 70 cm.	Kenaf, Sugar Cane and Elephant Grass, Soybean.	Nematode problems (kenaf). Some problems will be encountered with watering due to variability in depth of A horizons.
4 Dyc	Erosion and slope. Low water retention in A horizons. Downslope seepage.	Low general fertility.	Kenaf, Sugar Cane, Elephant Grass, Small Crops, Oil-seeds and Cereals.	Nematode problems (kenaf).
5 Dra, 5 Dya, 5 Dyb.	Erosion. Slope. Stone. Rock outcrops. Soil variability. Surface crusting.	Low general fertility.	All crops except rice.	
5 Dyc	Erosion. Slope. Soil variability. Surface crusting.	Low general fertility. Medium to high salinity and sodicity below 60 cm.	Most crops except rice.	Yield reduction relative to 5 Dra-5 Dya-5 Dyb can be expected for beans and small crops.

5 Uga	Stone. Slope and erosion. Some areas may have shallow soil depths.	Low general fertility.	Kenaf, Sugar Cane, Elephant Grass, Cereals and Oilseeds.	
6 Ufc	No major problem.	No major problem.	All crops except rice.	These soils are considered too permeable for rice.
6 Ufa, 6 Ufb, 6 Dba, 6 Dbb, 6 Dda.	Surface crusting. Moderately impermeable sub-soils. Soil variability in some areas.	Low general fertility	All crops except rice.	These soils are considered too permeable for rice.
6 Gna, 6 Uma.	No major problems.	No major problems.	All crops except rice. Preference should be given to small crops.	These soils are considered too permeable for rice.
6 Uca, 6 Ddb, 5 Dda, 3 Ugg	Small areas may be important as a source of local variability.		Only tree crops recommended for 6 Uca.	

6.2.8. Potential Crop Water Use

For the crops and soils outlined in Table 7, the major short term management decision will be the selection of irrigation schedules sufficient to meet crop requirements with the available water allocation of 6 Ml/hectare (Queensland Department of Primary Industries and Queensland Irrigation and Water Supply Commission, 1971).

Tabled below are the expected crop water requirement for various crops grown on various soils at Millaroo Research Station and throughout the Burdekin.

TABLE 8

Expected Irrigation Requirements of Various Crops

Crop	Season	Number of Crops 1 Year	Soils*	Expected Irrigation Requirements (Ml/ha) and Reference	
Rice	Dry	1	2 Ug	18	(1)
Rice	Wet	1	2 Ug	12	(1)
Rice	Dry	1	6 Dbb	Up to 40	(1)
Rice	Wet	1	6 Dbb	Up to 30	(1)
Maize	Dry	1	2 Ug, 2 Db	6 to 8	(1)
Maize	Wet	1	2 Ug, 2 Db	4 to 6	(1)
Grain Sorghum		1	2 Ug, 2 Db	6 to 8	(1)
Small Crops		1	6 Uma, 6 Gna	Up to 6	(1)
Sunflower	Dry	1	2 Ug, 2 Db	5 to 6	(1)
Seed Beans		1	6 Gna, 6 Dbb	3 to 5	(1)
Soybean		1	2 Ug, 2 Db	4 to 6	(1)
Sugar Cane		1	Lysimeter Studies	4.9 to 7.4	(2)

* Equivalent soil profile classes only.

(1) Brinsmead, R. *et al.* "Agronomic Potential and Expected Performance of Crops and Soils of the Lower Burdekin". August 1975, unpublished.

(2) Kingston and Ham (1975). Also Ham, pers. comm.

From these tables two general observations are possible:

1. Water use for rice on most soils will exceed the available irrigation supplies. For maximum water use efficiency rice must be confined to the more impermeable soils.

2. For all other crops except sugar cane the total on-farm water allocation of 6 Ml/hectare will be mostly consumed by one crop in its growing season. The possibility of saving enough water right for another crop in its growing year does not exist. Under this 6 Ml/hectare allocation, water stress will be a fact of life for one crop/year, while the problem will become worse if two crops per year are contemplated or if rainfall is low. In 60% of years rainfall is less than the long term average for this area (Queensland Regional Office of the Bureau of Meteorology, 1970).

3. As the water use figures for cane are based on district average yields of around 100 t/hectare less than district average yields may occur at the proposed water allocation because of water stress.

6.3. Summary of Irrigation Suitability

It is possible to give a brief overall assessment of the right bank areas suitability for irrigation. Broadly the region mapped falls into 2 distinct land areas.

(a) Burdekin River to Molongle Creek

The major problems in this area are the poor suitability of the sodic duplex group of soils for crops other than rice, and the potential for ground water table problems at the interfaces between the marine saline flats and the local alluvial plains, and between the local alluvial plains and the uplands.

Flooding will also be a problem over the areas around Inkerman Station, Stokes Range and Mt. Louisa.

(b) Molongle Creek to Elliot River

This area cannot be considered suitable for irrigation development without more detailed studies on the following areas:

1. Prior stream-channel infill areas. A detailed evaluation of the role they will play in ground water table stability.

2. The saline grey clay soils (3 Ugh,i and j). A detailed evaluation of water table behaviour and salt movement.

3. Crop suitability to be commercially established and evaluated by a monitored pilot farm for both of the above areas as well as the sodic duplex group of soils.

Under the circumstances it is impossible at this stage to justify on an agricultural basis the extension of the main channel past Molongle Creek.

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GLOSSARY

Alluvial Fan: The deposit of sediment laid down by streams as they enter open plains or open valleys. The stream bed ends in fan shaped deposits.

Channel Infills: Infilled beds, fan formations and sand splays of past distributary drainage lines.

Exchangeable sodium percentage (ESP): The percentage of the cation exchange capacity occupied by the sodium cation.

Local Alluvial Plain: A depositional plain composed essentially of alluvia derived from the local hills.

Local Alluvial-Colluvial Plains: A depositional plain composed of alluvia and less severely weathered sediments (colluvia) derived from local hills.

Mapping Unit: An area or group of areas coherent enough to be represented to scale on a map, which can be adequately described in a simple statement in terms of its main soil profile classes. (Beckett and Webster, 1971).

Microrelief: A repeating pattern of surface undulations, usually gilgai.

Plant Available Water (PAW): The amount of water a soil can hold which is available to a plant.

Primary Profile Form: The primary division of soils based on textural changes down the profile (See Northcote 1971).

Prior Streams: Infilled beds and associated levees of past stream courses.

Soil Profile Class: A group or class of soil profiles, not necessarily contiguous, grouped on their similarity of morphological characteristics. (Beckett, 1971; Beckett and Burrough, 1971; Beckett and Webster, 1971; Burrough *et al.*, 1971). As mapped, they are representative of bodies of soil with similar parent materials, topography, vegetative structure, and generally vegetation composition.

Soil Profile Class - Dominant: The soil profile class that occupies >70% of a mapping unit area.

Soil Profile Class - Associate: The soil profile class that occupies 30 to 70% of the mapping unit areas.

Soil Profile Class - Minor: The soil profile class that occupies <30% of the mapping unit area.

Topographic Form: An areal entity representing generalized uniformity of topography and geomorphology.

Tunnel Erosion: The erosion by water of subsoils while normally leaving the surface material intact over much of the affected area.

Uplands: Areas of low hills and rises consisting of sedentary soils and soils formed on sediments washed off the hills.

APPENDIX 1

Vegetation - Common and Specific Names

Species Referred to in Table 2:

Trees:

Bauhinia	*Bauhinia carronii*
Beefwood	*Grevillea striata*
Boree	*Acacia cana*
Burdekin plum	*Pleiogynium timorense*
Cabbage gum	*Eucalyptus papuana*
Carbeen	*E. tessellaris*
Cocky apple	*Planchonia careya*
Coral tree	*Erythrina vespertilio*
Grey bloodwood	*Eucalyptus polycarpa*
Ironbark	*E. drepanophylla*
Leichhardt tree	*Sarcocephalus coadunatus*
Pandanus	*Pandanus sp.*
Poplar gum	*Eucalyptus alba*
Red bloodwood	*E. dichromopholia*
Tea tree	*Melaleuca sp.*
Yellow wood	*Terminalia oblongata*

Shrubs:

Broad leaf tea tree	*Melaleuca viridiflora*
Bull oak	*Casuarina luehmannii*
Currant bush	*Carissa ovata*
Currant bush	*C. lanceolata*
False Sandalwood	*Eremophila mitchellii*
Mimosa	*Acacia farnesiana*
Parkinsonia	*Parkinsonia aculeata*
Prickly pine	*Bursaria incana*
Quinine bush	*Petalostigma pubescens*
Rubber vine	*Cryptostegia grandiflora*
Whitewood	*Atalaya hemiglauca*
Willow wattle	*Acacia salicina*

Species of Sparse Occurrence:

Chinee apple	*Ziziphus mauritiana*
Corkwood	*Acacia bidwillii*
Dead finish	*Albizia basaltica*
Native ebony	*Buahinia hookeri*
Red siris	*Albizia toona*
	Acacia arabica
	Clerodendrum floribundum

Grasses:

Blue Grasses	*Bothriochloa and Dicanthium spp.*
Brown Sorghum	*Sorghum nitidum*
Cane Grass	*Ophiurous exaltatus*
Flinders Grass	*Iseilema sp.*
Giant Spear	*Heteropogon triticeus*
Kangaroo Grass	*Themeda australis*
Love Grasses	*Eragrostis sp.*
Spear Black	*Heteropogon contortus*
Wire Grass	*Aristida sp.*

Other grasses of limited occurrence include:

Beard Grass	*Chrysopogon fallax*
Button Grass	*Dactyloctenium radulans*
Grader Grass	*Themeda quadrivaluis*
River Grass	*Cenchrus echinatus*

Exotic grasses also occur including green panic *(Panicum maximum)*, buffel *(Cenchrus ciliaris)*, para grass *(Brachiaria mutica)* and various species of couch grasses *(Cynodon sp. and Digitaria sp)*.

Although not grasses, sedges *(Cyperus sp.)* are common in the wetter areas on a seasonal basis.

APPENDIX 2

Soil Analytical Methods

Sample Preparation

Samples were dried in a forced air draught at 40°C and ground to less than 2 mm. Soil tests were carried out on the <2 mm soil except where indicated. Results are reported on air dry basis except where otherwise stated.

Electrical Conductivity

A 1:5 soil deionized water suspension was shaken for one hour and the electrical conductivity (E.C.) measured at 25°C.

pH

The soil water suspension used for determination of electrical conductivity was used for pH. pH was determined with glass and calomel electrodes and a Townsen Specific Ion/pH meter.

Chlorides

After electrical conductivity and pH were determined the same soil water suspension was used to measure chlorides. The specific ion chloride electrode was used according to Haydon, Williams and Ahern (1974).

Organic Carbon

For this determination the soil is finely ground (<80 mesh).

The wet combustion method of Walkley and Black (1934) was used.

Results were obtained using the colorimetric method of Sims and Haby (1971). Results are reported as per cent carbon.

Total Nitrogen

The sample was finely ground. Selenium catalyst was used in the Kjeldahl method. An Auto Analyser system was used for estimation of ammonium in the digests.

Available Phosphorus

Acid extractable phosphorus was determined by the method of Kerr and von Stieglitz (1938) by extracting with 0.01 N H_2SO_4 for 16 hours. An auto analyser system was used to read the extracts using the Murphy and Riley (1962) colour development method.

Bicarbonate extractable phosphorus Colwell (1963) was extracted with 0.5 M sodium bicarbonate pH 8.5 and shaken for 16 hours. The extracts were read by auto analyser using similar system to the acid extractable phosphorus.

Total Phosphorus, Potassium and Sulphur

About 3 gm of soil sample were finely ground in a 'Shatter-box' mill and pressed into a pellet as described by Norrish and Hutton (1964). The pellet was then exposed to a beam of X-rays in a Phillips 1410 vacuum X-ray spectrograph. Simple linear calibration was used to obtain percentage phosphorus, potassium and sulphur from fluorescent intensities.

Exchangeable Cations

A method similar to that reported in Methods For Analysis Of Irrigated Soils, Loveday (1974) was used.

Prewashing was done with 60% ethanol. Exchangeable cations were removed with 1N NH_4Cl at pH 8.5 in 60% ethanol. Absorbed ammonium was removed with 1N Sodium Sulphate.

Ammonium N and Cl were determined in milliequivalents on an auto analyser using colorimetric method similar to those described by Loveday (1974). The difference was reported as the C.E.C.

Particle Size Distribution

Particle size analysis are based on the method reported in Method For Analysis Of Irrigated Soils, Loveday (1974).

A slight modification is that an hydrometer is used to determine silt and clay readings. Results are reported on oven dry basis.

Dispersion Ratio

Dispersion ratios R_1 and R_2 are used as an estimate of aggregate stability. A sample of 50 g air dry soil was added to a sedimentation cylinder and shaken with deionized water. All the particles are brought into random suspension. Hydrometer readings are made at 5 mins and 5 hrs from the start of sedimentation.

R_1 is the ratio of the percent silt plus clay dispersed to the percent total silt plus clay in the soil.

R_2 is the ratio of the percent clay dispersed to the percent total clay in the soil.

Moisture Characteristics

A pressure plate apparatus of the Soil Moisture Equipment Co. of California was used.

Moisture percentage at matrix potentials of $^1/_3$ and 15 bar was determined.

Results are reported on oven dry basis.

Available water was calculated as the difference between these two measurements.

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APPENDIX 3

Morphological and Analytical Data

for Soil Profiles

1. LOCAL ALLUVIAL - COLLUVIAL PLAINS

Black Earths - Grey Clays

Soil Profile Class: 1 Uga
Great Soil Group: Black Earth
Parent Material: Alluvia-colluvia derived from nearby hills
Topography: Local alluvial-colluvial plains. Broad low lying areas
Vegetation: Low open woodland. Poplar gum and broad leaf tea tree.

Site No: 1a Mound
Location: Sample Area 2
Australian Map Grid Reference: Zone E55 538375E, 7815200N
Air Photo Reference:
Principal Profile Form: Ug 5.16

Profile Morphology: Surface: Moderate beta nuram gilgai. Weakly to moderately self mulching. Moderately cracking when dry.

0 - 10 cm Brownish black (10YR 3/1), 5% root line mottle; medium clay, trace of grit; strong fine sub angular blocky to blocky, dry very hard. Gradual to diffuse to -

10 - 40 cm Brownish black (10YR 3/1), medium clay, trace of grit; strong fine sub angular blocky, dry extremely hard; trace manganiferous concretions. Diffuse to -

40 - 130 cm Brownish black (10YR 3/1); medium heavy clay, trace of grit; strong fine prismatic to sub angular blocky breaking to very fine blocky; dry extremely hard; trace of concretionary lime and manganiferous concretions. Diffuse to -

130 - 150 cm Dull yellow (2.5Y 6/4), 10% red, yellow and grey mottle; medium clay, small trace of grit; strong fine to medium lenticular: dry extremely hard; trace of concretionary lime and manganiferous concretions.

Laboratory Data:

Lab. No.	Depth cm	pH 1:5	E.C.(1:5) $mScm^{-1}$	Cl ppm	Dispersion Ratio (R_1)	C.S.	F.S.	Si	C	C.E.C.	Ca^{++}	Mg^{++}	K^+	Na^+	P	K	S	Moisture % A.D.	1/3 bar	15 bar
						Particle Size % O.D.				Exch.Cations m.equiv/100g					% O.D.					
6243	0-10	6.8	0.05	40	.58	9	17	11	62	31	16.0	13.2	0.1	1.0	.030	0.28	.013	7.2	32	17
6244	10-20	6.9	0.04	30																
6245	20-30	7.2	0.04	30	.59	18	19	7	55	35	12.4	15.5	0.1	1.0	.014	0.26	.007	5.5	35	18
6248	50-60	8.4	0.07	60	.66	17	17	9	57	34	12.7	17.2	0.1	2.1	.013	0.32	.008	6.5	37	19
6251	80-90	8.3	0.27	470	70	17	18	10	55	36	11.4	18.8	0.1	3.4	.010	0.29	.006	7.3	37	20
6254	110-120	8.5	0.67	1230		15	17	11	57	37	10.8	19.2	0.1	4.5	.009	0.28	.007	6.3		

Lab. No.	Depth cm	Org. C %	Tot. N %	Acid Extr. P ppm	Bicarb P ppm	Repl. K m.equiv/100g	Fe D.T.P.A.	Mn D.T.P.A.	Cu Extr. ppm	Zn Extr. ppm	B ppm
6243	0-10	0.8	.05	15	16	0.2					
6244	10-20	0.6	.04	12	7	0.2					

Soil Profile Class: 1 Uga
Great Soil Group: Black Earth
Parent Material: Alluvia-colluvia derived from nearby hills.
Topography: Local alluvial-colluvial plains. Broad low lying areas.
Vegetation: Low open woodland. Poplar gum and broad leaf tea tree.

Site No: 1b Depression
Location: Sample Area 2
Australian Map Grid Reference: Zone E55 538375E, 7815200N
Air Photo Reference:
Principal Profile Form: Ug 5.16

Profile Morphology: Surface: Moderate beta nuram gilgai. Weakly to moderately self mulching. Moderately cracking when dry.

0 - 10 cm Black (10YR 2/1), 5% root line mottle; medium clay, trace of grit; dry extremely hard; trace of manganiferous concretions. Gradual to diffuse to -

10 - 90 cm Brownish black (10YR 3/1); medium clay, trace of grit; dry extremely hard; trace of manganiferous concretions. Diffuse to -

90 - 110 cm Brownish black (10YR 3/2); medium clay, trace of grit; dry extremely hard, trace of concretionary lime and manganiferous concretions. Diffuse to -

110 - 150 cm Dull yellow (2.5Y 6/4), 10% red and yellow mottle: medium clay, trace amounts of grit; dry extremely hard, trace amounts of concretionary lime and manganiferous concretions.

Laboratory Data:

Lab. No.	Depth cm	pH 1.5	E.C.(1:5) $mScm^{-1}$	Cl ppm	Dispersion Ratio (R_1)	C.S.	F.S.	Si	C	C.E.C.	Ca^{++}	Mg^{++}	K^+	Na^+	P	K	S	Moisture % A.D.	1/3 bar	15 bar
						Particle Size % O.D.				Exch.Cations m.equiv/100g					% O.D.					
6577	0-10	6.2	0.01	25	.52	12	21	17	50	37	11.9	13.8	0.4	0.7	.039	0.35	.014	7.1	33	19
6578	10-20	6.4	0.06	50																
6579	20-30	6.1	0.05	60	.72	12	20	16	52	41	14.5	16.4	0.1	1.1	.024	0.29	.009	7.5	36	22
6582	50-60	6.6	0.23	360	.79	15	19	12	54	41	8.8	16.9	0.1	2.6	.019	0.28	.009	7.4	36	21
6585	80-90	6.9	0.63	1140	.78	13	20	11	56	40	9.9	20.0	0.1	4.0	.018	0.31	.008	7.8	38	23
6588	110-120	8.3	0.95	1630		13	21	10	56	43	13.0	23.5	0.1	5.3	.013	0.33	.008	8.4		

Lab. No.	Depth cm.	Org. C %	Tot. N %	Acid Extr P ppm	Bicarb P ppm	Repl. K m.equiv/100g	Fe D.T.P.A.	Mn D.T.P.A.	Cu Extr. ppm	Zn Extr. ppm	B ppm
6577	0-10	1.3	.08	21	32	0.4					
6578	10-20	1.2	.07	19	25	0.2					

Soil Profile Class: 1 Ugb
Great Soil Group: Grey clay
Parent Material: Alluvia-colluvia derived from nearby hills
Topography: Local alluvial-colluvial plains. Low lying area.
Vegetation: Low open woodland of poplar gum and carbeen

Site No: 2a Mound
Location: Sample Area 3
Australian Map Grid Reference: Zone E55 567350E, 7803675N
Air Photo Reference:
Principal Profile Form: Ug 5.28

Profile Morphology: Surface: Moderate beta nuram gilgai. Weakly self mulching. Strongly cracking when dry.

0 - 30 cm Yellowish grey (2.5Y 4/1); medium clay, trace of grit; strong medium blocky breaking to fine sub angular blocky; dry extremely hard, trace of concretionary lime and manganese. Diffuse to -

30 - 150 cm Dark greyish yellow (2.5Y 4/2); medium heavy clay, trace of grit; strong medium prismatic breaking to fine blocky; dry extremely hard; trace of concretionary lime and manganiferous concretions.

Laboratory Data:

Lab. No.	Depth cm	pH 1:5	E.C.(1:5) $mScm^{-1}$	Cl ppm	Dispersion Ratio (R_1)	C.S.	F.S.	Si	C	C.E.C.	Ca^{++}	Mg^{++}	K^+	Na^+	P	K	S	Moisture % A.D.	1/3 bar	15 bar
						Particle Size % O.D.				Exch.Cations m.equiv/100g					% O.D.					
6318	0-10	8.3	0.11	80	.61	18	20	11	51	35	21.3	13.8	0.3	0.5	.014	0.54	.016	6.8	29	17
6319	10-20	8.8	0.10	35																
6320	30-40	9.0	0.10	30	.66	19	18	10	53	37	19.2	16.6	0.2	1.0	.010	0.49	.011	7.8	33	17
6323	50-60	9.2	0.15	55	.71	20	18	8	54	36	13.8	18.4	0.2	2.3	.009	0.50	.008	7.0	31	18
6326	80-90	9.2	0.40	425	.78	19	17	11	54	35	10.8	19.7	0.2	4.4	.009	0.48	.029	7.6	34	18
6329	110-120	8.9	0.82	1050		19	16	12	53	36	10.7	22.2	0.2	5.8	.011	0.55	.046	7.0		

Lab. No.	Depth cm	Org. C %	Tot. N %	Acid Extr. P ppm	Bicarb P ppm	Repl. K m.equiv/100g	Fe D.T.P.A.	Mn D.T.P.A.	Cu Extr. ppm	Zn Extr. ppm	B ppm
6318	0-10	0.7	.05	5	3	0.2					
6319	10-20	0.5	.04	1	2	0.2					

LOCAL ALLUVIAL - COLLUVIAL PLAINS
Black Earths - Grey Clays

Soil Profile Class: 1 Ugb
Great Soil Group: Black Earth
Parent Material: Alluvis-colluvis derived from nearby hills.
Topography: Local alluvial-colluviel plains. Low lying area.
Vegetation: Low open woodland of poplar gum and carbeen.

Site No: 2b Depression
Location: Sample 3
Australian Map Grid Reference: Zone E55 567350E, 7804675N
Air Photo Reference:
Principal Profile Form: Ug 5.16

Profile Morphology: Surface: Moderate nuram beta gilgai. Weakly self mulching. Strongly cracking when dry.

0 - 60 cm Black (2.5Y 2/1); medium clay, trace of grit; dry extremely hard. Gradual to -

60 - 120 cm Black (10YR 1.7/1); medium heavy clay, trace of grit; dry extremely hard; trace of lime concretions. Diffuse to -

120 - 150 cm Greyish yellow brown (10YR 5/2); medium heavy clay, trace of grit; dry extremely hard; trace of lime and manganiferous concretions.

Laboratory Data:

Lab. No.	Depth cm	pH 1:5	E.C.(1:5) mScm⁻¹	Cl ppm	Dispersion Ratio (R_1)	C.S.	F.S.	Si	C	C.E.C.	Ca⁺⁺	Mg⁺⁺	K⁺	Na⁺	P	K	S	Moisture % 1/3 A.D.	bar	15 bar
						Particle Size % O.D.				Exch.Cations m.equiv/100g					% O.D.					
6333	0-10	7.1	0.06	60	.73	13	19	13	55	37	10.3	19.3	0.2	1.2	.008	0.59	.053	6.9	31	17
6334	10-20	6.9	0.06	60																
6335	20-30	6.1	0.06	60	.85	14	17	14	55	37	13.8	19.6	0.1	1.9	.012	0.39	.008	7.3	31	18
6338	50-60	6.7	0.26	420	.92	14	20	13	53	37	13.8	19.8	0.1	3.4	.009	0.39	.012	7.4	34	18
6341	80-90	7.1	0.70	1085	.97	14	17	12	57	39	14.3	22.0	0.1	4.9	.010	0.43	.030	7.2	35	19
6344	110-120	8.8	0.86	980		14	19	12	55	37	13.1	17.0	0.1	5.4	.011	0.55	.045	7.9		

Lab. No.	Depth cm	Org. C %	Tot. N %	Acid Extr. P ppm	Bicarb Extr. P ppm	Repl. K m.equiv/100g	Fe D.T.P.A.	Mn D.T.P.A.	Cu Extr. ppm	Zn Extr. ppm	B ppm
6333	0-10	0.8	.04	5	3	0.2					
6334	10-20	0.8	.03	5	4	0.1					

Soil Profile Class: 1 Ugc
Great Soil Group: Grey clay
Parent Material: Alluvis derived from nearby hills.
Topography: Local alluvial-colluvial plains. Low lying area.
Vegetation: Low open woodland of poplar gum and carbeen.

Site No: 3a Mound
Location: Sample Area 3
Australian Map Grid Reference: Zone E55 538850E, 7814625N
Air Photo Reference:
Principal Profile Form: Ug 5.28

Profile Morphology: Surface: Moderate beta nuram gilgai. Weakly cracking when dry

0 - 10 cm Greyish yellow brown (10YR 4/2), 10% root line mottle; light medium clay with trace amounts of grit; strong medium subangular blocky breaking to fine crumb; dry slightly hard. Clear to -

10 - 20 cm Yellowish grey (2.5Y 4/1); medium clay with trace amounts of grit; strong fine prismatic to fine blocky; dry hard; trace amounts of lime and manganiferous concretions. Diffuse to -

20 - 110 cm Yellowish grey (2.5Y 4/1); medium clay with trace amounts of grit; strong fine prismatic to fine blocky; dry very hard; trace amounts of lime and manganiferous concretions. Diffuse to -

110 - 150 cm Yellowish brown (2.5Y 5/4), 10% red and yellow mottle; medium heavy clay with trace amounts of grit; strong fine blocky; dry very hard; trace amounts of lime and manganiferous concretions.

Laboratory Data:

Lab. No.	Depth cm	pH 1:5	E.C.(1:5) mScm⁻¹	Cl ppm	Dispersion Ratio (R_1)	C.S.	F.S.	Si	C	C.E.C.	Ca⁺⁺	Mg⁺⁺	K⁺	Na⁺	P	K	S	Moisture % 1/3 A.D.	bar	15 bar
						Particle Size % O.D.				Exch.Cations m.equiv/100g					% O.D.					
6592	0-10	6.9	0.06	70	.57	22	34	10	32	26	6.5	11.9	0.3	0.9	.020	0.33	.016	4.3	23	13
6593	10-20	7.0	0.09	120																
6594	20-30	7.2	0.20	310	.74	14	20	9	57	40	13.1	22.5	0.2	1.8	.013	0.31	.009	8.2	34	22
6597	50-60	9.7	0.21	90	.91	15	20	10	55	39	10.5	24.5	0.1	4.2	.013	0.32	.008	7.8	33	20
6600	80-90	9.4	0.53	720	.99	13	20	11	56	40	8.3	26.3	0.1	7.0	.012	0.29	.010	7.9	40	20
6603	110-120	9.0	0.84	1340		10	21	12	57	41	7.5	27.8	0.2	9.0	.011	0.33	.009	8.6		

Lab. No.	Depth cm	Org. C %	Tot. N %	Acid Extr. P ppm	Bicarb Extr. P ppm	Repl. K m.equiv/100g	Fe D.T.P.A.	Mn D.T.P.A.	Cu Extr. ppm	Zn Extr. ppm	B ppm
6592	0-10	1.4	.09	7	6	0.3					
6593	10-20	0.6	.04	5	1	0.2					

Soil Profile Class: 1 Ugc
Great Soil Group: Black earth
Parent Material: Alluvis derived from nearby hills.
Topography: Local alluvial-colluvial plains. Low lying area.
Vegetation: Low open woodland of poplar gum and carbeen.

Site No: 3b Depression
Location: Sample Area 2
Australian Map Grid Reference: Zone E55 538850E, 7814625N
Air Photo Reference:
Principal Profile Form: Ug 5.15

Profile Morphology: Surface: Moderate beta nuram gilgai. Weakly cracking when dry.

0 - 10 cm Brownish black (10YR 3/1), 5% root line mottle; light medium clay with trace amounts of grit; dry very hard. Clear to -

10 - 50 cm Brownish black (10YR 3/1); medium clay with trace amounts of grit; dry very hard; with small amounts of manganiferous concretions. Gradual to -

50 - 90 cm As above but with small amounts of concretionary lime. Diffuse to -

90 - 150 cm Bright yellowish brown (2.5Y 6/6), 5% red and yellow mottle; medium to medium heavy clay with trace amounts of grit; dry extremely hard; small amounts of concretionary lime and trace manganiferous concretions.

Laboratory Data:

Lab. No.	Depth cm	pH 1:5	E.C.(1:5) mScm⁻¹	Cl ppm	Dispersion Ratio (R_1)	C.S.	F.S.	Si	C	C.E.C.	Ca⁺⁺	Mg⁺⁺	K⁺	Na⁺	P	K	S	Moisture % 1/3 A.D.	bar	15 bar
						Particle Size % O.D.				Exch.Cations m.equiv/100g					% O.D.					
6607	0-10	6.5	0.05	60	.62	13	23	12	52	31	9.0	13.3	0.3	1.1	.028	0.33	.014	5.8	28	14
6608	10-20	7.1	0.05	50																
6609	20-30	7.3	0.06	60	.99	19	26	14	41	33	10.5	15.3	0.1	2.3	.016	0.29	.009	5.9	31	16
6612	50-60	8.3	0.31	490	.99	18	25	11	46	35	10.1	17.8	0.1	4.5	.012	0.32	.009	4.8	33	16
6615	80-90	8.6	0.87	1490	.99	22	21	9	48	38	9.4	22.3	0.2	6.6	.013	0.40	.006	7.0	38	19
6618	110-120	8.8	0.86	1590		7	24	9	60	41	8.6	23.8	0.2	7.9	.009	0.44	.003	8.2		

Lab. No.	Depth cm	Org. C %	Tot. N %	Acid Extr. P ppm	Bicarb Extr. P ppm	Repl. K m.equiv/100g	Fe D.T.P.A.	Mn D.T.P.A.	Cu Extr. ppm	Zn Extr. ppm	B ppm
6607	0-10	1.1	.08	6	7	0.2					
6608	10-20	0.7	.05	6	4	0.1					

Soil Profile Class: 1 Ugd
Site No: 4a Mound
Great Soil Group: Grey clay
Location: Sample Area 3
Parent Material: Alluvia-colluvia derived from nearby hills.
Australian Map Grid Reference: Zone E55 568200E, 7702725N
Topography: Local alluvial-colluvial plains. Low lying area.
Air Photo Reference:
Vegetation: Low open woodland. Poplar gum, broad leaf tea tree, willow wattle and cabbage gum.
Principal Profile Form: Ug 5.24

Profile Morphology: Surface: Moderate beta nuram gilgai. Weakly self mulching. Moderately cracking when dry.

0 - 10 cm Brownish grey (10YR 4/1), with 15% root line mottle; medium clay, small amounts of grit; strong fine prismatic; dry very hard; trace amounts of manganiferous concretions. Gradual to -

10 - 40 cm Brownish grey (10YR 4/1); medium clay, small amounts of grit; strong fine prismatic; dry extremely hard; small amounts of concretionary and powdery lime and manganiferous concretions. Diffuse to -

40 - 100 cm Brownish grey (10YR 4/1 to 10YR 5/1); medium clay, small amounts of grit; strong medium to fine angular blocky; dry extremely hard; small amounts of concretionary and powdery lime and manganiferous concretions. Gradual to -

100 - 150 cm Greyish yellow (2.5Y 6/2) with 5% red mottle; medium heavy clay with small amounts of grit; strong fine angular blocky; dry extremely hard; small amounts of concretionary lime and manganiferous concretions.

Laboratory Data:

Lab. No.	Depth cm	pH 1:5	E.C.(1:5) mScm^{-1}	Cl ppm	Dispersion Ratio (R_1)	C.S.	F.S.	Si	C	C.E.C.	Ca^{++}	Mg^{++}	K^+	Na^+	P	K	S	Moisture % A.D.	1/3 bar	15 bar
						Particle Size % O.D.				Exch.Cations m.equiv/100g					% O.D.					
6258	0-10	7.6	0.05	50	.53	18	17	13	51	34	15.3	14.4	0.1	1.2	.009	0.65	.007	5.8	32	16
6259	10-20	7.5	0.04	85																
6260	20-30	7.7	0.04	30	.66	18	18	15	49	31	13.2	13.2	0.1	1.6	.008	0.66	.007	5.2	32	17
6263	50-60	8.6	0.14	165	.73	21	17	15	48	30	12.2	14.2	0.1	3.4	.008	0.71	.017	5.0	35	17
6266	80-90	9.1	0.56	725	.54	15	19	15	51	35	11.3	15.8	0.2	5.2	.008	0.78	.035	6.0	35	19
6269	110-120	8.7	1.00	1540		3	5	8	83	30	9.6	15.6	0.2	5.9	.010	0.96	.047	5.7		

Lab. No.	Depth cm	Org. C %	Tot. N %	Acid Extr. P ppm	Bicarb Extr. P ppm	Repl. K m.equiv/100g	Fe D.T.P.A.	Mn D.T.P.A.	Cu Extr. ppm	Zn Extr. ppm	B ppm
6258	0-10	0.4	.02	1	1	0.1					
6259	10-20	0.4	.02	1	1	0.2					

Soil Profile Class: 1 Ugd
Site No: 4b Depression
Great Soil Group: Black earth
Location: Sample Area 3
Parent Material: Alluvia-colluvia derived from nearby hills.
Australian Map Grid Reference: Zone E55 568200E, 7702725N
Topography: Local alluvial-colluvial plains. Low lying area.
Air Photo Reference:
Vegetation: Low open woodland. Poplar gum, broad leaf tea tree, willow wattle and cabbage gum.
Principal Profile Form: Ug 5.16

Profile Morphology: Surface: Moderate beta nuram gilgai. Weakly self mulching. Moderately cracking when dry.

0 - 10 cm Brownish black (10YR 3/1) with 10% root line mottle; medium clay, trace of grit; dry very hard; small amount of manganiferous concretions. Gradual to -

10 - 70 cm Brownish black (10YR 3/1) medium clay, small amounts of grit; dry extremely hard; small amounts of manganiferous concretions. Diffuse to -

70 - 150 cm Greyish yellow brown (10YR 6/2); medium clay, small amounts of grit; dry extremely hard; small amounts of concretionary lime and manganiferous concretions.

Laboratory Data:

Lab No.	Depth cm	pH 1:5	E.C.(1:5) mScm^{-1}	Cl ppm	Dispersion Ratio (R_1)	C.S.	F.S.	Si	C	C.E.C.	Ca^{++}	Mg^{++}	K^+	Na^+	P	K	S	Moisture % A.D.	1/3 bar	15 bar
						Particle Size % O.D.				Exch.Cations m.equiv/100g					% O.D.					
6273	0-10	5.6	0.07	80	.40	18	19	16	47	29	6.8	9.6	0.5	0.9	.018	0.80	.015	5.1	32	14
6274	10-20	6.0	0.09	120																
6275	20-30	6.4	0.21	310	.72	25	17	13	45	28	9.8	11.8	0.1	2.3	.012	0.74	.014	5.6	32	15
6278	50-60	7.5	0.67	850	.76	29	16	11	44	28	10.0	13.4	0.1	4.4	.007	0.72	.032	5.1	33	16
6281	80-90	8.9	1.00	1010	.74	23	22	11	44	28	10.4	14.8	0.1	5.6	.010	0.95	.073	6.3	30	14
6284	110-120	9.0	0.90	940		20	25	11	44	29	8.8	15.1	0.1	6 0	.010	1.03	.043	5.9		

Lab. No.	Depth cm	Org. C %	Tot. N %	Acid Extr. P ppm	Bicarb Extr. P ppm	Repl. K m.equiv/100g	Fe D.T.P.A.	Mn D.T.P.A.	Cu Extr. ppm	Zn Extr. ppm	B ppm
6273	0-10	1.1	.09	12	13	0.7					
6274	10-20	0.9	.04	4	4	0.2					

Soil Profile Class: 1 Uge
Site No: 52a Mound
Great Soil Group: Grey Clay
Location: Sample Area 3.
Parent Material: Alluvia-colluvia derived from nearby hills.
Australian Map Grid Reference: Zone E55 568200E, 7802300N
Topography: Local alluvial-colluvial plains. Slightly elevated area. Relative relief 1 m.
Air Photo Reference:
Vegetation: Low open woodland. Poplar gum, white wood and cabbage gum.
Principal Profile Form: Ug 5.28

Profile Morphology: Surface: Weak beta linear gilgai. Weakly cracking when dry. Very slightly gravelly.

0 - 10 cm Yellowish grey (2.5Y 4/1); light medium clay with small amounts of grit; dry extremely hard; trace amounts of powdery lime. Diffuse to -

10 - 70 cm Dark greyish yellow (2.5Y 4/2); medium clay with small amounts of grit; dry extremely hard; moderate amounts of powdery lime and trace amounts of manganiferous concretions. Diffuse to -

70 - 150 cm Yellowish brown (2.5Y 5/3); medium heavy clay with small amounts of grit; dry extremely hard, small amount of powdery lime and manganiferous concretions.

Laboratory Data:

Lab. No.	Depth cm	pH 1:5	E.C.(1:5) mScm^{-1}	Cl ppm	Dispersion Ratio (R_1)	C.S.	F.S.	Si	C	C.E.C.	Ca^{++}	Mg^{++}	K^+	Na^+	P	K	S	Moisture % A.D.	1/3 bar	15 bar
						Particle Size % O.D.				Exch.Cations m.equiv/100g					% O.D.					
6170	0-10	7.7	0.07	80	.51	12	31	10	47	30	13.0	10.7	0.1	1.4	.021	0.43	.021	4.2	31	15
6171	10-20	7.5	0.05	30																
6172	20-30	8.3	0.05	30	.59	9	26	15	50	34	17.8	14.4	0.1	1.8	.016	0.43	.015	4.7	35	18
6175	50-60	9.4	0.23	110	.81	12	25	12	51	30	11.4	14.8	0.1	6.0	.014	0.45	.013	4.8	36	18
6178	80-90	9.5	0.47	980	.99	12	25	12	51	35	12.3	19.9	0.2	6.5	.014	0.41	.010	5.2	37	20
6181	110-120	9.0	1.17	1810		9	22	13	56	39	9.4	17.7	0.2	10.3	.012	0.33	.006	5.5		

Lab. No.	Depth cm	Org. C %	Tot. N %	Acid Extr. P ppm	Bicarb Extr. P ppm	Repl. K m.equiv/100g	Fe D.T.P.A.	Mn D.T.P.A.	Cu Extr. ppm	Zn Extr. ppm	B ppm
6170	0-10	1.3	.07	5	5	0.2					
6171	10-20	1.0	.06	2	3	0.1					

LOCAL ALLUVIAL - COLLUVIAL PLAINS

Black Earths - Grey Clays

Soil Profile Class: 1 Ugc

Great Soil Group: Grey clay

Parent Material: Alluvia-colluvia derived from nearby hills.

Topography: Local alluvial-colluvial plains. Slightly elevated area. Relative relief 1 m.

Vegetation: Low open woodland. Poplar gum, white wood and cabbage gum.

Site No: 52b Depression

Location: Sample Area 3.

Australian Map Grid Reference: Zone 255 568200E, 7802300N

Air Photo Reference:

Principal Profile Form: Ug 5.28

Profile Morphology: Surface: Weak beta linear gilgai. Weakly cracking when dry. No surface gravel.

0 - 10 cm Brownish black (10YR 3/1); fine sandy light clay with moderate amounts of grit; dry very hard. Gradual to -

10 - 50 cm Yellowish grey (2.5Y 4/1); fine sandy light medium clay with moderate amounts of grit; dry very hard. Clear to gradual to -

50 - 150 cm Yellowish brown (2.5Y 5/3); medium heavy clay with moderate amounts of grit; dry extremely hard; trace amounts of powdery lime and manganiferous concretions.

Laboratory Data:

Lab. No.	Depth cm	pH 1:5	E.C.(1:5) mScm⁻¹	Cl ppm	Dispersion Ratio (R_1)	C.S.	F.S.	Si	C	C.E.C.	Ca^{++}	Mg^{++}	K^{+}	Na^{+}	P	K	S	Moisture % A.D.	1/3 bar	15 bar
						Particle Size % O.D.				Exch.Cations m.equiv/100g					% O.D.					
6185	0-10	6.5	0.11	150	.61	11	27	19	43	27	7.2	9.7	0.2	1.4	.026	0.57	.018	4.0	32	14
6186	10-20	6.4	0.09	90																
6187	20-30	6.6	0.16	240	.70	11	24	24	41	28	8.2	10.9	0.1	2.6	.026	0.64	.013	3.2	32	15
6190	50-60	9.0	0.76	1290	.90	15	21	14	50	38	9.9	16.9	0.2	8.4	.016	0.47	.017	4.3	40	19
6193	80-90	9.1	1.02	1590	.99	16	25	13	46	33	8.0	16.6	0.2	8.7	.013	0.39	.005	5.9	33	18
6196	110-120	8.8	1.10	1740		11	24	12	53	38	7.8	18.6	0.2	10.3	.013	0.33	.003	5.2		

Lab. No.	Depth cm	Org. C %	Tot. N %	Acid Extr. P ppm	Bicarb Extr. P ppm	Exchl. K m.equiv/100g	Fe D.T.P.A.	Mn D.T.P.A.	Cu Extr. ppm	Zn Extr. ppm	B ppm
6185	0-10	2.2	.12	9	12	0.2					
6186	10-20	1.9	.09	3	3	0.1					

Solodics and Solodized Solonetz

Soil Profile Class: 1 Dye

Great Soil Group: Solodized solonetz

Parent Material: Alluvial-colluvial derived from nearby hills.

Topography: Local alluvial-colluvial plains. Slightly elevated area. Relative relief 0.5 m.

Vegetation: Low shrubland, False sandelwood.

Site No: 6

Location: Sample Area 3

Australian Map Grid Reference: Zone 255 568600E, 7802825N

Air Photo Reference:

Principal Profile Form: Dy 2.33

Profile Morphology: Surface: Very hard setting when disturbed.

0 - 6 cm Brown (10YR 4/4); sandy clay loam; massive; dry hard. Sharp to -

6 - 7 cm Sporadic bleach. Sharp to -

7 - 30 cm Dark greyish yellow (2.5Y 4/2); medium clay with small amounts of grit; strong columnar; dry extremely hard; small amounts of manganiferous concretions. Diffuse to -

30 - 90 cm Brown (10YR 4/6); medium heavy clay with small amounts of grit; strong medium prismatic to angular blocky; dry extremely hard; small amounts of concretionary lime and manganiferous concretions. Diffuse to -

90 - 150 cm Brown (10YR 4/6); medium clay with small amounts of grit; strong fine prismatic; dry extremely hard; small amounts of concretionary and powdery lime and moderate amounts of manganiferous concretions.

Laboratory Data:

Lab. No.	Depth cm	pH 1:5	E.C.(1:5) mScm⁻¹	Cl ppm	Dispersion Ratio (R_1)	C.S.	F.S.	Si	C	C.E.C.	Ca^{++}	Mg^{++}	K^{+}	Na^{+}	P	K	S	Moisture % A.D.	1/3 bar	15 bar
						Particle Size % O.D.				Exch.Cations m.equiv/100g					% O.D.					
6363	0-10	6.6	0.13	170	.74	30	48	4	19	7	1.8	2.9	0.3	0.8	.018	1.10	.013	1.7	13	11
6364	10-20	7.7	0.36	310																
6365	20-30	8.8	0.52	510	.94	20	31	3	46	21	3.8	10.3	0.1	5.0	.014	0.94	.047	5.3	32	16
6369	50-60	9.4	1.22	1360	.99	20	31	5	44	20	3.2	9.6	0.2	9.8	.012	1.08	.067	5.5	35	17
6372	80-90	9.4	1.38	1190	.99	19	32	6	43	19	3.2	10.1	0.2	9.0	.011	1.23	.053	5.2	35	17
6375	110-120	9.7	0.91	1540		23	34	9	34	21	3.4	9.0	0.1	8.5	.014	1.28	.034	5.1		

Lab. No.	Depth cm	Org. C %	Tot. N %	Acid Extr. P ppm	Bicarb Extr. P ppm	Exchl. K m.equiv/100g	Fe D.T.P.A.	Mn D.T.P.A.	Cu Extr. ppm	Zn Extr. ppm	B ppm
6363	0-10	0.9	.06	5	7	0.3					
6364	10-20	0.8	.07	1	1	0.1					

Soil Profile Class: 1 Dyb
Great Soil Group: Solodic
Parent Material: Alluvia-colluvia derived from nearby hills.
Topography: Local alluvial-colluvial plains. Slightly elevated area. Relative relief 1 m.
Vegetation: Low open woodland. Site partially cleared but dominant species were cabbage gum and beefwood.

Site No: 7
Location: Sample Area 4
Australian Map Grid Reference: Zone E55 580325E, 7798350N
Air Photo Reference:
Principal Profile Form: Dy 2.33

Profile Morphology: Surface: Hard setting

0 - 9 cm Dull yellowish brown (10YR 4/3); fine sandy clay loam with trace amounts of grit; massive; dry hard. Sharp to -

9 - 10 cm Sporadic bleach. Sharp to -

10 - 40 cm Greyish yellow brown (10YR 4/2); medium clay with trace amounts of grit; strong medium prismatic to angular blocky; dry extremely hard; small amounts of manganiferous concretions. Diffuse to -

40 - 70 cm Greyish yellow brown (10YR 4/2); medium clay with trace amounts of grit; strong medium blocky to angular blocky; dry extremely hard; small amounts of concretionary lime and manganiferous concretions. Clear to -

70 - 150 cm Dull yellow orange (10YR 6/4); light clay with trace amounts of grit; moderate medium blocky; dry very hard; trace amounts of concretionary lime and manganiferous concretions.

Laboratory Data:

Lab. No.	Depth cm	pH 1:5	E.C.(1:5) mScm^{-1}	Cl ppm	Dispersion Ratio (R_1)	C.S.	F.S.	Si	C	C.E.C.	Ca^{++}	Mg^{++}	K^{+}	Na^{+}	P	K	S	Moisture % A.D.	1/3 bar	15 bar
						Particle Size % O.D.				Exch.Cations m.equiv/100g					% O.D.					
10576	0-10	6.7	0.06	40	.87	29	43	14	13	10	2.8	2.2	0.2	1.2	.023	2.03	.010		15	5
10577	10-20	7.8	0.21	170																
10578	20-30	8.9	0.38	380	.99	17	28	6	49	26	4.4	9.3	0.2	9.1	.015	1.41	.016	4.6	36	17
10581	50-60	9.5	0.73	1090	.99	13	24	10	53	27	3.1	8.7	0.2	14.0	.012	1.66	.014	4.3	42	18
10584	80-90	9.2	0.86	1210	.99	24	37	11	28	18	1.8	5.7	0.2	9.9	.011	2.05	.002	2.8	32	13
10587	110-120	9.9	0.73	690		36	39	5	20	13	1.6	4.6	0.1	6.6	.012	2.44	.004	2.1		

Lab. No.	Depth cm	Org. C %	Tot. N %	Acid Extr. P ppm	Bicarb P ppm	Repl. K m.equiv/100g	Fe D.T.P.A.	Mn D.T.P.A.	Cu Extr. ppm	Zn Extr. ppm	B ppm
10576	0-10	0.8	.07	6	6	0.2					
10577	10-20	0.8	.06	2	2	0.1					

Soil Profile Class: 1 Dyc
Great Soil Group: Solodized-solonetz
Parent Material: Alluvia-colluvia derived from nearby hills.
Topography: Local alluvial-colluvial plains. Slightly elevated area. Relative relief 1 m.
Vegetation: Low open woodland. Cabbage gum, beefwood and false sandalwood.

Site No: 8
Location: Sample Area 2
Australian Map Grid Reference: Zone E55 538475E, 7815025N
Air Photo Reference:
Principal Profile Form: Dy 2.33

Profile Morphology: Surface: Hard setting. Incipient beta nuram gilgai present. Large diameter hexagons of cracks also present (>2 m from centre of one hexagon to the next).

0 - 9 cm Brownish black (10YR 3/2); clay loam; massive; dry hard. Sharp to -

9 - 10 cm Sporadic bleach. Sharp to -

10 - 30 cm Dark greyish yellow (2.5Y 4/2); light medium clay with small amounts of grit; strong medium columnar; dry extremely hard. Diffuse to -

30 - 60 cm Dark greyish yellow (2.5Y 4/2), medium clay with small amounts of grit; strong medium prismatic; dry extremely hard; trace amounts of concretionary lime and manganiferous concretions. Diffuse to -

60 - 120 cm Olive brown (2.5Y 4/4), medium heavy clay with small amounts of grit; strong medium prismatic; dry extremely hard; small amounts of concretionary lime and manganiferous concretions. Diffuse to -

120 - 150 cm Dark greyish yellow (2.5Y 5/2); medium heavy clay with small amounts of grit; strong medium prismatic; dry extremely hard; small amounts of concretionary lime and manganiferous concretions.

Laboratory Data:

Lab. No.	Depth cm	pH 1:5	E.C.(1:5) mScm^{-1}	Cl ppm	Dispersion Ratio (R_1)	C.S.	F.S.	Si	C	C.E.C.	Ca^{++}	Mg^{++}	K^{+}	Na^{+}	P	K	S	Moisture % A.D.	1/3 bar	15 bar
						Particle Size % O.D.				Exch.Cations m.equiv/100g					% O.D.					
6155	0-10	7.1	0.01	200	.82	25	34	11	30	17	4.4	6.1	0.1	1.5	.027	0.55	.011	3.1	22	9
6156	10-20	7.7	0.12	180																
6157	20-30	8.2	0.21	420	.97	29	26	5	40	21	6.6	10.3	0.1	4.4	.015	0.38	.015	2.8	28	13
6160	50-60	9.5	0.92	1810	.95	29	24	8	39	22	4.2	10.2	0.1	8.0	.012	0.33	.012	3.2	31	14
6163	80-90	9.2	1.20	2260	.97	17	20	6	58	34	4.9	15.3	0.1	13.0	.013	0.33	.014	4.7	39	20
6166	110-120	9.5	0.51	1190		19	20	6	55	33	5.8	16.0	0.2	12.6	.011	0.37	.010	6.1		

Lab. No.	Depth cm	Org. C %	Tot. N %	Acid Extr. P ppm	Bicarb P ppm	Repl. K m.equiv/100g	Fe D.T.P.A.	Mn D.T.P.A.	Cu Extr. ppm	Zn Extr. ppm	B ppm
6155	0-10	0.9	.06	6	6	0.1					
6156	10-20	0.9	.04	4	4	0.1					

Soil Profile Class: 1 Dba
Great Soil Group: Solodized solonetz
Parent Material: Alluvia-colluvia derived from nearby hills.
Topography: Local alluvial-colluvial plains. Slightly elevated area. Relative relief 1 m.
Vegetation: Low open woodland. Cabbage gum and beefwood.

Site No: 9
Location: Sample Area 4
Australian Map Grid Reference: Zone E55 579300E, 7797625N
Air Photo Reference:
Principal Profile Form: Dy 2.33

Profile Morphology: Surface: Hard setting.

0 - 7 cm Brownish black (10YR 3/2); sandy clay loam; massive; dry hard. Sharp to -

7 - 10 cm Sporadic bleach. Sharp to -

10 - 40 cm Dull yellowish brown (10YR 4.5/3); medium clay, small amounts of grit; strong medium prismatic to columnar; dry extremely hard; small amounts of manganiferous concretions. Diffuse to -

40 - 80 cm Dull yellowish brown (10YR 4/3); medium clay, small amounts of grit; strong medium blocky to angular blocky; dry extremely hard; small amounts of concretionary lime and manganiferous concretions. Diffuse to -

80 - 150 cm Dull yellowish brown (10YR 4/3); light medium clay, trace amounts of grit; strong fine blocky; dry very hard; small amounts of powdery and concretionary lime and manganiferous concretions.

Laboratory Data:

Lab. No.	Depth cm	pH 1:5	E.C.(1:5) mScm^{-1}	Cl ppm	Dispersion Ratio (R_1)	C.S.	F.S.	Si	C	C.E.C.	Ca^{++}	Mg^{++}	K^{+}	Na^{+}	P	K	S	Moisture % A.D.	1/3 bar	15 bar
						Particle Size % O.D.				Exch.Cations m.equiv/100g					% O.D.					
6517	0-10	6.6	0.07	70	.85	44	30	11	15	8	1.3	1.3	0.6	0.3	.014	2.44	.011	1.0	18	4
6518	10-20	7.3	0.14	180																
6519	20-30	8.2	0.22	310	.87	34	21	11	34	15	3.4	6.3	0.1	5.3	.010	2.00	.011	3.2	27	12
6522	50-60	9.7	0.67	830	.91	31	34	9	26	16	4.1	6.8	0.1	7.1	.013	2.13	.015	3.3	25	10
6525	80-90	9.5	0.45	600	.99	20	46	6	28	18	4.0	7.3	0.1	8.2	.017	2.25	.010	3.6	26	12
6528	110-120	9.4	0.83	1120		3	27	23	47	31	6.8	11.5	0.2	17.3	.024	1.79	.011	6.7		

Lab. No.	Depth cm	Org. C %	Tot. N %	Acid Extr. P ppm	Bicarb P ppm	Repl. K m.equiv/100g	Fe D.T.P.A.	Mn D.T.P.A.	Cu Extr. ppm	Zn Extr. ppm	B ppm
6517	0-10	0.8	.05	2	2	0.5					
6518	10-20	0.5	.05	1	1	0.1					

LOCAL ALLUVIAL - COLLUVIAL PLAINS

Solodics and Solodized Solonetz

Soil Profile Class: 1 Dbb

Great Soil Group: Solodic

Parent Material: Alluvia-colluvia derived from nearby hills.

Topography: Local alluvial-colluvial plains. Slightly elevated area. Relative relief 1 m.

Vegetation: Low open woodland. Cabbage gum and beefwood.

Site No: 10

Location: Sample Area 3

Australian Map Grid Reference: Zone E55 568875E, 7802200N

Air Photo Reference:

Principal Profile Form: Db 1.33

Profile Morphology: Surface: Hard setting

0 - 10 cm Olive brown (2.5Y 4/3); sandy clay loam; massive; dry hard. Sharp to -

10 - 15 cm Sporadic bleach. Sharp to -

15 - 20 cm Yellowish brown (2.5Y 5/3), 10-15% red and yellow mottle; light medium clay; small amount of grit; strong medium prismatic; dry extremely hard; trace amounts of manganiferous concretions. Clear to -

20 - 70 cm Olive brown (2.5Y 4/3); light medium clay with small amount of grit; strong medium blocky; dry extremely hard; small amounts of powdery lime and manganiferous concretions. Gradual to -

70 - 150 cm Brown (10YR 4/4), 30% grey patches; medium clay with trace amounts of grit; strong fine blocky; dry extremely hard; small amounts of powdery lime and manganiferous concretions.

Laboratory Data:

Lab. No.	Depth cm	pH 1:5	E.C.(1:5) $mScm^{-1}$	Cl ppm	Dispersion Ratio (R_1)	C.S.	F.S.	Si	C	C.E.C.	Ca^{++}	Mg^{++}	K^+	Na^+	P	K	S	Moisture % A.D.	1/3 bar	15 bar
						Particle Size % O.D.				Exch.Cations m.equiv/100g					% O.D.					
6379	0-10	6.5	0.09	50	.69	34	29	11	26	13	2.5	2.8	0.3	1.1	.018	1.36	.012	2.6	17	8
6381	15-20	7.2	0.09	40																
6382	20-30	8.1	0.08	40	.85	40	21	8	31	14	2.0	4.3	0.1	2.6	.012	1.26	.012	3.3	23	11
6385	50-60	9.9	0.52	330	.98	28	30	8	34	16	2.0	6.9	0.1	5.9	.012	1.26	.034	3.7	27	12
6388	80-90	9.9	0.49	450	.99	36	21	7	36	20	2.1	8.2	0.1	9.3	.012	1.31	.022	5.6	31	13
6391	110-120	9.8	0.57	610		31	24	7	38	22	2.2	8.9	0.1	10.0	.015	1.31	.033	4.9		

Lab. No.	Depth cm	Org. C %	Tot. N %	Acid Extr. P ppm	Bicarb Extr. P ppm	Repl. K m.equiv/100g	Fe D.T.P.A.	Mn D.T.P.A.	Cu Extr. ppm	Zn Extr. ppm	B ppm
6379	0-10	0.9	.06	5	5	0.3					
6381	15-20	0.5	.04	2	3	0.1					

Soil Profile Class: 1 Dbc

Great Soil Group: Solodized solonetz

Parent Material: Alluvia-colluvia derived from nearby hills.

Topography: Local alluvial-colluvial plains. Slightly elevated area. Relative relief 1 m.

Vegetation: Low shrubland. False sandalwood.

Site No: 11

Location: Sample Area 4

Australian Map Grid Reference: Zone E55 579400E, 7797950 N

Air Photo Reference:

Principal Profile Form: Db 2.43

Profile Morphology: Surface: Hard setting

0 - 9 cm Dull yellowish brown (10YR 4/3) sandy clay loam; massive; dry very hard. Sharp to -

9 - 10 cm Conspicuous bleach. Sharp to -

10 - 40 cm Brown (10YR 4/4), 20% red yellow mottle; medium clay with small amounts of grit; strong medium columnar; dry extremely hard; small amounts of manganiferous concretions. Diffuse to -

40 - 60 cm Brown (10YR 4/4); medium clay with small amounts of grit; strong medium prismatic to angular blocky; dry extremely hard; small amounts of manganiferous concretions. Diffuse to -

60 - 150 cm Brown (10YR 4/4); medium clay grading to light clay at 150 cm with trace amounts of grit; strong medium prismatic to angular blocky grading to weak angular blocky; dry extremely hard grading to dry hard; small amount of concretionary lime and manganiferous concretions.

Laboratory Data:

Lab. No.	Depth cm	pH 1:5	E.C.(1:5) $mScm^{-1}$	Cl ppm	Dispersion Ratio (R_1)	C.S.	F.S.	Si	C	C.E.C.	Ca^{++}	Mg^{++}	K^+	Na^+	P	K	S	Moisture % A.D.	1/3 bar	15 bar
						Particle Size % O.D.				Exch.Cations m.equiv/100g					% O.D.					
6532	0-10	6.3	0.04	50	.76	15	56	10	19	11	2.1	2.6	0.4	0.1	.019	2.46	.012	1.4	16	5
6533	10-20	6.7	0.09	150																
6534	20-30	7.4	0.19	310	.84	10	48	10	40	20	5.0	9.4	0.1	0.2	.014	2.04	.013	4.3	27	14
6537	50-60	9.4	0.64	940	.99	10	48	10	32	19	4.3	9.0	0.1	5.3	.017	2.26	.018	3.8	27	12
6540	80-90	9.6	0.71	990	.92	12	43	13	32	20	5.5	7.1	0.1	6.7	.025	2.08	.019	4.1	28	14
6543	110-120	9.7	0.67	910		19	34	13	34	24	5.3	10.7	0.1	7.5	.033	1.89	.023	4.5		

Lab. No.	Depth cm	Org. C %	Tot. N %	Acid Extr. P ppm	Bicarb Extr. P ppm	Repl. K m.equiv/100g	Fe D.T.P.A.	Mn D.T.P.A.	Cu Extr. ppm	Zn Extr. ppm	B ppm
6532	0-10	1.0	.07	6	2	0.3					
6533	10-20	0.6	.05	1	1	0.1					

Soil Profile Class: 1 Dda

Great Soil Group: Solodic

Parent Material: Alluvia-colluvia derived from nearby hills.

Topography: Local alluvial-colluvial plains. Slightly elevated area. Relative relief 0.5 m.

Vegetation: Low open woodland. Carbeen and poplar gum.

Site No: 12

Location: Sample Area 2

Australian Map Grid Reference: Zone E55 539050E, 7815025N

Air Photo Reference:

Principal Profile Form: Dd 1.33

Profile Morphology: Surface: Hard setting. Occurs as a mound component in a complex beta nuram gilgai with 1 Dyc and 1 Dba.

0 - 9 cm Dark brown (10YR 3/3); clay loam; massive; dry hard. Sharp to -

9 - 10 cm Sporadic bleach. Sharp to -

10 - 40 cm Brownish black (10YR 3/1); medium heavy clay with trace amounts of grit; strong medium prismatic to angular blocky; dry very hard; small amounts of manganiferous concretions. Diffuse to -

40 - 80 cm Brownish grey (10YR 4/1); medium heavy clay with trace amounts of grit; strong prismatic to angular blocky; dry very hard, small amounts of manganiferous concretions and concretionary and powdery lime. Diffuse to -

80 - 150 cm Yellowish brown (2.5Y 5/3), 30% red-yellow mottle; medium clay with trace amount of grit; strong medium angular blocky; dry extremely hard; small amounts of powdery lime and manganiferous concretions.

Laboratory Data:

Lab. No.	Depth cm	pH 1:5	E.C.(1:5) $mScm^{-1}$	Cl ppm	Dispersion Ratio (R_1)	C.S.	F.S.	Si	C	C.E.C.	Ca^{++}	Mg^{++}	K^+	Na^+	P	K	S	Moisture % A.D.	1/3 bar	15 bar
						Particle Size % O.D.				Exch.Cations m.equiv/100g					% O.D.					
6200	0-10	6.5	0.07	100	.78	30	36	7	27	14	2.6	4.2	0.1	1.0	.018	0.28	.011	2.0	17	7
6201	10-20	7.1	0.13	170																
6202	20-30	8.5	0.29	490	.95	23	23	4	50	30	6.8	14.2	0.1	7.1	.011	0.25	.032	3.9	37	18
6205	50-60	9.6	0.74	1320	.99	26	21	8	45	32	6.8	13.6	0.1	5.6	.010	0.25	.054	4.2	40	18
6208	80-90	9.4	0.84	1450	.99	21	25	8	46	29	5.9	13.4	0.1	4.9	.009	0.30	.042	6.0	36	19
6211	110-120	9.7	0.61	920		26	24	7	43	28	6.5	13.6	0.1	8.8	.009	0.38	.016	4.2		

Lab. No.	Depth cm	Org. C %	Tot. N %	Acid Extr. P ppm	Bicarb Extr. P ppm	Repl. K m.equiv/100g	Fe D.T.P.A.	Mn D.T.P.A.	Cu Extr. ppm	Zn Extr. ppm	B ppm
6200	0-10	0.7	.06	4	6	0.1					
6201	10-20	0.8	.06	2	4	0.1					

2. BURDEKIN RIVER FLOOD PLAIN

Grey Clays

Soil Profile Class: 2 Uga
Great Soil Group: Grey clay
Parent Material: Burdekin River flood plain sediments.
Topography: Burdekin River flood plain. Low lying area.
Vegetation: Low open woodland. Poplar gum and carbeen.

Site No: 13a Mound
Location: Sample Area 1
Australian Map Grid Reference: Zone E55 528450E, 7808050N
Air Photo Reference:
Principal Profile Form: Ug 5.29

Profile Morphology: Surface: Weak beta nuram gilgai. Weakly cracking when dry.

0 - 10 cm Brownish grey (10YR 4/1), 10% root line mottle; medium clay; strong fine blocky to sub angular blocky; dry extremely hard. Clear to -

10 - 40 cm Yellowish grey (2.5Y 4/1); medium clay: strong medium blocky; dry extremely hard; small amounts of manganiferous concretions. Diffuse to -

40 - 120 cm Yellowish grey (2.5Y 4/1); medium heavy clay: strong medium blocky; dry extremely hard; small amounts of manganiferous concretions. Diffuse to -

120 - 150 cm Brown (10YR 4/4); light medium clay; moderate medium sub angular blocky; dry very hard; moderate amounts of concretionary lime and small manganiferous concretions.

Laboratory Data:

Lab. No.	Depth cm	pH 1:5	E.C.(1:5) mScm^{-1}	Cl ppm	Dispersion Ratio (R_1)	C.S.	F.S.	Si	C	C.E.C.	Ca^{++}	Mg^{++}	K^+	Na^+	P	K	S	Moisture % A.D.	1/3 bar	15 bar
						Particle Size % O.D.				Exch.Cations m.equiv/100g					% O.D.					
10471	0-10	6.7	0.06	65	.45	1	6	21	72	42	15.4	16.1	0.8	1.6	.025	1.37	.010	4.3	43	23
10472	10-20	6.8	0.04	30																
10473	20-30	7.4	0.02	20	.62	1	6	18	75	42	18.2	17.0	0.4	2.1	.017	1.32	.005	4.7	45	24
10476	50-60	8.0	0.03	25	.68	2	6	18	74	45	18.3	18.8	0.4	3.3	.016	1.31	.006	4.3	46	24
10479	80-90	7.9	0.08	200	.65	1	6	18	75	46	19.4	19.1	0.4	4.3	.016	1.32	.006	4.0	48	24
10482	110-120	8.4	0.18	345		1	8	25	66	42	18.8	17.3	0.4	4.6	.025	1.59	.006	4.3		

Lab. No.	Depth cm	Org. C %	Tot. N %	Acid Extr. P ppm	Bicarb P ppm	Repl. K m.equiv/100g	Fe D.T.P.A.	Mn D.T.P.A.	Cu Extr. ppm	Zn Extr. ppm	B ppm
10471	0-10	0.9	.05	6	7	0.6					
10472	10-20	0.7	.04	2	1	0.4					

Soil Profile Class: 2 Ugb
Great Soil Group: Grey clay
Parent Material: Burdekin River flood plain sediments.
Topography: Burdekin River flood plain. Low lying areas
Vegetation: Low open woodland. Poplar gum and carbeen

Site No: 14
Location: Sample Area 1
Australian Map Grid Reference: Zone E55 528675E, 7807450N
Air Photo Reference:
Principal Profile Form: Ug 5.25

Profile Morphology: Surface: Weak to moderate beta nuram gilgai. Moderately self mulching. Moderately cracking.

0 - 10 cm Brownish grey (10YR 4/1); 10% red mottle; light medium clay; strong medium sub angular blocky; dry extremely hard. Gradual to -

10 - 50 cm Brownish grey (10YR 4/1); medium clay: strong medium to coarse sub angular blocky; dry extremely hard. Diffuse to -

50 - 90 cm Brownish grey (10YR 4/1); medium heavy clay; strong medium to coarse sub angular blocky; dry extremely hard. Diffuse to -

90 - 150 cm Brown (10YR 4/4); medium heavy clay; strong medium sub angular blocky breaking to very fine to fine sub angular blocky; dry extremely hard; small amounts of concretionary lime and manganiferous concretions.

Laboratory Data:

Lab. No	Depth cm	pH 1:5	E.C.(1:5) mScm^{-1}	Cl ppm	Dispersion Ratio (R_1)	C.S.	F.S.	Si	C	C.E.C.	Ca^{++}	Mg^{++}	K^+	Na^+	P	K	S	Moisture % A.D.	1/3 bar	15 bar
						Particle Size % O.D.				Exch.Cations m.equiv/100g					% O.D.					
10486	0-10	6.0	0 05	100	.65	<1	1	23	75	43	15.6	17.0	0.8	1.6	.023	1.59	.007	5.2	40	22
10487	10-20	6.7	0.02	20																
10488	20-30	7.1	0.02	20	.70	<1	1	2[illegible]	75	43	20.0	22.0	0.5	2.2	.017	1.49	.005	5.9	42	22
10491	50-60	7.7	0.12	120	.74	<1	1	24	74	45	17.4	18.4	0.4	2.7	.016	1.53	.006	6.0	41	22
10494	80-90	7.7	0.34	540	.68	<1	1	22	76	45	17.4	18.8	0.5	3.9	.015	1.51	.006	5.4	44	28
10497	110-120	8.5	0.50	740		1	3	25	72	40	12.1	13.2	0.3	3.6	.032	1.88	.004	5.4		

Lab. No.	Depth cm	Org. C %	Tot. N %	Acid Extr. P ppm	Bicarb P ppm	Repl. K m.equiv/100g	Fe D.T.P.A.	Mn D.T.P.A.	Cu Extr. ppm	Zn Extr. ppm	B ppm
10486	0-10	1.0	.05	4	8	0.8					
10487	10-20	0.8	.04	3	4	0.5					

BURDEKIN RIVER FLOOD PLAIN

Grey Clays

Soil Profile Class: 2 Ugc

Great Soil Group: Grey clay

Parent Material: Burdekin River flood plain sediments.

Topography: Burdekin River flood plain. Low lying area.

Vegetation: Low open woodland. Poplar gum and beefwood.

Site No: 15a Mound

Location: Sample Area 1

Australian Map Grid Reference: Zone E55 528150E, 7806175N

Air Photo Reference:

Principal Profile Form: Ug 5.25

Profile Morphology: Surface: Weak beta nuram gilgai. Weakly cracking when dry.

0 - 10 cm Brownish black (10YR 3/2), 10% root line mottle; light medium clay; moderate to strong coarse sub angular blocky; dry extremely hard. Gradual to -

10 - 50 cm Brownish grey (10YR 4/1); medium heavy clay; strong medium prismatic to angular blocky; breaking to medium lenticular and angular blocky; dry extremely hard; small amounts of concretionary lime and manganiferous concretions. Diffuse to -

50 - 90 cm Brownish grey (10YR 4/1); medium heavy clay; strong medium to coarse blocky; dry extremely hard; small amounts of manganiferous concretions. Diffuse to -

90 - 150 cm Brown (10YR 4/6); light medium clay; moderate to weak subangular blocky; dry very hard; small amounts of concretionary lime and manganiferous concretions.

Laboratory Data:

Lab. No.	Depth cm	pH 1:5	E.C.(1:5) $mScm^{-1}$	Cl ppm	Dispersion Ratio (R_1)	C.S.	F.S.	Si	C	C.E.C.	Ca^{++}	Mg^{++}	K^{+}	Na^{+}	P	K	S	Moisture % A.D.	1/3 bar	15 bar
						Particle Size % O.D.				Exch.Cations m.equiv/100g					% O.D.					
10410	0-10	6.4	0.05	70						33	11.6	10.7	0.8	1.2	.029	1.69	.012			
10411	10-20	5.8	0.02	30																
10412	20-30	6.1	0.03	20	.58	1	19	13	67	35	16.2	14.5	0.5	1.6	.022	1.56	.007	5.6	40	21
10415	50-60	7.3	0.03	20	.72	1	12	11	67	38	16.0	15.9	0.5	2.5	.020	1.57	.006	5.9	41	21
10418	80-90	8.2	0.12	220	.63	1	20	14	65	38	16.9	16.7	0.3	3.0	.021	1.53	.008	5.6	40	21
10421	110-120	9.0	0.18	420		1	46	12	41	21	9.8	7.7	0.3	2.3	.044	2.05	.005	2.9		

Lab. No.	Depth cm	Org. C %	Tot. N %	Acid Extr. P ppm	Bicarb P ppm	Repl. K m.equiv/100g	Fe D.T.P.A.	Mn D.T.P.A.	Cu Extr. ppm	Zn Extr. ppm	B ppm
10410	0-10	1.0	.07	5	5	0.6					
10411	10-20	0.8	.05	2	3	0.5					

Soil Profile Class: 2 Ugc

Great Soil Group: Grey clay

Parent Material: Burdekin River flood plain sediments.

Topography: Burdekin River flood plain. Low lying area.

Vegetation: Low open woodland. Poplar gum and beefwood.

Site No: 15b Depression

Location: Sample Area 1

Australian Map Grid Reference: Zone E55 528150E, 7806175N

Air Photo Reference:

Principal Profile Form: Ug 3.2

Profile Morphology: Surface: Weak beta nuram gilgai. Weakly cracking when dry.

0 - 10 cm Yellowish grey (2.5Y 4/1); light clay with strong sporadic bleach; moderate; dry very hard. Clear to -

10 - 70 cm Yellowish grey (2.5Y 4/1); medium heavy clay; dry extremely hard; small amounts of manganiferous concretions. Diffuse to -

70 - 150 cm Brown (10YR 4/4); light clay; dry very hard; small amounts of concretionary lime and manganiferous concretions.

Laboratory Data:

Lab. No.	Depth cm	pH 1:5	E.C.(1:5) $mScm^{-1}$	Cl ppm	Dispersion Ratio (R_1)	C.S.	F.S.	Si	C	C.E.C.	Ca^{++}	Mg^{++}	K^{+}	Na^{+}	P	K	S	Moisture % A.D.	1/3 bar	15 bar
						Particle Size % O.D.				Exch.Cations m.equiv/100g					% O.D.					
10425	0-10	5.8	0.04	40	.59	2	24	26	48	21	5.2	4.7	0.5	0.7	.028	1.65	.008	4.3	30	12
10426	10-20	5.4	0.03	20																
10427	20-30	5.4	0.03	30	.81	1	18	22	59	32	10.9	9.7	0.3	1.8	.020	1.44	.005	3.9	36	19
10430	50-60	7.1	0.12	280	.75	1	16	14	69	38	15.8	13.8	0.3	3.4	.018	1.47	.008	5.3	42	22
10433	80-90	8.9	0.18	330	.70	4	27	17	52	29	14.2	11.2	0.3	3.3	.035	1.75	.004	4.8	35	17
10436	110-120	7.9	0.10	250		<1	48	12	39	21	9.4	7.1	0.3	2.3	.052	2.11	.003	3.2		

Lab. No.	Depth cm	Org. C %	Tot. N %	Acid Extr. P ppm	Bicarb P ppm	Repl. K m.equiv/100g	Fe D.T.P.A.	Mn D.T.P.A.	Cu Extr. ppm	Zn Extr. ppm	B ppm
10425	0-10	1.0	.06	11	12	0.4					
10426	10-20	0.6	.06	6	6	0.4					

Soil Profile Class: 2 Dya
Great Soil Group: Solodic
Parent Material: Burdekin River flood plain sediments
Topography: Burdekin River flood plain.
Vegetation: Open woodland. Poplar gum and broad leaf tea tree.

Site No: 16
Location: Sample Area 1
Australian Map Grid Reference: Zone E55 528350E, 7806100N
Air Photo Reference:
Principal Profile Form: Dy 2.33

Profile Morphology: Surface: Hard setting. Moderate beta nuram gilgai occur. 2 Dya occupies the mound, 2 Ugc the depression. Associated are much larger areas of 2 Uga mound and depression.

0 - 4 cm — Dull yellowish brown (10YR 4/3); fine sandy clay loam; massive; dry very hard. Sharp to -

4 - 5 cm — Sporadic bleach. Sharp to -

5 - 40 cm — Dark greyish yellow (2.5Y 4.2); medium clay; strong medium prismatic to angular blocky; dry extremely hard; moderate amounts of lime concretions and manganiferous concretions. Diffuse to -

40 - 90 cm — Dull yellowish brown (10YR 4/3); medium heavy clay; strong fine blocky to sub angular blocky; dry extremely hard; moderate amounts of concretionary lime and manganiferous concretions. Clear to -

90 - 150 cm — Brown (10YR 4/4); fine sandy light clay; moderate medium sub angular blocky; dry hard.

Laboratory Data:

Lab. No.	Depth cm	pH 1:5	E.C.(1:5) mScm^{-1}	Cl ppm	Dispersion Ratio (R_1)	C.S.	F.S.	Si	C	C.E.C.	Ca^{++}	Mg^{++}	K$^+$	Na$^+$	P	K	S	Moisture % A.D.	1/3 bar	15 bar
						Particle Size % O.D.				Exch.Cations m.equiv/100g					% O.D.					
10455	0-5	6.0	0.14	144	.71	1	50	28	21	11	2.8	3.9		1.0	.026	1.66	.012	1.8	20	8
10457	10-20	7.9	0.08	120																
10458	20-30	8.5	0.09	250	.93	<1	12	11	76	36	13.0	18.3	0.3	7.5	.017	1.41	.013	6.1	44	20
10461	50-60	9.3	0.29	720	.96	3	11	13	73	36	12.2	17.3	0.4	9.6	.017	1.46	.016	5.9	48	23
10464	80-90	9.3	0.43	1140	.99	4	18	12	66	36	9.8	16.3	0.4	10.6	.022	1.67	.021	6.0	42	21
10467	110-120	8.5	0.33	940		2	40	12	46	25	7.0	9.9	0.4	7.5	.057	2.16	.007	4.1		

Lab. No.	Depth cm	Org. C %	Tot. N %	Acid Extr. P ppm	Bicarb Extr. P ppm	Repl. K m.equiv/100g	Fe D.T.P.A.	Mn D.T.P.A.	Cu Extr. ppm	Zn Extr. ppm	B ppm
10455	0-5	1.2	.08	9	7	0.3					
10457	10-20	0.8	.04	3	2	0.2					

Soil Profile Class: 2 Dba
Great Soil Group: Solodic
Parent Material: Burdekin River flood plain sediments.
Topography: Burdekin River flood plain. Slightly elevated area.
Vegetation: Low shrubland. False sandalwood.

Site No: 17
Location: Sample Area 1
Australian Map Grid Reference: Zone E55 527550E, 7808650N
Air Photo Reference:
Principal Profile Form: Db 1.33

Profile Morphology: Surface: Hard setting

0 - 9 cm — Brownish grey (10YR 4/1), with 10% root line mottle; fine sandy clay loam; dry very hard. Sharp to -

9 - 10 cm — Sporadic bleach. Sharp to -

10 - 30 cm — Brown (10YR 4/4); medium clay; strong medium to coarse sub angular blocky; dry extremely hard; small amounts of concretionary lime and manganiferous concretions. Sharp to -

30 - 90 cm — Brown (7.5YR 4/4); medium clay; strong medium blocky to sub angular blocky; dry very hard; small amounts of concretionary lime and moderate amount of manganiferous concretions. Diffuse to -

90 - 150 cm — Brown (10YR 4/4); light medium clay; strong medium blocky to medium sub angular blocky; dry hard.

Laboratory Data:

Lab. No.	Depth cm	pH 1:5	E.C.(1:5) mScm^{-1}	Cl ppm	Dispersion Ratio (R_1)	C.S.	F.S.	Si	C	C.E.C.	Ca^{++}	Mg^{++}	K$^+$	Na$^+$	P	K	S	Moisture % A.D.	1/3 bar	15 bar
						Particle Size % O.D.				Exch.Cations m.equiv/100g					% O.D.					
10440	0-10	6.8	0.05	60	.86	3	57	10	30	11	1.6	1.3	0.5	1.5	.041	1.61	.012	1.9	19	6
10441	10-20	7.6	0.10	180																
10442	20-30	8.5	0.11	230	.99	2	38	8	52	22	3.8	5.4	0.1	8.6	.021	1.44	.018	4.2	31	16
10445	50-60	9.9	0.33	1450	.99	6	43	8	43	18	2.2	4.9	0.2	11.0	.022	1.79	.026	3.0	30	15
10448	80-90	9.1	0.39	1210	.99	<1	39	13	47	25	1.8	5.9	0.4	14.0	.035	2.18	.013	3.8	38	23
10451	110-120	9.8	0.21	530		<1	40	13	46	24	3.0	5.2	0.4	13.0	.050	2.21	.010	3.4		

Lab. No.	Depth cm	Org. C %	Tot. N %	Acid Extr. P ppm	Bicarb Extr. P ppm	Repl. K m.equiv/100g	Fe D.T.P.A.	Mn D.T.P.A.	Cu Extr. ppm	Zn Extr. ppm	B ppm
10440	0-10	1.0	.08	20	23	0.3					
10441	10-20	0.7	.06	4	5	0.1					

Soil Profile Class: 2 Dbb
Great Soil Group: Solodic
Parent Material: Burdekin River flood plain sediments.
Topography: Burdekin River flood plain. Slightly elevated area. Relative relief 1 m.
Vegetation: Low open woodland. Poplar gum and carbeen.

Site No: 18
Location: Sample Area 1
Australian Map Grid Reference: Zone E55 528375E, 7807000N
Air Photo Reference:
Principal Profile Form: Db 1.33

Profile Morphology: Surface: Hard setting. Large diameter hexagonal cracking pattern (1.5 m between centres of hexagons).

0 - 15 cm — Dark brown (10YR 3/4), 10% root line mottle; fine sandy clay loam; weak very thick platy; dry hard. Sharp to -

15 - 17 cm — Very faint sporadic bleach. Sharp to -

17 - 40 cm — Dull yellowish brown (10YR 4/3); medium clay; strong medium sub angular blocky; dry extremely hard; small amounts of manganiferous concretions. Diffuse to -

40 - 90 cm — Brown (10YR 4/6); medium heavy clay; strong medium sub angular blocky; dry very hard; small amounts of concretionary lime and manganiferous concretions. Gradual to -

90 - 150 cm — Brown (10YR 4/4); light clay; moderate very coarse sub angular blocky; dry hard; small amounts of concretionary lime and manganiferous concretions.

Laboratory Data:

Lab. No.	Depth cm	pH 1:5	E.C.(1:5) mScm^{-1}	Cl ppm	Dispersion Ratio (R_1)	C.S.	F.S.	Si	C	C.E.C.	Ca^{++}	Mg^{++}	K$^+$	Na$^+$	P	K	S	Moisture % A.D.	1/3 bar	15 bar
						Particle Size % O.D.				Exch.Cations m.equiv/100g					% O.D.					
10395	0-10	5.6	0.10	150	.59	4	30	31	35	19	2.8	3.1	0.9	0.9	.034	1.57	.020	2.1	34	12
10396	10-15	6.2	0.04	40																
10397	15-30	7.3	0.08	120	.84	2	20	18	60	26	7.4	8.3	0.2	7.3	.024	1.24	.020	2.9	38	20
10400	50-60	9.3	0.40	580	.87	3	20	21	56	28	7.0	10.3	0.3	10.0	.024	1.50	.035	2.9	40	19
10403	80-90	9.3	0.61	1250	.92	1	23	23	53	28	6.6	9.8	0.4	12.7	.034	1.94	.029	3.4	44	19
10406	110-120	8.3	0.51	1010		3	45	18	34	22	3.8	7.2	0.3	8.8	.042	2.21	.015	2.3		

Lab. No.	Depth cm	Org. C %	Tot. N %	Acid Extr. P ppm	Bicarb Extr. P ppm	Repl. K m.equiv/100g	Fe D.T.P.A.	Mn D.T.P.A.	Cu Extr. ppm	Zn Extr. ppm	B ppm
10395	0-10	3.0	.14	4	12	0.7					
10396	15-30	1.1	.08	3	3	0.1					

3. LOCAL ALLUVIAL PLAINS

Black Earths

Soil Profile Class: 3 Uga
Great Soil Group: Black earth
Parent Material: Local alluvial deposits.
Topography: Local alluvial plains.
Vegetation: Grassland. Cane grass and blue grass.

Site No: 19
Location: Sample Area 1
Australian Map Grid Reference: Zone E55 5287250E, 7806875N
Air Photo Reference:
Principal Profile Form: Ug 5.16

Profile Morphology: Surface: Moderate beta nuram gilgai. Strong cracking when dry. Strongly self mulching.

0 - 10 cm Brownish black (10YR 3/1), 10% root line mottle; medium clay; strong medium blocky to sub angular blocky; dry extremely hard; small amounts of manganiferous concretions. Diffuse to -

10 - 40 cm Brownish black (10YR 3/1); medium heavy clay; strong fine blocky; dry extremely hard; small amounts of concretionary lime and manganiferous concretions. Diffuse to -

40 - 120 cm Brownish grey (10YR 4/1); medium heavy clay; strong very coarse lenticular to coarse sub angular blocky; dry extremely hard, small amounts of concretionary lime and manganiferous concretions. Diffuse to -

120 - 150 cm Dark greyish yellow (2.5Y 4/2) heavy clay; strong very coarse lenticular; dry extremely hard; small amounts of concretionary lime and manganiferous concretions.

Laboratory Data:

Lab. No.	Depth cm	pH 1:5	E.C.(1:5) mScm^{-1}	Cl ppm	Dispersion Ratio (R_1)	C.S.	F.S.	Si	C	C.E.C.	Ca**	Mg**	K*	Na*	P	K	S	Moisture % A.D.	1/3 bar	15 bar
						Particle Size % O.D.				Exch.Cations m.equiv/100g					% O.D.					
10801	0-10	6.5	0.06	30	.52	<1	5	16	78	47	23.7	15.8	1.0	1.4	.023	1.51	.011	7.5	45	19
10802	10-20	7.3	0.04	20																
10803	20-30	7.7	0.04	20	.52	<1	4	14	81	45	23.5	17.0	0.8	1.5	.015	1.41	.006	7.1	47	24
10806	50-60	8.7	0.11	20	.63	<1	5	17	77	45	27.1	17.3	0.5	2.9	.014	1.42	.004	5.6	47	24
10809	80-90	8.9	0.22	60	.76	1	5	13	81	44	24.1	18.3	0.4	4.3	.015	1.41	.005	6.6	48	25
10812	110-120	8.9	0.38	340		1	4	14	81	45	24.0	18.4	0.4	5.7	.017	1.48	.006	6.2		

Lab. No.	Depth cm	Org. C %	Tot. N %	Acid Extr. P ppm	Bicarb Extr. P ppm	Repl. K m.equiv/100g	Fe D.T.P.A.	Mn D.T.P.A.	Cu Extr. ppm	Zn Extr. ppm	B ppm
10801	0-10	1.2	.07	12	7	0.8					
10802	10-20	0.6	.04	3	3	0.7					

Soil Profile Class: 3 Ugb
Great Soil Group: Black earth
Parent Material: Local alluvial deposits. Strong recent alluvial influence.
Topography: Local alluvial plains.
Vegetation: Low open woodland. Carbeen and poplar gum. Strongly developed grassland of cane grass invaded by Noogoora burr.

Site No: 20
Location: Sample Area 2
Australian Map Grid Reference: Zone E55 541450E, 7815525N
Air Photo Reference:
Principal Profile Form: Ug 5.16

Profile Morphology: Surface: Weak beta nuram gilgai. Strongly cracking when dry. Strongly self mulching.

0 - 10 cm Black (10YR 2/1); medium clay with moderate amount of silt; strong fine sub angular blocky; dry extremely hard; trace of manganiferous concretions. Gradual to -

10 - 60 cm Brownish black (10YR 2.5/1); medium heavy clay; strong fine blocky; dry extremely hard; small amounts of manganiferous concretions. Diffuse to -

60 - 150 cm Brownish black (10YR 3/1); medium heavy clay; strong coarse prismatic to lenticular breaking to very fine blocky; dry extremely hard; small amounts of manganiferous concretions.

Laboratory Data:

Lab. No.	Depth cm	pH 1:5	E.C.(1:5) mScm^{-1}	Cl ppm	Dispersion Ratio (R_1)	C.S.	F.S.	Si	C	C.E.C.	Ca**	Mg**	K*	Na*	P	K	S	Moisture % A.D.	1/3 bar	15 bar
						Particle Size % O.D.				Exch.Cations m.equiv/100g					% O.D.					
10831	0-10	6.6	0.11	100		2	13	23	62	46	21.9	16.2	0.7	0.6	.085	1.10	.016	7.4	44	23
10832	10-20	7.1	0.05	25																
10833	20-30	7.1	0.05	25	.52	1	6	17	76	50	27.3	18.7	0.3	0.7	.050	0.92	.008	6.0	49	27
10836	50-60	7.1	0.09	80	.52	1	5	17	77	50	27.8	18.6	0.3	1.5	.056	0.99	.007	4.7	50	27
10839	80-90	7.4	0.39	580	.53	1	5	17	77	49	27.0	20.4	0.3	2.8	.061	0.94	.015	5.9	51	27
10842	110-120	7.5	0.87	1450		1	6	19	74	49	28.5	20.4	0.3	3.4	.063	1.01	.006	5.7		

Lab. No.	Depth cm	Org. C %	Tot. N %	Acid Extr. P ppm	Bicarb Extr. P ppm	Repl. K m.equiv/100g	Fe D.T.P.A.	Mn D.T.P.A.	Cu Extr. ppm	Zn Extr. ppm	B ppm
10831	0-10	1.6	.09	101	94	0.7					
10832	10-20	1.1	.06	38	31	0.5					

Soil Profile Class: 3 Ugc
Great Soil Group: Black earth
Parent Material: Local alluvial deposits.
Topography: Local alluvial plains. Broad drainage line.
Vegetation: Grassland, Cane grass

Site No: 21a Mound
Location: Sample Area 2
Australian Map Grid Reference: Zone E55 541175E, 7816050N
Air Photo Reference:
Principal Profile Form: Ug 5.16

Profile Morphology: Surface: Moderate beta nuram gilgai. Strongly self mulching. Strongly cracking when dry.

0 - 15 cm Brownish black (10YR 3/1), 5% root line mottle; medium clay; strong medium to coarse sub angular blocky; dry extremely hard; small amounts of manganiferous concretions. Diffuse to -

15 - 60 cm Brownish black (5Y to 2.5Y 3/1); medium heavy clay; strong coarse lenticular; dry extremely hard; small amounts of concretionary lime and manganiferous concretions. Diffuse to -

60 - 120 cm Yellowish grey (2.5Y 4/1); medium heavy clay; strong medium blocky to sub angular blocky; dry extremely hard; small amounts of concretionary lime and manganiferous concretions. Diffuse to -

120 - 150 cm Yellowish grey (2.5Y 4.5/1), 5% red mottle; heavy clay; strong coarse lenticular; dry extremely hard; small amounts of concretionary lime and manganiferous concretions.

Laboratory Data:

Lab. No.	Depth cm	pH 1:5	E.C.(1:5) mScm^{-1}	Cl ppm	Dispersion Ratio (R_1)	C.S.	F.S.	Si	C	C.E.C.	Ca**	Mg**	K*	Na*	P	K	S	Moisture % A.D.	1/3 bar	15 bar
						Particle Size % O.D.				Exch.Cations m.equiv/100g					% O.D.					
10846	0-10	6.5	0.13	140	.58	<1	4	17	78	46	21.3	25.7	0.8	0.9	.036	1.34	.010	7.6	48	26
10847	10-20	7.2	0.05	30																
10848	20-30	6.7	0.05	20	.65	<1	4	15	80	48	20.1	25.7	0.5	1.6	.026	1.35	.006	5.7	48	26
10851	50-60	8.3	0.09	40	.81	<1	4	13	82	50	19.0	27.6	0.4	3.4	.024	1.34	.005	5.5	51	27
10854	80-90	8.7	0.22	270	.87	<1	5	14	80	49	18.9	27.2	0.4	6.3	.026	1.40	.005	5.5	53	28
10857	110-120	8.3	0.81	1270		1	5	19	75	47	17.3	25.3	0.5	6.7	.033	1.53	.005	4.9		

Lab. No.	Depth cm	Org. C %	Tot. N %	Acid Extr. P ppm	Bicarb Extr. P ppm	Repl. K m.equiv/100g	Fe D.T.P.A.	Mn D.T.P.A.	Cu Extr. ppm	Zn Extr. ppm	B ppm
10846	0-10	1.0	.05	16	24	0.7					
10847	10-20	0.7	.04	11	19	0.4					

Soil Profile Class: 3 Ugc
Great Soil Group: Grey clay
Parent Material: Local alluvial deposits.
Topography: Local alluvial plains. Broad drainage line.
Vegetation: Grassland, para grass.

Site No: 21b Depression
Location: Sample Area 2
Australian Map Grid Reference: Zone E55 541175E, 7816050N
Air Photo Reference:
Principal Profile Form: Ug 5.28

Profile Morphology: Surface: Moderate beta nuram gilgai. Strongly self mulching. Strongly cracking when dry.

0 - 10 cm Brownish black (10YR 3/1), 10% root line mottle; medium clay; dry extremely hard; small amounts of manganiferous concretions. Gradual to -

10 - 30 cm Yellowish grey (2.5Y 4/1); medium heavy clay; dry extremely hard; small amounts of manganiferous concretions. Diffuse to -

30 - 100 cm Brownish black (10YR 3/1); medium heavy clay; dry extremely hard; small amounts of manganiferous concretions. Diffuse to -

100 - 150 cm Yellowish grey (2.5Y 4/1); heavy clay; dry extremely hard; small amounts of manganiferous concretions.

Laboratory Data:

Lab. No.	Depth cm	pH 1:5	E.C.(1:5) $mScm^{-1}$	Cl ppm	Dispersion Ratio (R_1)	C.S. Particle Size %	F.S.	Si	C O.D.	C.E.C. Exch.Cations m.equiv/100g	Ca^{++}	Mg^{++}	K^{+}	Na^{+}	P % O.D.	K	S	Moisture % A.D.	1/3 bar	15 bar
10861	0-10	6.3	0.04	20	.57	<1	5	17	77	47	16.6	18.6	1.0	0.9	.048	1.47	.010	6.5	45	24
10862	10-20	6.4	0.05	20																
10863	20-30	6.8	0.05	20	.66	<1	4	15	80	47	19.0	18.6	0.8	1.5	.037	1.35	.007	6.9	47	25
10866	50-60	7.0	0.15	130	.77	<1	4	12	83	48	18.3	19.4	0.5	2.9	.039	1.38	.008	6.6	48	25
10869	80-90	7.2	0.42	650	.76	<1	5	10	84	50	18.8	23.9	0.4	5.8	.030	1.33	.008	5.3	49	30
10872	110-120	8.0	0.41	1270		1	4	16	79	52	19.6	27.9	0.4	8.8	.039	1.24	.004	5.3		

Lab. No.	Depth cm	Org. C %	Tot. N %	Acid Extr. P ppm	Bicarb P ppm	Repl. K m.equiv/100g	Fe D.T.P.A.	Mn D.T.P.A.	Cu Extr. ppm	Zn Extr. ppm	B ppm
10861	0-10	1.2	.07	27	25	0.8					
10862	10-20	0.8	.05	24	21	0.7					

Soil Profile Class: 3 Ugd
Great Soil Group: Black earth
Parent Material: Local alluvial deposits
Topography: Local alluvial plains.
Vegetation: Grassland, Cane grass and blue grass.

Site No: 22
Location: Sample Area 1
Australian Map Grid Reference: Zone E55 528850E, 7808500N
Air Photo Reference:
Principal Profile Form: Ug 5.16

Profile Morphology: Surface: Incipient beta nuram gilgai. Strongly self mulching. Strongly cracking when dry.

0 - 90 cm Brownish black (10YR 3/1); medium heavy clay; strong medium sub angular blocky; dry extremely hard. Diffuse to -

90 - 100 cm Brownish black (10YR 3/1); heavy clay; strong coarse sub angular blocky breaking to fine lenticular; dry extremely hard. Diffuse to -

100 - 150 cm Yellowish grey (2.5Y 5/1); heavy clay; strong coarse lenticular breaking to fine lenticular; dry extremely hard.

Laboratory Data:

Lab. No.	Depth cm	pH 1:5	E.C.(1:5) $mScm^{-1}$	Cl ppm	Dispersion Ratio (R_1)	C.S. Particle Size %	F.S.	Si	C O.D.	C.E.C. Exch.Cations m.equiv/100g	Ca^{++}	Mg^{++}	K^{+}	Na^{+}	P % O.D.	K	S	Moisture % A.D.	1/3 bar	15 bar
762	0-10	6.4	0.04	25	.49	1	3	17	79	47	22.1	22.7	0.5	1.0	.022	0.58	.011	7.7	51	26
763	10-20	6.7	0.03	20																
764	20-30	6.8	0.03	20	.53	<1	3	16	80	46	23.1	24.9	0.4	1.8	.015	0.59	.007	8.1	55	27
767	50-60	7.9	0.09	35	.72	<1	4	11	85	50	24.2	24.5	0.4	2.3	.015	0.61	.007	8.2	58	28
770	80-90	8.3	0.22	220	.58	3	3	9	85	49	23.7	26.2	0.5	3.1	.015	0.74	.009	8.1	57	28

Lab. No.	Depth cm	Org. C %	Tot. N %	Acid Extr. P ppm	Bicarb P ppm	Repl. K m.equiv/100g	Fe D.T.P.A.	Mn D.T.P.A.	Cu Extr. ppm	Zn Extr. ppm	B ppm
762	0-10	0.5	.04	10	8	0.5					
763	10-20	0.4	.03	5	4	0.5					

Soil Profile Class: 3 Ugf
Great Soil Group: Black earth - alluvial soil intergrade.
Parent Material: Local alluvial deposits Strong recent alluvial influence.
Topography: Local alluvial plains.
Vegetation: Low open woodland. Carbeen, poplar gum and cocky apple.

Site No: 24
Location: Sample Area 2
Australian Map Grid Reference: Zone E55 541075E, 7815325N
Air Photo Reference:
Principal Profile Form: Ug 5.1

Profile Morphology: Surface: Hard setting. Very weakly cracking when dry.

0 - 20 cm Black (10YR 1.7/1); silty clay; strong medium subangular blocky; dry extremely hard. Clear to -

20 - 60 cm Black (10YR 1.7/1); silty medium clay; strong medium sub angular blocky; dry extremely hard. Clear to -

60 - 90 cm Brownish black (10YR 2/2); medium clay; strong medium sub angular blocky; dry extremely hard. Diffuse to -

90 - 150 cm Brownish black (10YR 3/2); light medium clay with trace amounts of grit; strong fine sub angular blocky; small amounts of manganiferous concretions.

Laboratory Data:

Lab. No.	Depth cm	pH 1:5	E.C.(1:5) $mScm^{-1}$	Cl ppm	Dispersion Ratio (R_1)	C.S. Particle Size %	F.S.	Si	C O.D.	C.E.C. Exch.Cations m.equiv/100g	Ca^{++}	Mg^{++}	K^{+}	Na^{+}	P % O.D.	K	S	Moisture % A.D.	1/3 bar	15 bar
10816	0-10	6.6	0.11	60	.48	3	10	29	58	44	15.8	12.8	0.7	1.2	.102	1.18	.018	4.9	48	23
10817	10-20	6.4	0.05	40																
10818	20-30	7.1	0.07	50	.60	4	14	20	62	42	28.9	18.2	0.2	2.3	.067	0.98	.007	5.0	43	24
10821	50-60	7.7	0.53	820	.64	1	10	23	66	46	23.6	20.8	0.2	5.4	.042	0.85	.009	4.7	50	26
10824	80-90	8.0	1.40	1810	.62	2	15	21	62	40	25.7	22.2	0.2	6.9	.045	1.01	.012	5.1	44	22
10827	110-120	7.9	1.07	1700		10	26	14	50	32	20.2	16.3	0.2	5.6	.045	1.05	.011	3.6		

Lab. No.	Depth cm	Org. C %	Tot. N %	Acid Extr. P ppm	Bicarb P ppm	Repl. K m.equiv/100g	Fe D.T.P.A.	Mn D.T.P.A.	Cu Extr. ppm	Zn Extr. ppm	B ppm
10816	0-10	3.1	.16	190	97	0.5					
10817	10-20	2.2	.10	105	59	0.2					

LOCAL ALLUVIAL PLAINS

Gilgaied Grey Clays

Soil Profile Class: 3 Ugg
Great Soil Group: Grey clay
Parent Material: Local alluvia of unknown origin
Topography: Local alluvial plains. Low lying area.
Vegetation: Low open woodland. Poplar gum and broad leaf tea tree.

Site No: 25a Mound
Location: Sample Area 4
Australian Map Grid Reference: Zone E55 580025E, 7798350N
Air Photo Reference:
Principal Profile Form: Ug 5.29

Profile Morphology: Surface: Weak to moderate beta nuram gilgai. Weakly cracking when dry.

0 - 10 cm Greyish yellow brown (10YR 4/2); with 40% root line mottle; light clay; strong medium to fine blocky; dry very hard; small amounts of manganiferous concretions. Gradual to -

10 - 60 cm Yellowish grey (2.5Y 4/1); medium clay; strong medium to fine blocky; dry extremely hard: small amounts of manganiferous concretions. Diffuse to -

60 - 120 cm Yellowish grey (2.5Y 4/1); medium heavy clay; strong medium to fine blocky: dry extremely hard; small amounts of manganiferous concretions. Diffuse to -

120 - 150 cm Dull yellowish brown (10YR 4/3); heavy clay; dry extremely hard, small amounts of concretionary lime and manganiferous concretions.

Laboratory Data:

Lab. No.	Depth cm	pH 1:5	E.C.(1:5) mScm^{-1}	Cl ppm	Dispersion Ratio (R_1)	C.S.	F.S.	Si	C	C.E.C.	Ca^{++}	Mg^{++}	K^{+}	Na^{+}	P	K	S	Moisture % A.D.	1/3 bar	15 bar
						Particle Size % O.D.				Exch.Cations m.equiv/100g					% O.D.					
6547	0-10	6.3	0.06	50	.42	5	22	42	31	30	6.5	9.8	0.6	1.0	.025	1.71	.019	5.3	32	18
6548	10-20	6.5	0.04	50																
6549	20-30	7.1	0.04	50	.82	3	15	20	62	37	11.9	15.6	0.5	2.0	.016	1.53	.011	9.9	43	23
6552	50-60	8.8	0.17	270	.90	3	15	18	64	37	15.0	15.9	0.4	4.9	.013	1.56	.011	6.7	44	26
6555	80-90	8.3	0.62	1160	.95	1	15	22	62	40	13.1	19.8	0.4	6.5	.013	1.50	.016	7.0	44	26
6558	110-120	8.2	0.93	1700		4	13	23	60	43	12.8	19.0	0.4	7.3	.015	1.50	.016	6.5		

Lab. No.	Depth cm	Org. C %	Tot. N %	Acid Extr. P ppm	Bicarb Extr. P ppm	Repl. K m.equiv/100g	Fe D.T.P.A. Extr. ppm	Mn D.T.P.A. Extr. ppm	Cu D.T.P.A. Extr. ppm	Zn D.T.P.A. Extr. ppm	B ppm
6547	0-10	0.6	.06	7	5	0.5					
6548	10-20	0.4	.03	3	2	0.3					

Soil Profile Class: 3 Ugg
Great Soil Group: Grey clays
Parent Material: Local alluvia of unknown origin.
Topography: Local alluvial plains. Low lying area.
Vegetation: Low open woodland. Poplar gum and broad leaf tea tree.

Site No: 25b Depression
Location: Sample Area 4
Australian Map Grid Reference: Zone E55 580025E, 7798350N
Air Photo Reference:
Principal Profile Form: Ug 5.24

Profile Morphology: Surface: Weak to moderate beta nuram gilgai. Weakly cracking when dry.

0 - 10 cm Brownish black (10YR 3/2); 10% root line mottle; light medium clay; dry extremely hard. Gradual to -

10 - 50 cm Brownish grey (10YR 4/1); medium clay; dry extremely hard; small amounts of manganiferous concretions. Diffuse to -

50 - 95 cm Brownish grey (10YR 4/1); medium clay; dry extremely hard; small amounts of concretionary lime and manganiferous concretions. Diffuse to -

95 - 150 cm Dull yellowish brown (10YR 4/3), with 10% yellow mottle; medium heavy clay; dry extremely hard; small amounts of concretionary lime and manganiferous concretions.

Laboratory Data:

Lab. No.	Depth cm	pH 1:5	E.C.(1:5) mScm^{-1}	Cl ppm	Dispersion Ratio (R_1)	C.S.	F.S.	Si	C	C.E.C.	Ca^{++}	Mg^{++}	K^{+}	Na^{+}	P	K	S	Moisture % A.D.	1/3 bar	15 bar
						Particle Size % O.D.				Exch.Cations m.equiv/100g					% O.D.					
6562	0-10	6.4	0.09	90	.89	2	26	26	46	27	7.8	7.9	0.4	1.1	.021	1.60	.014	5.2	34	21
6563	10-20	6.4	0.07	60																
6564	20-30	6.8	0.07	90	.94	2	22	26	50	31	7.8	10.1	0.3	1.9	.015	1.58	.008	5.9	35	20
6567	50-60	7.4	0.07	180	.96	3	20	25	52	32	9.8	11.5	0.2	3.6	.012	1.51	.009	6.3	38	21
6570	80-90	9.0	0.60	940	.96	5	21	22	52	37	11.9	14.8	0.2	6.5	.014	1.48	.020	7.4	44	24
6573	110-120	9.0	0.69	1180		7	20	22	51	38	12.7	15.5	0.2	7.2	.017	1.52	.017	7.6		

Lab. No.	Depth cm	Org. C %	Tot. N %	Acid Extr. P ppm	Bicarb Extr. P ppm	Repl. K m.equiv/100g	Fe D.T.P.A. Extr. ppm	Mn D.T.P.A. Extr. ppm	Cu D.T.P.A. Extr. ppm	Zn D.T.P.A. Extr. ppm	B ppm
6562	0-10	1.2	.09	3	5	0.3					
6563	10-20	0.6	.06	3	4	0.3					

Soil Profile Class: 3 Ugh
Great Soil Group: Grey clay
Parent Material: Local alluvia of unknown origin.
Topography: Local alluvial plains. Elevated area. Relative relief 1 m.
Vegetation: Low woodland. Grey ironbark, beefwood, false sandalwood and willow wattle.

Site No: 26
Location: Sample Area 4
Australian Map Grid Reference: Zone E55 584425E, 7796100N
Air Photo Reference:
Principal Profile Form: Ug 5.28

Profile Morphology: Surface: Incipient beta nuram gilgai. Weakly cracking when dry.

0 - 10 cm Yellowish grey (2.5Y 5.1); light medium clay; strong medium blocky; dry extremely hard. Diffuse to -

10 - 90 cm Yellowish grey (2.5Y 5/1); medium heavy clay; strong fine lenticular to medium blocky; small amounts of powdery lime. Diffuse to -

90 - 150 cm Greyish yellow (2.5Y 6/2); medium heavy clay; strong medium blocky; dry extremely hard; small amounts of powdery lime and manganiferous concretions and soft patches.

Laboratory Data:

Lab. No.	Depth cm	pH 1:5	E.C.(1:5) mScm^{-1}	Cl ppm	Dispersion Ratio (R_1)	C.S.	F.S.	Si	C	C.E.C.	Ca^{++}	Mg^{++}	K^{+}	Na^{+}	P	K	S	Moisture % A.D.	1/3 bar	15 bar
						Particle Size % O.D.				Exch.Cations m.equiv/100g					% O.D.					
6395	0-10	7.7	0.11	130	.86	17	27	12	44	22	6.0	9.3	0.2	2.3	.011	0.23	.019	4.4	27	13
6396	10-20	8.0	0.11	90																
6397	20-30	8.2	0.17	180	.95	11	24	15	50	26	7.8	10.9	0.1	3.7	.007	0.18	.017	5.3	33	16
63400	50-60	8.2	0.63	1010	.99	12	19	15	54	23	6.4	11.1	0.1	4.8	.008	0.24	.024	6.6	35	17
63403	80-90	7.5	1.05	1590	.99	8	19	16	57	26	7.3	12.0	0.1	6.0	.007	0.34	.025	8.5	38	19
63406	110-120	7.6	1.14	1810		4	19	15	62	27	8.0	12.9	0.1	7.1	.008	0.48	.014	8.6		

Lab. No.	Depth cm	Org. C %	Tot. N %	Acid Extr. P ppm	Bicarb Extr. P ppm	Repl. K m.equiv/100g	Fe D.T.P.A. Extr. ppm	Mn D.T.P.A. Extr. ppm	Cu D.T.P.A. Extr. ppm	Zn D.T.P.A. Extr. ppm	B ppm
6395	0-10	0.6	.05	4	4	0.1					
6396	10-20	0.5	.04	2	2	0.1					

Soil Profile Class: 3 Ugi
Great Soil Group: Grey clay
Parent Material: Local alluvia of unknown origin.
Topography: Local alluvial plains. Elevated area. Relative relief 1 m.
Vegetation: Layered open woodland. Upper storey of boree, shrub storey of false sandalwood, yellow wood and currant bush.

Site No: 27a Mound
Location: Sample Area 4
Australian Map Grid Reference: Zone E55 583675E, 7796025N
Air Photo Reference:
Principal Profile Form: Ug 5.28

Profile Morphology: Surface: Moderate to strong beta nuram gilgai. Weakly cracking when dry.

0 - 30 cm Yellowish grey (2.5Y 5/1); medium clay; strong medium blocky; dry extremely hard. Diffuse to -

30 - 90 cm Yellowish grey (2.5Y 5/1); medium heavy clay; strong medium lenticular; dry extremely hard. Diffuse to -

90 - 150 cm Yellowish grey (2.5Y 6/2); medium heavy clay; strong medium lenticular; dry extremely hard; small amounts of manganiferous concretions and soft patches.

Laboratory Data:

Lab. No.	Depth cm	pH 1:5	E.C.(1:5) mScm^{-1}	Cl ppm	Dispersion Ratio (R_1)	C.S.	F.S.	Si	C	C.E.C.	Ca^{++}	Mg^{++}	K^+	Na^+	P	K	S	Moisture % A.D.	1/3 bar	15 bar
						Particle Size % O.D.				Exch.Cations m.equiv/100g					% O.D.					
6410	0-10	6.6	0.14	210	.78	22	26	14	38	18	7.9	7.9	0.2	1.2	.008	0.28	.016	4.5	24	11
6411	10-20	6.8	0.20	335																
6412	20-30	6.9	0.52	870	.85	16	22	14	48	23	9.6	11.8	0.2	3.3	.008	0.36	.023	5.8	32	16
6415	50-60	7.4	1.27	1953	.97	14	21	14	51	29	9.6	12.0	0.1	4.6	.006	0.41	.015	7.6	36	18
6418	80-90	6.7	1.37	1810	.99	15	26	12	47	23	6.2	12.3	0.1	4.5	.006	0.40	.017	6.3	30	16
6421	110-120	6.1	1.48	1810		14	23	13	50	26	6.1	13.8	0.1	4.8	.006	0.42	.017	7.0		

Lab. No.	Depth cm	Org. C %	Tot. N %	Acid Extr. P ppm	Bicarb P ppm	Repl. K m.equiv/100g	Fe D.T.P.A.	Mn D.T.P.A.	Cu Extr. ppm	Zn Extr. ppm	B ppm
6410	0-10	0.7	.06	3	4	0.1					
6411	10-20	0.5	.03	3	2	0.1					

Soil Profile Class: 3 Ugi
Great Soil Group: Grey clay
Parent Material: Local alluvia of unknown origin.
Topography: Local alluvial plains. Elevated area. Relative relief 1 m.
Vegetation: Layered open woodland. Upper storey of boree, shrub storey of false sandalwood, yellow wood and currant bush.

Site No: 27b Depression
Location: Sample Area 4
Australian Map Grid Reference: Zone E55 583675E, 7796025N
Air Photo Reference:
Principal Profile Form: Ug 5.28

Profile Morphology: Surface: Moderate to strong beta nuram gilgai. Weakly cracking when dry.

0 - 30 cm Yellowish grey (2.5Y 5/1), 5% light yellow mottle; medium clay; dry extremely hard. Diffuse to -

30 - 90 cm Yellowish grey (2.5Y 5/1), 5% light yellow mottle; medium clay; dry extremely hard; trace of concretionary lime and manganiferous soft patches. Diffuse to -

90 - 150 cm Light grey (2.5Y 7/1), 5% light yellow mottle; medium clay; dry extremely hard; trace of concretionary lime and small amounts of manganiferous soft patches.

Laboratory Data:

Lab. No.	Depth cm	pH 1:5	E.C.(1:5) mScm^{-1}	Cl ppm	Dispersion Ratio (R_1)	C.S.	F.S.	Si	C	C.E.C.	Ca^{++}	Mg^{++}	K^+	Na^+	P	K	S	Moisture % A.D.	1/3 bar	15 bar
						Particle Size % O.D.				Exch.Cations m.equiv/100g					% O.D.					
6425	0-10	6.5	0.08	20	.86	21	26	13	40	22	7.0	9.4	0.1	0.9	.008	0.31	.007	4.5	24	12
6426	10-20	7.1	0.07	70																
6427	20-30	7.6	0.14	190	.99	22	27	15	36	20	7.0	10.5	0.1	1.9	.006	0.28	.014	4.6	25	13
6430	50-60	7.2	0.66	1100	.99	24	29	13	34	22	6.0	9.2	<0.1	2.7	.005	0.26	.016	4.7	24	12
6433	80-90	6.0	0.78	1270	.90	29	26	12	33	19	6.7	7.6	<0.1	2.7	.005	0.26	.020	4.4	21	11
6436	110-120	6.4	0.83	1360		30	28	10	32	17	3.6	7.0	<0.1	2.6	.005	0.26	.019	4.0		

Lab. No.	Depth cm	Org. C %	Tot. N %	Acid Extr. P ppm	Bicarb P ppm	Repl. K m.equiv/100g	Fe D.T.P.A.	Mn D.T.P.A.	Cu Extr. ppm	Zn Extr. ppm	B ppm
6425	0-10	0.3	.03	2	2	0.1					
6426	10-20	0.3	.03	1	2	0.1					

Soil Profile Class: 3 Ugj
Great Soil Group: Grey clay
Parent Material: Local alluvia of unknown origin.
Topography: Local alluvial plains. Elevated area. Relative relief 1 m.
Vegetation: Layered open woodland, upper storey of boree and bauhinia. Shrub storey of false sandalwood, yellow wood, currant bush, beefwood and rubber vine.

Site No: 28a Mound
Location: Sample Area 4
Australian Map Grid Reference: Zone E55 583050E, 7796200N
Air Photo Reference:
Principal Profile Form: Ug 5.28

Profile Morphology: Surface: Strong beta nuram gilgai. Weakly to moderately cracking when dry.

0 - 30 cm Dark greyish yellow (2.5Y 5/2); medium heavy clay; strong fine blocky; dry extremely hard; small amounts of concretionary lime. Diffuse to -

30 - 70 cm Dark greyish yellow (2.5Y 5/2); medium heavy clay; strong medium lenticular to coarse blocky; dry extremely hard; moderate amounts of manganiferous soft patches and veins. Diffuse to -

70 - 150 cm Greyish yellow (2.5Y 6/2), 5% yellow mottle; heavy clay; strong medium lenticular to coarse blocky; dry extremely hard; small amounts of manganiferous soft patches and concretions.

Laboratory Data:

Lab. No.	Depth cm	pH 1:5	E.C.(1:5) mScm^{-1}	Cl ppm	Dispersion Ratio (R_1)	C.S.	F.S.	Si	C	C.E.C.	Ca^{++}	Mg^{++}	K^+	Na^+	P	K	S	Moisture % A.D.	1/3 bar	15 bar
						Particle Size % O.D				Exch.Cations m.equiv/100g					% O.D.					
6440	0-10	8.7	0.15	130	.71	10	22	18	50	29	10.2	12.2	0.4	1.6	.020	0.86	.025	6.5	32	16
6441	10-20	9.0	0.19	160																
6442	20-30	9.1	0.40	470	.80	8	22	18	52	30	11.6	13.8	0.3	3.6	.015	0.89	.026	6.9	36	18
6445	50-60	7.9	1.58	1810	.98	5	18	19	58	33	11.4	14.5	0.2	7.5	.011	0.83	.201	8.7	40	20
6448	80-90	6.4	1.70	2320	.99	5	20	18	57	32	8.5	14.4	0.2	7.5	.010	0.82	.065	8.6	37	20
6451	110-120	6.6	1.74	2210		6	22	19	53	30	7.6	13.0	0.1	6.3	.012	0.92	.048	8.1		

Lab. No.	Depth cm	Org. C %	Tot. N %	Acid Extr. P ppm	Bicarb P ppm	Repl. K m.equiv/100g	Fe D.T.P.A.	Mn D.T.P.A.	Cu Extr. ppm	Zn Extr. ppm	B ppm
6440	0-10	0.7	.06	25	5	0.3					
6441	10-20	0.6	.06	25	4	0.3					

LOCAL ALLUVIAL PLAINS

Gilgaied Grey Clays

Soil Profile Class: 3 Ugj

Great Soil Group: Grey clay

Parent Material: Local alluvia of unknown origin.

Topography: Local alluvial plains. Elevated area. Relative relief 1 m.

Vegetation: Layered open woodland, upper storey of boree and bauhinia. Shrub storey of false sandalwood, yellow wood, currant bush, beefwood and rubber vine.

Site No: 28b Depression

Location: Sample Area 4

Australian Map Grid Reference: Zone E55 583050E, 7796200N

Air Photo Reference:

Principal Profile Form: Ug 5.28

Profile Morphology: Surface: Strong beta nuram gilgai. Weakly to moderately cracking when dry.

0 - 20 cm Brownish black (2.5Y 3/1); medium heavy clay; dry extremely hard. Diffuse to -

20 - 50 cm Yellowish grey (2.5Y 6/1); heavy clay; dry extremely hard. Diffuse to -

50 - 100 cm Greyish yellow (2.5Y 6/2); heavy clay; dry extremely hard; abundant manganiferous concretions and soft patches. Diffuse to -

100 - 150 cm Greyish yellow (2.5Y 6/2); heavy clay; dry extremely hard; moderate amounts of manganiferous soft patches.

Laboratory Data:

Lab. No.	Depth cm	pH 1:5	E.C.(1:5) mScm^{-1}	Cl ppm	Dispersion Ratio (R_1)	C.S.	F.S.	Si	C	C.E.C.	Ca^{++}	Mg^{++}	K^+	Na^+	P	K	S	Moisture % A.D.	1/3 bar	15 bar
						Particle Size % O.D.				Exch.Cations m.equiv/100g					% O.D.					
6455	0-10	6.7	0.09	90	.85	10	21	17	52	27	12.2	12.2	0.3	2.1	.012	0.72	.014	5.9	31	15
6456	10-20	7.0	0.12	140																
6457	20-30	7.6	0.24	380	.98	9	20	23	48	28	7.8	12.0	0.2	4.2	.009	0.70	.014	6.6	38	17
6460	50-60	7.3	1.22	1810	.99	8	21	19	52	29	6.0	12.1	0.1	6.2	.008	0.69	.028	6.8	37	18
6463	80-90	6.1	1.75	2390	.96	10	21	16	53	28	6.9	9.2	0.1	11.0	.007	0.67	.040	8.0	32	18
6466	110-120	6.0	1.79	2520		9	22	20	49	26	8.1	11.4	0.1	6.5	.009	0.69	.039	7.0		

Lab. No.	Depth cm	Org. C %	Tot. N %	Acid Extr. P ppm	Bicarb P ppm	Repl. K m.equiv/100g	Fe D.T.P.A. Extr. ppm	Mn D.T.P.A. Extr. ppm	Cu D.T.P.A. Extr. ppm	Zn D.T.P.A. Extr. ppm	B ppm
6455	0-10	0.6	.03	6	5	0.2					
6456	10-20	0.4	.02	5	4	0.2					

Solodics

Soil Profile Class: 3 Dya

Great Soil Group: Solodic

Parent Material: Local alluvial deposits of unknown origin.

Topography: Local alluvial plains. Slightly elevated areas. Relative relief 1 m.

Vegetation: Cleared. Regrowth of carbeen, cabbage gum and beefwood.

Site No: 29

Location: Sample Area 4

Australian Map Grid Reference: Zone E55 581850E, 7797500N

Air Photo Reference:

Principal Profile Form: Dy 2.33

Profile Morphology: Surface: Hard setting. Incipient beta nuram gilgai. Occurs in a gilgai complex with 3 Ugh, 3 Dya on mound.

0 - 4 cm Brownish black (10YR 3/2); clay loam; weak coarse blocky to platy; dry very hard. Sharp to -

4 - 5 cm Sporadic bleach. Sharp to -

5 - 65 cm Brownish grey (10YR 4/1); medium heavy clay with trace amounts of grit; strong medium prismatic to subangular blocky; dry extremely hard. Diffuse to -

65 - 150 cm Light grey (10YR 7/1); medium heavy clay with trace amounts of grit; strong medium lenticular; dry extremely hard; abundant amounts of powdery lime and moderate amounts of manganiferous concretions.

Laboratory Data:

Lab. No.	Depth cm	pH 1:5	E.C.(1:5) mScm^{-1}	Cl ppm	Dispersion Ratio (R_1)	C.S.	F.S.	Si	C	C.E.C.	Ca^{++}	Mg^{++}	K^+	Na^+	P	K	S	Moisture % A.D.	1/3 bar	15 bar
						Particle Size % O.D.				Exch.Cations m.equiv/100g					% O.D.					
6470	0-5	6.3	0.09	72	.49	19	37	23	21	14	4.4	5.2	0.2	1.0	.023	1.00	.014	2.3	22	9
6472	10-20	7.0	0.15	220																
6473	20-30	7.7	0.28	450	.99	15	27	14	44	22	6.2	7.9	0.1	4.6	.011	0.75	.034	5.3	32	15
6476	50-60	8.8	0.50	940	.99	10	22	15	53	28	5.8	9.8	0.1	12.5	.009	0.73	.035	7.2	41	19
6479	80-90	8.6	0.36	510	.51	12	23	14	51	30	4.6	9.5	0.1	14.6	.006	0.69	.020	7.4	41	18
6482	110-120	8.6	0.42	630		7	24	16	53	31	8.4	9.0	0.1	15.1	.006	0.68	.018	7.4		

Lab. No.	Depth cm	Org. C %	Tot. N %	Acid Extr. P ppm	Bicarb P ppm	Repl. K m.equiv/100g	Fe D.T.P.A. Extr. ppm	Mn D.T.P.A. Extr. ppm	Cu D.T.P.A. Extr. ppm	Zn D.T.P.A. Extr. ppm	B ppm
6470	0-5	3.0	.18	19	20	0.4					
6472	10-20	0.8	.05	5	4	0.1					

Deep Sands

Soil Profile Class: 4 Gna
Great Soil Group: Siliceous sand
Parent Material: Granitic sediments
Topography: Channel infill - infilled bed position.
Vegetation: Low woodland. Tea tree, pandanus, prickly pine and quinine berry.
Profile Morphology: Surface: Very weakly hard setting.

Site No: 34
Location: Sample Area 4
Australian Map Grid Reference: Zone E55 580000E, 7799100N
Air Photo Reference:
Principal Profile Form: Gn 2.85

0 - 40 cm Greyish yellow brown (10YR 5/2), coarse sand, single grain, sandy. Gradual to -
40 - 60 cm Dull yellow orange (10YR 6/3), coarse sand, single grain, sandy. Gradual to -
60 - 150 cm Dull yellow orange (10YR 6/3), 60% coarse red and yellow mottle, variably sandy loam to sandy clay loam, small amounts of grit and gravel, massive, coherent, earthy, small amounts of manganiferous concretions.

Laboratory Data:

Lab. No.	Depth cm	pH 1:5	E.C.(1:5) $mScm^{-1}$	Cl ppm	Dispersion Ratio (R_1)	C.S.	F.S.	Si	C	C.E.C.	Ca^{++}	Mg^{++}	K^+	Na^+	P	K	S	Moisture % A.D.	1/3 bar	15 bar
						Particle Size % O.D.				Exch.Cations m.equiv/100g					% O.D.					
6622	0-10	6.7	0.05	45	.59	68	17	3	12	7	2.6	1.3	0.3	0.1	.019	2.61	.014	0.8	10	4
6623	10-20	6.5	0.03	20																
6624	20-30	6.4	0.03	20	.53	62	20	6	12	4	1.6	1.0	0.1	<0.1	.015	2.70	.007	0.5	9	3
6627	50-60	7.3	0.03	20	.57	60	21	<1	19	4	1.4	1.0	0.2	<0.1	.013	2.76	.004	0.8	9	5
6630	80-90	6.9	0.04	40	.71	58	13	<1	25	7	2.9	1.4	0.2	0.1	.017	2.51	.007	3.2	16	8
6633	110-120	6.5	0.03	30		55	19	4	22	6	2.3	1.3	0.1	0.2	.014	2.54	.005	1.9		

Lab. No.	Depth cm	Org. C %	Tot. N %	Acid Extr. P ppm	Bicarb P ppm	Repl. K m.equiv/100g	Fe D.T.P.A.	Mn D.T.P.A.	Cu Extr. ppm	Zn Extr. ppm	B ppm
6622	0-10	1.4	.07	10	6	0.3					
6623	10-20	0.5	.03	4	4	0.1					

Duplex Soils

Soil Profile Class: 4 Dya
Great Soil Group: Solodized solonetz
Parent Material: Granitic sediments to 30 cm. Granitic and alluvial-colluvial sediments mixed below 30 cm.
Topography: Channel infills.
Vegetation: Low open woodland. Poplar gum and carbeen.
Profile Morphology: Surface: Hard setting

Site No: 30
Location: Sample Area 4
Australian Map Grid Reference: Zone E55 580025E, 7798950N
Air Photo Reference:
Principal Profile Form: Dy 3.43

0 - 15 cm Greyish yellow brown (10YR 4/2); coarse sand; massive. Sharp to -
15 - 30 cm Conspicuous bleach. Sharp to -
30 - 45 cm Dark greyish yellow (2.5Y 4/2), 30% red and yellow mottle; light medium clay with coarse sand lenses; strong medium columnar; dry extremely hard; trace of lime and manganiferous concretions. Sharp to -
45 - 70 cm Dull yellowish brown (10YR 5/3); sandy clay loam; moderate medium blocky; dry extremely hard; small amounts of manganiferous concretions. Sharp to -
70 - 100 cm Dull yellowish brown (10YR 5/3), 15% red and yellow mottle; light medium clay with coarse sand lenses; strong medium blocky; dry extremely hard; small amounts of lime and manganiferous concretions. Diffuse to -
100 - 150 cm Brown (10YR 4/4); medium clay with trace of grit and sand lenses; dry extremely hard.

Laboratory Data:

Lab. No.	Depth cm	pH 1:5	E.C.(1:5) $mScm^{-1}$	Cl ppm	Dispersion Ratio (R_1)	C.S.	F.S.	Si	C	C.E.C.	Ca^{++}	Mg^{++}	K^+	Na^+	P	K	S	Moisture % A.D.	1/3 bar	15 bar
						Particle Size % O.D.				Exch.Cations m.equiv/100g					% O.D.					
10531	0-10	6.2	0.04	30	.73	57	24	16	3	4	1.1	0.6	0.1	0.1	.017	2.90	.007	0.6	10	3
10532	10-20	6.0	0.03	20																
10533	20-30	6.8	0.03	20	.77	55	26	9	10	3	1.2	0.9	0.1	0.2	.012	2.83	.004	0.6	9	3
10536	50-60	7.1	0.07	20	.78	63	16	6	14	5	1.1	1.8	0.1	1.9	.009	2.76	.003	1.0	16	6
10539	80-90	8.5	0.28	150	.99	21	23	25	27	26	5.7	8.5	0.2	12.8	.026	2.05	.007	2.2	38	17
10542	110-120	9.0	0.35	220		28	24	17	27	24	5.2	8.3	0.2	13.6	.032	2.14	.005	3.4		

Lab. No.	Depth cm	Org. C %	Tot. N %	Acid Extr. P ppm	Bicarb P ppm	Repl. K m.equiv/100g	Fe D.T.P.A.	Mn D.T.P.A.	Cu Extr. ppm	Zn Extr. ppm	B ppm
10531	0-10	0.4	.04	7	5	0.1					
10532	10-20	0.2	.02	3	3	0.1					

4. CHANNEL INFILLS AND DISSECTED UPLANDS DEVELOPED FROM ACID INTRUSIVES

Duplex Soils

Soil Profile Class: 4 Dyb
Great Soil Group: Solodized solonetz
Parent Material: Granite
Topography: Uplands
Vegetation: Low open woodland. Cleared, with regrowth of broad leaf tea tree and beefwood.

Site No: 31
Location: Sample Area 4
Australian Map Grid Reference: Zone E55 579725E, 7797425N
Air Photo Reference:
Principal Profile Form: Dy 3.43

Profile Morphology: Surface: Hard setting

0 - 15 cm Brownish grey (10YR 4/1); sandy loam; dry slightly hard. Clear to -

15 - 30 cm Conspicuous bleach. Sharp to -

30 - 80 cm Bright yellowish brown (10YR 6/6), 30% red and grey mottle; light medium clay; strong coarse columnar and sub angular blocky; dry extremely hard; small amounts of manganiferous concretions and soft patches. Diffuse to -

80 - 110 cm Brown (10YR 4/4); light medium clay; moderate to strong blocky; dry extremely hard; small amounts of manganiferous concretions and soft patches and small amounts of concretionary lime. Diffuse to -

110 - 150 cm Dull yellowish brown (10YR 4/3); light clay with abundant amounts of grit. dry very hard; small amounts of manganiferous concretions and soft patches and small amounts of concretionary lime.

Laboratory Data:

Lab. No.	Depth cm	pH 1:5	E.C.(1:5) mScm^{-1}	Cl ppm	Dispersion Ratio (R_1)	C.S.	F.S.	Si	C	C.E.C.	Ca^{++}	Mg^{++}	K^+	Na^+	P	K	S	Moisture % A.D.	1/3 bar	15 bar
						Particle Size % O.D.				Exch.Cations m.equiv/100g					% O.D.					
6502	0-10	5.6	0.02	20	.79	46	35	6	13	5	0.8	0.8	0.2	<0.1	.013	2.65	.008	0.9	14	4
6503	10-20	5.8	0.02	20																
6504	20-30	6.8	0.06	60	.99	39	31	6	24	8	1.2	2.8	0.1	1.6	.011	2.30	.006	1.9	19	8
6507	50-60	8.6	0.21	270	.99	37	31	6	26	11	1.6	4.4	0.1	3.7	.010	2.37	.005	2.8	25	11
6510	80-90	9.7	0.58	610	.91	35	32	6	28	14	1.8	5.3	0.1	5.9	.018	2.30	.023	2.9	24	10
6513	110-120	9.4	0.55	760		52	25	3	20	13	2.1	5.1	0.1	5.3	.013	2.57	.005	2.1		

Lab. No.	Depth cm	Org. C %	Tot. N %	Acid Extr. P ppm	Bicarb P ppm	Repl. K m.equiv/100g	Fe D.T.P.A.	Mn D.T.P.A.	Cu Extr. ppm	Zn Extr. ppm	B ppm
6502	0-10	0.4	.05	2	3	0.2					
6503	10-20	0.2	.03	1	1	0.1					

Soil Profile Class: 4 Dyc
Great Soil Group: Yellow Podzolic
Parent Material: Granite
Topography: Low Uplands.
Vegetation: Low open woodland. Cleared, with red bloodwood and broad leaf tea tree regrowth.

Site No: 32
Location: Sample Area 4
Australian Map Grid Reference: Zone E55 581650E, 7796725N
Air Photo Reference:
Principal Profile Form: Dy 3.21

Profile Morphology: Surface: Hard setting.

0 - 20 cm Dull yellowish brown (10YR 4/3); sandy loam; massive; dry slightly hard. Diffuse to -

20 - 30 cm Dull yellowish brown (10YR 5/4), sandy clay loam, massive; dry slightly hard. Clear to -

30 - 50 cm Bright yellowish brown (10YR 6/6), 20% fine red mottle; light clay; weak to moderate fine blocky; dry hard. Diffuse to -

50 - 110 cm Bright yellowish brown (10YR 6/8), 50% red and grey mottle; medium clay; strong coarse blocky; with small amounts of grit; dry very hard. Gradual to -

110 - 150 cm Strong white, yellow and grey mottled light medium clay with small amounts of grit; moderate coarse blocky.

Laboratory Data:

Lab. No.	Depth cm	pH 1:5	E.C.(1:5) mScm^{-1}	Cl ppm	Dispersion Ratio (R_1)	C.S.	F.S.	Si	C	C.E.C.	Ca^{++}	Mg^{++}	K^+	Na^+	P	K	S	Moisture % A.D.	1/3 bar	15 bar
						Particle Size % O.D.				Exch.Cations m.equiv/100g					% O.D.					
10561	0-10	6.0	0.04	20	.46	51	36	<1	13	3	1.0	0.3	0.1	<0.1	.007	0.50	.004	0.5	6	2
10562	10-20	6.2	0.02	20																
10563	20-30	6.1	0.02	20	.48	49	36	1	14	3	1.0	0.7	<0.1	<0.1	.007	0.51	.004	0.6	8	3
10566	50-60	6.4	0.04	20	.39	40	20	3	37	9	2.5	2.5	<0.1	<0.1	.010	0.41	.003	1.7	22	11
10569	80-90	6.2	0.03	20	.31	41	13	1	45	10	3.1	3.1	<0.1	0.1	.007	0.36	.005	1.5	25	14
10572	110-120	6.4	0.03	20		40	20	3	37	13	4.8	4.3	<0.1	0.1	.005	0.89	.003	1.9		

Lab. No.	Depth cm	Org. C %	Tot. N %	Acid Extr. P ppm	Bicarb P ppm	Repl. K m.equiv/100g	Fe D.T.P.A.	Mn D.T.P.A.	Cu Extr. ppm	Zn Extr. ppm	B ppm
10561	0-10	0.2	.03	1	1	0.1					
10562	10-20	0.2	.02	1	1	<0.1					

5. DISSECTED UPLANDS ON INTERMEDIATE INTRUSIVES

Duplex Soils

Soil Profile Class: 5 Dra
Great Soil Group: Non-calcic brown soil {Neutral red duplex soil, (Isbell and Murtha, 1970)}
Parent Material: Granodiorite.
Topography: Upper slope of uplands.
Vegetation: Low open woodland. Grey ironbark and red bloodwood.

Site No: 35
Location: Sample Area 1
Australian Map Grid Reference: Zone E55 529200E, 7809325N
Air Photo Reference:
Principal Profile Form: Dr 2.12

Profile Morphology: Surface: Hard setting.

0 - 25 cm Brownish black (10YR 3/2); clay loam; weak blocky to sub angular blocky; dry hard Clear to -

25 - 80 cm Reddish brown (2.5YR 4/6); medium clay; strong coarse sub angular blocky to blocky; dry hard; trace of manganiferous concretions. Diffuse to -

80 - 110 cm Reddish brown (2.5YR 4/6); light medium clay with trace amounts of gravel; strong medium sub angular blocky to blocky; dry hard; trace of manganiferous concretions. Clear to -

110 - 120 cm Reddish brown (2.5YR 4/6); light medium clay; strong fine to medium prismatic to medium to coarse blocky; dry hard, trace of manganiferous concretions. Clear to -

120 - 150 cm Reddish brown (2.5YR 4/6); decomposed granodiorite; massive; with relic ghost rock structure.

Laboratory Data:

Lab. No.	Depth cm	pH 1:5	E.C.(1:5) $mScm^{-1}$	Cl ppm	Dispersion Ratio (R_1)	C.S.	F.S.	Si	C	C.E.C.	Ca^{++}	Mg^{++}	K^+	Na^+	P	K	S	Moisture % A.D.	1/3 bar	15 bar
						Particle Size % O.D.				Exch.Cations m.equiv/100g					% O.D.					
777	0-10	6.7	0.06	80	.66	32	30	11	27	13	9.3	3.7	0.3	0.4	.043	0.38	.014	2.2	21	9
778	10-20	6.5	0.03	20																
779	20-30	6.5	0.02	20	.39	24	22	5	49	24	7.6	5.3	0.1	0.2	.023	0.25	.009	3.2	27	14
782	50-60	6.9	0.02	20	.35	26	15	5	54	23	6.2	5.4	0.1	0.4	.020	0.51	.005	3.9	39	16
785	80-90	6.8	0.02	20	.50	10	20	18	52	23	12.3	11.8	0.1	0.5	.015	0.69	.004	6.4	39	19
788	110-120	7.0	0.02	20		22	30	20	28	22	15.3	16.6	0.1	0.5	.024	1.02	.003	5.7		

Lab. No.	Depth cm	Org. C %	Tot. N %	Acid Extr. P ppm	Bicarb P ppm	Repl. K m.equiv/100g	Fe D.T.P.A.	Mn D.T.P.A.	Cu Extr. ppm	Zn Extr. ppm	B ppm
777	0-10	1.2	.08	15	18	0.3					
778	10-20	0.8	.07	6	7	0.2					

Soil Profile Class: 5 Dya
Great Soil Group: None appropriate
Parent Material: Granodiorite.
Topography: Upper slope of uplands.
Vegetation: Low woodland. Grey ironbark.

Site No: 36
Location: Sample Area 1
Australian Map Grid Reference: Zone E55 528875E, 7809425N
Air Photo Reference:
Principal Profile Form: Dy 2.11

Profile Morphology: Surface: Hard setting.

0 - 25 cm Dark brown (7.5YR 3/3); sandy clay loam; weak sub angular blocky; dry hard. Clear to -

25 - 70 cm Bright brown (7.5YR 5/6); light medium clay; moderate very fine to fine blocky and sub angular blocky; dry hard; trace amounts of manganiferous concretions. Diffuse to -

70 - 90 cm Reddish brown (5YR 5/6), 10% yellow mottle; medium clay; strong medium sub angular blocky; small amounts of manganiferous concretions. Clear to -

90 - 150 cm Bright yellowish brown decomposed granodiorite; massive; with relic ghost rock structure.

Laboratory Data:

Lab. No.	Depth cm	pH 1:5	E.C.(1:5) $mScm^{-1}$	Cl ppm	Dispersion Ratio (R_1)	C.S.	F.S.	Si	C	C.E.C.	Ca^{++}	Mg^{++}	K^+	Na^+	P	K	S	Moisture % A.D.	1/3 bar	15 bar
						Particle Size % O.D.				Exch.Cations m.equiv/100g					% O.D.					
814	0-10	6.2	0.03	20	.79	41	30	9	20	10	6.1	2.7	0.1	0.2	.034	0.45	.013	1.8	14	7
815	10-20	6.1	0.02	20																
816	20-30	5.9	0.02	20	.60	34	28	7	31	10	5.6	3.2	0.1	0.2	.016	0.34	.006	2.2	16	9
819	50-60	6.2	0.02	20	.46	40	16	8	35	14	7.5	5.1	0.1	0.3	.014	0.32	.005	3.1	21	12
822	80-90	6.5	0.02	20	.66	44	18	4	34	10	6.0	4.1	0.1	0.4	.008	0.28	.001	2.5	16	9
825	110-120	6.7	0.02	20		29	20	8	43	18	11.5	7.6	0.1	0.5	.006	0.36	.001	3.8		

Lab. No.	Depth cm	Org. C %	Tot. N %	Acid Extr. P ppm	Bicarb P ppm	Repl. K m.equiv/100g	Fe D.T.P.A.	Mn D.T.P.A.	Cu Extr. ppm	Zn Extr. ppm	B ppm
814	0-10	1.1	.07	24	12	0.2					
815	10-20	0.8	.06	3	5	0.1					

Soil Profile Class: 5 Dyb
Great Soil Group: None appropriate.
Parent Material: Granodiorite.
Topography: Mid-slope of uplands.
Vegetation: Low woodland. Poplar gum, grey bloodwood.

Site No: 37
Location: Sample Area 1
Australian Map Grid Reference: Zone E55 528950E, 7809075N
Air Photo Reference:
Principal Profile Form: Gn 3.23

Profile Morphology: Surface: Hard setting.

0 - 20 cm Brownish black (10YR 2/2); clay loam; moderate medium subangular blocky; dry hard. Gradual to -

20 - 50 cm Brownish black (10YR 2/2); light clay; moderate medium sub angular blocky; dry hard; trace of manganiferous concretions. Clear to -

50 - 70 cm Brown (10YR 4/6); light medium clay; strong coarse sub angular blocky; dry hard; moderate amounts of manganiferous concretions. Clear to -

70 - 100 cm Brown (10YR 4/6), 15% red grey mottle; light medium clay; strong fine blocky to sub angular blocky; dry very hard; moderate amounts of manganiferous concretions. Clear to -

100 - 150 cm Yellowish brown (10YR 5/6); decomposed granodiorite; massive; with relic ghost rock structure.

Laboratory Data:

Lab. No.	Depth cm	pH 1:5	E.C.(1:5) $mScm^{-1}$	Cl ppm	Dispersion Ratio (R_1)	C.S.	F.S.	Si	C	C.E.C.	Ca^{++}	Mg^{++}	K^+	Na^+	P	K	S	Moisture % A.D.	1/3 bar	15 bar
						Particle Size % O.D.				Exch.Cations m.equiv/100g					% O.D.					
842	0-10	6.4	0.02	20	.71	43	26	10	21	9	4.8	3.3	0.2	0.2	.038	0.27	.014	1.9	16	7
843	10-20	6.4	0.02	20																
844	20-30	6.4	0.01	20	.82	31	31	11	27	14	5.4	3.4	0.1	0.3	.022	0.29	.010	2.2	16	9
847	50-60	7.3	0.09	20	.51	12	20	9	59	18	7.8	4.5	0.1	0.4	.013	0.19	.007	4.0	27	17
850	80-90	8.5	0.10	20	.54	28	20	10	42	15	8.8	5.8	0.1	1.3	.010	0.18	.025	4.4	25	14
853	110-120	8.9	0.14	20		21	35	15	29	28	15.4	14.0	<0.1	3.1	.107	0.40	.013	5.0		

Lab. No.	Depth cm	Org. C %	Tot. N %	Acid Extr. P ppm	Bicarb P ppm	Repl. K m.equiv/100g	Fe D.T.P.A.	Mn D.T.P.A.	Cu Extr. ppm	Zn Extr. ppm	B ppm
842	0-10	0.6	.09	21	16	0.2					
843	10-20	0.6	.07	3	6	0.1					

DISSECTED UPLANDS ON INTERMEDIATE INTRUSIVES

Duplex Soils

Soil Profile Class: 5 Dyc

Great Soil Group: Solodized solonetz

Parent Material: Granodiorite.

Topography: Lower slopes of uplands.

Vegetation: Low open woodland. Poplar gum and grey bloodwood.

Site No: 38

Location: Sample Area 1

Australian Map Grid Reference: Zone E55 528875E, 7808950N

Air Photo Reference:

Principal Profile Form: Dy 2.43

Profile Morphology: Surface: Hard setting.

0 - 25 cm Black (10YR 2/1); clay loam; weak granular; hard. Clear to -

25 - 30 cm Conspicuous bleach; clay loam. Sharp to -

30 - 55 cm Dark greyish brown (10YR 4/2); medium heavy clay; trace amounts of grit and gravel; strong medium columnar to coarse angular blocky; dry very hard; trace amounts of manganiferous concretions. Diffuse to -

55 - 110 cm Yellowish brown (10YR 5/6); medium clay; trace amounts of gravel; strong coarse blocky; dry extremely hard; trace amounts of manganiferous concretions and concretionary and powdery lime. Clear to -

110 - 150 cm Intensely red and grey mottled decomposed granodiorite, massive.

Laboratory Data:

Lab. No.	Depth cm	pH 1:5	E.C.(1:5) mScm^{-1}	Cl ppm	Dispersion Ratio (R_1)	C.S.	F.S.	Si	C	C.E.C.	Ca^{++}	Mg^{++}	K^+	Na^+	P	K	S	Moisture % 1/3 bar	A.D.	15 bar
						Particle Size % O.D.				Exch.Cations m.equiv/100g					% O.D.					
857	0-10	6.8	0.05	30	.83	32	27	18	23	16	6.5	5.8	0.1	0.1	.036	0.26	.014	2.5	20	9
858	10-20	7.1	0.04	20																
859	20-30	7.9	0.09	50	.90	28	22	10	40	17	9.0	7.4	0.1	4.5	.016	0.24	.013	3.4	24	13
862	50-60	9.1	0.49	410	.86	29	22	10	39	18	5.4	5.8	0.1	6.5	.023	0.24	.013	3.8	30	14
865	80-90	9.1	0.93	1390	.56	25	22	12	41	22	6.0	6.0	0.1	11.0	.035	0.48	.034	4.0	29	16
868	110-120	9.4	0.58	870		34	32	13	21	19	4.3	5.6	0.1	12.3	.078	1.06	<.001	2.8		

Lab. No.	Depth cm	Org. C %	Tot. N %	Acid Extr. P ppm	Bicarb Extr. P ppm	Repl. K m.equiv/100g	Fe D.T.P.A.	Mn D.T.P.A.	Cu Extr. ppm	Zn Extr. ppm	B ppm
857	0-10	1.3	.08	16	16	0.1					
858	10-20	0.4	.04	4	7	<0.1					

Soil Profile Class: 5 Dyd

Great Soil Group: Solodized solonetz.

Parent Material: Colluvial deposits at the base of Mt. Louisa

Topography: Colluvial foot slopes.

Vegetation: Low open shrubland. False sandalwood and beefwood.

Site No: 47

Location: 3100 m S.S.W. of S.W. corner of Sample Area 1.

Australian Map Grid Reference: Zone E55 539750E, 7815650N

Air Photo Reference:

Principal Profile Form: Dy 2.43

Profile Morphology: Surface: Hard setting. 10% rock outcrop.

0 - 9 cm Greyish yellow brown (10YR 4/2); sandy clay loam; massive; dry very hard. Sharp to -

9 - 10 cm Conspicuous bleach. Sharp to -

10 - 20 cm Greyish yellow brown (10YR 4/2); light medium clay with moderate amounts of grit; strong medium columnar; dry extremely hard; small amounts of concretionary lime and manganiferous concretions. Gradual to -

20 - 70 cm Greyish yellow brown (10YR 4/2); light medium clay with abundant grit; strong fine sub angular blocky to blocky; dry extremely hard; small amounts of concretionary lime and abundant amounts of manganiferous concretions. Diffuse to -

70 - 120 cm Greyish yellow brown (10YR 4/2); light clay with abundant grit; strong fine sub angular blocky to blocky; dry extremely hard; small amounts of concretionary lime and abundant amounts of manganiferous concretions. Diffuse to -

120 - 150 cm Greyish yellow brown (10YR 4/2), 40% red yellow mottle; light clay; moderate amounts of grit; strong fine prismatic to fine sub angular blocky; small amounts of concretionary lime and abundant amounts of manganiferous concretions.

Laboratory Data:

Lab. No.	Depth cm	pH 1:5	E.C.(1:5) mScm^{-1}	Cl ppm	Dispersion Ratio (R_1)	C.S.	F.S.	Si	C	C.E.C.	Ca^{++}	Mg^{++}	K^+	Na^+	P	K	S	Moisture % 1/3 bar	A.D.	15 bar
						Particle Size % O.D.				Exch.Cations m.equiv/100g					% O.D.					
3962	0-10	6.6	0.17	160	.83	23	37	21	18	10	5.0	3.1	0.4	1.4	.020	1.64	.013	3.5	20	8
3963	10-20	6.8	0.22	270																
3964	20-30	8.0	0.67	1050	.86	14	31	21	33	22	7.6	5.9	0.1	6.8	.012	1.41	.010	5.8	27	14
3967	50-60	8.9	1.34	1810	.92	14	33	19	35	22	6.9	5.8	<0.1	9.5	.010	1.53	.013	5.9	29	14
3970	80-90	8.2	1.16	1720	.87	52	15	14	20	17	5.4	4.2	0.1	7.2	.025	2.09	<.001	4.1	21	10
3973	110-120	8.8	1.22	1720		29	23	15	33	14	5.3	4.2	<0.1	6.8	.012	1.64	<.001	5.2		

Lab. No.	Depth cm	Org. C %	Tot. N %	Acid Extr. P ppm	Bicarb Extr. P ppm	Repl. K m.equiv/100g	Fe D.T.P.A.	Mn D.T.P.A.	Cu Extr. ppm	Zn Extr. ppm	B ppm
3962	0-10	1.1	.10	14	8	0.3					
3963	10-20	0.6	.05	5	4	0.1					

Soil Profile Class: 5 Dda

Great Soil Group: None appropriate.

Parent Material: Tunnel erosion detritus.

Topography: Mid slopes of uplands.

Vegetation: Low woodland. Extensive regrowth. Poplar gum and grey bloodwood.

Site No: 40

Location: Sample Area 1

Australian Map Grid Reference: Zone E55 528975E, 7810300N

Air Photo Reference:

Principal Profile Form: Dd 2.11

Profile Morphology: Surface: Hard setting.

0 - 30 cm Black (10YR 2/1); sandy clay loam; massive; dry hard. Clear to -

30 - 120 cm Brownish black (10YR 2/2), 40% yellow and gley mottle; medium clay with moderate amount of grit and broken gravel; dry hard; moderate amounts of manganiferous concretions. Clear to -

120 - 150 cm Yellowish brown (10YR 5/8), medium clay.

Laboratory Data:

Lab. No.	Depth cm	pH 1:5	E.C.(1:5) mScm^{-1}	Cl ppm	Dispersion Ratio (R_1)	C.S.	F.S.	Si	C	C.E.C.	Ca^{++}	Mg^{++}	K^+	Na^+	P	K	S	Moisture % 1/3 bar	A.D.	15 bar
						Particle Size % O.D.				Exch.Cations m.equiv/100g					% O.D.					
6107	0-10	7.1	0.05	20											.035	0.13	.018		21	11
6108	10-20	6.6	0.03	20																
6109	20-30	6.4	0.02	20	.45	29	21	9	49	16	8.7	3.3	0.1	0.1	.019	0.11	.006	7.8	22	14
6112	50-60	7.0	0.02	20	.29	18	14	4	64	14	8.1	3.0	<0.1	0.2	.017	0.10	.004	5.2	39	18
6115	80-90	6.9	0.02	20	.38	20	17	9	54	15	7.2	2.9	<0.1	0.2	.013	0.09	.003	3.8	24	16
6118	110-120	6.5	0.01	20		19	18	8	55	15	8.2	4.6	<0.1	0.2	.012	0.10	.003	4.5		

Lab. No.	Depth cm	Org. C %	Tot. N %	Acid Extr. P ppm	Bicarb Extr. P ppm	Repl. K m.equiv/100g	Fe D.T.P.A.	Mn D.T.P.A.	Cu Extr. ppm	Zn Extr. ppm	B ppm
6107	0-10	1.5	.09	5	8	0.1					
6108	10-20	1.3	.07	4	7	0.1					

DISSECTED UPLANDS ON INTERMEDIATE INTRUSIVES

Black Earth

Soil Profile Class: 5 Uga

Great Soil Group: Black earth

Parent Material: Diorite dyke.

Topography: Uplands.

Vegetation: Grassland. Cane and blue grasses.

Site No: 39

Location: Sample Area 1

Australian Map Grid Reference: Zone E55 529150E, 7808850N

Air Photo Reference:

Principal Profile Form: Ug 5.12

Profile Morphology: Surface: Weak beta nuram gilgai. Moderately cracking when dry. Weakly self mulching.

0 - 15 cm Black (7.5YR 2/1); medium clay with small amounts of broken diorite; strong fine platy to sub angular blocky; dry extremely hard; small amounts of manganiferous concretions. Diffuse to -

15 - 50 cm Black (10YR 2/1); medium heavy clay; small amounts of broken diorite; strong very coarse lenticular; dry extremely hard; trace amounts of manganiferous concretions. Diffuse to -

50 - 150 cm Brownish black (10YR 3/1); medium clay with abundant diorite rock fragments.

Laboratory Data:

Lab. No.	Depth cm	pH 1:5	E.C.(1:5) $mScm^{-1}$	Cl ppm	Dispersion Ratio (R_1)	C.S.	F.S.	Si	C	C.E.C.	Ca^{++}	Mg^{++}	K^+	Na^+	P	K	S	Moisture % A.D.	1/3 bar	15 bar
						Particle Size % O.D.				Exch.Cations m.equiv/100g					% O.D.					
791	0-10	6.5	0.02	20	.60	25	30	11	34	21	13.9	8.4	0.2	0.8	.045	0.46	.025	3.8	24	12
792	10-20	6.5	0.02	20																
793	20-30	6.6	0.02	20	.47	20	27	10	43	22	13.7	9.6	0.1	0.6	.024	0.36	.015	4.1	28	15
796	50-60	6.8	0.02	20	.43	20	20	10	50	30	13.1	8.0	0.2	0.9	.023	0.29	.013	5.2	34	19

Lab. No.	Depth cm	Org. C %	Tot. N %	Acid Extr. P ppm	Bicarb P ppm	Repl. K m.equiv/100g	Fe D.T.P.A.	Mn D.T.P.A.	Cu Extr. ppm	Zn Extr. ppm	B ppm
791	0-10	1.3	.09	16	21	0.3					
792	10-20	0.9	.06	6	7	0.2					

6. MISCELLANEOUS ALLUVIAL DEPOSITS

Non-Cracking Clay

Soil Profile Class: 6 Ufc

Great Soil Group: Alluvial soil.

Parent Material: Levee deposits of Rocky Ponds Creek.

Topography: Levee

Vegetation: Low woodland. Poplar gum and carbeen.

Site No: 41

Location: 425 m S.W. of Wakala Siding.

Australian Map Grid Reference: Zone E55 564700E, 7804450N

Air Photo Reference:

Principal Profile Form: Uf 6.32

Profile Morphology: Surface: Hard setting.

0 - 10 cm Black (10YR 2/1); fine sandy to silty light clay; moderate fine sub angular blocky to blocky; dry hard to very hard. Diffuse to -

10 - 40 cm Black (10YR 2/1); fine sandy light clay; strong to moderate fine sub angular blocky to blocky; dry hard. Diffuse to -

40 - 60 cm Greyish yellow brown (10YR 4/2); light medium clay, small amounts of grit; strong fine sub angular blocky to blocky; dry extremely hard. Gradual to -

60 - 150 cm Yellowish grey (2.5Y 6/1); medium heavy clay, trace of grit; strong fine sub angular blocky to blocky; dry extremely hard.

Laboratory Data:

Lab. No.	Depth cm	pH 1:5	E.C.(1:5) $mScm^{-1}$	Cl ppm	Dispersion Ratio (R_1)	C.S.	F.S.	Si	C	C.E.C.	Ca^{++}	Mg^{++}	K^+	Na^+	P	K	S	Moisture % A.D.	1/3 bar	15 bar
						Particle Size % O.D.				Exch.Cations m.equiv/100g					% O.D.					
10516	0-10	6.5	0.04	50	.55	11	55	10	24	22	9.4	7.5	0.3	1.9	.051	1.63	.053	2.4	29	10
10517	10-20	6.8	0.05	20																
10518	20-30	6.9	0.04	20	.53	12	59	7	22	19	8.4	6.8	0.1	0.8	.031	1.59	.008	2.2	25	9
10521	50-60	7.5	0.04	20	.81	22	51	6	21	15	4.8	6.8	0.1	1.3	.020	1.77	.004	1.9	21	9
10524	80-90	9.0	0.13	100	.86	13	20	17	50	37	8.2	21.8	0.2	3.6	.019	1.07	.007	3.7	40	20
10527	110-120	9.2	0.56	720		14	21	11	54	38	7.4	24.3	0.2	5.8	.017	0.96	.007	4.3		

Lab. No.	Depth cm	Org. C %	Tot. N %	Acid Extr. P ppm	Bicarb P ppm	Repl. K m.equiv/100g	Fe D.T.P.A.	Mn D.T.P.A.	Cu Extr. ppm	Zn Extr. ppm	B ppm
10516	0-10	1.5	.09	82	18	0.3					
10517	10-20	1.0	.06	56	7	0.2					

MISCELLANEOUS ALLUVIAL DEPOSITS

Duplex Soils

Soil Profile Class: 6 Dda

Great Soil Group: Solodic

Parent Material: Recent alluvial deposits of R.M. Creek.

Topography: Broad levee system of R.M. Creek.

Vegetation: Low open woodland. Poplar gum and carbeen.

Site No: 44

Location: Sample Area 3

Australian Map Grid Reference: Zone E55 569758E, 7803029N

Air Photo Reference:

Principal Profile Form: Dd 1.33

Profile Morphology: Surface: Hard setting.

0 - 15 cm Brownish black (10YR 3/2); clay loam; trace amounts of grit; weak medium sub angular blocky; dry hard. Clear to -

15 - 20 cm Sporadic bleach. Sharp to -

20 - 70 cm Brownish black (2.5Y 3/1); light medium clay; trace amounts of grit; strong medium prismatic to coarse subangular blocky; dry hard to very hard. Diffuse to -

70 - 110 cm Brownish black (2.5Y 3/1); medium clay; trace amounts of grit; strong coarse blocky; dry very hard; small to moderate amounts of powdery lime. Diffuse to -

110 - 150 cm Yellowish grey (2.5Y 4/1); medium clay with trace amounts of grit; moderate to strong very fine lenticular; dry very hard; small to moderate amounts of powdery lime and small amounts of manganiferous soft patches and concretions.

Laboratory Data:

Lab. No.	Depth cm	pH 1:5	E.C.(1:5) mScm^{-1}	Cl ppm	Dispersion Ratio (R_1)	C.S.	F.S.	SI	C	C.E.C.	Ca^{++}	Mg^{++}	K^{+}	Na^{+}	P	K	S	Moisture % A.D.	1/3 bar	15 bar
						Particle Size % O.D.				Exch.Cations m.equiv/100g					% O.D.					
10501	0-10	6.7	0.06	30	.51	35	27	9	29	14	3.7	4.0	0.3	0.9	.017	1.74	.011	2.3	15	6
10502	10-20	6.8	0.05	20																
10503	20-30	7.8	0.11	60	.77	22	27	11	40	21	6.8	8.8	0.1	3.0	.020	1.58	.008	3.4	26	13
10506	50-60	9.5	0.25	60	.85	17	22	13	48	28	7.0	12.3	0.2	8.7	.015	1.23	.021	3.8	32	16
10509	80-90	9.1	1.21	470	.87	12	19	13	56	38	11.0	15.3	0.2	13.0	.012	0.79	.023	4.0	37	18
10512	110-120	9.2	1.15	940		18	21	11	50	35	8.8	13.5	0.2	13.0	.011	0.97	.063	4.1		

Lab. No.	Depth cm	Org. C %	Tot. N %	Acid Extr. P ppm	Bicarb Extr. P ppm	Repl. K m.equiv/100g	Fe D.T.P.A.	Mn D.T.P.A.	Cu Extr. ppm	Zn Extr. ppm	B ppm
10501	0-10	0.7	.04	3	4	0.3					
10502	10-20	0.6	.04	2	3	0.1					

Soil Profile Class: 6 Dba

Great Soil Group: Solodic

Parent Material: Recent alluvial deposits.

Topography: Prior stream levee.

Vegetation: Low woodland. Grey bloodwood, carbeen and Burdekin plum.

Site No: 43

Location: Sample Area 3

Australian Map Grid Reference: Zone E55 566450E, 7803825N

Air Photo Reference:

Principal Profile Form: Dy 2.33

Profile Morphology: Surface: Hard setting.

0 - 19 cm Brownish black (10YR 3/2); sandy loam; weak to moderate fine subangular blocky. Clear to -

19 - 20 cm Sporadic bleach. Sharp to -

20 - 80 cm Dull yellowish brown (10YR 5/4); medium clay; trace amounts of grit; strong medium prismatic; dry very hard; trace of manganiferous concretions and soft patches. Diffuse to -

80 - 120 cm Dull yellowish brown (10YR 5/4); medium clay; trace of grit; strong medium prismatic to blocky; dry very hard; small amounts of manganiferous concretions and soft patches; abundant powdery and concretionary lime. Gradual to -

120 - 150 cm Dull yellowish brown (10YR 5/4); sandy clay loam, trace of grit; moderate medium blocky; dry hard; trace of manganiferous concretions and soft patches; abundant concretionary and powdery lime.

Laboratory Data:

Lab. No.	Depth cm	pH 1:5	E.C.(1:5) mScm^{-1}	Cl ppm	Dispersion Ratio (R_1)	C.S.	F.S.	SI	C	C.E.C.	Ca^{++}	Mg^{++}	K^{+}	Na^{+}	P	K	S	Moisture % A.D.	1/3 bar	15 bar
						Particle Size % O.D.				Exch.Cations m.equiv/100g					% O.D.					
6348	0-10	6.4	0.07	40	.85	38	43	11	8	9	2.5	2.4	0.2	0.2	.019	1.50	.010	1.5	14	5
6349	10-18	6.6	0.05	30																
6350	18-30	7.6	0.08	70	.76	17	33	12	39	22	6.1	9.1	0.1	2.4	.021	1.10	.015	5.6	31	15
6353	50-60	8.8	0.27	380	.99	24	39	11	26	18	4.4	8.8	0.1	3.4	.023	1.30	.012	3.8	23	11
6356	80-90	9.3	0.51	590	.99	17	47	13	24	21	4.2	10.3	0.1	4.0	.027	1.16	.012	4.3	23	11
6359	110-120	9.3	0.37	430		54	25	8	13	11	4.2	6.2	0.1	2.6	.032	1.56	.007	2.6		

Lab. No.	Depth cm	Org. C %	Tot. N %	Acid Extr. P ppm	Bicarb Extr. P ppm	Repl. K m.equiv/100g	Fe D.T.P.A.	Mn D.T.P.A.	Cu Extr. ppm	Zn Extr. ppm	B ppm
6348	0-10	0.8	.05	6	7	0.2					
6350	18-30	0.6	.04	3	6	0.1					

Soil Profile Class: 6 Dbb

Great Soil Group: Solodic

Parent Material: Burdekin River levee deposits.

Topography: Levee.

Vegetation: Woodland. Poplar gum and carbeen.

Site No: 46

Location: Up river 1900 m S.E. of Clare township.

Australian Map Grid Reference: Zone E55 525400E, 7811150N

Air Photo Reference:

Principal Profile Form: Db 1.33

Profile Morphology: Surface: Hard setting.

0 - 10 cm Brownish black (10YR 3/2); fine sandy clay loam; weak fine blocky breaking to massive. Clear to -

10 - 30 cm Sporadic bleach, fine sandy clay loam; weak medium to coarse prismatic; small amount of manganiferous concretions. Sharp to -

30 - 70 cm Dark brown (10YR 3/3); light medium clay; strong fine blocky; dry hard. Diffuse to -

70 - 100 cm Brownish black (10YR 3/2); light clay; dry hard; small amount of concretionary lime and manganiferous concretions. Diffuse to -

100 - 150 cm Brownish black (10YR 2/3); light clay; dry hard; small amounts of concretionary lime and manganiferous concretions.

Laboratory Data:

Lab. No.	Depth cm	pH 1:5	E.C.(1:5) mScm^{-1}	Cl ppm	Dispersion Ratio (R_1)	C.S.	F.S.	SI	C	C.E.C.	Ca^{++}	Mg^{++}	K^{+}	Na^{+}	P	K	S	Moisture % A.D.	1/3 bar	15 bar
						Particle Size % O.D.				Exch.Cations m.equiv/100g					% O.D.					
3947	0-10	6.4	0.03	20	.60	2	41	35	22	21	9.6	7.0	0.3	0.5	.073	2.09	.011	4.9	27	12
3948	10-20	6.4	0.03	20																
3949	20-30	6.6	0.02	20	.69	3	38	37	23	20	8.8	6.9	0.1	1.4	.059	2.03	.009	5.2	28	12
3952	50-60	8.0	0.07	290	.85	2	35	31	32	27	13.5	10.8	0.1	5.7	.027	1.87	.009	6.0	29	16
3955	80-90	8.5	0.59	820	.85	2	34	30	33	29	13.0	11.2	0.1	8.8	.028	1.83	.013	6.5	29	16
3958	110-120	8.7	0.64	830		2	30	29	38	30	13.5	11.0	0.1	10.3	.039	1.79	.017	8.4		

Lab. No.	Depth cm	Org. C %	Tot. N %	Acid Extr. P ppm	Bicarb Extr. P ppm	Repl. K m.equiv/100g	Fe D.T.P.A.	Mn D.T.P.A.	Cu Extr. ppm	Zn Extr. ppm	B ppm
3947	0-10	1.4	.08	66	25	0.4					
3948	10-20	1.4	.08	43	24	0.3					

APPENDIX 4

Land Capability Classification for Lower Burdekin Valley

Limiting Factor	Degree of Limitation	Capability Class (If sole limiting factor)	Sub-Class Symbol
Effective soil depth.	>100 cm	1	d1
	60 - 100	2	d2
	45 - 60	3	d3
	25 - 45	4	d4
	<25	5	d5
Soil physical factors affecting plant growth and management	1. B horizon or sub-soil depth. Depth to B horizon with dry extremely hard consistence		
	>45 cm	1	pb1
	20 - 45	2	pb2
	10 - 20	3	pb3
	<10	4	pb4
	2. Surface crust. Surface soils likely to set hard if overworked.	2	pc2
	Surface soils set hard	3	pc3
	3. Distribution of soil profile classes. Soil distribution is such that 2 or more different soil profile classes occur within a 300 m traverse. Soil profile classes are different such that markedly different inputs are required:		
	For specific crops	3	pd3
	For any crop	4	pd4
	4. Texture of surface soils Sands to sandy loams to:		
	45 - 60 cm	2	pt2
	60 - 90	3	pt3
	>90	4	pt4
Soil salinity or sodicity	Electrical conductivity of 1:5 extract at 25°C is greater than 1 mS cm^{-1} at:		
	30 - 90 cm	3	sa3
	<30	4	sa4
	Exchangeable sodium percentage greater than 15		
	40 - 90 cm	2	so2
	20 - 40	3	so3
	<20	4	so4
Topography	Slopes 0.1 - 0.5%	1	t1
	0.5 - 1.0	2	t2
	1.0 - 3.0	3	t3
	3.0 - 6.0	4	t4
	6.0 - 8.0	5	t5

Limiting Factor	Degree of Limitation	Capability Class (If sole limiting factor)	Sub-Class Symbol
Rockiness and stoniness	Tillage restricted - stone picking required.	3	r3
	Tillage difficult - stone picking required.	4	r4
	Tillage impossible.	5	r5
Microrelief	Vertical interval of gilgai		
	<10 cm	1	g1
	10 - 25	2	g2
	25 - 60	3	g3
	>60	4	g4
Wetness	Requires accurate levelling and storm drains.	2	w2
	Requires permanent drainage.	3	w3
Susceptibility to water erosion.	To reduce erosion to an acceptable level, require:		
	Simple practices	2	e2
	Intensive practices	3	e3
	Pasture phase	4	e4
Susceptibility to flooding	Areas subject to fast stream-rise flooding at frequency less than 1 in 10 years.	2	f2
	Areas subjected to major Burdekin River overbank flood at frequency of more than 1 in 10 years.	3	f3

LAND CLASSES

The following are modified versions of land classes as defined by the United States Bureau of Reclamation (1951).

CLASS 1 - ARABLE

Lands that are highly suitable for irrigation farming, being capable of producing sustained and relatively high yields of a wide range of climatically adapted crops at reasonable cost. They are smooth lying with gentle slopes. The soils are deep and of medium to fairly fine texture with mellow, open structure allowing easy penetration of roots, air and water and having free drainage yet good available moisture capacity. These soils are free from harmful accumulations of soluble salts or can be readily reclaimed. Both soil and topographic conditions are such that no specific farm drainage requirements are anticipated, minimum erosion will result from irrigation and land development can be accomplished at relatively low cost.

CLASS 2 - ARABLE

Lands of moderate suitability for irrigation, being lower than Class 1 in productive capacity. They are not so desirable nor of such high value as lands of Class 1 because of certain correctible or non-correctible limitations. They may have a lower available moisture capacity as indicated by coarse texture or limited soil depth; they may be only slowly permeable to water because of clay layers in the subsoil; or they also may be moderately saline which may limit productivity or involve moderate costs of leaching. Topographic limitations include uneven surface requiring moderate costs for levelling, short slopes requiring shorter length of runs, or steeper slopes necessitating special care and greater costs to irrigate and prevent erosion. Farm drainage may be required at a moderate cost or loose rock or woody vegetation may have to be removed from the surface. Any one of the limitations may be sufficient to reduce the lands from Class 1 to Class 2 but frequently a combination of two or more of them is operating.

CLASS 3 - ARABLE

Lands that are suitable for irrigation development but are of restricted suitability because of greater deficiencies in the soil, topographic, or drainage characteristics than described for Class 2 lands. They may have good topography, but because inferior soils have restricted adaptability, require larger amounts of irrigation water or special irrigation practices and demand greater fertilization or more intensive soil improvement practices. They may have uneven topography, moderate to high concentration of salts or restricted drainage, susceptible to correction but only at relatively high costs. Generally, greater risk may be involved in farming Class 3 lands than better classes of land, but under proper management they are expected to have adequate payment capacity.

CLASS 4 - LIMITED ARABLE OR SPECIAL USE

Lands that have an excessive, specific deficiency or deficiencies susceptible to correction at high cost; or they may have one or more excessive, non-correctible deficiencies thereby limiting their utility to pasture, orchard or other relatively permanent crops. The deficiency may be inadequate drainage, excessive salt content requiring extensive leaching, unfavourable position allowing periodic flooding or

making water distribution and removal very difficult, rough topography, excessive quantities of loose rock on the surface or in the plough zone. On these lands special economic and agronomic and/or engineering studies are required to show they are capable of sustained production and capable of supporting a farm family and meeting water changes if operated in units of adequate size or in association with better lands.

CLASS 5 - NON-ARABLE

Lands in this class are non-arable under existing conditions. They have specific soil deficiencies such as being excessively steep, shallow, rocky, rough or badly eroded or have very high salinity.

APPENDIX 5

1:25 000 Sample Area Mapping Unit Composition

Map Unit	Dominant Profile Class	Associate Profile Class	Minor Profile Class
1 Uga	1 Uga (95%)		1 Dyc, 1 Dda
1 Ugb	1 Ugb (75%)		1 Ugc, 1 Ugd
1 Ugc	1 Ugc (70%)		1 Ugb, 1 Ugd
1 Ugd	1 Ugd (70%)		1 Ugb, 1 Ugc, 1 Dya*, 1 Uge
1 Uge	1 Uge (80%)		1 Uga, 1 Ugd, 1 Dya
1 Dya	1 Dya (70%)		1 Db3*, 1 Ugd*
1 Dyb	1 Dyb (70%)		1 Dya*, 1 Dda*
1 Dyc	1 Dyc (70%)		1 Dda*, 1 Dba:, 1 Dya*
1 Dba	1 Dba (70%)		1 Dda*, 1 Dy3
1 Dbb	1 Dbb (70%)		1 Dy3
1 Dbc	1 Dbc (80%)		1 Dy3, 1 Dba
1 Dda	1 Dda (80%)		1 Dba*
2 Uga	2 Uga (80%)		2 Ugb*, 2 Ugc*, 2 Dya*
2 Ugb	2 Ugb (80%)		2 Uga
2 Ugc	2 Ugc (80%)		2 Ugb, 2 Dya
2 Dbb	2 Dbb (80%)		2 Dba, 2 Uga
3 Uga	3 Uga (80%)		3 Ugd
3 Ugb	3 Ugb (80%)		3 Uga
3 Ugc	3 Ugc (80%)		3 Ugd, 3 Uga
3 Ugd	3 Ugd (80%)		3 Ugc, 3 Uga
3 Uge	3 Uge (80%)		3 Uga
3 Ugf	3 Ugf (80%)		6 Ufa, 6 Ufc
3 Ugg	3 Ugg (>95%)		
3 Ugh	3 Ugh (80%)		3 Dya
3 Ugi	3 Ugi (70%)		3 Ugj
3 Ugj	3 Ugj (70%)		3 Ugi
3 Dya	3 Dya (80%)		3 Ugh
4 Dyb	4 Dyb (80%)		4 Uca, 4 Gna, 4 Dya
4 Dyc	4 Dyc (80%)		5 Dra, 5 Dya
5 Dra	5 Dra (80%)		5 Dya, 5 Dyb, 5 Uga
5 Dyb	5 Dyb (70%)		5 Dra, 5 Pga
6 Ufa	6 Ufa (80%)		6 Dba, 3 Ugf
6 Ufb	6 Ufb (80%)		6 Ufa, 6 Dba
6 Ufc	6 Ufc (80%)		6 Ufc, 6 Ufb, 6 Dba

* Soil profile class occurs in a gilgaied situation with the dominant or associate soil profile class.

Map Unit	Dominant Profile Class	Associate Profile Class	Minor Profile Class
6 Dda	6 Dda (80%)		6 Ufa, 6 Ufb
6 Gna	6 Gna (>95%)		
6 Uca	6 Uca (95%)		
6 Pga	6 Pga (80%)		6 Dba
6 Dba	6 Dba (80%)		6 Dda, 6 Uca
1 Uga-1 Dba	1 Uga (55%)	1 Dba (30%)	1 Dyc
1 Dba-1 Uga	1 Dba (60%)	1 Uga (30%)	1 Dyc
1 Dba-1 Dda	1 Dba (60%)	1 Dda (30%)	1 Dya
1 Dyc-1 Dba	1 Dyc (60%)	1 Dba (30%)	1 Dda
1 Dyb-1 Uga	1 Dyc (60%)	1 Uga (30%)	1 Dba, 1 Dda
2 Ugc-2 Dya	2 Ugc (60%)	2 Dya (30%)	2 Dbb, 2 Uga
2 Dbb-2 Dba	2 Dbb (60%)	2 Dba (30%)	2 Uga
2 Ugc-2 Uga	2 Ugc (55%)	2 Uga (40%)	
4 Gna-4 Dya	4 Gna (55%)	4 Dya (40%)	4 Uca
5 Dra-5 Dya	5 Dra (60%)	5 Dya (30%)	5 Dyb
5 Dyb-5 Dyc	5 Dyb (55%)	5 Dyc (40%)	5 Dra, 5 Pga
5 Dyb-5 Dra	5 Dyb (60%)	5 Dra (30%)	5 Dya, 5 Uga
5 Dyc-5 Dyb	5 Dyc (60%)	5 Dyb (30%)	5 Pga, 5 Dra
6 Uca-6 Dda	6 Uca (50%)	6 Dda (30%)	6 Ufa, 6 Ufc
R	Areas of Rocky outcrop.		
E-3 Uge	Areas of unstable gully erosion on 3 Uge soils.		
E-3 Ugd	Areas of unstable gully erosion on 3 Ugd soils.		
E-1 Ugc	Areas of unstable gully erosion on 1 Ugc soils.		
E-1 Ugd	Areas of unstable gully erosion on 1 Ugd soils.		
E-1 Dba	Areas of unstable gully erosion on 1 Dba soils.		

APPENDIX 6

Hubble and Thompson (1953) Soil Series - Soil Profile Class Equivalents.

Hubble and Thompson Soil Series	Soil Profile Class (Equivalents)
Barrunga	1 Uga, 1 Ugb, 1 Ugc, 1 Ugd
Lingilor	1 Uge
Gaynor*	1 Dya, 1 Dyb, 1 Dyc, 1 Dba, 1 Dbb, 1 Dbc, 1 Dda
Koberinga	3 Uga, 3 Ugb, 3 Ugc, 3 Ugd
Barratta	2 Uga, 2 Ugb, 2 Ugc
Oakey	2 Dya, 2 Dbb
Dowie	2 Dba
Tolgai**	3 Ugh, 3 Ugi, 3 Ugj
Grendal	4 Dyc
Woodhouse	4 Dya
Mulgrave	4 Dyb
Dalrymple***	5 Dra
Kyanoota	5 Dyb
Ranly	5 Dyc
Wygong	5 Uga
Burdekin	6 Uma
Farencer	6 Gna
Wenlee	6 Uca
Glenalder	6 Dbb

* Underly are very similar to Gaynor (Hubble and Thompson, 1953, p. 15)

** Tolgai have similar profile descriptions (Reeve *et al*, 1960 pp 33-34) to 3 Ugh, 3 Ugi, 3 Ugj. The vegetation differs (Hubble and Thompson, 1953 p. 15) suggesting there may be some soil differences. Tolgai, as mapped by Hubble and Thompson are not found within the area of this survey, but further south near Kirknie Creek and Bogie River.

*** Dalrymple are similar to 5 Dra, differing only in subsoil pH. Dalrymple are described as red brown earths by Reeve *et al* (1960, p. 3) with alkaline lower subsoils. Within the area of this survey all profiles had neutral subsoils and are considered non-calcic brown soils. Isbell and Murtha (1970) described them as neutral red duplex soils.

APPENDIX 7

Classification of Soil Profile Classes Sampled for Analysis

Site No.	Soil Profile Class	Principal Profile Form (Northcote, 1971)	Great Soil Group (Stace *et al*, 1968)	Soil Taxonomy Subgroup (Soil Survey Staff, 1975)
1 a	1 Uga	Ug 5.16	Black earth	Typic Pellustert
1 b	1 Uga	Ug 5.16	Black earth	Typic Pellustert
2 a	1 Ugb	Ug 5.28	Grey clay	Entic Pellustert
2 b	1 Ugb	Ug 5.16	Black earth	Typic Pellustert
3 a	1 Ugc	Ug 5.28	Grey clay	Entic Chromustert
3 b	1 Ugc	Ug 5.15	Black earth	Typic Pellustert
4 a	1 Ugd	Ug 5.24	Grey clay	Entic Pellustert
4 b	1 Ugd	Ug 5.16	Black earth	Typic Pellustert
52 a	1 Uge	Ug 5.28	Grey clay	Entic Chromustert
52 b	1 Uge	Ug 5.28	Grey clay	Entic Pellustert
6	1 Dya	Dy 2.33	Solodized solonetz	Typic Natrustalf
7	1 Dyb	Dy 2.33	Solodic	Typic Natrustalf
8	1 Dyc	Dy 2.33	Solodized solonetz	Typic Natrustalf
9	1 Dba	Dy 2.33	Solodized solonetz	Typic Natrustalf
10	1 Dbb	Db 1.33	Solodic	Typic Natrustalf
11	1 Dbc	Db 2.43	Solodized solonetz	Typic Natrustalf
12	1 Dda	Dd 1.33	Solodic	Mollic Natrustalf
13	2 Uga	Ug 5.29	Grey clay	Entic Pellustert
14	2 Ugb	Ug 5.25	Grey clay	Entic Pellustert
15 a	2 Ugc	Ug 5.25	Grey clay	Entic Chromustert
15 b	2 Ugc	Ug 3.2	Grey clay	Entic Pellustert
16	2 Dya	Dy 2.33	Solodic	Typic Natrustalf
17	2 Dba	Db 1.33	Solodic	Aridic Haplustalf
18	2 Dbb	Db 1.33	Solodic	Aridic Paleustalf
19	3 Uga	Ug 5.16	Black earth	Typic Pellustert
20	3 Ugb	Ug 5.16	Black earth	Typic Pellustert
21 a	3 Ugc	Ug 5.16	Black earth	Typic Pellustert
21 b	3 Ugc	Ug 5.28	Grey clay	Entic Pellustert
22	3 Ugd	Ug 5.16	Black earth	Typic Pellustert
24	3 Ugf	Ug 5.1	Black earth - alluvial soil intergrade	Vertic Ustropept
25 a	3 Ugg	Ug 5.29	Grey clay	Entic Chromustert
25 b	3 Ugg	Ug 5.25	Grey clay	Entic Chromustert
26	3 Ugh	Ug 5.28	Grey clay	Entic Pellustert
27 a	3 Ugi	Ug 5.28	Grey clay	Entic Pellustert
27 b	3 Ugi	Ug 5.28	Grey clay	Entic Pellustert
28 a	3 Ugj	Ug 5.28	Grey clay	Entic Chromustert
28 b	3 Ugj	Ug 5.28	Grey clay	Entic Pellustert
29	3 Dya	Dy 2.33	Solodic	Typic Natrustalf

Site No.	Soil Profile Class	Principal Profile Form (Northcote, 1971)	Great Soil Group (Stace *et al*, 1968)	Soil Taxonomy Subgroup (Soil Survey Staff, 1975)
31	4 Dyb	Dy 3.43	Solodized solonetz	Typic Natrustalf
32	4 Dyc	Dy 3.21	Yellow podzolic	Aquultic Haplustalf
34	4 Gna	Gn 2.85	Siliceous sand	Arenic Haplustalf
30	4 Dya	Dy 3.43	Solodized solonetz	Typic Natrustalf
35	5 Dra	Dr 2.12	Non-calcic brown soil	Udic Paleustalf
36	5 Dya	Dy 2.11	None appropriate	Udic Haplustalf
37	5 Dyb	Gn 3.23	None appropriate	Udic Paleustalf
38	5 Dyc	Dy 2.43	Solodized solonetz	Mollic Natrustalf
47	5 Dyd	Dy 2.43	Solodized solonetz	Typic Natrustalf
40	5 Dda	Dd 2.11	None appropriate	Udic Paleustalf
39	5 Uga	Ug 5.12	Black earth	Typic Pellustert
41	6 Ufc	Uf 6.32	Alluvial soil	Typic Ustropept
44	6 Dda	Dd 1.33	Solodic	Mollic Natrustalf
43	6 Dba	Dy 2.33	Solodic	Mollic Natrustalf
46	6 Dbb	Db 1.33	Solodic	Mollic Natrustalf

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