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Soils and land suitability of Haughton Section - Stage III Burdekin River Irrigation Area North Queensland

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Land Use and Fisheries

DPI QUEENSLAND DEPARTMENT OF PRIMARY INDUSTRIES

Queensland Government Technical Report

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Summary

A high intensity soil survey (scale 1:25 000) and land suitability assessment were undertaken in Haughton Section, Stage III in the Burdekin River Irrigation Area (BRIA), North Queensland. The area covers 5 036 ha and is located to the southwest of Ayr and northwest of Clare. The area is generally low lying and is subject to frequent excess water on a local scale during the wet season.

The area contains only two landscape units, but has a total of 380 unique map areas (UMAs) with 78 soils and phases making landuse fairly complex. The soils of landscape unit 6 (miscellaneous alluvial landforms) are extensive and variable, are usually located on the higher ground and cover 3 525 ha (70% of the total area). The most common soils in this landscape unit are uniform medium-textured soils and non-sodic and weakly sodic duplex soils. Cracking clays and sodic duplex soils are the main soils of landscape unit 2 (Burdekin and Haughton River alluvial plains).

Soil distribution and distinguishing morphological characteristics and analytical data of the soils mapped are presented in this report. Twelve representative soil profiles were analysed and the results used to discuss the chemical and physical properties of the major soils of the survey area as well as their effects related to management.

Each mapping unit was assessed as to its suitability for the major crops of the region ie. furrow irrigation of sugar-cane, grain crops and small crops, or for low volume irrigation of mangoes and for flood irrigation of rice. The land suitability assessment indicates the total area suitable for sugar-cane is 3 899 ha, for maize 3 778 ha, for rice 1 258 ha, for capsicums 708 ha and mangoes 2 190 ha. A total of 670 ha is unsuitable for any of the crops considered because of limitations (such as extreme sodicity, poor internal drainage, excessive slope, excessive wetness, severe existing erosion) or complex soil distribution.

A soils map (1:25 000) and a land suitability map (1:50 000) indicating the extent of land suitability classes for the above crops accompany this report. Soil and land limitations related to the crops or crop groups under appropriate irrigation methods are discussed in detail. Potential problems in land development and management of the area, which are of particular concern involve nematode populations, excessive water fluxes (and the associated land degradation) or the complexities of soil distribution. There is an urgent need to investigate the hydrology of the area, especially that relating to the freely draining soils.

1. INTRODUCTION

The Queensland Department of Primary Industries (DPI) is undertaking a series of high intensity surveys at a scale of 1:25 000 throughout the Burdekin River Irrigation Area (BRIA). Haughton Section, Stage III adjoins the Haughton River and is part of the BRIA. The survey area is within the broadscale 1:100 000 soil survey of the Burdekin Left Bank (Reid and Baker 1984). The purpose of this survey is to provide the design engineers of Water Resources with detailed land resource information and an assessment of land suitability for irrigation farm design. This information is also provided to prospective farm purchasers and subsequent landholders, extension officers of DPI and Bureau of Sugar Experiment Station (BSES), and other agribusiness groups to assist with farm development planning and crop management.

The Haughton Stage III covers 5 036 ha. It is located between the Haughton River and Gumhole overflow, northwest of Clare and south of Horseshoe Lagoon. The location of the area is shown in Figure 1.

This report contains detailed soils information and a detailed assessment of suitability for irrigated crops. It highlights the unsuitable areas for irrigation farm design and the constraints in the development of the area. A soils map (at 1:25 000) and a land suitability map (at 1:50 000) for five commonly grown crops are attached at the back of this report.

2. PHYSICAL ENVIRONMENT

2.1 Climate

Haughton Stage III is in the dry tropics and has distinct wet and dry seasons. The dry season spans from April to November.

The average annual rainfall at Clare (14 km to the southeast) from 1952 to 1986 is 893 mm and 75 percent falls between December and March. Rainfall intensity and duration is highly variable.

In Ayr (28 km to the northeast), the average maximum temperature in December is 32.5°C and average minimum for July is 11.5°C. Frosts (screen temperatures <2°C) and heat waves (maximum screen temperatures >38°C) are rare. Mean pan evaporation varies from 3-4 mm per day in July to 7 mm per day in November-December.

A detailed analysis of the climatic data can be found in Donnollan *et al.* (1990).

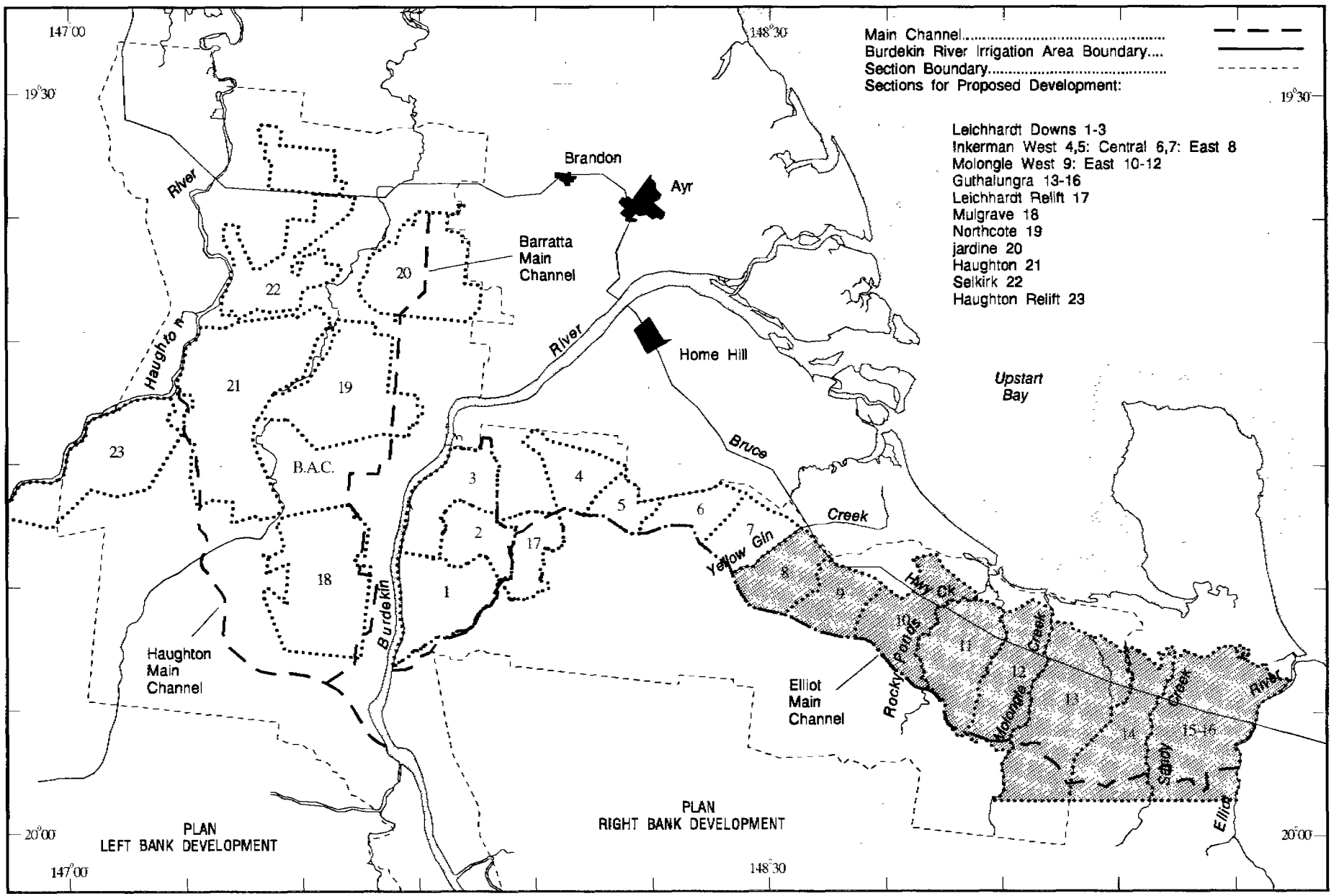

Figure 1. Burdekin River Irrigation Area general layout and location of Right Bank - Yellow Gin Creek to Elliot River Study

2.2 Geology and Landscape Units

The alluvial deposits, from which the present soils and landform pattern are derived, were laid down in the Pleistocene/Holocene period, 4 500 to 7 000 years ago (Hopley 1970, Reid and Baker 1984). The detailed surface features have since evolved through fluvial geomorphology.

The terrain in the area is characterised by two landscape units: Landscape Unit 2 (LU2) comprises low-lying, very gently sloping alluvial plains of the Haughton and Burdekin Rivers whereas Landscape Unit 6 (LU6) consists of miscellaneous alluvial landforms, river levees, relict levees and prior streams. Landscape Unit 6 generally occupies higher positions. Unlike previous detailed survey areas of the left bank, LU6 is more extensive and covers 70 percent of the area.

The mainly clayey alluvial sediments of LU2 were deposited in a low energy environment of slow-moving waters, which later developed to cracking clays and sodic duplex soils. The alluvial sediments of LU6 represent a later alluvial cycle when another sequence of deposition occurred. Most soils of LU6 are well drained. Those soils on the levee of the Haughton River are medium-textured. However, there are some cracking clays and non-cracking clays in small depressions that are relicts of prior stream deposits untransgressed by later alluvial activities. These soils are probably as old as the clayey soils found in LU2.

2.3 Vegetation

The vegetation was systematically recorded during the field survey. The general relationships between vegetation and soils noted in Reid and Baker (1984) hold true for this area. Appendix I shows the common names and scientific names of the species recorded during the soil survey.

Most of the area is medium to high woodland or open woodland. Poplar gum *(Eucalyptus platyphylla)* is the most common tree and occurs in both LU2 and LU6. Carbeen *(Eucalyptus tessellaris)* is more common in LU2, particularly on cracking clays. Broad-leaf tea-tree *(Melaleuca viridiflora)* is common in areas subject to seasonal or prolonged waterlogging. Trees are sparse in areas of sodic duplex soils of both LU2 and LU6. In addition, indicator trees of cabbage gum *(Eucalyptus papuana)* and beefwood *(Grevillea striata)* are common on these soils. A tall shrubland of beefwood and false sandalwood *(Eremophila mitchellii)* occurs on strongly sodic duplex soils.

Cocky apple *(Planchonia careya)* is common on soils of LU6. Vegetation is tallest and most dense on well-drained soils, medium-textured soils on levees and coarse-textured soils on prior streams of LU6. Grey bloodwood *(Eucalyptus polycarpa)* is generally present as an indicator tree on these well-drained soils. In addition, pandanus is always present on coarse-textured soils.

2.4 Hydrology

The landform and drainage pattern in the area are mainly controlled by the fluvial geomorphology of the Pleistocene/Holocene. The surface drainage in the area is poor because of the well-developed levees of the Haughton River and Gumhole overflow, and the lack of drainage channels within the area. Runoff water from rainfall is collected in the depressions and abandoned distributaries and channels running in a northeasterly direction. The excess water eventually drains into tributaries of Barratta Creek to the north and northeast of the area.

Major floods in the past are evident in the northwestern portion of the area where patches of coarse material with a mixture of sands, gravels and rounded pebbles are associated with soils of LU6. The probable cause of this deposition was the additional intensity and volume of water from Major Creek to the west flowing into the Haughton River. Depressions and areas adjacent to abandoned channels are inundated by local runoff and backflooding from the Barratta Creek system whenever there is a distinct wet season. However, significant flooding in the Barratta Creek system occurs only once every three to five years and in the Haughton River only once every five to seven years (Reid and Baker 1984). A major flood similar to those of 1940, 1946 or 1958 is likely to occur once in 35 years (McIntyre and Associates, unpublished). Inundation in this area would be expected to be greater than one metre, and more than two metres in the depressions.

3. METHODOLOGY

Rectified 1:10 000 colour aerial photographs were interpreted to delineate physical features such as terrain, and density and tone of vegetation. The location of pegged grids of 250 m x 100 m established by Water Resources surveyors, were then marked on the photos so as to ensure accurate positioning of the field observation sites.

A free survey technique was used to establish soil boundaries. Soils, land surface features and vegetation were recorded in a systematic field survey of the area. The number of observation sites depended on the complexity of soil distribution from aerial photo interpretation and from information about the soils from the earlier broadscale survey of Reid and Baker (1984). Site numbers are lowest in areas of cracking clays and more intense in the miscellaneous alluvial landscape (LU6) where soils are more variable. Soil profiles were described on an average of one site per 6 hectares. This is within the maximum intensity recommended for 1:25 000 scale mapping and the minimum for 1:10 000 scale mapping (Reid, 1988). This intensity also accommodates the use of a 1:10 000 scale working map by Water Resources in farm design, although the final published coloured map is 1:25 000 scale.

The field survey was conducted with a vehicle fitted with a soil-coring rig. The soil profile, vegetation and site characteristics were recorded using the terminology of McDonald *et al.* (1984). The recorded information was later entered onto a computer using the WARIS software program (Rosenthal *et al.* 1988). Boundaries of unique map areas (UMAs) were digitised onto a geographic information system (GIS) using ARC/INFO software (see Section 3.1 for explanation of UMAs). The Australian Map Grid (AMG) coordinates of each observation site were recorded and added to the site description file. Representative soils of the area were sampled from soil pits and their physical and chemical properties analysed to fully characterise the major soils. Figure 2 shows the location of the soil sampling sites.

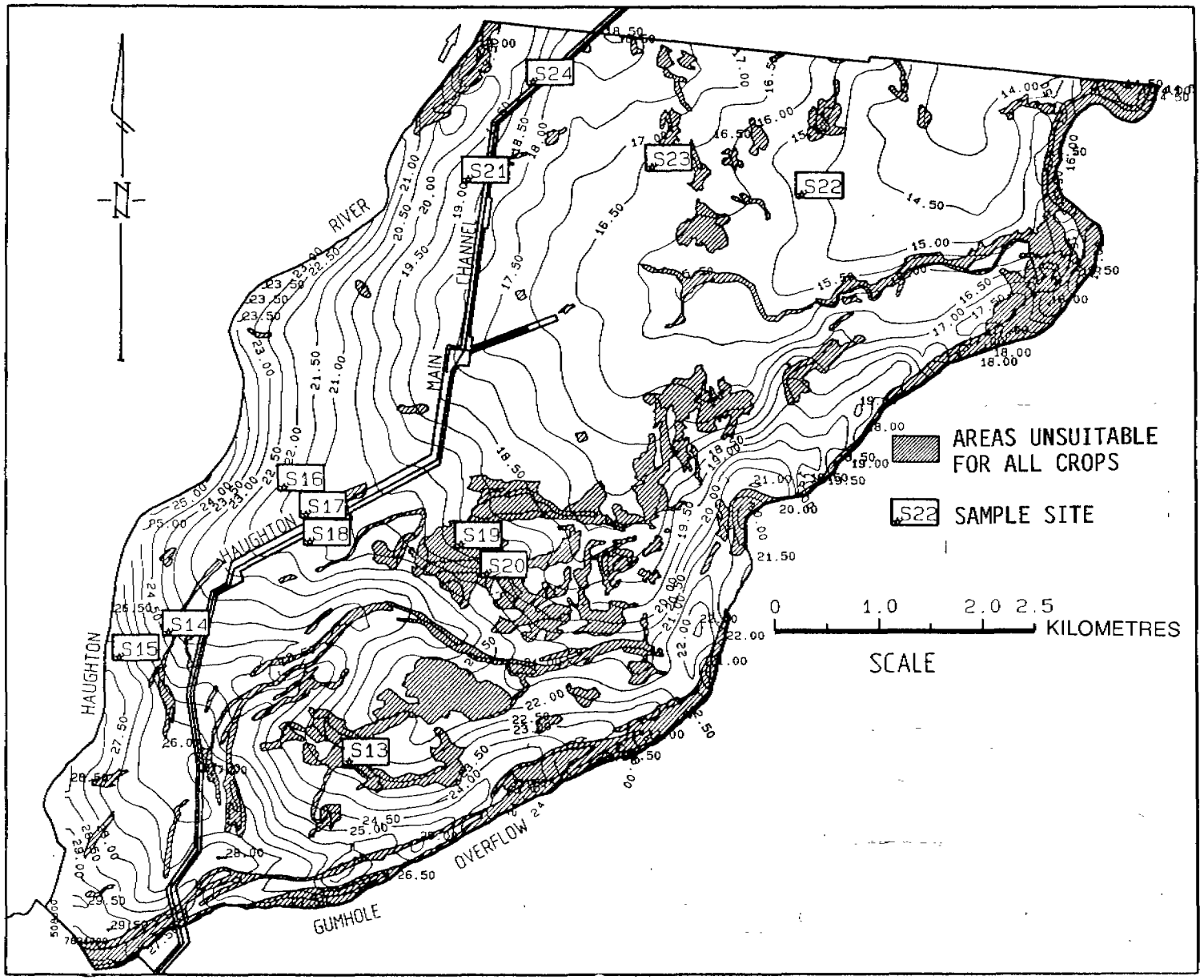

Figure 2. Contours, location of sample sites and areas unsuitable for all crops in Haughton Section, Stage III, BRIA

The soils and land information gathered during the soil survey were used to assess the suitability of each UMA for a range of crops and irrigated land use. Each UMA was given a number and a name, and these were added to the site description file. This links the site description file with the UMA file which contains land suitability data for each UMA. A Land Suitability map for the main crops was published at the scale of 1:50 000 (see back of report).

3.1 Soil classification and mapping units

Soil classification in the BRIA employs an alphanumeric code to identify each soil type (Thompson and Reid 1982). The first number of the code indicates the landscape unit. The two letters following the number represent the appropriate subdivision of the primary profile form (Northcote 1979), and the last letter separates each soil type within the primary profile form. Soil characteristics considered important for irrigated land use and crop production were used as criteria for differentiating soil type. For example, code 2Uge denotes a soil type of landscape unit 2 (Burdekin-Haughton River alluvial plain); "Ug" indicates that the soil type is a uniform-textured cracking clay, a subdivision of the primary profile form (Northcote, 1979) and the last letter "e" separates this soil type from other soil types of the same landscape unit and primary profile form. The separation is based on its distinctive morphological and chemical properties. Details of the soil classification is found in Thompson and Reid (1982) and Loi *et al.* (in press).

This soil classification was used to classify all the soil profiles described in the area. Infrequently, where characteristics of a soil profile differ from the modal soil type it is classified as a variant of that soil type and denoted by a number after the soil code, e.g. 2Uge2. Major distinguishing characteristics of the soil types of Haughton Stage III are shown in Table 1. Brief descriptions of the soil types mapped is given in the reference of the soils map (see back of this report). Correlation of the soil types with other soil classifications is shown in Table 2, and correlation with USDA Soil Taxonomy (Soil Survey Staff 1992) is shown only for the sampled soil profiles (Appendix II). A detailed correlation of the soil types with other soil classifications can be found in Loi *et al.* (in press).

Each occurrence of a map unit within the survey area was termed a unique map area (UMA; Basinski 1978) and each allocated a number. A simple UMA consisted of a single soil type which occupied 70% or more of the UMA and was named after the soil type name, eg. 2Uge. A complex UMA comprises two or more soil types none of which occupy 70% of the mapping unit. A complex UMA was named after the two most common soil types with the dominant soil type named first, eg. 2Uge-2Ugd. In some areas a phase of the normal soil type was used to identify a terrain feature that affected land use or management. Phases are identified by a capital letter code after the soil type, for example, 6DbcE indicates the mapping unit 6Dbc has an eroded phase(E).

Table 1. Major distinguishing characteristics of the soils of Haughton Section, Stage III, BRIA

Soil** Type	A Horizon			B Horizon		pH at 0.3 m	Depth (m) pH ≥ 8.5	D Horizon	
	Depth *** (m)	Texture	Mottled=M Bleached = B	Colour++	Texture			Depth (m)	Texture
2Dba	0.08	CLFS	M,B	B	LMC-MC	9.5	0.3	-	-
2Dbc	0.25-0.4	LFSY-ZCL	(M)+,B	G,B	MC	6.8 [6.0-7.6]*	0.9	0.8-1.0	SC-LMC
2Dbd	0.2-0.32	LFSY-CL	M,B	Bk,B	LMC-MHC	7.3 [6.0-7.6]	0.6	0.7-1.2	FSC
2Dbe	0.2	CL	M,B	G,B	MC-MHC	6.4 [6.1-6.6]	0.9	1.2-1.3	CL-LMC
2Ddb	0.05-0.12	LFSY-CL	M,B	Bk,G,B	LMC-MC	8.8 [8.5-9.4]	0.3	0.65-0.95	FSC-MC
2Dya	0.1	CL	-,B	G	LMC	7.6	0.6	0.85-1.0	SC-LMC
2Dyb	0.14-0.2	LFSY-CL	(M),B	Bk,G,B	LMC-MC	7.3 [5.8-8.5]	0.6	0.6-1.0	LC-MC
2Dyc	0.16-0.27	L-CL	M,B	G	LMC-MC	6.1 [5.8-6.6]	0.9	0.95-1.35	FSC-MC
2Ugc	0.05-0.15	LC-LMC	(M,B)	G	MC-MHC	6.3 [5.8-6.8]	1.2	0.8-1.4	SC-LMC
2Ugd	0.1-0.25	LC-LMC	M,B	G,B	MC-MHC	6.5 [6.0-6.8]	0.9	0.8-1.4	LC-MC
2Uge	0.05-0.2	LC-LMC	(M,B)	G,B	MC	7.8 [7.5-8.9]	0.6,(0.3)+	0.8-1.2	LMC-MC
2Ugf	0.05	MC	-,B	G	MC	6.0 [5.8-6.2]	0.9	-	-
2Ugg	0.12-0.15	MC	-,-	G	MC	7.4 [6.6-8.2]	0.6,(0.9)	-	-
2Ugk (Mound)	0.1	MHC	-,-	G	MC	6.2	0.6	-	-
6Dba	0.18-0.28	SL-SCL	-,B	G,B	SC-MC	6.8 [6.5-7.0]	0.6	(0.5-1.05)+	(LC-LMC)+
6Dbb	0.2-0.35	CLFS-CL	-,B	G,B	LMC-MC	6.3 [6.0-6.6]	0.9	1.1-1.2	FSC-LC
6Dbc	0.25-0.38	LFSY-CLFS	-,B	B	LMC-MC	6.3 [5.8-6.9]	-	0.6-1.3	SL-LMC
6Dbd	0.2-0.35	SL-CL	M,B	B	LMC-MC	7.3 [6.0-7.6]	(0.9), 1.2	0.65-1.4	LS-LMC
6Dbe	0.18-0.2	LFSY-CL	-,B	B	LMC-MC	7.0 [6.6-7.3]	0.9	0.6-0.85	LS-FSC
6Dbf	0.2-0.35	FSL-LFSY	-,-	B	FSC-MC	6.3 [5.8-6.9]	-	0.6-1.4	KS-SC
6Dbg	0.7-1.1	FSL-L	-,-	G	LMC	7.9	-	-	-
6Dbh	0.12-0.2	LFSY-CLFS	-,B	B	LMC-MC	7.5 [7.0-7.9]	0.6	0.65-1.1	LC
6Dda	0.15-0.25	L-CL	-,B	Bk	LMC-MC	6.6 [5.8-7.8]	0.9	0.6-1.2	SCL-FSC
6Dga	0.25	LFSY	-,-	G	FSC-ZC	6.7	(1.2)	0.8	FSL
6Drb	0.2-0.35	L-CL	-,(B)	R	LMC-MC	6.4 [5.9-6.6]	-	(0.6-1.25)	(SCL-SC)

Table 1. (continued)

Soil Type	A Horizon			B Horizon		pH at 0.3 m	Depth (m) pH ≥ 8.5	D Horizon	
	Depth *** (m)	Texture	Mottled=M Bleached = B	Colour++	Texture			Depth (m)	Texture
6Drc	0.25-0.35	LFSY	-,B	R	MC	5.9	1.2	1.1-1.3	SC-MC
6Dyb	0.28-0.4	CS-SCL	-,B	B	SC-LMC	5.9	-	(0.7-1.1)	(SCL-MC)
6Dyc	0.4-0.65	LFSY	-,B	G,B	LMC-MC	6.3 [5.8-6.7]	-	0.65-1.3	SC
6Dyd	0.3-0.4	LFSY	-,B	G,B	LMC	6.2 [5.8-6.4]	-	0.55-1.4	SCL-SC
6Dyf	0.2-0.4	L-CL	M,B	G,B	LMC-MC	6.1 [5.8-6.8]	0.9,(1.2)	0.7-1.4	SCL-LMC
6Dyg	0.1-0.2	L-CL	M,B	G,B	LMC-MHC	6.8 [6.0-7.9]	0.6	0.7-1.4	SCL-LMC
6Dyj	0.08-0.2	SL-CL	(M),B	Bk,G,B	LMC-MC	8.7	(0.1),0.3	0.6-1.3	FSL-LMC
6Gna	0.25-0.35	CL	-,-	Bk,G,B	LMC-MC	6.6 [6.0-7.0]	(1.2)	0.9-1.1	LS-SC
6Gnc	0.3	SCL-CL	-,B	B	LMC	6.8 [6.6-6.9]	1.2	0.75	FSL
6Ucb	0.3-0.8	S-SL	-,B	B	S-SL	6.2 [5.9-6.6]	-	-	-
6Ucc	0.3-1.2	LS-SL	-,-	B	S-SCL	6.3 [6.0-6.6]	-	-	-
6Ufc	0.1-0.4	LC	-,-	G	LC-MC	6.0 [5.5-6.6]	(1.2)	0.85-1.1	SC
6Ufd	0.1-0.35	ZC-LC	(M,B)	Bk,G,B	LC-MC	6.0 [5.9-6.2]	-	0.5-1.3	KS-FSC
6Ugc	0.1-0.35	LC	(M),B	G	LMC-MC	6.4 [5.8-8.4]	0.9,(1.2)	0.8-1.4	FSC-LMC
6Uma	0.2-0.35	SL-CLS	-,-	Y,B	SL-CLFS	6.4 [6.0-7.0]	-	0.8-1.4	S-SCL
6Umb	0.2-0.6	LFSY-CL	-,-	Y,B	SCL-LC	6.2 [5.9-7.0]	(1.2)	(0.8-1.4)	(S-MC)

\+ ( ) - Characteristic not always present.
++ Bk = Black, G = Grey, B = Brown, Y = Yellow, R = Red (Isbell 1993).
* [ ] - range of values.
** Soil phases are not included.
*** Refer to depth recorded during the survey.

Table 2. Correlation of DPI soil types with other soil classifications and groupings in Haughton Section, Stage III, BRIA

DPI Soil type	Principal profile form+	Soil++ series	BRIA soil* group	Australian soil classification**
2Dba	Db1.33	Dowie	2A	Calcic, Hypernatric, Brown Sodosols
2Dbc	Db1.33, Dy2.43, Dy3.43, Dd1.43	Oakey	2C	Calcic, Mesonatric, Brown, Grey and Black Sodosols
2Dbd	Db1.43, Dy2.33, Dy2.43, Dd1.33	Oakey	2B	Calcic, Mesonatric, Brown, Grey and Black Sodosols
2Dbe	Db1.33, Db2.33, Dy2.33	Oakey	2C	Calcic, Mesonatric, Brown, Grey and Black Sodosols
2Ddb	Dy2.33, Dd1.33	Dowie	2A	Calcic, Hypernatric, Black and Grey Sodosols
2Dya	Dy2.33, Dy2.43	Oakey	2B	Calcic, Mesonatric, Grey and Brown Sodosols
2Dyb	Dy2.33, Dy2.43, Dy3.33, Dy3.43, Dd1.33, Dd1.43	Oakey	2B	Calcic, Mesonatric, Grey and Black Sodosols
2Dyc	Dy3.33, Dy3.43	Oakey	2B	Calcic, Subnatric, Grey and Brown Sodosols
2Ugc	Ug3.1, Ug5.24, Ug5.28	Barratta	1A	Mottled, Epipedal, Grey Vertosols
2Ugd	Ug2, Ug3.2, Ug3.3	Barratta	1A	Mottled, Epipedal, Grey and Brown Vertosols
2Uge	Ug3.2, Ug5.24, Ug5.28	Barratta	1A	Mottled, Epipedal, Grey and Brown Vertosols
2Ugf	Ug3.2, Ug5.28	Barratta	1B	Mottled, Epipedal, Grey Vertosols
2Ugg	Ug5.28	Barratta	1B	Epipedal, Grey Vertosols
6Dba	Db1.33, Db1.43, Dy2.43	Embie	2B	Calcic, Mesonatric, Grey and Brown Sodosols
6Dbb	Db1.33, Db1.43, Dy2.33, Dy2.43	Glenalder	2C	Hypocalcic, Subnatric, Brown and Black Sodosols
6Dbc	Db1.22, Db1.32, Dy2.22, Dy2.32	Glenalder	3A	Haplic, Eutrophic, Brown Chromosols
6Dbd	Db1.33, Db1.43, Db2.43	Glenalder	2C	Bleached-Sodic, Calcic, Brown Chromosols
6Dbe	Db1.43	Glenalder	2C	Bleached-Mottled, Eutrophic, Brown Chromosols
6Dbf	Db1.22, Dy2.12, Dy2.22	Glenalder	3A	Haplic, Eutrophic, Brown Chromosols
6Dbh2	Dy2.33, Dy2.43	Noto	2A	Hypocalcic, Hypernatric, Brown Sodosols
6Dda	Dd1.33, Dd1.43	Wilkey	2B	Hypocalcic, Mesotrophic, Black Sodosols
6Dga	Dg2.42	Grendal	-	Chromosolic Redoxic Hydrosols
6Drb	Dr2.32, Dr3.42	Lancer	3A	Bleached-Mottled, Eutrophic, Red Chromosols
6Drc	Dr3.43	Lanona	2C	Bleached-Sodic, Calcic, Red Chromosols
6Dyb	Dy3.31, Dy3.41, Dy3.42	Clare	2C	Bleached-Mottled, Brown and Grey Chromosols
6Dyc	Dy3.32, Dy3.42	Tootra	3A	Bleached-Mottled, Eutrophic Brown Chromosols
6Dyd	Dy3.32, Dy3.41, Dy3.42	Tootra	3A	Bleached-Mottled, Eutrophic, Brown Chromosols
6Dyf	Dy2.43, Dy3.33, Dy3.43	Lanona	2C	Bleached-Mottled, Calcic, Brown Chromosols
6Dyg	Dy2.33, Dy2.43, Dy3.43	Kelona	2B	Calcic, Mesonatric, Grey and Brown Sodosols

Table 2 (continued)

DPI Soil type	Principal profile form+	Soil++ series	BRIA soil* group	Australian soil classification**
6Dyj	Dy2.33, Dy2.43, Dy3.33	Jacuna	2A	Calcic, Hypernatric, Brown Sodosols
6Gna	Dy2.13	Farencer	4A	Melanic, Brown Dermosols
6Gnc	Gn3.83	Tootra	2B	Sodic-Mottled, Eutrophic, Brown Dermosols
6Ucb	Uc2.21	Hylo	4C	Basic, Brown, Bleached Tenosols
6Ucc	Uc5.11, Uc5.22	Burdekin	4C	Basic, Brown and Yellow, Orthic Tenosols
6Ufc	Uf6.32, Uf6.33	-	4A	Black and Grey Dermosols
6Ufd	Uf6.31, Uf6.32	-	4A	Melanic, Black and Brown Dermosols
6Ugc	Ug2, Ug3.2	-	1A	Haplic, Massive, Grey Vertosols
6Uma	Um5.22, Um5.52	Burdekin	4B	Haplic, Eutrophic, Brown Kandosols
6Umb	Gn3.92, Um5.52, Um6.34	Burdekin	4B	Eutrophic Brown Dermosols

\+ Northcote (1979)

++ Hubble and Thompson (1953)

* Donnollan (1991)

** Isbell (1993)

4. SOILS

4.1 Soil distribution

A total of 380 unique map areas (UMAs) with 78 soil types, phases and variants were mapped over two landscape units (LU2 and LU6). The area of mapping units and frequency of occurrence of UMAs in each mapping unit are shown in Table 3.

The soils of LU6 cover 3 525 ha (70% of the total area). The complexity of the alluvial deposits have caused the development of a variable range of soil types. The uniform medium-textured soils (6Um) and duplex soils (6Dy, 6Db, 6Dr) are the most extensive. Uniform coarse-textured soils (6Uc), cracking clays (6Ug), non-cracking clays (6Uf), and gradational soils (6Gn) are less common. Some general remarks about the distribution of the soil types are:

- Non-sodic, brown, duplex soil type (6Dbc) and the uniform, medium-textured, soil types (6Uma, 6Umb) are associated with the Haughton River levee to the west of the area and along Gumhole overflow at the southeastern boundary of the area.

- Brown, weakly sodic, duplex soil type (6Dbd), associated with Gumhole overflow occupies a significant portion of the eastern half of the area.

- Non-sodic, red, duplex soil type (6Drb) is confined to the northwestern portion of the study area.

- Non-sodic, duplex, soil types with thick A horizons (6Dyc, 6Dyd) occur in the northwestern portion of the Haughton River levee.

- The weakly sodic, duplex, soil type (6Dyf) and sodic and strongly sodic, duplex soil types (6Dyg, 6Dyj) occur in patches throughout LU6.

- The cracking clays (6Ugc) and non-cracking clays (6Ufc, 6Ufd) are found in narrow, closed depressions which are relict stream channels of LU6. The coarse-textured soil type (6Ucc) occur on slightly elevated, narrow, wavy and often discontinuous ridges which are remnants of prior stream courses.

The soils of LU2 occupy 1 511 ha (the remaining 30% of the area). The cracking clays (2Ugd, 2Uge) and sodic duplex soils (2Dbd, 2Dyb, 2Dyc) occur in the middle of the area stretching northeast-southwest, approximately parallel to Gumhole overflow. Some features of the soils of the landscape unit are:

- The cracking clays occupy 875 ha and occur on the lowest part of the low-lying, relatively level alluvial plains.

- The sodic duplex soils fringe the cracking clays and occur on areas that are slightly higher but still lower than areas occupied by soils of LU6.

- Soils of LU2 were derived from alluvial deposits of an earlier alluvial cycle than those of LU6.

Table 3. Areas of mapping units and frequency of UMAs in each mapping unit, Haughton Section, Stage III, BRIA

Mapping units	Area (ha)	UMA frequency	Mapping units	Area (ha)	UMA frequency
2P	0.8	1	6DbcE-6UfdW	65.2	1
2SP	21.2	2	6Dbd	195.9	17
Total	**22.0**		6Dbd3	2.0	1
2Dba	4.2	1	6Dbe	32.5	1
2Dbc	65.9	4	6Dbf	85.2	11
2Dbd	75.5	3	6Dbf2	2.5	2
2Dbd-2Dbc	15.4	1	6DbgW	1.0	1
2Dbe	7.1	1	6Dbh2	11.2	1
2DbcW	1.2	1	6Dda	22.9	4
2Ddb	27.3	2	6Dda2	11.9	2
2Ddb-2Uge	31.9	2	6Dda3	15.2	2
2Ddb-2UgeW	30.5	1	6DdaW	5.2	2
2Ddb2-2UgeW	17.1	1	6Dga-6Uma	2.7	1
2Dya-2Ugc	5.4	1	6Drb	79.4	3
2Dyb	253.7	14	6Drb2	65.0	7
2Dyb-2UgcW	3.4	1	6Drc	11.0	1
2Dyb2	19.8	2	6Dyb	2.5	1
2Dyc	6.5	1	6Dyb2	25.8	3
2Dyc-2Dbc	49.8	1	6Dyc	43.7	1
Sub Total	**614.7**		6Dyc-6Umb	6.6	1
2Ugc	10.7	2	6Dyc2	67.8	2
2UgcW	59.4	4	6Dyd	51.2	7
2UgcW-2Dyb	4.6	1	6Dyd2	25.0	6
2Ugd	358.9	9	6Dyf	240.1	16
2Ugd2	18.1	3	6Dyf-6Drc	11.9	1
2UgdW	14.9	4	6Dyf-6Ufc	14.1	1
2Uge	375.0	17	6Dyf-6SP	1.7	1
2Uge-2Ddb	9.9	1	6Dyf2	67.3	9
2Uge-2Dyb	2.1	1	6Dyg	269.7	25
2Uge2	3.6	1	6Dyg-6Ucc	2.0	1
2UgeW	1.1	1	6Dyg-6Uga	2.9	1
2UgeW-2SP	1.3	1	6Dyg2	207.4	16
2Ugf	10.2	1	6Dyg3	71.6	6
2Ugg	3.7	1	6Dyg4	2.4	1
2Ugk	1.4	1	6DygE	1.1	1
Sub Total	**874.7**		6Dyj	76.6	10
TOTAL LU2*	**1511.4**		6Dyj-6Ugc	6.2	1
6E	17.3	2	6Dyj2	4.1	1
6P	1.2	2	6Dyj2-6Dyb	2.9	1
6 SP	15.2	5	**Sub Total**	**2646.9**	
Sub Total	**33.7**		6Gna	14.2	3
6Dba	23.5	2	6Gna2	3.9	1
6Dba2	8.9	2	6Gna2-6Ufc	2.7	1
6Dbb	25.1	1	6Gnc	2.4	1
6Dbc	748.4	13	6Gnc2	2.4	1
6Dbc-6Uca	8.4	1	**Sub Total**	**25.6**	
6Dbc2	3.2	1	6Ucb	29.8	5
6Dbc4-6Uca4	13.4	1	6Ucc	19.0	14
6DbcC	2.6	1	**Sub Total**	**48.8**	

Table 3 (continued)

Mapping units	Area (ha)	UMA Frequency	Mapping units	Area (ha)	UMA frequency
6Ufc	3.7	3	6Uma	124.4	14
6UfcW	11.2	2	6Uma-6UfdW	45.6	2
6Ufd-6Ugc	2.4	1	6Uma2	17.4	2
6UfdW	33.5	3	6UmaC	14.9	1
Sub Total	**50.8**		6Umb	222.6	12
6Ugc	21.9	8	6Umb2	163.1	4
6Ugc2	1.5	1	6UmbC	76.0	3
6UgcW	20.7	6	**Sub Total**	**664.0**	
6UgcW-6Dbc	11.0	2	**TOTAL LU6***	**3524.9**	
Sub Total	**55.1**		**TOTAL AREA**	**5036.3**	

* Landscape unit

4.2 Soil morphology

Brief descriptions of the major attributes of the soil types of Haughton Stage III are given in the reference to the accompanying soils map. A discussion of the soil types is presented below.

4.2.1 Soils of landscape unit 2

The cracking clays and sodic duplex soils exclusively occupy the LU2. The cracking clays are found in the lower part of the LU2. Some features of these soils are:

- The main soil types, 2Uge and 2Ugd are of about equal abundance. Both soil types have a light to light-medium clay topsoil with a hard-setting or weakly self-mulching surface. Soil type 2Uge is strongly alkaline (pH>8.5) at or above 0.6 m whereas 2Ugd is strongly alkaline at or below 0.9 m.

- Soil type 2Ugc is rare. It is strongly alkaline only at 1.2 m or below.

- Soil types 2Ugg and 2Ugf are also of minor occurrence. These soil types have a medium to medium-heavy clay topsoil with a strongly self-mulching surface. 2Ugg is strongly alkaline at 0.6 m and below whereas 2Ugf is strongly alkaline at 0.9 m and below. A common phase in the cracking clays is "W" (which indicates excessive wetness), and a common variant "2" (which has a coarse-textured horizon at depth).

- In some areas, sodic duplex soil types, 2Dyb and 2Ddb, occupy minor areas in association with the cracking clays (Table 3).

The sodic duplex soils occupy slightly higher areas on the low-lying alluvial plains. The main characteristics of these soils are shown in Table 1. A summary of the distinguishing features are:

- The upper clay B horizon(s) of the sodic duplex soils are brown, grey or, less commonly, black. The B horizon of these soils has a strong consistency and coarse prismatic or blocky structure. The thickness of the A horizon and the depth at which field pH becomes strongly alkaline (pH>8.5) are the major criteria used to separate these soils.

- Soil types 2Dba, 2Ddb and 2Dya have a thin (≤0.12 m) A horizon. Both 2Dba and 2Ddb are strongly alkaline at 0.3 m whereas 2Dya is strongly alkaline at 0.6 m.

- Soil types 2Dyb and 2Dbe have A horizons of 0.15-0.2 m thick and are strongly alkaline by 0.6 m (2Dyb) or by 0.9 m (2Dbe).

- Soil type 2Dyb (which occupies 277 ha) is the most widespread in the LU2.

- Soil Types 2Dbc, 2Dbd and 2Dyc have A horizons 0.2-0.4 m thick. Soil type 2Dbd is strongly alkaline by 0.6 m but the other two soils are strongly alkaline only by 0.9 m.

- Wetness (W) is a common phase and 2 is a common variant of these soil types.

- Soil types 2Uge and 2Ugc are mapped in complex mapping units with the sodic duplex soils.

4.2.2 Soils of landscape unit 6

Three main groups of soils occur on the landscape unit 6. These groups are the well drained non-sodic duplex soils, sodic duplex soils, and the coarse to medium-textured soils and gradational soils. The first two groups are the most extensive. The major distinguishing characteristics of these soils are shown in Table 1.

The non-sodic duplex soil types are 6Dbc, 6Dbf, 6Dbg, 6Drb, 6Dyc and 6Dyd with 6Dbc the most extensive (about 840 ha). Some features of these soils are:

- The thickness of A horizons of the non-sodic duplex soils ranges from 0.2-0.4 m except for 6Dyc which is 0.4-0.65 m thick.

- Soil types 6Dbc and 6Dbf have brown B horizons indicating good internal drainage. The texture of the A horizon of 6Dbf is sandy loam to loam whereas the texture of 6Dbc is loam to clay loam.

- Soil type 6Dbg has a thick A horizon of up to 1.1 m of fine sandy loam to loam texture.

- Soil type 6Drb has a distinct red B horizon with an A horizon texture of loam to clay loam.

- Both soil types 6Dyc and 6Dyd have grey and less commonly brown B horizons.

The sodic duplex soils of LU6 can be divided into three groups depending on the depth where the sodic horizon occurs. Some features are:

- Soil type 6Dyj is strongly sodic (ESP>15*; pH>8.5**) by 0.3 m and has sandy loam to clay loam A horizon 0.08-0.2 m thick overlying a black, grey or brown light-medium clay to medium clay B horizon.

- Soil types 6Dba, 6Dbh and 6Dyg are strongly sodic by 0.6 m. Both 6Dyg and 6Dbh have 0.1-0.2 m thick A horizons but 6Dbh has a slightly lighter texture of loam, fine sandy compared to loam to clay loam texture of 6Dyg. Soil type 6Dba has 0.15-0.3 m of sandy loam to sandy clay loam A horizon.

- Soil types 6Dbb, 6Dbd, 6Dbe, 6Drc, 6Dyb and 6Dyf are sodic (ESP 6-14) to strongly sodic (ESP>15) and strongly alkaline (pH>8.5) below 0.9 m. Soil type 6Dbb has an A horizon 0.2 m thick. The other soils have a thicker A horizon of up to 0.4 m. Soil type 6Drc has a red B horizon.

- Soil type 6Gnc is included in the sodic duplex group because it is sodic and strongly alkaline at 1.2 m or below. It has 0.3 m of sandy clay loam to clay loam A horizon overlying brown light-medium clay.

The coarse to medium-textured and gradational soils include soil types 6Gna, 6Ucb, 6Ucc, 6Uma, and 6Umb.

- Soil type 6Gna increases in clay with depth, from clay loam to light-medium clay to medium clay B horizon.

- Soil types 6Ucb and 6Ucc are uniform coarse-textured soils. 6Ucb has a bleached A horizon.

- Soil types 6Uma and 6Umb are medium-textured soils. Soil 6Umb has a better structured B horizon than 6Uma and may be alkaline to strongly alkaline (pH >8.0) at 1.2 m or below.

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* Exhangeable sodium percentage (ESP) = $\frac{\text{Exchangeable sodium x 100}}{\text{cation exchange capacity}}$

** pH measured in 1:5 soil:water

4.3 Chemical and physical characteristics

Twelve representative soil profiles from 11 soil types were sampled for laboratory analysis. The morphological and analytical data for the soil profiles are given in Appendix II.

The soil profiles were sampled at 0-0.1, 0.2-0.3, 0.5-0.6, 0.8-0.9, 1.1-1.2, and 1.4-1.5m depths unless a soil horizon boundary occurred within any particular sampling interval. Eight surface soil samples (at 0-0.1 m) were taken from each site and bulked for soil fertility analyses. Analytical methods used follow Bruce and Rayment (1982) and guidelines in data interpretation follow Baker (1991) and Baker and Eldershaw (1993).

An overview of chemical and physical characteristics of the soil groups in the BRIA is given by Donnollan (1991). The following discussion of the results of soil analyses is specific to the current project, Haughton Stage III. The soils discussed in relation to the groupings of Donnollan (1991) are shown in Table 4.

Table 4. Relationship between the soils sampled and soil groupings of Donnollan (1991)

Subgroup	Soils
1A (cracking clays)	2Ugd (mound and depression)
2A (strongly sodic duplex soils)	2Ddb, 6Dyj
2B (sodic duplex soils)	2Dyb, 6Dyg
2C (weakly sodic red duplex soils)	6Drc
3A (non-sodic duplex soils)	6Dbf, 6Dyc
4B (medium textured soils)	6Uma, 6Umb
4C (coarse-textured soils)	6Ucb

4.3.1 Surface fertility

The fertility of surface soils based on 0-10 cm bulk samples, is a measure of the amount of nutrients that is immediately available to a crop. Table 5 gives the rating for some of the more important nutrients for the surface soils. A summary of the major chemical properties are:

- Bicarbonate extractable phosphorus (P): Levels of bicarbonate P range from medium to high (21-67 mg/kg) except for soil type 6Dyj which has a low (20 mg/kg) phosphorus level (Table 5 and Appendix II). This medium to high level of phosphorus is contrary to the low bicarbonate P values (<20 mg/kg) reported by McClurg (in press) and Day (1993), in areas east and south of this area.

- Extractable potassium (K): Levels range from medium to high (0.27-0.8 meq/100g), although levels in soil type 6Umb2 are very high (1.2 meq/100g). This would generally be expected in these soils of alluvial origin.

- Organic carbon (Org.C) and total nitrogen (N): Org.C measurements range from low to medium (0.8-2.2%). The total N in all soils is low (0.06-0.12%) and in 6Ucb, very low (0.04%). The low total N combined with high C:N ratio suggest that sufficient N will not be available for crops without fertilising.

- Trace elements copper (Cu), zinc (Zn) and manganese (Mn): Copper and zinc are in the medium range, with Cu, 0.4-2.1 mg/kg and Zn, 0.5-4.8 mg/kg. Manganese is in the high level (51-140 mg/kg).

Table 5. Levels and ratings+ for nutrients in the bulk surface samples (0-0.1 m) for the sampled soil types of Haughton Section, Stage III, BRIA

Soil type	Bicarb. P (mg/kg)	Extr.K (meq/100g)	DTPA-extr. (mg/kg)			Org. C (%)	Tot. N (%)	C:N
			Manganese	Copper	Zinc			
2Ddb	67(H)+	0.48(M)+	54(H)	1.2(M)	0.5(M)	1.1(L)+	0.08(L)	14
2Dyb	32(M)	0.60(H)	97(H)	1.3(M)	2.0(M)	2.0(M)	0.12(L)	18
2Ugd (Mound)	67(H)	0.64(H)	96(H)	2.1(M)	2.2(M)	1.8(M)	0.11(L)	17
2Ugd (Depression)	46(H)	0.54(H)	92(H)	2.0(M)	2.2(M)	1.5(M)	0.09(L)	18
6Dbf	48(H)	0.80(H)	122(H)	0.8(M)	2.5(M)	2.2(M)	0.11(L)	22
6Drc	26(M)	0.61(H)	140(H)	0.7(M)	3.0(M)	2.1(M)	0.09(L)	27
6Dyc	29(M)	0.60(H)	60(H)	0.6(M)	2.5(M)	1.5(L)	0.07(L)	21
6Dyg	22(M)	0.70(H)	88(H)	1.1(M)	2.5(M)	1.9(M)	0.09(L)	21
6Dyj	20(L)	0.43(M)	71(H)	1.2(M)	0.93(M)	1.0(L)	0.09(L)	11
6Ucb	21(M)	0.27(M)	51(H)	0.4(M)	1.7(M)	0.8(L)	0.04(VL)	20
6Uma	36(M)	0.67(H)	51(H)	0.4(M)	2.6(M)	1.3(L)	0.06(L)	22
6Umb2	45(H)	1.2(VH)	61(H)	0.82(M)	4.8(M)	1.9(M)	0.08(L)	24

+ Ratings of H = High, M = Medium, L = Low and VL = very low are from Bruce and Rayment (1982).

4.3.2 Cation exchange capacity (CEC), exchangeable cations (Ca, Mg, Na, K) and clay activity ratio (CCR)

The cation exchange capacity (CEC) is dependent on the amount and type of clay minerals, and organic matter in the soil. The levels of exchangeable cations and CEC can indicate the nutrient status of the soil. The levels of exchangeable calcium (Ca), magnesium (Mg), sodium (Na), and potassium (K) found, indicate the ability or otherwise of the soil to provide these nutrients to crops.

The exchangeable cations and CEC for selected depths (0.2-0.3, 0.5-0.6, 1.1-1.2 m) of the soils of both landscape unit 2 and landscape unit 6 are shown in Table 6.

In Haughton Stage III, CEC is generally related to the clay content of the soils. Variation in CEC within some soil profiles is due to the stratification of the alluvial parent material from which these soils have developed. This is indicated by the particle size distribution data. A summary of some levels in the soils are given below. The levels low, medium and high are those of Landon (1984).

- Cracking clay 2Ugd has a medium level (15-25 meq/100g) of CEC.

- In the strongly sodic duplex soils, the CEC is medium in 2Ddb and high (25-40 meq/100g) in 6Dyj.

- In the medium-textured soil types (6Uma, 6Umb2) and duplex soil types 6Dbf, 6Dyc, and 6Drc, the CEC is mainly in the low range (5-15 meq/100g). The high CEC at depth in 6Umb2 is due to a buried clay layer.

- The coarse-textured soil 6Ucb has very low CEC of 3-4 meq/100g. This suggests a very low nutrient level and low nutrient retention capacity of this soil.

- The ratio of CEC to clay, or clay activity ratio (CCR), is about 0.5 in the cracking clay (2Ugd) and sodic duplex soil (6Dyg). In the <2μm fraction of a Barratta clay (2Ug) with a clay activity ratio of 0.62, Coughlan (1979) found a mixture of poorly crystalline montmorillonite, kaolinite, quartz, illite and interstratified kaolin-montmorillonite. There are possibly less expanding 2:1 clay minerals in 2Ugd and 6Dyg of Haughton Stage III. However, the comparatively high exchangeable Ca to Na would suggest that vermiculite instead of montmorillonite might be a major component of the 2:1 clays.

- The strongly sodic duplex soils 2Ddb and 6Dyj have clay activity ratio of 0.6. The high exchangeable Na suggests that montmorillonite is possibly a major component in the 2:1 expanding clay minerals in these soils.

- The comparatively low clay activity ratio in weakly sodic (6Drc), non-sodic (6Dbf, 6Dyc) and coarse-textured (6Ucb) soil types, suggests that proportionately more 1:1 (kaolinite) and 2:1 non-expanding clay (illite) are present in these soils.

Relative abundance of exchangeable cations can also influence soil physical properties such as plant available water capacity (PAWC), uptake of soil water, permeability and dispersion.

- In the strongly sodic duplex soil types (2Ddb and 6Dyj) sodium is the main exchangeable cation throughout the profile. In all other soils calcium is the main exchangeable cation. High sodium in the soil induces dispersion of clay (and silt) to produce unfavourable structured soils. This poorly structured soil would give rise to low plant available water capacity, low infiltration rate and high resistance to plant roots.

- Exchangeable Ca and Mg of all soils except 6Ucb are above the "sufficiency" level (Baker 1991). However, when each cation is expressed as a percentage of total CEC, Ca is lower than the desired levels, throughout the profile, in strongly sodic (2Ddb, 6Dyj), sodic duplex(2Dyb) soils and the cracking clay (2Ugd). This is due to the antagonistic effect of Ca and Mg. The presence of excess Mg, and in this case also Na, makes Ca relatively unavailable to the plant. The high levels of Mg in 2Ddb and 6Dyj are also indicated by the lower than unity Ca:Mg ratio.

- The high levels of Na also cause the silt and clay particles in the strongly sodic and sodic soils to be more dispersible, as indicated by the high dispersion ratio which will be discussed below. The dispersive effects in the soils causes the blockage of water-conducting pores which in turn creates adverse physical conditions of low PAWC, low permeability and surface waterlogging.

- Exchangeable K is below the "sufficiency" level in 2Ddb, 2Dyb, 6Dyg and 6Drc, although the surface soils have medium to high levels extractable K. Crops should respond to K fertiliser in these soils although the total K levels are high (see below). For perennial crops, the capacity of the soils to supply K may be acceptable, but maintenance of this level is critical.

Table 6. Exchangeable cations, ESP, Ca:Mg ratio, CEC:clay ratio, cation exchange capacity (CEC) and clay content for selected depths of the sampled soil types in Haughton Section, Stage III, BRIA

Soil type and depth (m)	Exchangeable cations (meq/100g)				ESP	Exch. Ca:Mg	CEC (meq /100g)	Clay (%)	CEC: Clay
	Ca	Mg	Na	K					
Landscape unit 2									
2Ddb									
0.2-0.3	6.0	6.3	14.0	0.11	67	0.95	21	31	0.7
0.5-0.6	5.9	6.1	19.0	0.12	83	0.97	23	37	0.6
1.1-1.2	5.3	5.0	17.0	0.11	81	1.06	21	33	0.6
2Dyb									
0.2-0.3	5.8	4.5	1.5	0.11	11	1.29	14	36	0.4
0.5-0.6	11.0	8.1	3.8	0.15	17	1.36	23	53	0.4
1.1-1.2	12.0	11.0	6.0	0.14	19	1.10	31	51	0.6
2Ugd (Mound)									
0.2-0.3	6.0	4.4	0.4	0.30	3	1.36	13	33	0.4
0.5-0.6	12.0	9.8	1.7	0.31	7	1.22	24	53	0.5
1.1-1.2	11.0	8.7	2.4	0.19	11	1.26	21	42	0.5
2Ugd (depression)									
0.2-0.3									0.4
0.5-0.6	8.4	6.7	0.97	0.30	5	1.25	18	41	0.5
1.1-1.2	15.0	12.0	1.9	0.22	7	1.25	26	53	0.5
	11.0	8.9	2.0	0.27	11	1.24	18	38	
Landscape unit 6									
6Dbf									
0.2-0.3	8.4	2.9	0.06	0.57	1	2.90	11	25	0.4
0.5-0.6	7.9	3.6	0.08	0.39	1	2.19	12	30	0.4
1.1-1.2	6.1	3.1	0.07	0.25	1	1.97	9	21	0.4
6Drc									
0.2-0.3	4.4	1.4	0.08	0.06	2	3.14	5	17	0.3
0.5-0.6	10.0	5.6	0.36	0.16	2	1.79	18	53	0.3
1.1-1.2	13.0	5.5	0.36	0.15	2	2.36	15	34	0.4
6Dyc									
0.2-0.3	7.5	2.3	0.01	0.22	<1	3.26	11	17	0.6
0.5-0.6	3.6	1.5	0.01	0.14	<1	2.40	5	18	0.3
1.1-1.2	7.7	4.7	0.33	0.28	2	1.64	14	36	0.4
6Dyg									
0.2-0.3	10.0	5.4	0.58	0.16	4	1.85	16	35	0.5
0.5-0.6	13.0	7.7	1.8	0.14	9	1.69	19	42	0.5
1.1-1.2	12.0	10.0	1.7	0.09	7	1.20	25	47	0.5
6Dyj									
0.2-0.3	10.0	10.0	15.0	0.22	50	1.00	30	53	0.6
0.5-0.6	6.6	7.6	14.0	0.28	56	0.87	25	41	0.6
1.1-1.2	6.3	8.4	17.0	0.34	57	0.75	30	58	0.5

Table 6 (continued)

Soil type and depth (m)	Exchangeable cations (meq/100g)				ESP	Exch. Ca:Mg	CEC (meq /100g)	Clay (%)	CEC: Clay
	Ca	Mg	Na	K					
Landscape unit 6									
6Ucb									
0.2-0.3	2.6	0.88	0.04	0.20	1	2.95	3	8	0.4
0.5-0.6	1.5	0.86	0.03	0.14	1	1.74	3	8	0.4
1.1-1.2	2.9	1.4	0.02	0.22	5	2.07	4	13	0.3
6Uma									
0.2-0.3	5.0	1.7	0.08	0.35	1	2.94	8	16	0.5
0.5-0.6	6.1	2.2	0.08	0.40	1	2.77	9	20	0.5
1.1-1.2	4.7	2.1	0.05	0.26	1	2.24	7	13	0.5
6Umb2									
0.2-0.3	9.1	3.6	0.07	0.32	<1	2.53	13	25	0.5
0.5-0.6	11.0	5.0	0.14	0.47	1	2.20	16	33	0.5
1.1-1.2	15.0	7.4	0.71	0.14	3	2.03	22	40	0.6

4.3.3 Total phosphorus (P), potassium (K) and sulfur (S)

Levels of total P, K and S indicate the reserves and likely long-term availability of these nutrients in the soil. The levels of each element are discussed below.

- Levels of total P at the surface of all soils sampled, range from medium to high except for the mound of cracking clay, 2Ugd. There is a general trend of decreasing level of P with depth. Total P is comparatively higher in the uniform medium-textured soils (6Uma and 6Umb2), and to a lesser extent non-sodic duplex soils (6Dbf and 6Dyc). The sodic duplex soils (2D and 6D) and coarse-textured soils, 6Ucb, generally have low total P below the surface 0.1 m.

- The total K levels of all soils are within the high levels (Bruce and Rayment 1982). This is possibly due to the alluvial origin of the soil parent material of these soils. The K-bearing minerals of layer silicates (mainly muscovite and illite) and potash feldspars are comparatively stable in the sedimentary environment. Illite is possibly a significant clay mineral in the clay fraction of most of the soils. Coughlan (1979) found a subordinate amount of illite in a cracking clay in this region. In the case of coarse- and medium-textured soils (6Ucb, 6Uma and 6Umb) muscovite has been found to occur in significant amounts in the soil profile during this survey.

- Total S in the soils sampled ranges from low to very low. Crops are likely to respond to addition of sulfur.

4.3.4 Soil pH, sodicity, dispersion ratio and salinity

The pH of the surface soils range from 5.6 to 7.6 and is lowest in 2Ugd. In all soil profiles there is a general increase in pH with depth. Some interesting aspects of the relationship between these attributes are included below:

- Soil pH is strongly correlated with sodicity. Baker *et al.* (1983) demonstrated that soil ESP can be predicted from pH values within the range of 6 to 10. They showed that pH-ESP were more closely related in sodic duplex soils than the cracking clays with r^2=0.85 in the relationship for sodic soils.

- The soil pH is extremely high (>9) at 0.2-0.3 m and below in the strongly sodic duplex soils (2Ddb, 6Dyj) with corresponding ESP values in excess of 50% and even in excess of 80% in the subsoils of 2Ddb (Table 6). These values are higher than that would be established by the pH-ESP relationship.

- In the sodic duplex soils (2Dyb, 6Dyg) the pH is 8.5 or more at 0.5-0.6 m and below. The ESP at the equivalent depths ranges from 7 to 9% in 6Dyg and 17 to 19% in 2Dyb. These values are lower than those predicted by the pH-ESP relationship.

- The cracking clay 2Ugd has a pH of 8.3 at 0.8-0.9 m and 9.0 at 1.4-1.5 m. The corresponding ESP ranges from 7 to 11%. These values are very close to those predicted from the pH-ESP relationship. The subsoil ESP is within the range of 6-14 (sodic) even though the pH is high.

- In the lower subsoils of 6Drc where the pH is in excess of 8.0, ESP is below the sodic level of 6%. Soil profiles from Reid and Baker (1984) show ESP ranges from less than 6 throughout to as high as 10 at 1.2 m. In this area, the high pH values at depth do not reflect high ESP for 6Drc.

- From pH and ESP values in Haughton Stage III, absolute values of ESP cannot be determined by soil pH alone, although high pH does generally reflect higher ESP.

- Based on the dispersion ratio index, R1 (Appendix II), the strongly sodic duplex soils (2Ddb, 6Dyj) have a high tendency to disperse (R1>0.9) at 0.3 m and below. The sodic duplex soil 2Dyb has high tendency (R1>0.9) to disperse at 0.6 m and below. The results are consistent with high ESP values and low Ca:Mg ratio at these depths. Non-sodic duplex soil 6Dyc and coarse-textured soil 6Ucb have a low to very low tendency to disperse (R1<0.6).

- Electrical conductivity values (EC) are high (1.0-1.6 dS m^{-1}) at 0.2-0.3 m and below in strongly sodic duplex soils (2Ddb and 6Dyj). In the sodic duplex soils (2Dyb, 6Dyg) EC values are moderate (0.5-0.8 dS m^{-1}) in the subsoils. The chloride levels are high in both the strongly sodic and sodic duplex soils, indicating that the soluble salts are mainly in the form of NaCl. The soluble salt levels are very low in other soils.

4.3.5 Plant available water capacity

The PAWC values, based on the regression equation of Shaw and Yule (1978) and estimated rooting depths determined by EC and ESP data, are comparatively higher than those given in Donnollan (1991) for the whole BRIA. The results are shown below:

Soils (subgroup)	Rooting depth (m)	PAWC (mm)
2Ugd (mound and depression) (1A)	0.9	184
2Ddb, 6Dyj (2A)	0.3	101
2Dyb, 6Dyg (2B)	0.6	143
6Drc (2C)	0.9	183
6Dbf, 6Dyc (3A)	0.9	182
6Uma, 6Umb2 (4B)	0.9	181
6Ucb (4C)	0.9	177

These results should be treated with caution because of the limited number of soil profiles analysed. The similarity of values in soils of each soil subgroup and the relative values between subgroups are, however, important.

5. LAND EVALUATION

5.1 Land suitability classification

A five-class land suitability classification, with suitability decreasing progressively from class 1 to class 5, was used in assessing Haughton Stage III lands. The land is assessed on the basis of a specified land use which allows optimum production with minimal degradation to the land resource in the long term (LRB staff 1990). This assessment of land provides an estimate of the potential of any parcel of land for a particular land use. The five classes are briefly defined below:

Class 1 Suitable land with negligible limitations;
Class 2 Suitable land with minor limitations;
Class 3 Suitable land with moderate limitations;
Class 4 Marginal land, presently unsuitable due to severe limitations; and
Class 5 Unsuitable land with extreme limitations that preclude its use.

Detailed definitions of the suitability classes are given in Appendix III.

Each mapping unit or unique map area (UMA) was assessed on its suitability for:

- **furrow irrigation** of sugar-cane, soybeans, sorghum, maize, kenaf, sunflower, cotton, legume seeds (include mungbean, chickpeas, pidgeon peas and dolichos), beans, capsicums, eggfruit, tomatoes, cucumbers, rockmelons, squash and zucchini;

- **flood irrigation** of rice; and

- **low volume irrigation** of mangoes and avocados.

A different land suitability classification system (Donnollan and Day 1986) is used for each of the irrigation methods. Soil and land attributes considered important for crop growth and irrigation method are used in suitability assessment. The criteria used for each suitability classification system are based on the requirements of the crops under the appropriate irrigation method in terms of the soil and land characteristics. Soil and land characteristics which caused land to have less than optimum conditions for a particular crop under the specific irrigation method were recognised as limitaions. The limitations were grouped into four categories depending on their effects on crops as follow:

- **Crop productivity limitations** - nutrients, salinity, sodicity, and for tree crops, soil depth;

- **Water management limitations** - water availability, excessive permeability, soil complexity, internal drainage and for rice, deep drainage;

- **Land surface management limitations** - rockiness, slope, microrelief, surface condition and wetness; and

- **Degradation limitations** - erosion and outflow potential.

The overall framework of the land suitability classification systems and details of each limitation (subclass) are given in Appendices IV, V and VI. In assessing the suitability of each UMA, the most severe limitation (subclass) usually determined the overall land suitability class. The suitability class may be downgraded if interactions between two or more limitations cause more detrimental effects than if these limitations are present alone.

5.2 Land suitability assessment

A total of 670 ha of Haughton Stage III is suitable for **none** of the crops considered because of one or more of extreme sodicity, poor internal drainage, excessive slope, wetness, severe existing erosion, complex soil distribution. A list of the soils and UMAs unsuitable for any cropping is shown in Table 9. Only severe limitations (subclasses 4, 5) are shown. This allows land users to determine if any unsuitable mapping unit can be ameliorated and the estimated costs involved.

Excessive slope (t), erosion hazard (e), and excessive wetness (w) associated with relict streams, abandoned channels and drainage depressions are the major land limitations.

Land suitability data for the 19 crops assessed may be accessed through the Ayr office of the Department of Primary Industries. For immediate farm design and planning purposes, the assessment for the most commonly grown crops, sugar-cane, maize, rice, capsicums and mangoes is discussed here. The area of land suitable for these five crops is given in Table 7. A list of the mapping units, their extent and their suitability for various crops are shown in Table 8. The limitations and land suitability classes of each UMA for sugar-cane, maize and rice are given in Appendix VII and capsicums and mangoes in Appendix VIII.

5.2.1 Furrow-irrigated crops

- Sugar-cane can be grown on a wide range of soils (Table 8). A total of 3899 ha is suitable for sugar-cane in this area. The main limitations for the use of the land for sugar-cane are high levels of sodicity (so), rapid internal drainage (id), excessive wetness (w) and low plant water availability (m). Sodicity at shallow depths which restricts water entry, occurs in the strongly sodic duplex soils 2Dba, 2Ddb, 2Dyb and 6Dyj. Rapid internal drainage and poor plant water availability occur in the coarse-textured 6Uc soils. Complex soil distribution (pd) which causes problems with efficient irrigation management is also a major limitation which affects many UMAs.

- The area suitable for maize is similar to that for sugar-cane as the land use requirements for maize is similar to that for sugar-cane. However, the greater sensitivity of this crop to high sodicity levels and adverse surface conditions reduce the total area suitable to 3778 ha.

- Non-sodic duplex soils (6Dbc, 6Dbf, 6Drb, 6Dyc etc.), weakly sodic duplex soils (6Dbd and 6Dyf) and medium-textured soils (6Uma and 6Umb) are the most suitable soils for furrow irrigation of capsicums. Capsicums, like most horticultural crops, are susceptible to waterlogging and therefore are grown more successfully on well-drained soils. Some sodic duplex soils where high sodicity occurs below 0.6 m are also suitable for capsicums. A total of 2708 ha is suitable for the furrow irrigation of this crop. A larger area would be suitable for trickle irrigation. Unlike previous high intensity survey areas of the BRIA, a substantial proportion of the Haughton Stage III area is suitable for horticultural and tree crops. This fact should be taken into account when designing this area for development.

5.2.2 Flood-irrigated crop

- Rice can be grown on cracking clays (2Ug) and sodic duplex soils (2Db, 2Dy, 6Dyg). However, in the southern half of the area, these soils occur as small, isolated units amongst unsuitable UMAs, so most of the UMAs are regarded as unsuitable for rice due to soil complexity. A total of 1258 ha is suitable for this crop. The major limitation for rice production is excessive deep drainage losses (dd) caused by a high proportion of sand either in the subsoil or throughout the soil profile. Weakly sodic duplex (6Dbd, 6Dyf), non-sodic duplex (6Dbc, 6Dbf, 6Drb), medium-textured (6Um) and coarse-textured (6Uc) soils are unsuitable for rice due to excessive deep drainage losses (dd). The slope gradient requirement in rice is more rigid than for other crops because of the precise irrigation management required for rice.

Table 7. Area of land suitability classes for furrow irrigation of sugar-cane, maize and capsicums, flood irrigation of rice and low volume irrigation of mangoes, in Haughton Section, Stage III, BRIA

Land suitability class	Area of land (ha) within each suitability class				
	Sugar-cane	Maize	Rice	Capsicums	Mangoes
1	-	-	-	-	-
2	1400	-	742	-	938
3	2499	3778	516	2708	1252
Sub Total Suitable	**3899**	**3778**	**1258**	**2708**	**2190**
4	793	905	908	1974	2030
5	345	354	2870	354	818

5.2.3 Low volume irrigated crops

. Mangoes can only be grown on a limited number of soils. Medium-textured soil types (6Uma and 6Umb), coarse-textured soils (6Uc) and duplex soils (6Dbc, 6Dbf, 6Drb and 6Dyf) are suitable for this crop. Imperfect to poor internal drainage of sodic duplex soils (2D, some 6D) and most of the cracking clays (2Ug and 6Ug) is the major limitation for mango production. Subsoil impediments such as buried clay layers, sodicity and salinity would render any of the generally suitable soils unsuitable for mangoes because of the deeper rooting system of this crop.

5.3 Land development and management considerations

In the Haughton Stage III, particular concerns for farm design, subdivision and subsequent management of the land are:

* **Land degradation hazards** - flooding, erosion, outflow potential and development of perched watertables;

* **land management problems** - landform pattern, complex soil distribution, likely presence of nematodes in certain soils and unsuitable mapping units.

Table 8. Area and land suitability for sugar-cane, maize, rice, capsicums and mangoes for mapping units in Haughton Section, Stage III, BRIA

Mapping unit	Sugar-cane	Maize	Rice	Capsicum	Mangoes	Area
2Dba	4	4	4	4	4	4.2
2Dbc	3	3	4(3)	4	4	65.9
2Dbd	3	3	3	4	4	90.9
2Dbe	3	3	2	3	4	7.1
2DbeW	4	4	4	4	5	1.2
2Ddb, 2Ddb2	4	4	4	4	4	106.8
2Dya	3	3	3	4	4	5.4
2Dyb	3-4	4(3)	3-4	4	4(5)	257.1
2Dyb2	3	3	4	4	4	19.8
2Dyc	3	3	3	3-4	4	56.3
2Ugc	2	3	2	3	4	10.7
2UgcW	4	4	4(3)	4	5	64.0
2Ugd	3(4)	3(4)	2(4)	4	4	358.9
2Ugd2	2-3	3	4	4	4	18.1
2UgdW	4	4	3-4	4	5	14.9
2Uge	3(4)	3(4)	3(4)	4(3)	4(5)	387.0
2Uge2	3	3	4	4	4	3.6
2UgeW	4	4	4-5	4	5	2.4
2Ugf	2	3	3	4	4	10.2
2Ugg	3	3	3	4	5	3.7
2Ugk	3	3	3	4	4	1.4
6Dba, 6Dba2	4	4	5(4)	4	4	32.4
6Dbb	3	3	4	3	4	25.1
6Dbc	3(4)	3(4)	5	3(4)	2-3	759.2
6Dbc - 6Uca	5	5	5	5	2	8.4
6Dbc2	3	3	5	3	5	3.2
6Dbc4 - 6Uca4	5	5	5	5	2	13.4
6DbcC	4	4	5	4	5	2.6
6DbcE - 6UfdW	5	5	5	5	5	65.2
6Dbd, 6Dbd3	3(4)	3(4)	5	3(4)	3	197.9
6Dbe	3	3	5	3	3	32.5
6Dbf - 6Dbf2	2-4	3-4	5	3(4)	3	76.9
6DbgW	5	5	5	5	5	1.0
6Dbh2	3	3	4	4	4	11.2
6Dda	3-5	3-5	4-5	4(5)	4(5)	22.9
6Dda2	3	3	4-5	4	4	11.9
6Dda3	3(5)	3(5)	5	3(5)	4(5)	15.2

Table 8. (continued)

Soils	Sugar-Cane	Maize	Rice	Capsicum	Mangoes	Area
6DdaW	5	5	5	5	5	5.2
6Dga	5	5	5	5	5	2.7
6Drb	2	3	5	3	3	79.4
6Drb2	2-4	3(4)	5	3	3	65.0
6Drc	2	3	5	3	3	11.0
6Dyb	4	4	5	4	4	2.5
6Dyb2	3(4)	(3-4)	5	3	3	25.8
6Dyc	2	3	5	3	3	43.7
6Dyc - 6Umb	4	4	5	4	3	6.6
6Dyc2	3-4	3-4	5	3-4	3-5	67.8
6Dyd	2-4	3-4	5	3(4)	2-3	51.2
6Dyd2	2(4)	3(4)	5	3(4)	3(2)	25.0
6Dyf	2(4)	3(4)	5	3	3	266.1
6Dyf - 6 SP	4	4	5	4	5	1.7
6Dyf2	3(4)	3(4)	5	3	3	67.3
6Dyg	3(4)	3(4)	2-5	3-4	4	269.7
6Dyg - 6Uga	4	4	4	4	4	2.9
6Dyg - 6Ucc	5	5	5	5	5	2.0
6Dyg2	3(4)	3(4)	4	4(3)	4(5)	207.4
6Dyg3	3	3	4(3)	3-4	4	71.6
6Dyg4	4	4	5	4	4	2.4
6DygE	5	5	5	5	5	1.1
6Dyj	4	4	4(5)	4	4	82.8
6Dyj2	4	4	5	4	5	7.0
6Gna	3(4)	3(4)	5	4(3)	4	14.2
6Gna2	3-4	3-4	5	4	4	6.6
6Gnc, 6Gnc2	4	4	5	4	4	4.8
6Ucb, 6Ucc	5	5	5	5	2	48.8
6Ufc	5(4)	5(4)	5	5(4)	5	3.7
6UfcW	4-5	4-5	4-5	4-5	5	11.2
6Ufd - 6Ugc	4	4	5	4	5	2.4
6UfdW	4(5)	4(5)	5	4(5)	5	33.5
6Ugc	3(4)	3(4)	4(2)	4	4	21.9
6Ugc2	4	4	4	4	4	1.5
6UgcW	4-5	4-5	5(4)	4-5	5	31.7
6Uma	3-5	3-5	5	3-5	3(5)	170.0
6Uma2	3-4	3-4	5	3	2(4)	17.4
6UmaC	4	4	5	4	2	14.9
6Umb	3(4)	3(4)	5	3(4)	2-3	222.6
6Umb2	3(4)	3(4)	5	3(4)	5(3)	163.1
6UmbC	3	3	5	3	5(2)	76.0

( ) indicates minor occurrences.
Mapping units 2P, 2SP, 6E, 6P, 6SP totalled 55.7 ha are unsuitable for all crops.

Table 9. **Major limitations and areas of UMAs unsuitable for ALL crops of sugar-cane, maize, rice, capsicums and mangoes in Haughton Section, Stage III, BRIA**

				Sugar-cane (C)										Maize (Mz)						Rice (R)					Capsicums (Cap)						Mangoes (Mg)						
ST1	ST2	C	UMA	m	pd	id	g	w	e	p	t	so	C	ps	t	p	so	Mz	so	t	g	dd	pd	R	pd	ps	p	so	Cap	so	sa	d	id	w	Mg	AREA
2 P		N	652				4					4					4		4				4					4					5	5	0.8
2 SP		N	497				5					5					5		5				5					5					5	5	0.6
2 SP		N	522				5					5					5		5				5					5					5	5	20.6
2Dba	2Uge	N	389								4	4	4			4	4	4					4			4		4	4	4	4	4		4	4.2
2DbeW	2 SP	N	382				4					4					4		4				4					4	4			4	5	5	1.2
2Ddb		N	392								4	4	4			4	4	4					4			4		4	4	4	4	4		4	21.2
2Ddb	2Uge	Y	418								4	4	4			4	4	4					4			4		4	4	4	4	4		4	17.2
2Ddb		N	599								4	4				4	4	4					4					4	4	4	4	4		4	6.1
2Ddb	2Uge	Y	614								4	4				4	4	4					4					4	4	4	4	4		4	14.7
2Ddb	2UgeW	Y	615				4				4	4				4	4	4					4					4	4	4	4	4	5	5	30.5
2Ddb2	2UgeW	N	616				4				4	4				4	4	4				4	4					4	4	4	4	4	5	5	17.1
2Dyb	2UgcW	Y	405				4				4	4				4	4	4					4					4	4	4	4	4	5	5	3.4
2Ugc	2UgcE	N	416		4		4	5				5					5		5				5	4		4		5	4			4	5	5	2.1
2UgcW	2 SP	N	351				4			4		4			4		4		4				4			4		4	4			4	5	5	49.3
2UgcW	2 SP	N	386				4					4					4					4	4			4		4	4			4	5	5	3.9
2UgcW	2Dyb	Y	414				4				4	4				4	4	4					4			4	4	4	4	4		4	5	5	4.6
2Ugd2	2Ugc	N	313		4		4					4					4				4		4	4		4		4	4			4	5	5	8.9
2UgdW		N	560		4		4					4					4					4	4			4		4	4			4	5	5	1.0
2UgdW		N	579		4		4					4					4					4	4			4		4	4			4	5	5	6.5
2Uge		N	422		4							4					4					4	4	4		4		4	4			4	4	4	1.6
2Uge	2Dyb	Y	425								4	4				4	4	4					4			4	4	4	4	4		4	4	4	2.1
2Uge	2Ddb	Y	438								4	4	4			4	4	4					4		4		4	4	4	4	4		4	4	4	9.9
2Uge		N	437						4			4		4			4					4	4			4		4	4			4	5	5	11.3
2UgeW	2 SP	Y	635				4					4					4					4	4			4		4	4			4	5	5	1.3
2UgeW		N	645				4					4					4		5		4		5					4	4			4	5	5	1.1
6 E		N	356				5	5		5		5		5			5		5				5					5					5	5	3.2
6 E		N	471				4	5		5		5		5			5		5				5					5					5	5	14.1
6 P		N	596				4					4					4				5		5					4					5	5	0.4
6 P		N	609				4					4					4				5		5					4					5	5	0.8
6 SP		N	630				5					5					5		5				5					5					5	5	0.8
6 SP		N	634				5					5					5		5				5					5					5	5	0.2
6 SP		N	640				5					5					5		5				5					5					5	5	1.6
6 SP		N	648				5					5					5		5				5					5					5	5	5.2
6 SP		N	653				5					5					5		5				5					5					5	5	7.4
6Dba		N	432		4							4					4		5		4		5				4	4	4	4		4		4	10.8
6Dba		N	576		4							4					4		5				5				4	4	4	4		4		4	12.7
6Dba2		N	331		4							4					4				4		4	4			4	4	4	4		4		4	2.0
6Dba2	6Dyj	N	427		4							4					4		5		4		5	4			4	4	4	4		4		4	6.9

Table 9. (continued)

				Sugar-cane (C)										Maize (Mz)						Rice (R)					Capsicums (Cap)						Mangoes (Mg)				
ST1	ST2	C	UMA	m	pd	id	g	w	e	p	t	so	C	ps	t	p	so	Mz	so	t	g	dd	pd	R	pd	ps	p	so	Cap	so	sa	d	id	w	Mg	AREA
6DbcC	6DbcW	N	306				4	4					4		4			4		5	4	5		5					4					5	5	2.6
6DbcE	6UfdW	Y	577		4			4	4		5		5		5			5		5		5		5	4				5				4	5	5	65.2
6DbgW		N	453					4	5		5		5		5			5		5		5		5					5					5	5	1.0
6Dda		N	390		4								4					4					4	4	4			4	4	4	4	4		4	1.2
6Dda	6Dba2	N	568		4								4					4					4	4				4	4	4	4	4		4	10.6
6Dda	6Dyg2	N	355		4			4	5		5		5		5			5		5				5	4				4	5	4	4	4	5	5	6.2
6Dda3	6Ufe	N	338		4			4	5		4		5		5			5		5				5	4				5	4	4	4	5	5	10.3
6DdaW		N	321		4			4	5		5		5		5			5		5				5	4			4	5	4	4	4	5	5	3.0
6DdaW		N	400		4			4	5		5		5		5			5		5				5	4			4	5	4	4	4	5	5	2.2
6Dga	6Uma	Y	283		4			5	5		5		5		5			5		5		5		5	4			4	5	4			5	5	2.7
6Dyb	6Ucc	N	429		4								4					4				5		5	4				4					4	2.5
6Dyf	6 SP	Y	644		4			4					4					4		5		4		5	4				4					5	5	1.7
6Dyg	6Uga	Y	395									4	4				4	4	4			4		4				4	4	4	4	4		4	2.9
6Dyg		N	459		4								4					4		4				4	4			4	4	4	4	4		4	1.5
6Dyg	6Ucc	Y	401	4	4	5		4	5	4	5		5		5	4		5		5		5		5	4		4	4	5	4	4		4	5	5	2.0
6Dyg2		N	421		4								4					4				4		4	4			4	4	4	4		4		4	1.3
6Dyg2		N	480		4								4					4				4		4	4				4	4	4		4		4	1.7
6Dyg4		N	510		4								4		4			4		5		4		5					4	4	4		4		4	2.4
6DygE		N	280		4			4	5		5		5		5			5		5		4		5	4				5	4	4		4	5	5	1.1
6Dyj		N	325									4	4	4			4	4	4			4		4			4		4	4	4	4	4		4	6.3
6Dyj	6Ugc	N	327									4	4	4			4	4	4			4		4			4		4	4	4	4	4		4	30.6
6Dyj	6Dyg	N	349									4	4	4			4	4	4			4		4			4		4	4	4	4	4		4	11.3
6Dyj		N	442									4	4	4			4	4	4			4		4			4		4	4	4	4	4		4	8.1
6Dyj		N	532		4							4	4				4	4	4	4				4				4	4	4	4		4		4	2.3
6Dyj		N	597									4	4				4	4	4					4				4	4	4	4		4		4	2.5
6Dyj		N	394					4				4	4	4			4	4	4					4			4		4	4	4	4	4	5	5	5.9
6Dyj		N	541									4	4				4	4	4					4				4	4	4	4		4	5	5	1.3
6Dyj		N	542									4	4				4	4	4				4	4				4	4	4	4		4	5	5	3.7
6Dyj	6Ugc	Y	399		4							4	4	4			4	4	4	5				5		4		4	4	4	4	4	4	4		4	6.2
6Dyj		N	436									4	4	4			4	4	4	5		4		5		4		4	4	4	4	4	4	4		4	4.6
6Dyj2		N	557									4	4				4	4	4			4		4				4	4	4	4		4	5	5	4.1
6Dyj2	6Dyb	Y	428		4						4	4	4	4	4		4	4	4	5		5		5	4	4		4	4	4	4	4	4	5	5	2.9
6Gna		N	407		4								4		4			4		5		5		5	4			4	4	4			4		4	4.8
6Gna2		N	391		4								4					4				5		5	4				4	4			4		4	3.9
6Gnc		N	340				4						4		4			4		5	4	5		5				4	4	4			4		4	2.4
6Gnc2		N	289		4								4					4				5		5	4			4	4	4			4		4	2.4
6Ucc		N	410	4	4	5		4	5	4	5		5		5	4		5		5		5		5	4		4		5					5	5	1.0

Table 9. (continued)

						Sugar-cane (C)							Maize (Mz)					Rice (R)					Capsicums(Cap)					Mangoes (Mg)				
ST1	ST2	C	UMA	m	pd	id	g	w	e	p	t	so	C	ps	t	p	so	Mz	so	t	g	dd	pd	R	pd	ps	p	so	Cap	so	sa	d	id	w	Mg	AREA
6Ufc		N	348		4								4					4				5		5	4		4		4				4	5	5	1.6
6Ufc		N	650		4			4	4		5		5		5			5		5				5					5				4	5	5	0.8
6Ufc		N	651		4			4	4		5		5		5			5		5				5					5				4	5	5	1.3
6UfcW	6 SP	N	294		4			4					4					4					4	4	4		4		4				4	5	5	3.5
6UfcW	6 SP	N	279					4	5		5		5		5			5		5		5		5			4		5				4	5	5	7.7
6Ufd	6Ugc	Y	335				4						4					4			4	5		5			4		4				4	5	5	2.4
6UfdW	6Dda3	N	305				4	4					4		4			4		5	4	5		5			4		4				4	5	5	5.6
6UfdW		N	362		4			4					4					4				5		5	4		4		4				4	5	5	1.6
6UfdW	6UgcW	N	277					4	5		5		5		5			5		5		5		5			4		5				4	5	5	26.3
6Ugc		N	553		4								4					4					4	4			4		4				4	4	4	0.4
6Ugc	6Ucc	N	632		4								4					4					4	4			4		4				4	4	4	1.8
6Ugc		N	439								4		4		4			4					4	4			4		4				4	5	5	4.1
6Ugc2		N	330		4								4					4				4		4	4		4		4				4	4	4	1.5
6UgcW		N	319		4			4					4					4					4	4	4		4		4				4	5	5	0.8
6UgcW	6 SP	N	322		4			4					4					4					4	4	4		4		4				4	5	5	1.8
6UgcW	6 SP	N	357					4					4					4		5				5			4		4				4	5	5	1.4
6UgcW		N	430		4			4					4					4		5				5	4		4		4				4	5	5	1.8
6UgcW	6 SP	N	308		4			4	5		5		5		5			5		5				5	4		4		5				4	5	5	11.0
6UgcW	6Dbc	Y	354		4			4	5		5		5		5			5		5		5		5	4		4		5				4	5	5	7.6
6UgcW		N	408		4			4	5		5		5		5			5		5				5	4		4		5				4	5	5	3.9
6UgcW	6Dbc	Y	413		4			4	5		5		5		5			5		5		5		5	4		4		5				4	5	5	3.4
6Uma	6UfdW	Y	278					4			4		4		4			4		5		5		5					4				4	5	5	11.8
6Uma	6UfdW	Y	300					4	5		5		5		5			5		5		5		5					5				4	5	5	33.8
																																				669.6 ha

5.3.1 Flooding

One of the major concerns in the area is the poor surface drainage caused by the high levee of the Haughton River and the absence of any tributary streams. Excess surface water is inefficiently drained by the abandoned distributary channels and relict streams which flow in a northeasterly direction. The bulk of the surface water flows to the tributaries of West Barratta creek to the north and northeast of the area. The high levee of Gumhole overflow is sufficiently elevated to prevent runoff entering the drainage and depression except during major floods. This inefficient drainage system causes local ponding of the depression areas, particularly in the wet season. Soils of landscape unit 2, especially UMA 351 (2UgcW) between Gumhole overflow and the abandoned channel in the eastern portion of the area are seriously affected. **Considerable drainage improvement is therefore a prerequisite to the development of this area.**

Significant flooding over some of the area will occur when the Haughton River overflows and Gumhole overflow becomes a major distributary channel. This is estimated to occur once in five to seven years (Reid and Baker 1984). The most recent flood occurred in 1991. The areas of major concern are UMAs of LU2 (UMAs 371, 2Uge; 448, 2Ugd; 496, 2Dbd; 551,655, 2Ugd) in the middle of the area and stretching northeast-southwest. Adjacent areas of landscape unit 6 are also at risk.

5.3.2 Erosion

Existing gullies are delineated on the soils map as an eroded phase (E). Major gullies asssociated with UMAs 356, 471 and 577 are so severe that reclamation would be considered uneconomical. These gullies should however be fully stabilised as part of the development of the area to prevent further erosion. The banks of the Haughton River, Gumhole overflow and the other major drainage depressions through the area must be protected by adequately maintained buffer zones to prevent erosion.

5.3.3 Outflow potential

Areas of sodic to strongly sodic soils with high salt levels at depth in the profile (eg. 6Dyj, 6Dyg, 6Dba, 2Ddb and 2Dyb) occur in a broad band below the freely drained soils, for example, 6Dbc, adjacent to Gumhole overflow and the other major drainage depressions through the area. The distribution of these sodic and saline soils indicates the groundwater movement from the freely drained soils may have caused salinisation. Considering the very gentle slopes of the sodic soils, lateral movement of groundwater away from the higher, freely drained soils is probably limited to the area immediately below the former soils. To determine if lateral movement of saline water is likely, an investigation should be made of the difference in the elevation of the freely drained soils and the sodic duplex soils as well as the depth at which salinity occurs in the freely drained soils.

The effects of irrigation on the freely drained soils needs to be carefully monitored to assess groundwater movement and its effects on the lower adjacent areas of already saline soils. An investigation is urgently required on the composition and hydraulics of the groundwater under furrow irrigation on the freely drained soils and the potential effects on the lower adjacent areas of soils.

5.3.4 Development of perched watertables

Large areas of loamy soil type (6Umb2) associated with the present Haughton River levee overlie a grey medium to heavy clay at 0.5-1.5 m. The almost impermeable buried layer appears to be continuous with the cracking clays of LU2. A perched non-saline water-table is present above the clay during the wet season and may persist for several months.

Investigations are urgently needed to determine the likely extent of the area subject to the development of shallow watertables under irrigated conditions. Crops sensitive to waterlogging will not be suitable in areas with perched watertables.

5.3.4 Landform pattern

Farm design in this area will be constrained by topography. The shape of the area as well as the size and direction of the major drainage depressions and levees through the area will influence farm subdivision. The area in the southwest, between Gumhole overflow and the other major drainage depression, will pose problem in developing a viable farm design as large areas of strongly sodic soils (class 4 for all crops) lie across the slope of the land. In addition, a large mapping unit (UMA 351, 2UgcW) is not suitable for any crops considered because of excessive wetness in this area. The size and location of this mapping unit will further exacerbate farm design problems in this area.

Large depressions such as old drainage channels should be excluded from within farms and used in the designed drainage network if possible.

5.3.5 Complex soil distribution

Areas with a complex pattern of soils with widely different management requirements often prevent optimum production being achieved. Such a complex pattern occurs in the southern portion, north of the second major drainage depression (UMA 356) between the tramway and the NW-SE powerline. Uniform sandy soils (6Ucb), freely drained soils (6Dbc, 6Umb), sodic and strongly sodic soils (6Dyj, 2Ddb, 6Dyg, 2Dyb) and cracking clays (6Ugc, 2Uge) occur in close proximity. This soil variability may prevent the establishment of viable farms in the area and should be excluded from development.

5.3.6 Needle nematodes

Monitoring of needle nematode populations on the cracking clays of landscape unit 2 is desirable if rice production is attempted in this area. Areas with excessive populations which may cause economic damage or crop failure should be avoided.

5.3.7 Unsuitable UMAs

Any large contiguous UMAs which are not suitable for any crops considered, should be excluded from farms. However, if the areas are small and impracticable to exclude, the unsuitable UMAs should be located at the boundaries rather than in the centre of the farm if possible.

For ease of farm management, individual farms should be apportioned so as to consist of soils with similar characteristics. Ameliorative measures, when they are required, would be easier to implement on such farms.

In Gumhole overflow and other major drainage depressions through the area, the combined effects of erosion, steep slopes and excessive wetness during considerable periods of the year, render them not suitable for crops. Soil types 6UfcW (UMA 279), 6UfdW (UMA 277), 6UgcW (UMAs 308,354,408 and 413), 6Uma (UMA 300) and 6DbcE-6UfdW (UMA 577) have all these severe limitations and are considered class 5 for all crops.

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APPENDIX I

VEGETATION OF HAUGHTON SECTION STAGE III, BRIA

COMMON NAMES	SCIENTIFIC NAMES
Trees:	
Beefwood	*Grevillea striata*
Cabbage gum	*Eucalyptus papuana*
Carbeen	*Eucalyptus tessellaris*
Cocky apple	*Planchonia careya*
Grey bloodwood	*Eucalyptus polycarpa*
Pandanus	*Pandanus* spp.
Poplar gum	*Eucalyptus platyphylla*
Tea-tree	*Melaleuca nervosa*
Shrubs:	
Broad leaf tea-tree	*Melaleuca viridiflora*
Chinee apple	*Zizaphus mauritiana*
Corkwood wattle	*Acacia bidwillii*
False sandalwood	*Eremophila mitchellii*
Mimosa bush	*Acacia farnesiana*
Rubber vine	*Cryptostegia grandiflora*
Grasses:	
Black spear grass	*Heteropogon contortus*
Blady grass	*Imperata cylindrica*
Blue grasses	*Bothriochloa* and *Dicanthium* spp.
Brown sorghum	*Sorghum nitidum*
Giant spear grass	*Heteropogon triticeus*
Golden beard grass	*Chrysopogon fallax*
Love grass	*Eragrostis* spp.
Purple top Rhodes grass	*Chloris barbata*
Wire grass	*Aristida* spp.

APPENDIX II

MORPHOLOGICAL AND ANALYTICAL DATA

FOR REPRESENTATIVE SOIL PROFILES,

HAUGHTON SECTION, STAGE III, BRIA

SOIL TYPE: 6DYJ
SITE NO: S13
A.M.G. REFERENCE: 510 824 mE 7 822 775 mN ZONE 55

GREAT SOIL GROUP: Solodic soil
PRINCIPAL PROFILE FORM: Db1.33
SOIL TAXONOMY UNIT: Typic Natrustalfs
FAO UNESCO UNIT:

AUSTRALIAN CLASSIFICATION: Calcic, Hypernatric, Brown Sodosols

SUBSTRATE MATERIAL: Alluvium
CONFIDENCE SUBSTRATE IS PARENT MATERIAL:

SLOPE:
LANDFORM ELEMENT TYPE: Back-plain
LANDFORM PATTERN TYPE: Alluvial plain

VEGETATION
STRUCTURAL FORM: Low isolated clump of trees
DOMINANT SPECIES: Eremophila mitchellii, Acacia farnesiana, Ziziphus mauritiana

ANNUAL RAINFALL:

PROFILE MORPHOLOGY:

CONDITION OF SURFACE SOIL WHEN DRY: Hard setting

HORIZON	DEPTH	DESCRIPTION
ASb	0 to .10 m	Dull yellowish brown (10YR5/3) moist, light grey (10YR8/2) dry; few medium faint brown mottles; clay loam; weak 5-10mm platy; dry; moderately strong. Sharp smooth to-
B21t	.10 to .30 m	Dull yellowish brown (10YR4/3); few medium faint orange mottles; medium clay; strong 100-200mm prismatic tertiary, parting to 10-20mm angular blocky primary; dry; very strong; few medium carbonate nodules. Sharp smooth to-
B22t	.30 to .50 m	Dull yellowish brown (10YR5/3); few medium faint orange mottles; medium clay; strong 20-50mm prismatic tertiary, parting to 10-20mm angular blocky primary; dry; very strong; few coarse carbonate nodules. Clear wavy to-
B23t	.50 to .75 m	Dull yellowish orange (10YR6/3); common medium distinct orange mottles; medium clay; strong 20-50mm prismatic tertiary, parting to 10-20mm angular blocky primary; dry; very strong; few coarse carbonate nodules. Clear broken to-
B24t	.75 to 1.50 m	Greyish yellow-brown (10YR5/2); common medium faint orange mottles; medium clay; strong 20-50mm prismatic tertiary, parting to 10-20mm angular blocky primary; dry; very strong; few coarse carbonate nodules.

Depth	1:5 Soil/Water pH	EC	Cl	Particle Size CS	FS	S	C	Exch. Cations CEC	Ca	Mg	Na	K	Total Elements P	K	S	Moistures ADM 33*	1500*	Disp.Ratio R1	R2	Exch Al	Exch Acid	ECEC	pH CaCl2
metres		dS/m @ 40C	% @105C	% @ 105C				m.eq/100g @ 105C					@ 80C			% @ 105C		@ 40C		m.eq/100g @ 105C			@ 40C
B 0.10	6.2	.30	.035																				
0.10	6.7	.27	.028	3	43	24	34	20	5.4	5.9	4.1	.23	.046	1.25	.018	2.80	13	.74					
0.20	8.4	.52	.055																				
0.30	9.2	.91	.082	1	31	21	53	30	10	10	15	.22	.034	1.11	.036	3.80	20	.94					
0.60	9.4	1.3	.126	4	38	26	41	25	6.6	7.6	14	.28	.027	1.41	.032	2.40	19	.90					
0.90	9.0	1.4	.169	1	26	31	50	30	7.0	8.9	20	.33	.025	1.55	.025	3.20	22	.94					
1.20	9.0	1.3	.169	3	21	24	58	30	6.3	8.4	17	.34	.017	1.25	.022	2.90							
1.50	9.1	1.4	.169																				

Depth	Org.C (W&B)	Tot.N	Extr. P Acid Bicarb.	HCl K	CaCl2 Extr K	P	DTPA-extr. Fe	Mn	Cu	Zn	B	Extractable SO4S	NO3N	NH4N	P Buff Cap	Equil	Alternative Cations CEC	Ca	Mg	Na	K
metres	% @ 105C	% @ 105C	mg/kg @ 105C	meq% @105C	mg/kg @ 105C		mg/kg @ 105C					mg/kg @ 105C			@ 40C	ug/L	m.eq/100g @ 105C				
B 0.10	1.0	.09	20	.43			111	71	1.2	.93											
0.60												1.0	0								
0.90												1.0	0								
1.20												1.0	0								
1.50												2.1	0								

* -33kPa (-0.33bar) and -1500kPa (-15 bar) using pressure plate apparatus.

SOIL TYPE: 6UMA
SITE NO: S14
A.M.G. REFERENCE: 508 588 mE 7 823 752 mN ZONE 55

GREAT SOIL GROUP: No suitable group
PRINCIPAL PROFILE FORM: Um5.52
SOIL TAXONOMY UNIT: Aridic Ustochrepts
FAO UNESCO UNIT:

AUSTRALIAN CLASSIFICATION: Haplic, Eutrophic, Brown Kandosols

SUBSTRATE MATERIAL: Alluvium
CONFIDENCE SUBSTRATE IS PARENT MATERIAL:

SLOPE:
LANDFORM ELEMENT TYPE: Levee
LANDFORM PATTERN TYPE: Alluvial plain

VEGETATION
STRUCTURAL FORM: Mid-high open forest
DOMINANT SPECIES: Eucalyptus polycarpa, Eucalyptus tessellaris

ANNUAL RAINFALL:

PROFILE MORPHOLOGY:

CONDITION OF SURFACE SOIL WHEN DRY: Hard setting

HORIZON	DEPTH	DESCRIPTION
A11	0 to .20 m	Brownish black (10YR2/2); fine sandy loam; massive; many fine macropores; dry; moderately strong. Gradual smooth to-
A12	.20 to .40 m	Brownish black (7.5YR3/2); loam, fine sandy; massive; many fine macropores; dry; moderately strong. Gradual smooth to-
B	.40 to 1.20 m	Brown (7.5YR4/4); loam, fine sandy; massive; few fine macropores; dry; very firm. Gradual smooth to-
D	1.20 to 1.40 m	Brown (7.5YR4/6); fine sandy loam; massive; few fine macropores; dry; moderately weak.

Depth	1:5 Soil/Water pH	EC	Cl	Particle Size CS	FS	S	C	Exch. Cations CEC	Ca	Mg	Na	K	Total Elements P	K	S	Moistures ADM	33*	1500*	Disp.Ratio R1	R2	Exch Al	Exch Acid	ECEC	pH CaCl2
metres		dS/m	%	%				m.eq/100g					%				%					m.eq/100g		
	@ 40C	@105C		@ 105C				@ 105C					@ 80C				@ 105C		@ 40C			@ 105C		@ 40C
B 0.10	6.7	.07	.001	12	68	10	13	10	5.8	2.3	1.2	.54	.083	1.97	.014	1.20		6	.70					
0.10	6.6	.07	.001	10	68	12	16	8	5.0	1.7	.08	.35	.077	1.95	.007	1.10		6	.64					
0.30	6.4	.04		10	68	12	16	8	5.0	1.7	.08	.35	.077	1.95	.007	1.10		6	.64					
0.60	6.7	.03		10	65	11	20	9	6.1	2.2	.08	.40	.084	1.96	.005	1.70		7	.96					
0.90	6.8	.02	.001	17	63	5	16	8	5.0	2.1	.09	.29	.064	2.00	.002	1.30		6	.74					
1.20	7.0	.01	.001	21	61	4	13	7	4.7	2.1	.05	.26	.065	2.06	.002	1.00								
1.50	7.2	.01	.001																					

Depth	Org.C (W&B)	Tot.N	Extr. P Acid	Bicarb.	HCl K	CaCl2 Extr K	P	DTPA-extr. Fe	Mn	Cu	Zn	B	Extractable SO4S	NO3N	NH4N	P Buff	Equil	Alternative Cations CEC	Ca	Mg	Na	K
metres	%	%	mg/kg		meq%	mg/kg		mg/kg					mg/kg			Cap	ug/L	m.eq/100g				
	@ 105C	@ 105C	@ 105C		@105C	@ 105C		@ 105C					@ 105C			@ 40C		@ 105C				
B 0.10	1.3	.06	36		.67	47	51	.40	2.6				1.0		0							

* -33kPa (-0.33bar) and -1500kPa (-15 bar) using pressure plate apparatus.

1

SOIL TYPE: 6DBF
SITE NO: S15
A.M.G. REFERENCE: 509 083 mE 7 824 024 mN ZONE 55

GREAT SOIL GROUP: Brown podzolic soil
PRINCIPAL PROFILE FORM: Dy2.22
SOIL TAXONOMY UNIT: Aridic Paleustalfs
FAO UNESCO UNIT:

AUSTRALIAN CLASSIFICATION: Haplic, Eutrophic, Brown Chromosols

SUBSTRATE MATERIAL: Alluvium
CONFIDENCE SUBSTRATE IS PARENT MATERIAL:

SLOPE:
LANDFORM ELEMENT TYPE: Levee
LANDFORM PATTERN TYPE: Alluvial plain

VEGETATION
STRUCTURAL FORM: Tall closed forest
DOMINANT SPECIES: Eucalyptus polycarpa

ANNUAL RAINFALL:

PROFILE MORPHOLOGY:

CONDITION OF SURFACE SOIL WHEN DRY: Hard setting

HORIZON	DEPTH	DESCRIPTION
A1	0 to .10 m	Brownish black (10YR3/2); clay loam,fine sandy; weak 20-50mm subangular blocky; many fine macropores; dry; very firm. Gradual smooth to-
A3	.10 to .30 m	Dull yellowish brown (10YR4/3); clay loam,fine sandy; weak 20-50mm subangular blocky; common fine macropores; dry; moderately strong. Gradual smooth to-
B21t	.30 to .70 m	Dull yellowish brown (10YR5/4); ?? LMCFS ??; strong 50-100mm angular blocky; dry; very strong. Gradual smooth to-
B22t	.70 to 1.25 m	Yellowish brown (10YR5/6); ?? LMCFS ??; strong 50-100mm angular blocky; dry; very strong; very few medium manganiferous soft segregations. Gradual smooth to-
D	1.25 to 1.50 m	Brown (10YR4/6); loam, fine sandy; massive; dry; moderately weak.

Depth	1:5 Soil/Water pH	EC	Cl	Particle Size CS	FS	S	C	Exch. Cations CEC	Ca	Mg	Na	K	Total Elements P	K	S	Moistures ADM	33*	1500*	Disp.Ratio R1	R2	Exch Al	Exch Acid	ECEC	pH CaCl2
metres	@ 40C	dS/m	@105C	% @ 105C				m.eq/100g @ 105C					% @ 80C			% @ 105C			@ 40C		m.eq/100g @ 105C			@ 40C
B 0.10	6.4	.09	.001																					
0.10	6.2	.06	.001	6	66	15	18	11	7.1	2.8	.02	.44	.081	1.91	.009	1.50		7	.69					
0.30	6.2	.04	.001	11	55	17	25	11	8.4	2.9	.06	.57	.068	1.92	.006	1.60		9	.67					
0.60	6.8	.02	.001	15	46	13	30	12	7.9	3.6	.08	.39	.044	1.95	.002	2.00		10	.71					
0.90	7.0	.02	.001	18	46	7	30	11	6.6	3.3	.08	.32	.038	1.94	.002	2.00		10	.63					
1.20	7.2	.02	.001	13	59	9	21	9	6.1	3.1	.07	.25	.040	2.04	.002	1.50								
1.50	6.9	.01	.001																					

Depth	Org.C (W&B)	Tot.N	Extr. P Acid	Bicarb.	HCl K	CaCl2 Extr K	P	Fe	DTPA-extr. Mn	Cu	Zn	B	Extractable SO4S	NO3N	NH4N	P Buff Cap	Equil	Alternative Cations CEC	Ca	Mg	Na	K
metres	% @ 105C	% @ 105C	mg/kg @ 105C		meq% @105C	mg/kg @ 105C			mg/kg @ 105C				mg/kg @ 105C			@ 40C	ug/L	m.eq/100g @ 105C				
B 0.10	2.2	.11	48		.80			83	122	.81	2.5											

* -33kPa (-0.33bar) and -1500kPa (-15 bar) using pressure plate apparatus.

1

SOIL TYPE: 6UMB2
SITE NO: S16
A.M.G. REFERENCE: 510 177 mE 7 825 413 mN ZONE 55

GREAT SOIL GROUP: Prairie soil
PRINCIPAL PROFILE FORM: Gn3.45
SOIL TAXONOMY UNIT: Aridic Ustochrepts
FAO UNESCO UNIT:

AUSTRALIAN CLASSIFICATION: Eutrophic, Black Dermosols

SUBSTRATE MATERIAL: Alluvium
CONFIDENCE SUBSTRATE IS PARENT MATERIAL:

SLOPE:
LANDFORM ELEMENT TYPE: Levee
LANDFORM PATTERN TYPE: Alluvial plain

VEGETATION
STRUCTURAL FORM: Tall closed forest
DOMINANT SPECIES: Eucalyptus polycarpa

ANNUAL RAINFALL:

PROFILE MORPHOLOGY:

CONDITION OF SURFACE SOIL WHEN DRY: Hard setting

HORIZON	DEPTH	DESCRIPTION
A1	0 to .30 m	Brownish black (10YR3/1); clay loam,fine sandy; weak 20-50mm angular blocky; many medium macropores; dry; very firm; many fine roots. Clear smooth to-
A2	.30 to .60 m	Brown (7.5YR4/3); clay loam,fine sandy; weak 10-20mm angular blocky; many medium macropores; dry; very firm; common very fine roots. Clear smooth to-
B2	.60 to .80 m	Brownish black (10YR3/1); light clay; strong 100-200mm prismatic secondary, parting to 10-20mm angular blocky primary; dry; moderately strong; common very fine roots. Abrupt wavy to-
D1	.80 to .95 m	Dull brown (7.5YR5/4); clayey coarse sand; few small pebbles, subrounded gravel; massive; dry; very weak. Sharp wavy to-
D2	.95 to 1.50 m	Dark greyish yellow (2.5Y5/2); common coarse faint yellow mottles; medium clay; very few small pebbles, subrounded gravel; strong 50-100mm angular blocky secondary, parting to 10-20mm angular blocky primary; few distinct clay skins; dry; very strong; very few fine manganiferous concretions.

Depth	1:5 Soil/Water pH	EC dS/m @ 40C	Cl % @105C	Particle Size CS	FS	S	C	Exch. Cations CEC	Ca	Mg	Na	K	Total Elements P	K	S	Moistures ADM 33*	1500*	Disp.Ratio R1 @ 40C	R2	Exch Acid Al	Exch Acid @ 105C	ECEC	pH CaCl2 @ 40C
metres				% @ 105C				m.eq/100g @ 105C					% @ 80C			% @ 105C		@ 40C		m.eq/100g @ 105C			
B 0.10	6.3	.11	.004																				
0.10	6.1	.08	.001	7	60	18	21	15	8.6	3.4	.01	.61	.094	1.84	.016	1.90	9	1.1					
0.30	6.6	.05	.001	11	49	19	25	13	9.1	3.6	.07	.32	.061	1.79	.005	2.20	9	.71					
0.60	6.8	.04	.001	19	33	17	33	16	11	5.0	.14	.47	.044	1.80	.004	3.00	11	.66					
0.80	7.1	.03	.001																				
0.90	6.5	.01	.001	80	8	2	13	6	3.9	2.2	.03	.18	.037	1.93	.002	.900	4	.80					
1.20	7.7	.03	.001	14	27	21	40	22	15	7.4	.71	.14	.012	1.61	.002	3.90							
1.50	8.2	.04	.001																				

Depth	Org.C (W&B) % @ 105C	Tot.N % @ 105C	Extr. P Acid mg/kg @ 105C	Bicarb. K meq% @105C	CaCl2 Extr K mg/kg @ 105C	P mg/kg	DTPA-extr. Fe	Mn	Cu	Zn	B mg/kg @ 105C	Extractable SO4S NO3N NH4N mg/kg @ 105C	P Buff Cap @ 40C	Equil ug/L	Alternative Cations CEC	Ca	Mg	Na	K m.eq/100g @ 105C
metres																			
B 0.10	1.9	.08	45	1.2		82	61	.82	4.8										

* -33kPa (-0.33bar) and -1500kPa (-15 bar) using pressure plate apparatus.

1

SOIL TYPE: 2UGD (Mound)
SITE NO: S17
A.M.G. REFERENCE: 510 361 mE 7 825 168 mN ZONE 55

GREAT SOIL GROUP: No suitable group
PRINCIPAL PROFILE FORM: Ug3.2
SOIL TAXONOMY UNIT: Entic Chromusterts
FAO UNESCO UNIT:
AUSTRALIAN CLASSIFICATION: Pedal, Grey Vertosols
TYPE OF MICRORELIEF: Normal gilgai
VERTICAL INTERVAL: .15 m
HORIZONTAL INTERVAL: 07 m
COMPONENT OF MICRORELIEF SAMPLED: Mound

SUBSTRATE MATERIAL: Alluvium
CONFIDENCE SUBSTRATE IS PARENT MATERIAL:

SLOPE:
LANDFORM ELEMENT TYPE: Flat
LANDFORM PATTERN TYPE: Alluvial plain

VEGETATION
STRUCTURAL FORM: Tall woodland
DOMINANT SPECIES: Eucalyptus alba, Eucalyptus tessellaris

ANNUAL RAINFALL:

PROFILE MORPHOLOGY:

CONDITION OF SURFACE SOIL WHEN DRY: Hard setting, periodic cracking

HORIZON	DEPTH	DESCRIPTION
A1	0 to .18 m	Brownish black (10YR3/2); common medium distinct orange mottles; light clay; strong 10-20mm subangular blocky; many fine macropores; dry; moderately strong; very few fine ferromanganiferous nodules; common fine roots. Clear wavy to-
A2sb	.18 to .29 m	Greyish yellow-brown (10YR6/2) moist, light grey (10YR8/1) dry, dry sporadically bleached; common medium distinct orange mottles; light clay; strong 10-20mm subangular blocky; many fine macropores; dry; very firm; very few fine ferromanganiferous nodules; common fine roots. Abrupt wavy to-
B21	.29 to .55 m	Dark greyish yellow (2.5Y5/2); common medium faint orange mottles; medium clay; very few small pebbles, rounded unspecified coarse fragments; strong 20-50mm subangular blocky; dry; very strong; very few fine ferromanganiferous nodules; few very fine roots. Clear wavy to-
B22	.55 to 1.10 m	Greyish yellow-brown (10YR5/2); medium clay; very few small pebbles, rounded unspecified coarse fragments; strong 50-100mm lenticular tertiary, parting to 10-20mm lenticular primary; many distinct clay skins; dry; very strong; few fine ferromanganiferous nodules; few very fine roots. Clear wavy to-
D	1.10 to 1.50 m	Dull yellowish orange (10YR6/4); many medium prominent orange mottles; fine sandy clay; strong 20-50mm subangular blocky; dry; moderately strong; few coarse carbonate tubules.

Depth	1:5 Soil/Water pH	EC	Cl	Particle Size CS	FS	S	C	Exch. Cations CEC	Ca	Mg	Na	K	Total Elements P	K	S	Moistures ADM	33*	1500*	Disp.Ratio R1	R2	Exch Al	Exch Acid	ECEC	pH CaCl2
metres	@ 40C	dS/m	@105C	% @ 105C				m.eq/100g @ 105C					% @ 80C			% @ 105C			@ 40C		m.eq/100g @ 105C			@ 40C
B 0.10	5.6	.07	.002																					
0.10	5.6	.06	.002	4	53	23	26	15	5.4	3.8	.10	.45	.011	1.63	.002	1.60		10	.67					
0.29	6.2	.04	.001	7	41	28	33	13	6.0	4.4	.40	.30	.035	1.76	.003	2.10		12	.69					
0.60	7.4	.09	.007	4	23	22	53	24	12	9.8	1.7	.31	.016	1.62	.002	3.20		19	.79					
0.90	8.3	.18	.019	5	23	26	52	27	15	11	2.6	.19	.011	1.56	.003	3.20		18	.74					
1.20	8.9	.38	.032	13	33	18	42	21	11	8.7	2.4	.19	.013	1.42	.002	3.20								
1.50	8.9	.36	.035																					

Depth	Org.C (W&B)	Tot.N	Extr. P Acid	Bicarb.	HCl K	CaCl2 Extr K	P	DTPA-extr. Fe	Mn	Cu	Zn	B	Extractable SO4S	NO3N	NH4N	P Buff Cap	Equil	Alternative Cations CEC	Ca	Mg	Na	K
metres	% @ 105C	% @ 105C	mg/kg @ 105C		meq% @105C	mg/kg @ 105C		mg/kg @ 105C					mg/kg @ 105C			@ 40C	ug/L	m.eq/100g @ 105C				
B 0.10	1.8	.11	67		.64	263	96	2.1	2.2													

* -33kPa (-0.33bar) and -1500kPa (-15 bar) using pressure plate apparatus.

SOIL TYPE: 2UGD (Depression)
SITE NO: S18
A.M.G. REFERENCE: 510 361 mE 7 825 168 mN ZONE 55

GREAT SOIL GROUP: No suitable group
PRINCIPAL PROFILE FORM: Ug3.2
SOIL TAXONOMY UNIT: Entic Chromusterts
FAO UNESCO UNIT:
AUSTRALIAN CLASSIFICATION: Pedal, Grey Vertosols
TYPE OF MICRORELIEF: Normal gilgai
VERTICAL INTERVAL: .15 m
HORIZONTAL INTERVAL: 07 m
COMPONENT OF MICRORELIEF SAMPLED: Depression

SUBSTRATE MATERIAL: Alluvium
CONFIDENCE SUBSTRATE IS PARENT MATERIAL:

SLOPE:
LANDFORM ELEMENT TYPE: Flat
LANDFORM PATTERN TYPE: Alluvial plain

VEGETATION
STRUCTURAL FORM: Tall woodland
DOMINANT SPECIES: Eucalyptus alba, Eucalyptus tessellaris

ANNUAL RAINFALL:

PROFILE MORPHOLOGY:

CONDITION OF SURFACE SOIL WHEN DRY: Hard setting, periodic cracking

HORIZON	DEPTH	DESCRIPTION
A1	0 to .16 m	Greyish yellow-brown (10YR5/2); few fine distinct orange mottles; light clay; strong 20-50mm subangular blocky secondary, parting to 10-20mm subangular blocky primary; many medium macropores; dry; very firm; common fine roots. Clear smooth to-
A2sb	.16 to .25 m	Dull yellowish orange (10YR6/3) moist, light grey (2.5Y8/2) dry, dry sporadically bleached; few medium distinct brown mottles; light clay; strong 20-50mm subangular blocky secondary, parting to 10-20mm subangular blocky primary; common medium macropores; dry; very firm; few fine ferruginous nodules; common fine roots. Clear wavy to-
B21	.25 to .55 m	Dark greyish yellow (2.5Y5/2); few fine faint orange mottles; medium clay; very few small pebbles, rounded unspecified coarse fragments; strong 50-100mm prismatic tertiary, parting to 10-20mm subangular blocky primary; dry; very strong; few fine ferruginous nodules; few very fine roots. Clear wavy to-
B22	.55 to .90 m	Dark greyish yellow (2.5Y5/2); few medium faint orange mottles; medium clay; very few small pebbles, rounded unspecified coarse fragments; strong 50-100mm lenticular tertiary, parting to 10-20mm lenticular primary; many prominent clay skins; dry; very strong; few fine ferruginous nodules; few very fine roots. Clear wavy to-
B23k	.90 to 1.10 m	Dull yellowish brown (10YR5/4); medium clay; very few small pebbles, rounded unspecified coarse fragments; strong 50-100mm lenticular tertiary, parting to 10-20mm lenticular primary; many prominent clay skins; dry; very strong; common coarse carbonate nodules, few medium ferruginous nodules. Clear wavy to-
DK	1.10 to 1.50 m	Dull yellowish orange (10YR6/4); common coarse prominent orange mottles; fine sandy clay; strong 10-20mm subangular blocky; dry; very strong; common coarse carbonate nodules.

Depth	1:5 Soil/Water			Particle Size				Exch. Cations					Total Elements			Moistures		Disp.Ratio		Exch Al	Exch Acid	ECEC	pH
	pH	EC	Cl	CS	FS	S	C	CEC	Ca	Mg	Na	K	P	K	S	ADM 33*	1500*	R1	R2				CaCl2
metres		dS/m	%			%			m.eq/100g					%			%				m.eq/100g			
	@ 40C	@105C		@ 105C				@ 105C					@ 80C			@ 105C		@ 40C		@ 105C			@ 40C
0.10	5.6	.06	.002	4	42	30	29	17	5.8	4.0	.19	.48	.062	1.81	.012	12.50	11	.65					
0.30	6.7	.07	.006	7	30	25	41	18	8.4	6.7	.97	.30	.032	1.70	.003	13.50	15	.80					
0.60	7.6	.08	.007	7	21	23	53	26	15	12	1.9	.22	.012	1.52	.002	13.20	18	.74					
0.90	8.7	.32	.026	11	26	17	48	24	14	11	2.4	.17	.011	1.45	.004	12.90	17	.65					
1.20	9.0	.33	.025	18	30	19	38	18	11	8.9	2.0	.27	.018	1.42	.002	13.20							
1.50	9.0	.26	.014																				

Depth	Org.C	Tot.N	Extr. P	HCl	CaCl2 Extr	DTPA-extr.				Extractable			P	Alternative Cations				
	(W&B)		Acid Bicarb.	K	K	P	Fe	Mn	Cu	Zn	B	SO4S	NO3N	NH4N	Buff Equil	CEC	Ca	Mg	Na	K
metres	%	%	mg/kg	meq%	mg/kg		mg/kg					mg/kg			Cap ug/L	m.eq/100g				
	@ 105C	@ 105C	@ 105C	@105C	@ 105C		@ 105C					@ 105C			@ 40C	@ 105C				
0.10	1.5	.09	46	.54		190	92	2.0	2.2											

* -33kPa (-0.33bar) and -1500kPa (-15 bar) using pressure plate apparatus.

SOIL TYPE: 2DDB
SITE NO: S19
A.M.G. REFERENCE: 511 895 mE 7 824 874 mN ZONE 55

GREAT SOIL GROUP: Solodic soil
PRINCIPAL PROFILE FORM: Dy2.33
SOIL TAXONOMY UNIT: Typic Natrustalfs
FAO UNESCO UNIT:
AUSTRALIAN CLASSIFICATION: Calcic, Hypernatric, Grey Sodosols

SUBSTRATE MATERIAL: Alluvium
CONFIDENCE SUBSTRATE IS PARENT MATERIAL:

SLOPE:
LANDFORM ELEMENT TYPE: Flat
LANDFORM PATTERN TYPE: Alluvial plain

VEGETATION
STRUCTURAL FORM:
DOMINANT SPECIES

ANNUAL RAINFALL:

PROFILE MORPHOLOGY:
CONDITION OF SURFACE SOIL WHEN DRY: Hard setting

HORIZON	DEPTH	DESCRIPTION
ASb	0 to .04 m	Dull yellowish brown (10YR5/4) moist, light grey (10YR8/2) dry; clay loam,fine sandy; massive; dry; very firm; common fine roots. Abrupt smooth to-
B21t	.04 to .17 m	Greyish yellow-brown (10YR5/2); light medium clay; strong 20-50mm angular blocky secondary, parting to 5-10mm angular blocky primary; dry; very firm; common fine roots. Abrupt wavy to-
B22t	.17 to .30 m	Dull yellowish brown (10YR5/3); light medium clay; strong 20-50mm angular blocky secondary, parting to 5-10mm angular blocky primary; dry; very firm; common coarse carbonate nodules; common fine roots. Clear broken to-
B23t	.30 to .60 m	Dull yellowish orange (10YR6/3); light medium clay; strong 20-50mm angular blocky secondary, parting to 5-10mm angular blocky primary; dry; very firm; common coarse carbonate nodules; few fine roots. Clear broken to-
B24t	.60 to .70 m	Dull yellowish brown (10YR5/3); few medium distinct brown mottles; light medium clay; strong 20-50mm angular blocky secondary, parting to 5-10mm angular blocky primary; dry; moderately strong; common coarse carbonate nodules. Abrupt broken to-
D1	.70 to .90 m	Greyish yellow-brown (10YR4/2); fine sandy clay; very few small pebbles, subangular gravel; strong 20-50mm angular blocky secondary, parting to 5-10mm angular blocky primary; dry; moderately strong; common coarse carbonate nodules. Abrupt broken to-
D2	.90 to 1.20 m	Dull yellowish orange (10YR6/3); fine sandy clay; strong 10-20mm angular blocky secondary; dry; moderately strong; common coarse carbonate nodules. Abrupt broken to-
D3	1.20 to 1.50 m	Greyish yellow-brown (10YR6/2); medium clay; strong 50-100mm angular blocky secondary, parting to 5-10mm angular blocky primary; dry; moderately strong; few medium carbonate nodules, few medium manganiferous soft segregations.

Depth metres	1:5 Soil/Water pH @ 40C	EC dS/m @ 40C	Cl % @105C	Particle Size CS FS S % @ 105C	C	Exch. Cations CEC Ca Mg Na K m.eq/100g @ 105C	Total Elements P % @ 80C	K	S	Moistures ADM 33* % @ 105C	1500*	Disp.Ratio R1 @ 40C	R2	Exch Al m.eq/100g @ 105C	Exch Acid	ECEC	pH CaCl2 @ 40C
B 0.10	6.7	.52	.079														
0.04	7.0	.50	.079	6 54 15 32		19 5.2 5.8 5.2 .38	.069	1.63	.017	5.80	12	.88					
0.20	9.1	1.0	.115			21 6.0 6.3 14 .11											
0.30	9.7	1.3	.143	4 59 12 31			.038	1.69	.017	4.30	14	.95					
0.60	9.3	1.6	.198	3 42 28 37		23 5.9 6.1 19 .12	.030	1.72	.006	6.50	19	.90					
0.90	9.6	1.5	.184	11 31 31 39		24 5.9 6.3 21 .10	.024	1.58	.003	8.10	21	.91					
1.20	9.8	1.3	.142	12 45 18 33		21 5.3 5.0 17 .11	.031	1.69	.002	5.90							
1.50	9.8	.97	.119														
0.10	7.6	.65	.079														

Depth metres	Org.C (W&B) % @ 105C	Tot.N % @ 105C	Extr. P Acid Bicarb. mg/kg @ 105C	HCl K meq% @105C	CaCl2 Extr K mg/kg @ 105C	P	DTPA-extr. Fe Mn Cu Zn mg/kg @ 105C	B	Extractable SO4S NO3N NH4N mg/kg @ 105C	P Buff Cap @ 40C	Equil ug/L	Alternative Cations CEC Ca Mg Na K m.eq/100g @ 105C
B 0.10	1.1	.08	67	.48		72	54 1.2 .53		3.2	0		
0.04									4.2	0		
0.10									4.2	0		

* -33kPa (-0.33bar) and -1500kPa (-15 bar) using pressure plate apparatus.

1

SOIL TYPE: 6UCB
SITE NO: S20
A.M.G. REFERENCE: 512 133 mE 7 824 604 mN ZONE 55

GREAT SOIL GROUP: Siliceous sand
PRINCIPAL PROFILE FORM: Uc2.21
SOIL TAXONOMY UNIT: Aridic Ustochrepts?
FAO UNESCO UNIT:

AUSTRALIAN CLASSIFICATION: Basic, Brown, Bleached Tenosols

SUBSTRATE MATERIAL: Alluvium
CONFIDENCE SUBSTRATE IS PARENT MATERIAL:

SLOPE:
LANDFORM ELEMENT TYPE: Prior stream
LANDFORM PATTERN TYPE:

VEGETATION
STRUCTURAL FORM: Very tall woodland
DOMINANT SPECIES: Eucalyptus tessellaris, Eucalyptus polycarpa, Planchonia careya

ANNUAL RAINFALL:

PROFILE MORPHOLOGY:

CONDITION OF SURFACE SOIL WHEN DRY: Loose

HORIZON	DEPTH	DESCRIPTION
A11	0 to .16 m	Brownish black (10YR3/2); coarse sandy loam; massive; dry; moderately weak. Clear smooth to-
A12	.16 to .30 m	Dull yellowish brown (10YR4/3); coarse sandy loam; massive; dry; moderately weak. Clear smooth to-
A2cb	.30 to .60 m	Dull yellowish orange (10YR6/4) moist, light grey (10YR8/2) dry; clayey coarse sand; massive; dry; very weak. Clear smooth to-
B	.60 to 1.10 m	Orange (7.5YR6/6); coarse sandy loam; massive; dry; very weak. Clear smooth to-
D	1.10 to 1.50 m	Orange (7.5YR6/6); clayey coarse sand; many coarse pebbles, subrounded unspecified coarse fragments; massive; dry; very weak.

Depth	1:5 Soil/Water pH @ 40C	EC dS/m @ 40C	Cl % @105C	Particle Size CS FS % S % C % @ 105C	Exch. Cations CEC Ca Mg Na K m.eq/100g @ 105C	Total Elements P % @ 80C	K %	S %	Moistures ADM 33* 1500* % @ 105C	Disp.Ratio R1 @ 40C	R2	Exch Acid m.eq/100g @ 105C	Exch ECEC	pH CaCl2 @ 40C
B 0.10	7.3	.06	.001											
0.10	7.2	.06	.001	65 22 8 10	6 4.4 1.4 .03 .30	.030	1.94	.010	.700 4	.57				
0.30	7.3	.02	.001	65 24 7 8	3 2.6 .88 .04 .20	.029	2.11	.002	.500 3	.72				
0.60	6.4	.01	.001	62 27 7 8	3 1.5 .86 .03 .14	.019	2.10	.002	.400 3	.58				
0.90	6.5	.01	.001	55 31 8 10	3 2.1 .73 .01 .14	.023	2.10	.002	.700 3	.59				
1.20	6.7	.01	.001	60 24 7 13	4 2.9 1.4 .02 .22	.016	2.09	.002	.900					
1.50	6.5	.01	.001											

Depth	Org.C (W&B) % @ 105C	Tot.N % @ 105C	Extr. P Acid Bicarb. mg/kg @ 105C	HCl K meq% @105C	CaCl2 Extr K mg/kg @ 105C	CaCl2 Extr P mg/kg @ 105C	DTPA-extr. Fe Mn Cu Zn mg/kg @ 105C	B	Extractable SO4S NO3N NH4N mg/kg @ 105C	P Buff Cap @ 40C	Equil ug/L	Alternative Cations CEC Ca Mg Na K m.eq/100g @ 105C
B 0.10	.81	.04	21	.27		15	51 .40 1.7					

* -33kPa (-0.33bar) and -1500kPa (-15 bar) using pressure plate apparatus.

1

SOIL TYPE: 6DYC
SITE NO: S21
A.M.G. REFERENCE: 511 950 mE 7 828 420 mN ZONE 55

GREAT SOIL GROUP: Yellow podzolic soil
PRINCIPAL PROFILE FORM: Dy3.42
SOIL TAXONOMY UNIT: Aridic Paleustalfs
FAO UNESCO UNIT:

AUSTRALIAN CLASSIFICATION: Bleached-Mottled, Eutrophic Brown Chromosols

SUBSTRATE MATERIAL: Alluvium
CONFIDENCE SUBSTRATE IS PARENT MATERIAL:

SLOPE:
LANDFORM ELEMENT TYPE: Flood-out
LANDFORM PATTERN TYPE: Alluvial plain

VEGETATION
STRUCTURAL FORM: Tall woodland
DOMINANT SPECIES: Eucalyptus alba, Eucalyptus polycarpa, Planchonia careya

ANNUAL RAINFALL:

PROFILE MORPHOLOGY:

CONDITION OF SURFACE SOIL WHEN DRY: Hard setting

HORIZON	DEPTH	DESCRIPTION
A1	0 to .30 m	Brownish black (10YR3/2); sandy clay loam; weak 20-50mm prismatic. Clear smooth to-
A21sb	.30 to .45 m	Greyish yellow-brown (10YR6/2) moist, light grey (10YR8/1) dry, dry sporadically bleached; very few medium faint brown mottles; clay loam,sandy; weak 10-20mm prismatic; many medium macropores. Clear smooth to-
A22cb	.45 to .60 m	Dull yellowish orange (10YR6/3) moist, light grey (10YR8/1) dry; very few medium faint brown mottles; clay loam,sandy; massive; many medium macropores. Sharp smooth to-
B21t	.60 to .85 m	Dull brown (7.5YR5/4); many coarse prominent red mottles; medium clay; strong 100-200mm prismatic tertiary, parting to 10-20mm angular blocky primary. Clear smooth to-
B22t	.85 to 1.20 m	Bright reddish brown (5YR5/6); common coarse distinct red mottles; medium clay; strong 100-200mm prismatic tertiary, parting to 10-20mm angular blocky primary; very few medium manganiferous soft segregations. Clear smooth to-
DM	1.20 to 1.50 m	Bright brown (7.5YR5/6); common coarse faint brown mottles; fine sandy clay; very few small pebbles, rounded unspecified coarse fragments; strong 50-100mm prismatic tertiary, parting to 10-20mm angular blocky primary; common medium manganiferous soft segregations.

Depth	1:5 Soil/Water pH	EC	Cl	Particle Size CS	FS	S	C	Exch. Cations CEC	Ca	Mg	Na	K	Total Elements P	K	S	Moistures ADM	33*	1500*	Disp.Ratio R1	R2	Exch Al	Exch Acid	ECEC	pH CaCl2
metres		dS/m @ 40C	% @105C	% @ 105C				m.eq/100g @ 105C					% @ 80C			% @ 105C			@ 40C		m.eq/100g @ 105C			@ 40C
B 0.10	6.2	.07	.001																					
0.10	6.4	.04	.001	20	64	7	12	8	5.7	2.0	.01	.36	.060	2.03	.006	1.20		4	.53					
0.30	6.2	.04	.001	16	55	19	17	11	7.5	2.3	.01	.22	.042	1.82	.007	1.70		6	.59					
0.60	6.8	.02	.001	25	39	23	18	5	3.6	1.5	.01	.14	.015	1.82	.002	1.00		5	.85					
0.90	6.7	.02	.001	14	25	13	49	16	8.3	4.8	.33	.31	.029	1.63	.002	3.00		15	.47					
1.20	7.0	.02	.001	20	33	12	36	14	7.7	4.7	.33	.28	.024	1.83	.002	2.70								
1.50	7.4	.02	.001																					

Depth	Org.C (W&B) % @ 105C	Tot.N % @ 105C	Extr. P Acid Bicarb. mg/kg @ 105C	HCl K meq% @105C	CaCl2 Extr K mg/kg @ 105C	CaCl2 Extr P mg/kg @ 105C	DTPA-extr. Fe	Mn	Cu	Zn	B mg/kg @ 105C	Extractable SO4S	NO3N	NH4N mg/kg @ 105C	P Buff Cap @ 40C	Equil ug/L	Alternative Cations CEC	Ca	Mg	Na	K m.eq/100g @ 105C
B 0.10	1.5	.07	29	.60			82	60	.61	2.5											
0.60														1.0	0						

* -33kPa (-0.33bar) and -1500kPa (-15 bar) using pressure plate apparatus.

1

SOIL TYPE: 2DYB
SITE NO: S22
A.M.G. REFERENCE: 515 134 mE 7 828 267 mN ZONE 55

GREAT SOIL GROUP: Solodic soil
PRINCIPAL PROFILE FORM: Dy2.43
SOIL TAXONOMY UNIT: Typic Natrustalfs
FAO UNESCO UNIT:

AUSTRALIAN CLASSIFICATION: Calcic, Mesonatric, Grey Sodosols

SUBSTRATE MATERIAL: Alluvium
CONFIDENCE SUBSTRATE IS PARENT MATERIAL:

SLOPE:
LANDFORM ELEMENT TYPE: Flat
LANDFORM PATTERN TYPE: Alluvial plain

VEGETATION
STRUCTURAL FORM: Mid-high woodland
DOMINANT SPECIES: Eucalyptus alba, Eucalyptus papuana, Eucalyptus tessellaris

ANNUAL RAINFALL:

PROFILE MORPHOLOGY:

CONDITION OF SURFACE SOIL WHEN DRY: Hard setting

HORIZON	DEPTH	DESCRIPTION
A1	0 to .10 m	Brownish black (10YR3/2); few medium faint brown mottles; clay loam,fine sandy; massive; many fine macropores; dry; moderately firm; common fine roots. Clear smooth to-
A2cb	.10 to .20 m	Dull yellowish orange (10YR6/3) moist, light grey (10YR8/2) dry; few medium distinct brown mottles; clay loam,fine sandy; massive; many fine macropores; dry; moderately firm; common fine roots. Abrupt smooth to-
B21t	.20 to .30 m	Greyish yellow-brown (10YR4/2); common medium distinct brown mottles; light medium clay; strong 10-20mm subangular blocky; dry; very strong; few very fine roots. Clear smooth to-
B22t	.30 to .60 m	Greyish yellow-brown (10YR4/2); medium clay; strong 20-50mm subangular blocky; dry; very strong; very few fine manganiferous nodules. Clear smooth to-
B23t	.60 to 1.20 m	Greyish yellow-brown (10YR4/2); medium clay; very few medium pebbles, subrounded gravel; strong 20-50mm subangular blocky; dry; very strong; common medium carbonate nodules. Clear smooth to-
B24t	1.20 to 1.50 m	Greyish yellow-brown (10YR4/2); few coarse faint brown mottles; medium clay; strong 20-50mm lenticular tertiary, parting to 10-20mm lenticular primary; common prominent clay skins; dry; very strong; few coarse carbonate nodules.

Depth (metres)	1:5 Soil/Water pH @ 40C	EC dS/m @105C	Cl % @105C	Particle Size CS FS S % @ 105C	C	Exch. Cations CEC Ca Mg Na K m.eq/100g @ 105C	Total Elements P K % @ 80C	S	Moistures ADM 33* 1500* % @ 105C	Disp.Ratio R1 @ 40C	R2	Exch Al m.eq/100g @ 105C	Exch Acid	ECEC	pH CaCl2 @ 40C
B 0.10	5.9	.09	.004												
0.10	5.9	.06	.001	4 45 32 25		15 6.2 3.9 .42 .20	.047 1.51	.011	2.30 10	.69					
0.30	7.0	.12	.010	4 39 26 36		14 5.8 4.5 1.5 .11	.016 1.43	.006	3.00 12	.78					
0.60	8.4	.46	.061	4 25 22 53		23 11 8.1 3.8 .15	.015 1.27	.010	3.80 17	.91					
0.90	9.0	.79	.080	5 21 26 53		29 11 10 4.8 .14	.020 1.43	.006	4.20 17	.95					
1.20	9.2	.71	.079	6 20 28 51		31 12 11 6.0 .14	.019 1.45	.002	5.80						
1.50	8.7	.78	.081												

Depth (metres)	Org.C (W&B) % @ 105C	Tot.N % @ 105C	Extr. P Acid Bicarb. mg/kg @ 105C	HCl K meq% @105C	CaCl2 Extr K mg/kg @ 105C	P	DTPA-extr. Fe Mn Cu Zn mg/kg @ 105C	B	Extractable SO4S NO3N NH4N mg/kg @ 105C	Buff Cap	P Equil ug/L @ 40C	Alternative Cations CEC Ca Mg Na K m.eq/100g @ 105C
B 0.10	2.0	.12	32	.60			153 97 1.3 2.0					
1.20									1.1	0		
1.50									2.1	0		

* -33kPa (-0.33bar) and -1500kPa (-15 bar) using pressure plate apparatus.

1

SOIL TYPE: 6DYG
SITE NO: S23
A.M.G. REFERENCE: 513 700 mE 7 828 522 mN ZONE 55

GREAT SOIL GROUP: Solodic soil
PRINCIPAL PROFILE FORM: Dy2.43
SOIL TAXONOMY UNIT:
FAO UNESCO UNIT:

AUSTRALIAN CLASSIFICATION; Calcic, Mesonatric, Brown Sodosols

SUBSTRATE MATERIAL: Alluvium
CONFIDENCE SUBSTRATE IS PARENT MATERIAL:

SLOPE:
LANDFORM ELEMENT TYPE: Back-plain
LANDFORM PATTERN TYPE: Alluvial plain

VEGETATION
STRUCTURAL FORM: Very tall woodland
DOMINANT SPECIES: Eucalyptus alba, Planchonia careya, Acacia farnesiana

ANNUAL RAINFALL:

PROFILE MORPHOLOGY:

CONDITION OF SURFACE SOIL WHEN DRY: Hard setting

HORIZON	DEPTH	DESCRIPTION
A1	0 to .10 m	Greyish yellow-brown (10YR4/2); clay loam,fine sandy; massive; dry; very firm; few fine roots. Clear smooth to-
A2cb	.10 to .20 m	Greyish yellow-brown (10YR6/2), light grey (10YR7/1) dry; clay loam,fine sandy; massive; dry; very firm; few fine roots. Abrupt smooth to-
B21t	.20 to .50 m	Dull yellowish brown (10YR5/4); medium clay; strong 10-20mm subangular blocky; dry; very strong; very few medium manganiferous soft segregations; few very fine roots. Clear smooth to-
B22t	.50 to .90 m	Dull yellowish brown (10YR5/4); medium clay; strong 20-50mm angular blocky; dry; moderately strong; common coarse carbonate nodules, very few fine manganiferous concretions. Clear smooth to-
2B23t	.90 to 1.60 m	Dark greyish yellow (2.5Y4/2); medium clay; very few small pebbles, subangular gravel; strong 20-50mm lenticular secondary, parting to 5-10mm lenticular primary; many distinct clay skins; dry; moderately strong; few medium carbonate nodules.

Depth	1:5 Soil/Water pH	EC	Cl	Particle Size CS	FS	S	C	Exch. Cations CEC	Ca	Mg	Na	K	Total Elements P	K	S	Moistures ADM	33*	1500*	Disp.Ratio R1	R2	Exch Al	Exch Acid	ECEC	pH CaCl2
metres		dS/m @ 40C	% @105C	% @ 105C				m.eq/100g @ 105C					% @ 80C			% @ 105C			@ 40C		m.eq/100g @ 105C			@ 40C
B 0.10	6.2	.09	.004																					
0.10	6.4	.07	.001	11	41	28	22	15	8.8	4.0	.12	.72	.041	1.63	.013	1.70		8	.70					
0.30	6.7	.06	.003	14	34	21	35	16	10	5.4	.58	.16	.010	1.55	.003	2.70		11	.72					
0.60	8.9	.44	.034	14	32	18	42	19	13	7.7	1.8	.14	.016	1.61	.007	3.30		13	.73					
0.90	8.9	.68	.071	13	30	18	42	21	10	8.4	2.1	.11	.017	1.66	.002	3.20		13	.80					
1.20	8.8	.68	.066	11	23	19	47	25	12	10	1.7	.09	.019	1.60	.002	2.70								
1.50	9.0	.58	.052																					

Depth	Org.C (W&B)	Tot.N	Extr. P Acid Bicarb.	HCl K	CaCl2 Extr K	P	DTPA-extr. Fe	Mn	Cu	Zn	B	Extractable SO4S	NO3N	NH4N	P Buff Cap	Equil ug/L	Alternative Cations CEC	Ca	Mg	Na	K
metres	% @ 105C	% @ 105C	mg/kg @ 105C	meq% @105C	mg/kg @ 105C		mg/kg @ 105C					mg/kg @ 105C			@ 40C		m.eq/100g @ 105C				
B 0.10	1.9	.09	22	.70		103	88	1.1	2.5												

* -33kPa (-0.33bar) and -1500kPa (-15 bar) using pressure plate apparatus.

1

SOIL TYPE: 6DRC
SITE NO: S24
A.M.G. REFERENCE: 512 547 mE 7 829 373 mN ZONE 55

GREAT SOIL GROUP: Solodic soil
PRINCIPAL PROFILE FORM: Dr2.42
SOIL TAXONOMY UNIT: Udic Paleustalfs
FAO UNESCO UNIT:

AUSTRALLIAN CLASSIFICATION: Bleached, Red Chromosols

SUBSTRATE MATERIAL: Alluvium
CONFIDENCE SUBSTRATE IS PARENT MATERIAL:

SLOPE:
LANDFORM ELEMENT TYPE: Back-plain
LANDFORM PATTERN TYPE: Alluvial plain

VEGETATION
STRUCTURAL FORM: Tall woodland
DOMINANT SPECIES: Eucalyptus alba, Eucalyptus polycarpa

ANNUAL RAINFALL:

PROFILE MORPHOLOGY:

CONDITION OF SURFACE SOIL WHEN DRY: Hard setting

HORIZON	DEPTH	DESCRIPTION
A1	0 to .15 m	Brownish black (10YR3/2); clay loam,fine sandy; massive; many medium macropores; dry; moderately firm; common fine roots. Clear smooth to-
A2cb	.15 to .30 m	Dull yellowish orange (10YR7/2) moist, light grey (7.5YR8/1) dry; clay loam,fine sandy; massive; many medium macropores; dry; moderately firm; common fine roots. Abrupt smooth to-
B21t	.30 to .45 m	Dull reddish brown (5YR5/4); medium heavy clay; strong 100-200mm prismatic tertiary, parting to 10-20mm angular blocky primary; dry; very strong. Clear smooth to-
B22t	.45 to .90 m	Reddish brown (5YR4/6); medium heavy clay; strong 100-200mm prismatic tertiary, parting to 10-20mm angular blocky primary; dry; very strong. Clear smooth to-
D	.90 to 1.50 m	Dull reddish brown (5YR5/4); light medium clay; strong 100-200mm prismatic tertiary, parting to 5-10mm angular blocky primary; dry; very strong; few coarse manganiferous soft segregations.

Depth	1:5 Soil/Water pH	EC	Cl	Particle Size CS	FS	S	C	Exch. Cations CEC	Ca	Mg	Na	K	Total Elements P	K	S	Moistures ADM	33*	1500*	Disp.Ratio R1	R2	Exch Al	Exch Acid	ECEC	pH CaCl2
metres	@ 40C	dS/m @105C	%	% @ 105C				m.eq/100g @ 105C					% @ 80C			% @ 105C			@ 40C		m.eq/100g @ 105C			@ 40C
B 0.10	6.4	.08	.001																					
0.10	6.2	.04	.001	12	45	29	19	9	7.1	2.0	.46	.11	.040	1.62	.008	1.30		6	.79					
0.30	6.2	.01	.001	13	44	31	17	5	4.4	1.4	.08	.06	.011	1.72	.002	1.00		4	.82					
0.60	6.9	.06	.005	3	30	16	53	18	10	5.6	.36	.16	.022	1.64	.022	2.60		17	.55					
0.90	7.5	.09	.007	4	43	17	39	14	9.7	5.2	.41	.21	.022	1.80	.002	2.10		13	.64					
1.20	8.1	.07	.004	4	47	19	34	15	13	5.5	.36	.15	.017	1.84	.002	2.50								
1.50	8.4	.07	.004																					

Depth	Org.C (W&B)	Tot.N	Extr. P Acid	Bicarb.	HCl K	CaCl2 Extr K	P	DTPA-extr. Fe	Mn	Cu	Zn	B	Extractable SO4S	NO3N	NH4N	Buff Cap	P Equil ug/L	Alternative Cations CEC	Ca	Mg	Na	K
metres	% @ 105C	% @ 105C	mg/kg @ 105C		meq% @105C	mg/kg @ 105C		mg/kg @ 105C					mg/kg @ 105C			@ 40C		m.eq/100g @ 105C				
B 0.10	2.1	.09	26		.61			84	140	.71	3.0											

* -33kPa (-0.33bar) and -1500kPa (-15 bar) using pressure plate apparatus.

APPENDIX III
IRRIGATED LAND SUITABILITY CLASSES, BURDEKIN RIVER IRRIGATION AREA

Five land suitability classes have been defined for use in Queensland, with land suitability decreasing progressively from Class 1 to Class 5. Land is classified on the basis of a specified land use which allows optimum production with minimal degradation to the land resource in the long-term.

Class 1 **Suitable land with negligible limitations.** This is highly productive land requiring only simple management practices to maintain economic production.

Class 2 **Suitable land with minor limitations** which either reduce production or require more than the simple management practices* of class 1 land to maintain economic production.

Class 3 **Suitable land with moderate limitations** which either further lower production or require more than those management practices of class 2 land to maintain economic production.

Class 4 **Marginal land which is presently considered unsuitable due to severe limitations.** The long term significance of these limitations on the proposed land use is unknown. The use of this land is dependent upon undertaking additional studies to determine whether the effects of the limitation(s) can be reduced to achieve sustained economic production.

Class 5 **Unsuitable land with extreme limitations** that preclude its use.

Land is considered less suitable as the severity of limitations for a land use increase, reflecting either (a) reduced potential for production, and/or (b) increased inputs to achieve an acceptable level of production and/or (c) increased inputs required to prevent land degradation. The first three classes are considered suitable for the specified land use as the benefits from using the land for that land use in the long term should outweigh the inputs required to initiate and maintain production. Decreasing land suitability within a region often reflects the need for increased inputs rather than decreased potential production.

Class 4 is considered presently unsuitable or is used for marginal land where it is doubtful that the inputs required to achieve and maintain production outweigh the benefits in the long term. Additional studies are needed to determine whether the effect of the limitation(s) can be reduced to achieve sustained production.

Class 5 is considered unsuitable having limitations that in aggregate are so severe that the benefits would not justify the inputs required to initiate and maintain production in the long term. It would require a major change in economics, technology or management expertise before the land could be considered suitable for that land use. Some class 5 lands however, such as escarpments, will always remain unsuitable for agriculture.

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* Where more than simple management practices are required, this may involve changes in land preparation, irrigation management, the addition of soil ameliorants and the use of additional measures to prevent land degradation.

APPENDIX IV

LAND SUITABILITY CLASSIFICATION FOR FURROW IRRIGATION OF SUGAR-CANE, GRAIN CROPS AND SMALL CROPS, BURDEKIN RIVER IRRIGATION AREA.

Limiting factor	Assumptions/ comments	Degree of limitation in terms of soil/land attributes	Subclass for various crop groups
PRODUCTIVITY FACTORS			
Nutrients - n	All soils will require some fertiliser input. N assumed to be always low. Minor elements can be added at low cost. S may be required in the future if P not supplied as superphosphate. Soil test interpretations are those of Bruce and Rayment (1982).	P alone very low.	All crops n2
		P and K very low or 2 to 3 times higher P plus Zn required following exposure of high pH (> 7.5 at 0.2 - 0.3 m) subsoils.	n3

Salinity - sa	Based on the relative salt tolerance of a range of plants expressed in terms of yield reduction (Shaw 1986). Subclass limits taken as 10 to 25% yield reduction for subclass 2; 25 to 50% for subclass 3 and > 50% for subclass 4.		Field/Grain crops				Sugar-cane	Small crops				
			Moderately tolerant	Tolerant		Very tolerant	Moderately tolerant	Moderately sensitive	Moderately tolerant			Tolerant
			Maize Kenaf*	Soybeans Sunflower Legume Seeds*	Sorghum	Cotton		Beans	Tomato Capsicum* Eggfruit*	Cucumber Pumpkin*	Rockmelon	Squash Zucchini
		ECse(dSm^{-1})	Weighted profile mean to 0.9 m					Weighted profile mean to 0.6 m				
		1.5 - 2.5						sa2				
		2.6 - 3.5	sa2					sa3	sa2			
		3.6 - 4.5	sa3				sa2	sa4	sa3	sa2	sa2	
		4.6 - 5.5	sa3				sa2	↓	sa3	sa3	sa2	
		5.6 - 6.5	sa3	sa2			sa2		sa4	sa3	sa3	sa2
		6.6 - 7.5	sa4	sa3			sa3		↓	sa4	sa3	sa2
		7.6 - 9.0	↓	sa4	sa2		sa3			↓	sa3	sa3
		9.1 - 10.0		↓	sa3		sa3				sa4	sa3
		10.1 - 12.5			sa4		sa4				↓	sa4
		12.6 - 17.0			↓	sa2	↓					↓
		> 17.0				sa3						
						sa4						

* Salt tolerance limits specific to these crops not available.
Legume seeds include mungbean, chickpea, pidgeon pea and dolichos.

APPENDIX IV (CONT.)

Limiting factor	Assumptions/ comments	Degree of limitation in terms of soil/land attributes						Subclass for various crop groups			
Sodicity - so		ESP	or	Field pH		Field/Grain crops		Sugar-cane	Small crops		
				Clay soils	Sodic duplex soils	Sorghum, Cotton Legume seeds**	Maize, Sunflower, Kenaf, Soybean		Tomato	Eggfruit Capsicum Beans**	Cucurbits
	Assessed on 0.2 to 0.3 m depth. ESP related to pH only for sodic duplex and cracking clay soils (Baker et al. 1983).										
	Sodicity classes as per Northcote and Skene (1972) and Landon (1984).	< 6		< 8.0	< 6.5		so2			so3	so2
	Subclass limits taken as 10 to 25% yield reduction for subclass 2; 25 to	6 - 14		8.0 - 9.5	6.5 - 8.0	so2	so3	so2	so2	so4 ↓	so3
	50% for subclass 3 and > 50% for subclass 4. Subclasses so2 and so3	14.1 - 25		> 9.5	8.1 - 8.5	so3	so4 ↓	so3	so3		so4 ↓
	not differentiated for less tolerant crops.	> 25			> 8.5	so4		so4	so4		

** Sodium tolerance limits unavailable for beans and legume seeds.

WATER MANAGEMENT FACTORS (Govern water distribution efficiency and trafficability)

Water availability - m	PAWC* based on measured or predicted values for major soils (Gardner and Coughlan, 1982). All cracking clays known to have PAWC > 100 mm.	Effective soil depth (m) (depth to rock or salt bulge)	**and/or**	PAWC (mm)	All crops
		0.7 - 1.0		75 - 100 mm Non cracking clays; non sodic and weakly sodic duplex soils with medium textured** A horizons < 0.5 m deep; gradational and uniform medium textured soils.	m2
	PAWC subclass limits relate to irrigation frequency as follows:	0.45 - 0.6			
	75 - 100 mm = 8 - 10 days, 50 - 75 mm = 5 - 8 days, < 50 mm = < 5 days	< 0.45		50 - 75 mm Sodic duplex soils; duplex soils with sandy loam to loamy sand A horizons deeper than 0.5 m.	m3
				< 50 mm Uniform sands.	m4

* PAWC = Plant Available Water Capacity
** Texture terms are as defined in Northcote (1979).

APPENDIX IV (CONT.)

Limiting factor	Assumptions/ comments	Degree of limitation in terms of soil/land attributes			Subclass for various crop groups			
Permeability-p	Refers to the permeability of the upper root zone of the soil profile. Affects trafficability and irrigation efficiency and also considers tolerance of crops to short periods of water-logging.	(a) Soils with texture of sands or sandy loams to depths of:	**or**	All duplex soils with A horizons finer than sandy loam with dry very firm or stronger B horizons at depths of:	All crops			
		0.3 - 0.5 m		0.2 - 0.4 m	p2			
		0.6 - 0.9 m		< 0.2 m	p3			
		> 0.9 m			p4			
		(b) Black earths and clays (Uf and Ug profiles) with A horizon textures of light medium clay and lighter and without mottling and/or bleaching (Northcote 1979).			Maize, Cotton, Kenaf Sunflower, Legume seeds	Soybean, Sugar-cane, Sorghum	Cucurbits, Tomato Capsicum, Eggfruit	Beans
					p2	p2	p3	p4
		A horizon textures of medium to heavy clay and/or A horizons that are mottled and/or bleached.			p3	p2	p4	p4
Soil complexity - pd	Refers to (i) a complex UMA where no component soil exceeds 70% of the area and (ii) any UMA less than 250 m width for grain crops and sugar cane and 100 m for small crops and a surrounding or adjacent UMA, depending on slope magnitude and direction. Based on a minimum irrigation run length of 250 m for sugar cane and grain crops and 100 m for small crops. * Depth difference determined by multiplication. ** Texture groups as defined by Northcote (1979).	B horizon permeability between soils similar:						
		A horizon features			All crops			
		Depth		Texture differences	Depth difference factor			
		depth of A of both soils < 0.2 m		1.5 - 2.0 texture** groups				pd2
		depth of A of one soil > 0.2 m		1.5 - 2.0 texture groups	**or** 1.5 - 2.0			pd3
				> 2.0 texture groups	**and/or** > 2.0			pd4
		B horizon permeability markedly different between soils:						pd4

APPENDIX IV (CONT.)

Limiting factor	Assumptions/ comments	Degree of limitation in terms of soil/land attributes	Subclass for various crop groups
			All crops
Internal Drainage - id	Considers drainage of the whole profile and the affects on crop growth and also losses to groundwater. Terms used are those of (McDonald et al. 1984). Soils considered as well drained include 6Dra, 6Drb, 6Gnd and 6Uma.	Moderately well to imperfectly drained soils: clay soils, some non-sodic and weakly sodic duplex soils eg., 6Dyd, 6Drc.	id2
		Imperfectly to poorly drained soils: sodic duplex soils and better drained soils underlain by pans or prone to the development of high non-saline water tables due to their position in the landscape and in relation to adjacent soils eg. 5Dyb.	id3
		Well drained soils acting as intake areas: red and yellow non-sodic duplex soils eg. 5Dra, 5Dya. Usually higher in the landscape, drainage losses may cause secondary salinisation downslope. Special irrigation management and design required eg. use of overhead sprinklers or modified furrow irrigation techniques.	id4
		Very poorly or rapidly drained soils: gleyed duplex or coarse textured soils eg. 4Dga or 6Ucc respectively. Irrigation technique restricted to trickle and drip methods.	id5

LAND SURFACE MANAGEMENT FACTORS

Rockiness - r	Based on field observation and influence on machinery use (FAO, 1983) and moisture availability. Sizes relate to the class intervals in McDonald et al. (1984). Soybeans, sugar-cane and beans need to be harvested closer to the soil surface than in the case of other crops. This incidence of rock and stone is considered more limiting when it occurs within the upper 0.45 m as repeated stone picking may be required.	% Rock Outcrop (outcrop and boulders > 600 mm).	and/or	% Pebble, cobble and stone on surface or within the upper 0.45 m. 6 - 60 mm or 60 - 600 mm		All crops with outcrop, cobble or stone on surface only.	Soybeans, Sugar-cane and Beans where stone and/or cobble within upper 0.45 m.
				2 - 10	< 2		r2
		< 2		10 - 20	2 - 10	r2	r3
		2 - 10		20 - 50	10 - 20	r3	r4
		10 - 20		> 50	20 - 50	r4	r5
		> 20			> 50	r5	

APPENDIX IV (CONT.)

Limiting factor	Assumptions/ comments	Degree of limitation in terms of soil/land attributes	Subclass for various crop groups		
Slope - t	Slope limits should be used as a guide only as there have been very few studies on the influence of furrow flow velocity and furrow slopes and lengths currently in use to gauge erosion losses, furrow overtopping and wetting up times for various soils. Suggested furrow slopes for sodic duplex soils in order of preference are: 0.1 to 0.2, 0.06 to 0.1 or 0.2 to 0.3; 0.3 to 0.5%. Suggested furrow slopes for other soils in order of preference are: 0.1 to 0.25, 0.06 to 0.1 or 0.25 to 0.5; 0.5 to 1.0%. Furrow irrigation not recommended on slopes > 0.5% in the direction of irrigation for sodic duplex soils and 1% for other soils.	(a) Sodic Duplex Soils Land slope % 0.2 - 0.5 0.06 - 0.1 or 0.6 - 1.0 < 0.06 or 1.1 - 2.0 2.1 - 4.0 (b) Other Soils Land slope % 0.25 - 0.5 0.06 - 0.1 or 0.5 - 2.0 < 0.06 or 2.1 - 4.0 > 4.0%	All crops except Sugar-Cane t2 t3 t4 t5 Land slope % t2 t3 t4 t5	Land slope % 0.2 - 0.5 0.06 - 0.1 or 0.6 - 2.0 < 0.06 or 2.1 - 4.0 > 4.0 Land slope % 0.25 - 0.5 0.06 - 0.1 or 0.6 - 4.0 < 0.06 or > 4.0	Sugar-cane t2 t3 t4 t5 t2 t3 t4
Microrelief - g	Gilgai vertical and horizontal interval related to the amount of levelling required. Elongated mounds and depressions due to overbank flooding and deposition and other microrelief eg. debil debil.	(a) Cracking clay soils and sodic duplex soils with gilgai e.g. 2Dyc. Normal gilgai - vertical interval 0.1 to 0.3 m, area of mound > depression or area of mound and shelf > depression. or Linear gilgai Normal gilgai vertical-interval 0.3 to 0.6 m or 0.1 to 0.3 m if area of mound < depression. (b) Sodic duplex soils. Vertical interval 0.05 - 0.1 m, A horizon depth < 0.15 m. (c) All soils Vertical interval 0.1 - 0.3 m 0.4 - 0.6 m > 0.6 m	All crops g2 g3 All crops g3 g2 g3 g4		

APPENDIX IV (CONT.)

Limiting factor	Assumptions/ comments	Degree of limitation in terms of soil/land attributes								Subclass for various crop group
Surface condition - ps	Applies to soils with properties known to influence seed bed preparation and plant establishment eg. depth to hard, slowly permeable sodic B horizon, surface consistency and potential to surface seal due to particle size distribution.	(a) Cracking clay soils Percentage of dry aggregates of surface horizon > 5 mm in diameter:								All crops except Sugar-Cane
		24 - 45%								ps2
		> 45%								ps3
	Cracking clay properties based on Coughlan and Loch (1984), and Gardner and Coughlan (1982).	(b) Other Soils Depth to slowly permeable sodic B horizon	And/or	Condition of surface soil when dry	And/or	Texture* of surface horizon	And/or	Grade of pedality	And/or	Consistency of surface soil when dry	
	Adaptation of various crops not accounted for, although it is recognised that some crops may be more difficult to establish e.g. soybeans, or have specific seed bed requirements.	0.21 - 0.4 m		Firm or hardsetting		Sandy loams to clays		Moderate or strong pedality		Moderately firm to very firm (3-4)	ps2
		0.1 - 0.2 m		Hardsetting		Sandy loams to clays		Massive or weak pedality		Moderately firm to very firm (3-4)	ps3
		< 0.1 m		Hardsetting		Sandy clay loams to clay loams		Massive or weak pedality		Moderately strong to very strong (5-6)	ps4
	* Textures as defined by Northcote (1979). Other terminology for surface properties are as defined by McDonald et al. (1984).										
Wetness - w		Areas remaining wet for several months, water remains on the surface for long periods and requires filling, special dramage or reclamation eg. small closed depressions.								All crops
										w3
		Areas which are wet for most of the year or pond water for considerable periods and require major dramage and reclamation works eg. swamps.								w4

APPENDIX IV (CONT.)

Limiting factor	Assumptions/ comments	Degree of limitation in terms of soil/land attributes		Subclass for various crop groups
DEGRADATION FACTORS				
Erosion - e	Refers to slope limits on cleared fallow land or land irrigated during the wet season in terms of erosion risk only. Slope limits require substantiating with either measured or calculated soil losses for the soils of the area. **Note that any UMA with an eroded soil phase (E) is class 5.**	(a) Sodic duplex soils Land slope %		All crops
		0.5 - 1.0	Shorter furrow lengths required and simple conservation practices eg. use of cover crops, contour cultivation.	e2
		1.1 - 2.0	Shorter furrow lengths required and simple conservation practices as above as well as graded banks to reduce slope length.	e3
		> 2.0	Not recommended for furrow irrigated crops.	e4
			Gully or stream bank erosion severe.	e5
		(b) Other soils Land slope %		
		1.0 - 2.0	Shorter furrow lengths required and simple conservation practices e.g. use of cover crops, contour cultivation.	e2
		2.1 - 4.0	Shorter furrow lengths required and simple conservation practices as above as well as graded banks to reduce slope length.	e3
		> 4.0	Not recommended for furrow irrigated crops.	e4
			Gully or stream bank erosion severe.	e5
Outflow potential - ss		Areas susceptible to the development of saline seeps, usually located downslope of permeable soils and confined by either dykes or soils of heavy texture and very low hydraulic conductivity.		All crops ss4

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APPENDIX V LAND SUITABILITY CLASSIFICATION FOR FLOOD IRRIGATION OF RICE, BURDEKIN RIVER IRRIGATION AREA.

Limiting factor	Assumptions/comments	Degree of limitation in terms of soil/land attributes	Subclass
PRODUCTIVITY FACTORS			
Nutrients - n	N always low and applications of 180 kg N/ha for winter crops and 140 kg N/ha for summer crops required	P very low (Bruce and Rayment 1982) and applications of 5 to 10 kg/ha required.	n2
		Applications of Zn as well as higher applications of P than above (up to 30 kg/ha) required when subsoils exposed after levelling have a pH greater than 7.5.	n3
Salinity - sa	Subclass limits taken as 10 to 25% yield reduction for subclass 2; 25 to 50% for subclass 3 and > 50% for subclass 4 (Shaw et al 1986).	ECse (dSm^{-1}) Weighted profile mean to 0.6 m 4.0 -5.0	sa2
		5.1 -7.0	sa3
		> 7.0	sa4
		and/or	
	EC 1:5 > 0.6 dSm^{-1} in 0 - 0.2 m depth zone regarded as toxic for rice seedlings. Subclass limits taken as ECse (dSm^{-1}) values with the corresponding range of clay percentages.	ECse (dSm^{-1}) (0 - 0.2 m) > 7 (20 - 40%) > 4.9 (40 - 60%) > 2.8 (60 - 80%) Clay	sa4
Sodicity - so	Assessed on 0.2 to 0.3 m depth. ESP related to pH only for sodic duplex and cracking clay soils (Baker et al. 1983).	ESP or Field pH: Clay soils / Sodic duplex soils	
	Sodicity classes as per Northcote and Skene (1972) and Landon (1984).	6 - 14: 8.0 - 9.5 / 6.5 - 8.0	so2
		14.1 - 25: > 9.5 / 8.1 - 8.5	so3
		>25: / > 8.5	so4

Limiting factor	Assumptions/comments	Degree of limitation in terms of soil/land attributes	Subclass
WATER MANAGEMENT FACTORS			
Deep drainage - **dd**	Duplex soils with A horizons of < 0.2 m, moderately strong upper B horizons, textures in the clay range from the base of the A horizon to 1.5 m with alkaline soil reaction trends and with ESP > 14 are considered the least permeable.	Clay soils (Ug and Uf profiles) with clay textures extending to 1.5 m, neutral or alkaline soil reaction trend and/or ESP > 14 within the profile.	dd2
		Duplex soils with A horizons of 0.2 to 0.4 m, moderately strong upper B horizons, textures in the clay range from the base of the A horizon to 1.5 m, alkaline soil reaction trend and ESP > 14 within the profile.	dd3
		As for dd3 but upper B horizons not moderately strong or all soils with alkaline soil reaction trend and textures coarser than sandy clay between 0.4 and 1.5 m.	dd4
		All gradational, uniform (excluding Ug and Uf soils) and other duplex soils with acid and neutral soil reaction trends or an alkaline soil reaction trend with ESP < 14 throughout or A horizons > 0.4 m.	
		or	
		Land with rock outcrop and/or soils with stone or cobble in the profile and/or BC or C horizon before 1.5 m.	dd5

APPENDIX V (CONT.)

Limiting factor	Assumptions/comments	Degree of limitation in terms of soil/land attributes	Subclass
Soil complexity - pd	Affects water use efficiency and applies only to (i) a complex UMA where no component soil exceeds 70% of the area;	Adjacent UMA's and soil types within a complex UMA are suitable and within subclass 2 for all limiting factors.	pd2
	(ii) a UMA less than < 10 ha with a minimum width of 250 m and adjacent UMA's*;	As above but with subclasses of 3 for one or more limiting factors or Any suitable UMA < 10 ha and any one adjacent UMA is suitable.	pd3
	(iii) the characteristics of individual soil profiles within a simple UMA	Any suitable UMA < 10 ha and the surrounding UMA is unsuitable or Any suitable UMA which contains some soil profiles with a dd rating of 4 or 5.	pd4
	* Acceptable minimum size of a rice field is 10 ha with a minimum width of 250 m. If a small UMA (below these criteria) is unsuitable due to other limiting factors, a pd rating is not provided.		
LAND SURFACE MANAGEMENT FACTORS			
Rockiness - r	Based on field observation and influence on machinery use (FAO 1983). Sizes relate to the class intervals in McDonald et al. (1984).	Cover % of stone and cobble 60 - 600 mm **and/or** Cover % of pebble on surface 6 - 60 mm	
		2 - 10 / 10 - 20	r2
		10 - 20 / 20 - 50	r3
		20 - 50 / >50	r4
		>50	r5

APPENDIX V (CONT.)

Limiting factor	Assumptions/comments	Degree of limitation in terms of soil/land attributes	Subclass
Slope - t	The upper slope limit is based on a ponding depth range of 0.05 to 0.2 m with a minimum bay width of 30 m requiring only minor levelling. Slopes of 0.05 to 0.1% regarded as optimum. Major levelling required on land with slopes between 0.5 and 0.75%. Land with a slope <0.03% is considered too flat for flushing of bays.	Land slope %	
		0.1 - 0.25	t2
		0.03 - 0.05 or 0.26 - 0.5	t3
		0.51 - 0.75 or < 0.03	t4
		> 0.75	t5
Microrelief - g	Gilgai vertical and horizontal interval related to the amount of levelling required.	(a) Cracking clay soils and sodic duplex soils with gilgai e.g. 2Dyc Normal gilgai - vertical interval 0.1 to 0.3 m, area of mound > depression or area of mound and shelf > depression. or Linear gilgai	g2
		Normal gilgai - vertical interval 0.3 to 0.6 m or 0.1 to 0.3 m if area of mound < depression	g3
		(b) Sodic duplex soils	
		Vertical interval 0.05 to 0.1 m, A horizon depth < 0.15 m.	g3
		(c) All soils	
	Elongated mounds and depressions due to overbank flooding and deposition and other microrelief eg. debil debil.	Vertical interval 0.1 - 0.3 m	
		0.4 - 0.6 m	g2
		> 0.6 m	g3
			g4

APPENDIX V (CONT.)

Limiting factor	Assumptions/comments	Degree of limitation in terms of soil/land attributes	Subclass
DEGRADATION FACTORS			
Erosion - e	**Note that any UMA with an eroded soil phase (E) is class 5.**	Gully and streambank erosion severe.	**e5**
Outflow potential - ss		Areas susceptible to the development of saline seeps, usually located downslope of permeable soils and confined by either dykes or soils of heavy texture and very low hydraulic conductivity.	**ss4**

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APPENDIX VI

LAND SUITABILITY CLASSIFICATION FOR LOW VOLUME IRRIGATION OF MANGOES AND AVOCADOES, BURDEKIN RIVER IRRIGATION AREA.

Limiting factor	Assumptions/comments	Degree of limitation in terms of soil/land attributes		Subclass	
PRODUCTIVITY FACTORS					
Salinity - sa	Subclass limits taken as 10 to 25% yield reduction for subclass 2, 25 to 50% for subclass 3 and > 50% for subclass 4. Subclass limits for mangoes and avocados from Shaw et al. (1986).	ECse (dSm^{-1}) Weighted profile mean to 1.2 m		Mangoes	Avocados
		1.0 - 1.2		sa2	
		1.3 - 1.7		sa3	
		1.8 - 2.5		sa4	sa2
		2.6 - 3.7			sa3
		> 3.7			sa4
Sodicity - so	ESP levels refer to any depth in the profile - ESP related to pH only for sodic duplex soils and cracking clays (Baker et al. 1983). Sodicity classes as per Northcote and Skene (1972) and Landon (1984).	ESP	or Field pH		
			Clay soils	Sodic duplex soils	Both crops
		< 6	< 8.0		so2
		6 - 14	8.0 - 9.5	6.5 - 8.0	so3
		> 14	> 9.5	> 8.0	so4
Soil depth - d	Assessed on depth of soil for root proliferation and anchorage. Derived from Hackett and Carolane (1982), Nel (1983) and Capelin (1987).	Effective soil depth (depth to decomposing rock, pan or salt bulge).		Mangoes	Avocados
		1.51 - 2.0 m			d2
		1.1 - 1.5 m			d3
		0.61 - 1.0 m		d2	d4
		0.45 - 0.6 m		d3	
		< 0.45 m		d4	

Limiting factor	Assumptions/comments	Degree of limitation in terms of soil/land attributes	Subclass	
Internal drainage - id	Duplex soils with red to red-brown B horizons and acid to neutral soil reaction trends are considered the most suitable eg. 5Dra, 6Dra.		Mangoes	Avocados
		Rapidly drained soils:		
		Uniform coarse textured soils with no pan or seasonal water table by 1.5 m.	id2	id2
		Well to moderately well drained soils:		
		(i) uniform medium, gradational and duplex soils with brown to yellow-brown B horizons with acid to neutral soil reaction trends and ESP < 14 throughout eg. 6Dyd, 6Gnd, 5Dya.	id2	id3
		(ii) duplex soils with alkaline soil reaction trend with red to red-brown or brown to yellow-brown B horizons with less than 2% calcareous segregations above 0.75m and ESP < 14 throughout eg. 6Dyf, 6Drc.	id3	id4
		Imperfectly to poorly drained soils:		
		Clay soils and other sodic duplex soils together with better drained soils prone to the development of high non-saline water tables due to their position in the landscape in relation to adjacent soils eg. 5Dyb.	id4	id5
		Very poorly drained soils:		
		Gleyed duplex soils eg. 4Dga and rapidly drained soils with a pan or seasonal water table above 1.5 m.	id5	id5

LAND SURFACE MANAGEMENT FACTORS

Rockiness - r	Based on field observation and influence on machinery use (FAO 1983). Sizes relate to the class intervals in McDonald et al. (1984).	% Rock outcrop or boulders (> 600 mm) and/or cobble and stone (60-600 mm) on surface or within profile.		Both crops
		Outcrop or boulders > 600 mm	Cobble and stone 60 - 600 mm	
		2 - 10	10 - 20	r2
		10 - 20	20 - 50	r3
		20 - 50	50 - 90	r4
		> 50	> 90	r5

APPENDIX VI (CONT.)

Limiting factor	Assumptions/comments	Degree of limitation in terms of soil/land attributes	Subclass	
Wetness - w		Areas with slopes of:	Mangoes	Avocados
		> 2%		w2
		1.1 - 2%	w2	w3
		0.6 - 1%	w2	w4
		0.1 - 0.5%	w3	w4
		Areas with water remaining on the surface for several weeks and may require successive levelling eg. gilgaied cracking clays.	w4	w5
		Areas < 0.1% slope and/or areas remaining wet for several months which require major drainage and reclamation works eg. closed depressions and swamps.	w5	w5
DEGRADATION FACTORS				
Erosion - e	**Note that any UMA with an eroded soil phase (E) is class 5.**	Gully or streambank erosion severe.	Both crops e5	
Outflow potential - ss		Areas susceptible to the development of saline seeps, usually located downslope of permeable soils and confined by either dykes or soils of heavy texture and very low hydraulic conductivity.	ss4	

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Appendix VII. Suitability of each UMA for sugar-cane, maize and rice, Haughton Section, Stage III, BRIA

UMA	Land Resource Data C	Dom.ST	ST2	%ST2	ST3	Common Limitations n	m	pd	id	g	w	e	ss	Cane(C) r	p	t	so	sa	Suit. ! C !	Maize(Mz) ps	t	r	p	so	sa	Suit! Mz!	Rice(R) Limitations n	sa	so	ss	r	t	g	dd	pd	Suit. ! R !	Area
276	N	6Dbc	6Dbf	15	6Dyf	2	2		2					2	3				! 3 !	3	3	2			! 3 !	2				4		5		! 5 !	210.3
277	N	6UfdW	6UgcW	10	6UmaW		2		2		4	5		2	5				! 5 !	3	5	3			! 5 !					5		5		! 5 !	26.3
278	Y	6Uma	6UfdW	40			2		2		4				4				! 4 !	3	4				! 4 !					5		5		! 5 !	11.8
279	N	6UfcW	6 SP	10			2		2		4	5		2	5				! 5 !	3	5	3	2		! 5 !					5		5		! 5 !	7.7
280	N	6DygE				2	3	4	3		4	5		3	5	2			! 5 !	3	5	3	3	2	! 5 !	2		2		5		4		! 5 !	1.1
281	N	6Umb	6Uma	20	6Gnd		2								3				! 3 !	3	3				! 3 !					4		5		! 5 !	12.8
282	N	6UmbC	6Uma	20	6Dda		2			3					3				! 3 !	3	3				! 3 !					4	3	5		! 5 !	37.7
283	Y	6Dga	6Uma	40	6Dyj3	2	2	4	2		5	5		2	5	2			! 5 !	3	5	2	3		! 5 !	2		2		5		5		! 5 !	2.7
284	N	6Umb2	6Uma2	20	6Umb		2		3						2				! 3 !	3	2				! 3 !					3		5		! 5 !	20.5
285	N	6Dbf	6Dbc	20		2	2		2					2	2				! 2 !	3	2	2			! 3 !	2				3		5		! 5 !	10.0
286	N	6Dyg	6Dyg3	25	6Dyg2	2	3		3					3	2	2			! 3 !	3	2	3	3	2	! 3 !	2		2		3			4	! 4 !	18.2
287	N	6UmbC	6Umb2	20	6Gnd		2		3	3					2				! 3 !	3	2				! 3 !					3	3	5		! 5 !	8.9
288	N	6Umb2	6Uma	15	6Gnd		2		3						2				! 3 !	3	2				! 3 !					3		5		! 5 !	29.2
289	N	6Gnc2				2	2	4	3	3				2	2	2			! 4 !	3	2	2	3		! 4 !	2		2		3	3	5		! 5 !	2.4
290	N	2Ugd				2		3	2	3				2	2				! 3 !	3	2	3	2		! 3 !	2				3	3	2	4	! 4 !	2.3
291	N	6Umb	6Umb2	15	6Dbf2		2								2				! 2 !	3	2				! 3 !					3		5		! 5 !	30.8
292	N	2Dbc	2Ugd	15	2Dbd2	2	3		3					2		2			! 3 !	3		2	3		! 3 !	2		2		2		3	4	! 4 !	9.8
293	N	6Dbc				2	2	4	2					2					! 4 !	3		2			! 4 !	2				2		5		! 5 !	1.3
294	N	6UfcW	6 SP	20			2	4	2	2	4			2					! 4 !	3		3	2		! 4 !					2	2	2	4	! 4 !	3.5
295	N	6Dyg	6Ugc	20		2	3		3					3	2	2			! 3 !	3	2	3	3	2	! 3 !	2		2		3			4	! 4 !	3.0
296	N	6Dbb	6Dyg3	25	6Ugc	2	3		3					2	2				! 3 !	3	2	2	2		! 3 !	2				3		4		! 4 !	25.1
297	N	6Dbf	6Dbf2	25		2	2	4	2					2	2				! 4 !	3	2	2			! 4 !	2				3		5		! 5 !	6.2
298	N	6Dbf				2	2	4	2					2	2				! 4 !	3	2	2			! 4 !	2				3		5		! 5 !	1.9
299	N	6Umb	6Uma	15	6UfdW		2	4							2				! 4 !	3	2				! 4 !					3		5		! 5 !	31.3
300	Y	6Uma	6UfdW	40	6UfcW		2		2		4	5			5				! 5 !	3	5				! 5 !					5		5		! 5 !	33.8
301	N	6Uma					2	4											! 4 !	3					! 4 !					2		5		! 5 !	3.9
302	N	6Dbe	6Dbh2	15	6Dbd	2	2		2					3	2				! 3 !	3	2	3	2		! 3 !	2				3		5		! 5 !	32.5
303	N	6Dyg3	6Dyg	20	6Dbb	2	3		3			2		2	3				! 3 !	3	3	2	2	2	! 3 !	2				4		4		! 4 !	6.8
304	N	6Dyf				2	2	4	2					2	2				! 4 !	3	2	2	2		! 4 !	2				3		5		! 5 !	3.2
305	N	6UfdW	6Dda3	10			2		2	4	4			2	3				! 4 !	3	4	3			! 4 !					5	4	5		! 5 !	5.6
306	N	6DbcC	6DbcW	15		2	2		2	4	4	3		2	3				! 4 !	3	4	2			! 4 !	2				5	4	5		! 5 !	2.6
307	N	6Dbf	6Dbc	10		2	2	4	2					2					! 4 !	3		2			! 4 !	2				2		5		! 5 !	13.1
308	N	6UgcW	6 SP	10		2		4	2		4	5		2	5				! 5 !	3	5	3	2		! 5 !	2				5		2		! 5 !	11.0
309	N	6Dyf2	6Drb2	10		2	2		2					2	2				! 2 !	3	2	2	2		! 3 !	2				3		5		! 5 !	7.3
310	N	6Ucc				2	4	4	5					4	3				! 5 !		3	4			! 5 !	2				4		5		! 5 !	1.4
311	N	6Dbf	6Dbc	10		2	2		2					2	3				! 3 !	3	3	2			! 3 !	2				4		5		! 5 !	2.0
312	N	6Uma	6Umb	10	6Ucc		2								2				! 2 !	3	2				! 3 !					3		5		! 5 !	12.4
313	N	2Ugd2	2Ugc	10	2 SP	2		4	2	2	4			2					! 4 !	3		3	2		! 4 !	2				2	2	4		! 4 !	8.9
314	N	6Umb	6Uma	15	6Gnd		2								3				! 3 !	3	3				! 3 !					4		5		! 5 !	16.2

C-Complex ST-Soil Type n-fertility m-plant water availability pd-soil distribution complexity id-internal drainage
g-microrelief w-wetness e-erosion ss-secondary salinisation r-rockiness/stoniness p-permeability t-gradient so-sodicity
sa-salinity ps-soil surface conditions dd-deep drainage

Appendix VII (continued).

UMA	Land Resource Data C	Dom.ST	ST2	%ST2	ST3	Common Limitations n	m	pd	id	g	w	e	ss	Cane(C) r	p	t	so	sa	Suit. ! C !	Maize(Mz) ps	t	r	p	so	sa	Suit ! Mz !	Rice(R) Limitations n	sa	so	ss	r	t	g	dd	pd	Suit. ! R !	Area
315	N	6Uma	6Umb	10	6UmaC		2									3			! 3 !	3	3					! 3 !					4		5		! 5 !	26.6
316	N	6Dbf	6Dbc	10		2	2		2					2	2				! 2 !	3	2		2			! 3 !	2				3		5		! 5 !	4.0
317	N	6Dbc	6Dyf	10	6Dbf	2	2		2					2	2				! 2 !	3	2		2			! 3 !	2				3		5		! 5 !	13.2
318	N	6Dyg3	6Dba2	10	6Dbb	2	3		3					2	2				! 3 !	3	2		2	2	2	! 3 !	2				3		3	4	! 4 !	26.8
319	N	6UgcW				2		4	2		4			2					! 4 !	3			3	2		! 4 !	2				2		2	4	! 4 !	0.8
320	N	6Dbc	6Dyf2	10	6Dbf	2	2		2					2	3				! 3 !	3	3		2			! 3 !	2				5		5		! 5 !	146.6
321	N	6DdaW				2	3	4	3		4	5		2	5	2			! 5 !	3	5		2	3		! 5 !	2		2		5		3		! 5 !	3.0
322	N	6UgcW	6 SP	10		2		4	2		4			2					! 4 !	3			3	2		! 4 !	2				2		2	4	! 4 !	1.8
323	N	6Ucb	6Ucc	10	6Dra3	2	4	4	5					4	3				! 5 !		3		4			! 5 !	2				4		5		! 5 !	6.7
324	N	6Dyg2				2	3		3					3	2	2			! 3 !	3	2		3	3	2	! 3 !	2		2		3		4		! 4 !	6.0
325	N	6Dyj				3	3		3					3	2	4	2		! 4 !	4	2		3	4	3	! 4 !	3	2	4		3		4		! 4 !	6.3
326	N	6Ugc				3			2	2				2	2	2			! 3 !	3	2		3	3		! 3 !	3		2		3	2	2	4	! 4 !	4.8
327	N	6Dyj	6Ugc	20		3	3		3					3	2	4	2		! 4 !	4	2		3	4	3	! 4 !	3	2	4		3		4		! 4 !	30.6
328	Y	6Gna2	6Ufc	40		2	2		3	3				2	2	2			! 3 !	3	2		2	3		! 3 !	2		2		3	3	5		! 5 !	2.7
329	N	6Dbh2	6Dbh	20		3	3		3					3		2			! 3 !	3			3	3	2	! 3 !	3		2		2		4		! 4 !	11.2
330	N	6Ugc2				2		4	2	3				2					! 4 !	3			3	2		! 4 !	2				2	3	4		! 4 !	1.5
331	N	6Dba2				2	3	4	3					3	2	2			! 4 !	3	2		3	3		! 4 !	2		2		3		4		! 4 !	2.0
332	N	6Ugc				2			2	3				2	2				! 3 !	3	2		3	2		! 3 !	2				3	3	5		! 5 !	1.5
333	N	6Dbc				2	2		2					2	2				! 2 !	3	2		2			! 3 !	2				3		5		! 5 !	17.2
334	N	6Dyg2				2	3		3					3	2	2			! 3 !	3	2		3	3	2	! 3 !	2		2		3		4		! 4 !	4.4
335	Y	6Ufd	6Ugc	35			2		2	4				2	2				! 4 !	3	2		3			! 4 !					3	4	5		! 5 !	2.4
336	N	6Dbd				2	2		2					2	2				! 2 !	3	2		2	2		! 3 !	2				3		5		! 5 !	14.4
337	N	6Dbc				2	2		2			2		2	3				! 3 !	3	3		2			! 3 !	2				5		5		! 5 !	82.1
338	N	6Dda3	6Ufe	25		2	3	4	3		4	5		2	4				! 5 !	3	5		2	2		! 5 !	2				5		3		! 5 !	10.3
339	N	6Uma	6Ucc	25			4		5					4	2				! 5 !	3	2		4			! 5 !					3		5		! 5 !	13.9
340	N	6Gnc				2	2		3	4		3		2	3	2			! 4 !	3	4		2	3		! 4 !	2		2		5	4	5		! 5 !	2.4
341	N	2Dyb	2Ugc	25	2Ddb	2	3		3					3		2			! 3 !	3			3	3	2	! 3 !	2		2		2			3	! 3 !	20.4
342	N	6Dbc2				2	2		2					2	3				! 3 !	3	3		2			! 3 !	2				5		5		! 5 !	3.2
343	N	6Dyf				2	2		2					2	3				! 3 !	3	3		2	2		! 3 !	2				5		5		! 5 !	3.5
344	N	6Ugc				3			2	2				2	2	2			! 3 !	3	2		3	3		! 3 !	3		2		3	2	2	4	! 4 !	4.3
345	N	6Dyg2				2	3		3					3	2	2			! 3 !	3	2		3	3	2	! 3 !	2		2		3		4		! 4 !	15.1
346	N	2Uge	2Ugh	20	2Ugg2	3			2	2				2	2	2			! 3 !	3	2		3	3		! 3 !	3		2		3	2	2		! 3 !	19.6
347	N	6Dbf				2	2	4	2					2	2				! 4 !	3	2		2			! 4 !	2				3		5		! 5 !	2.1
348	N	6Ufc					2	4	2	3				2	2				! 4 !	3	2		3	2		! 4 !					3	3	5		! 5 !	1.6
349	N	6Dyj	6Dyg	20		3	3		3					3	2	4	2		! 4 !	4	2		3	4	3	! 4 !	3	2	4		3		4		! 4 !	11.3
350	Y	2Dya	2Ugc	40		3	3		3	3				3	2	2			! 3 !	3	2		3	3		! 3 !	3		2		3	3	2	3	! 3 !	5.4
351	N	2UgcW	2 SP	20	2UggW	2			2	2	4			2	4				! 4 !	3	4		3	2		! 4 !	2				4	2	2		! 4 !	49.3
352	N	6Dyg2	6Dyg	10		2	3		3					3	2	2			! 3 !	3	2		3	3	2	! 3 !	2		2		3		4		! 4 !	33.3
353	N	6Dyf				2	2		2					2	3				! 3 !	3	3		2	2		! 3 !	2				5		5		! 5 !	3.1

C-Complex ST-Soil Type n-fertility m-plant water availability pd-soil distribution complexity id-internal drainage g-microrelief w-wetness e-erosion ss-secondary salinisation r-rockiness/stoniness p-permeability t-gradient so-sodicity sa-salinity ps-soil surface conditions dd-deep drainage

Appendix VII (continued).

UMA	Land Resource Data C	Dom.ST	ST2	%ST2	ST3	Common Limitations n	m	pd	id	g	w	e	ss	Cane(C) r	p	t	so	sa	Suit. ! C !	Maize(Mz) ps	t	r	p	so	sa	Suit! Mz!	Rice(R) Limitations n	sa	so	ss	r	t	g	dd	pd	Suit. ! R !	Area
354	Y	6UgcW	6Dbc	40	6Uma2	2	2	4	2		4	5		2	5				! 5 !	3	5	3	2		! 5 !	2				5		5			! 5 !	7.6
355	N	6Dda	6Dyg2	20		2	3	4	3		4	5		3	5	2			! 5 !	3	5	3	3		! 5 !	2	2			5					! 5 !	6.2
356	N	6 E									5	5			5				! 5 !		5				! 5 !					5					! 5 !	3.2
357	N	6UgcW	6SP	10		2			2	3	4			2	3				! 4 !	3	3	3	2		! 4 !	2				5	3	2			! 5 !	1.4
358	N	6Dyg2	6Dba2	10		2	3		3					2	2	2			! 3 !	3	2	2	3	2	! 3 !	2	2			3		4			! 4 !	21.3
359	N	2Dyb2	2Dbe	15	2Dbd2	2	3		3					3	2	2			! 3 !	3	2	3	3	2	! 3 !	2	2			3		4			! 4 !	18.6
360	N	6Dbf	6Dyf3	15	6Dyd	2	2		2					2	2				! 2 !	3	2	2			! 3 !	2				3		5			! 5 !	24.9
361	N	6Dbd	6Dbd3	15		2	2		2					2	2				! 2 !	3	2	2	2		! 3 !	2				3		5			! 5 !	11.5
362	N	6UfdW					2	4	2		4			2	2				! 4 !	3	2	3			! 4 !					3		5			! 5 !	1.6
363	N	6Dbf	6Gna	10		2	2		2					2	2				! 2 !	3	2	2			! 3 !	2				3		5			! 5 !	8.7
364	N	6Umb2	6Dbf2	10	6Uma2		2		3						3				! 3 !	3	3				! 3 !					5		5			! 5 !	111.7
365	N	6Umb	6Uma	10	6Gnd		2								3				! 3 !	3	3				! 3 !					5		5			! 5 !	15.8
366	N	6Dbf2				2	2		2					2	3				! 3 !	3	3	2			! 3 !	2				5		5			! 5 !	1.4
367	N	6Dbd3				2	2		2			2		3	3				! 3 !	3	3	3	2		! 3 !	2				5		5			! 5 !	2.0
368	N	6Ucc				2	4	4	5					4	3				! 5 !		3	4			! 5 !	2				5		5			! 5 !	1.5
369	N	6Gna	6Umb2	10		2	2		3					2	3				! 3 !	3	3	2	2		! 3 !	2				4		5			! 5 !	7.1
370	N	6Gna				2	2	3	3					2	3	2			! 3 !	3	3	2	3		! 3 !	2	2			4		5			! 5 !	2.3
371	N	2Uge	2Ugd	10	2Dyb	2			2	2				2					! 2 !	3		2	2		! 3 !	2				2	2	2			! 2 !	177.1
372	N	6Dyg	6Dyj3	10	6Dyg3	2	3		3			2		3	3	2			! 3 !	3	3	3	3	2	! 3 !	2	2			4			4		! 4 !	10.4
373	N	6Dyf2				2	2		2					2	3				! 3 !	3	3	2	2		! 3 !	2				4		5			! 5 !	3.2
374	N	6Ucc				2	4	4	5					4	3				! 5 !		3	4			! 5 !	2				4		5			! 5 !	0.8
375	N	6Umb	6Drb	10	6Gnd		2								3				! 3 !	3	3				! 3 !					4		5			! 5 !	11.7
376	N	2Dbd	2Dyb	15		2	3	3	3					2	2				! 3 !	3	2	2	2		! 3 !	2				3		3	3		! 3 !	7.1
377	N	6UmbC	6Umb2	20	6Gnd2		2		3	3					3				! 3 !	3	3				! 3 !					5	3	5			! 5 !	29.4
378	N	6Umb	6Uma	20	6Dbc		2								3				! 3 !	3	3				! 3 !					5		5			! 5 !	35.2
379	N	2Dbc	2Dbd	20	2Dyb3	2	3		3					2	2	2			! 3 !	3	2	2	3		! 3 !	2	2			3		3	3		! 3 !	28.8
380	N	2Dyb				2	3		3			2		3	3	2			! 3 !	3	3	3	3	2	! 3 !	2	2			4					! 4 !	6.9
381	N	6Dyg3	6Dyg2	10	6Dbb	2	3		3			2		2	3	2			! 3 !	3	3	2	3	2	! 3 !	2	2			4		3			! 4 !	15.5
382	N	2DbeW	2 SP	20		2	3		3		4			3	3				! 4 !	3	3	3	2		! 4 !	2				4		3			! 4 !	1.2
383	N	6Umb	6Gnd	15	6Gna2		2	4							3				! 4 !	3	3				! 4 !					4		5			! 5 !	5.8
384	N	2Dbc	2Dbc2	15	2Dbd	2	3	3	3					2		2			! 3 !	3		2	3		! 3 !	2	2			2		3	4		! 4 !	14.2
385	N	2Ugd				2		3	2	2				2					! 3 !	3		3	2		! 3 !	2				2	2	2	4		! 4 !	3.1
386	N	2UgcW	2 SP	10		2			2	2	4			2					! 4 !	3		3	2		! 4 !	2				2	2	2	4		! 4 !	3.9
387	N	2Dbc	2Dbc2	15	2Dyb	2	3		3					2		2			! 3 !	3		2	3		! 3 !	2	2			2		3	4		! 4 !	13.1
388	N	6Dbf				2	2	4	2					2					! 4 !	3		2			! 4 !	2				2		5			! 5 !	1.5
389	N	2Dba	2Uge	15		3	3		3					3		4	2		! 4 !	4		3	4	3	! 4 !	3	4			2					! 4 !	4.2
390	N	6Dda				2	3	4	3					2		2			! 4 !	3		2	3		! 4 !	2	2			2		3	4		! 4 !	1.2
391	N	6Gna2				2	2	4	3					2	2				! 4 !	3	2	2	2		! 4 !	2				3		5			! 5 !	3.9
392	N	2Ddb				3	3		3					3		4	2		! 4 !	4		3	4	3	! 4 !	3	4			2					! 4 !	21.2

C-Complex ST-Soil Type n-fertility m-plant water availability pd-soil distribution complexity id-internal drainage g-microrelief w-wetness e-erosion ss-secondary salinisation r-rockiness/stoniness p-permeability t-gradient so-sodicity sa-salinity ps-soil surface conditions dd-deep drainage

Appendix VII (continued).

UMA	Land Resource Data C	Dom.ST	ST2	%ST2	ST3	Common Limitations n	m	pd	id	g	w	e	ss	Cane(C) r	p	t	so	sa	Suit. C	Maize(Mz) ps	t	r	p	so	sa	Suit. Mz	Rice(R) Limitations n	sa	so	ss	r	t	g	dd	pd	Suit. R	Area
393	N	6Ucb				2	4	4	5					4	2				5		2		4			5	2				3		5			5	8.2
394	N	6Dyj				3	3		3		4			3	2	4	2		4	4	2	3	4	3		4	3	2	4			3				4	5.9
395	Y	6Dyg	6Uga	40		2	3		3	3				3	2	4			4	3	2	3	4	2		4	2		4			3	3	4		4	2.9
396	N	6Dbf	6Dbc5	10	6Dbc6	2	2		2					2	3				3	3	3	2				3	2				5		5			5	10.8
397	N	6Dbd	6Dyg	20		2	2		2					2	3				3	3	3	2	2			3	2				5		5			5	8.7
398	N	6Ucb	6Ucc	10		2	4	4	5					4	3				5		3		4			5	2				5		5			5	10.2
399	Y	6Dyj	6Ugc	40		3	3	4	3	3		2		3	3	4	2		4	4	3	3	4	3		4	3	2	4			5	3	2		5	6.2
400	N	6DdaW				2	3	4	3		4	5		2	5	2			5	3	5	2	3			5	2				5		3			5	2.2
401	Y	6Dyg	6Ucc	40	6Ugc	2	4	4	5		4	5		4	5	2			5	3	5	4	3	2		5	2				5		5			5	2.0
402	N	6Dyg				2	3		3			2		3	3	2			3	3	3	3	3	2		3	2				5		4			5	1.8
403	N	2Dyb2				2	3		3					3	2	2			3	3	2	3	3	2		3	2				3		4			4	1.2
404	N	6Dbd	6Dyg	20		2	2		2			2		2	3				3	3	3	2	2			3	2				5		5			5	20.6
405	Y	2Dyb	2UgcW	40		2	3		3	3	4			3		4			4	3		3	4	2		4	2		4			2	3	2		4	3.4
406	N	6Dyg	6Ugc	20	6Dyg2	2	3		3					3	2	2			3	3	2	3	3	2		3	2				3			4		4	17.1
407	N	6Gna				2	2	4	3			3		2	3	2			4	3	4	2	3			4	2				5		5			5	4.8
408	N	6UgcW				2		4	2		4	5		2	5				5	3	5	3	2			5	2				5		2			5	3.9
409	N	6Uma	6Ucc	20			4	4	5			2		4	4				5	3	4	4				5	2				5		5			5	15.0
410	N	6Ucc				2	4	4	5		4	5		4	5				5		5	4				5	2				5		5			5	1.0
411	N	2Dyb	2Ddb	20	2Uge	2	3		3					3		3			3	3		3	4	2		4	2		3		2				4		4	5.7
412	N	6Dyg				2	3		3					3	2	2			3	3	2	3	3	2		3	2		2		3				4		4	5.5
413	Y	6UgcW	6Dbc	40		2	2	4	2		4	5		2	5				5	3	5	3	2			5	2				5		5			5	3.4
414	Y	2UgcW	2Dyb	35	2UgdW	3	3		3	3	4			3		4			4	3		3	4	2		4	3	2	4		2	3	2			4	4.6
415	N	2Dyb				2	3		3					3	2	3			3	3	2	3	4	2		4	2		3		3				4		4	7.3
416	N	2Ugc	2UgcE	20		2		4	2		4	5		2	3				5	3	3	3	2			5	2				5		2			5	2.1
417	N	6Dyg				2	3		3			2		3	3	2			3	3	3	3	3	2		3	2		2		5					5	5.0
418	Y	2Ddb	2Uge	45	6Ucc	3	3		3	3				3		4	2		4	4		3	4	3		4	3		4		2	3	2			4	17.2
419	N	6Dbc	6Ucb	15	6Ugc	2	2		2					2					2	3		2				3	2				2		5			5	105.3
420	N	6Ucb				2	4	4	5					4					5			4				5	2				2		5			5	4.0
421	N	6Dyg2				2	3	4	3					2		2			4	3		2	3	2		4	2		2		2		4			4	1.3
422	N	2Uge				3		4	2					2					4	3		3	2			4	3				2		2		4	4	1.6
423	N	6Dbf2				2	2	4	2					2					4	3		2				4	2				2		5			5	1.1
424	N	6Dyg	6Dyg2	10		2	3		3					3		2			3	3		3	3	2		3	2		2		2		4			4	6.4
425	Y	2Uge	2Dyb	40		3	3		3					3		4			4	3		3	4	2		4	2		4		2		2			4	2.1
426	N	2Uge				2			2					2					2	3		3	2			3	2				2		2	4		4	13.9
427	N	6Dba2	6Dyj	15		2	3	4	3			2		2	3	2			4	3	3	2	3			4	2		2		5		4			5	6.9
428	Y	6Dyj2	6Dyb	35	6Dga	3	3	4	3			2		3	4	4	2		4	4	4	3	4	3		4	3	2	4			5		5			5	2.9
429	N	6Dyb	6Ucc	20		2	3	4	2					2	2				4	3	2	2				4	2				3		5			5	2.5
430	N	6UgcW				2		4	2		4			2	3				4	3	3	3	2			4	2				5		2			5	1.8
431	N	6Ucb				2	4	4	5					4	3				5		3	4				5	2				5		5			5	0.7

C-Complex ST-Soil Type n-fertility m-plant water availability pd-soil distribution complexity id-internal drainage g-microrelief w-wetness e-erosion ss-secondary salinisation r-rockiness/stoniness p-permeability t-gradient so-sodicity sa-salinity ps-soil surface conditions dd-deep drainage

Appendix VII (continued).

UMA	Land Resource Data C	Dom.ST	ST2	%ST2	ST3	Common Limitations n	m	pd	id	g	w	e	ss	Cane(C) r	p	t	so	sa	Suit. ! C !	Maize(Mz) ps	t	r	p	so	sa	Suit. ! Mz!	Rice(R) Limitations n	sa	so	ss	r	t	g	dd	pd	Suit. ! R !	Area
432	N	6Dba				2	3	4	3			2		2	3	2			! 4 !	3	3	2	3		! 4 !	2		2		5		4		! 5 !	10.8
433	N	6Dyg	6Dyg2	10	6Dyg3	2	3		3			2		3	3	2			! 3 !	3	3	3	3	2	! 3 !	2		2		5		4		! 5 !	12.0
434	N	6Dyb2				2	3		2			2		2	3				! 3 !	3	3	2			! 3 !	2				5		5		! 5 !	7.0
435	N	6Ugc				2			2	2				2	2				! 2 !	3	2	3	2		! 3 !	2				3	2	2	4	! 4 !	3.5
436	N	6Dyj				3	3		3			2		3	3	4	2		! 4 !	4	3	3	4	3	! 4 !	3	2	4		5		4		! 5 !	4.6
437	N	2Uge				2			2	2				2	4				! 4 !	3	4	3	2		! 4 !	2				3	2	2	4	! 4 !	11.3
438	Y	2Uge	2Ddb	45		3	3		3	2				3	2	4	2		! 4 !	4	2	3	4	3	! 4 !	3		4		3	2	2		! 4 !	9.9
439	N	6Ugc				2			2		3			2	4				! 4 !	3	4	3	2		! 4 !	2				3		2	4	! 4 !	4.1
440	N	2Dyb				2	3		3					3	2	2			! 3 !	3	2	3	3	2	! 3 !	2		2		3				! 3 !	44.9
441	N	6Dyg3	6Dbb	15		2	3		3					2	2	2			! 3 !	3	2	2	3	2	! 3 !	2		2		3		4		! 4 !	2.9
442	N	6Dyj				3	3		3					3	2	4	2		! 4 !	4	2	3	4	3	! 4 !	3	2	4		3		4		! 4 !	8.1
443	N	6Umb	6Gnd	15	6Uma		2	4							2				! 4 !	3	2				! 4 !					3		5		! 5 !	0.9
444	N	2Ugg	2Ugh	25		3		2	2					2	3	2			! 3 !	3	3	3	3		! 3 !	3		2				2	3	! 3 !	3.7
445	N	6Dyg	6Dyj	15		2	3		3					3	2	2			! 3 !	3	2	3	3	2	! 3 !	2		2		3			3	! 3 !	38.5
446	N	2Uge				2			2					2	3				! 3 !	3	3	3	2		! 3 !	2						2	3	! 3 !	3.2
447	N	6Dyf				2	2		2					2	2				! 2 !	3	2	2	2		! 3 !	2				3		5		! 5 !	7.0
448	N	2Ugd	2Dyc	25	2Dya	2			2	2				2					! 2 !	3		3	2		! 3 !	2				2	2	2		! 2 !	91.9
449	N	2Dyb	2Uge	15	2Ugd	2	3		3					3		2			! 3 !	3		3	3	2	! 3 !	2		2		2				! 2 !	18.6
450	N	6Dbc				2	2	4	2					2	2				! 4 !	3	2	2			! 4 !	2				3		5		! 5 !	2.1
451	N	6Dbc	6Dbf	15		2	2		2					2	2				! 2 !	3	2	2			! 3 !	2				3		5		! 5 !	24.5
452	N	6Dyg3	6Dyg	20	6Dyf5	2	3		3					2	2				! 3 !	3	2	2	2	2	! 3 !	2				3		3	3	! 3 !	13.0
453	N	6DbgW				2	2		2		4	5			5				! 5 !		5				! 5 !	2				5		5		! 5 !	1.0
454	N	6Dyf				2	2		2					2	2				! 2 !	3	2	2	2		! 3 !	2				3		5		! 5 !	9.3
455	N	6Dyg3	6Dbb	15	6Dyg	2	3	3	3					2	2	2			! 3 !	3	2	2	3	2	! 3 !	2		2		3		3	3	! 3 !	6.6
456	N	6Dyd	6Dyc	20	6Dbc	2	2		2					2	3				! 3 !	3	3	2			! 3 !	2				4		5		! 5 !	22.5
457	N	6Dyf				2	2		2						3				! 3 !	3	3		2		! 3 !	2				4		5		! 5 !	6.0
458	N	6Umb	6Uma2	15	6Umb2		2								3				! 3 !	3	3				! 3 !					4		5		! 5 !	48.8
459	N	6Dyg				2	3	4	3			2		3	3	2			! 4 !	3	3	3	3	2	! 4 !	2		2		4				! 4 !	1.5
460	N	6Dyf				2	2		2					2	2				! 2 !	3	2	2	2		! 3 !	2				3		5		! 5 !	7.4
461	N	6Uma	6Uma2	10			2												! 2 !	3					! 3 !					2		5		! 5 !	16.6
462	N	6Dyg	6Dyg2	15	6Dyg3	2	3		3					3	2	2			! 3 !	3	2	3	3	2	! 3 !	2		2		3		4		! 4 !	39.6
463	N	6Dyf				2	2		2					2	2				! 2 !	3	2	2	2		! 3 !	2				3		5		! 5 !	3.2
464	N	6Dyg				2	3		3					3	2	2			! 3 !	3	2	3	3	2	! 3 !	2		2		2			2	! 2 !	1.0
465	N	6Dda3				2	3		3						2				! 3 !	3	2		2		! 3 !	2				3		5		! 5 !	4.9
466	N	6Dyf	6Dyf3	20	6Dyf2	2	2		2					2	2				! 2 !	3	2	2	2		! 3 !	2				3		5		! 5 !	98.9
467	N	6Uma	6Ucc	25			2			3					3				! 3 !	3	3				! 3 !					4	3	5		! 5 !	6.7
468	N	6Dyc2	6Ucc2	25	6Umb2	2	2		2	3					2				! 3 !	3	2				! 3 !	2				3	3	5		! 5 !	66.4
469	N	6Dyc				2	2		2										! 2 !	3					! 3 !	2				2		5		! 5 !	43.7
470	N	6Uma2	6Ucc2	25			2			3					3				! 3 !	3	3				! 3 !					4	3	5		! 5 !	13.7

C-Complex ST-Soil Type n-fertility m-plant water availability pd-soil distribution complexity id-internal drainage g-microrelief w-wetness e-erosion ss-secondary salinisation r-rockiness/stoniness p-permeability t-gradient so-sodicity sa-salinity ps-soil surface conditions dd-deep drainage

Appendix VII (continued).

UMA	Land Resource Data C	Dom.ST	ST2	%ST2	ST3	Common Limitations n	m	pd	id	g	w	e	ss	Cane(C) r	p	t	so	sa	Suit. ! C !	Maize(Mz) ps	t	r	p	so	sa	Suit. ! Mz!	Rice(R) Limitations n	sa	so	ss	r	t	g	dd	pd	Suit. ! R !	Area
471	N	6 E									4	5				5			! 5 !			5				! 5 !					5				! 5 !	14.1
472	N	6UmaC	6Ucc	5			2			4	4	4				3			! 4 !	3	4					! 4 !					5		5		! 5 !	14.9
473	N	6Dyd	6Ucc	5		2	2		2			4		2	4				! 4 !	3	5		2			! 5 !	2				5		5		! 5 !	9.1
474	N	6Drb2				2	2							2					! 2 !	3			2			! 3 !	2				2		5		! 5 !	3.9
475	Y	6Dyf	6Drc	40		2	2		2					2	2				! 2 !	3	2		2	2		! 3 !	2				3		5		! 5 !	11.9
476	N	6Drb	6Dyd	20		2	2							2					! 2 !	3			2			! 3 !	2				2		5		! 5 !	55.7
477	N	6Dyf				2	2		2					2					! 2 !	3			2	2		! 3 !	2				2		5		! 5 !	1.4
478	N	6Dyg	6Dyg3	15		2	3		3					3					! 3 !	3			3	2	2	! 3 !	2				2				! 2 !	19.7
479	N	6Umb					2												! 2 !	3						! 3 !					2		5		! 5 !	11.2
480	N	6Dyg2				2	3	4	3					3					! 4 !	3			3	2	2	! 4 !	2				2		4		! 4 !	1.7
481	N	6Dyb2				2	2		2					2	2				! 3 !	3	2		2			! 3 !	2				3		5		! 5 !	5.3
482	N	6Dyg				2	3		3					3			2		! 3 !	3			3	3	2	! 3 !	2		2		2			4	! 4 !	7.7
483	N	6Drc	6Drb	20		2	2		2					2	2				! 2 !	3	2		2	2		! 3 !	2				3		5		! 5 !	11.0
484	N	6Dyd				2	2		2					2	2				! 2 !	3	2		2			! 3 !	2				3		5		! 5 !	4.0
485	N	6Drb2	6Drb	20		2	2							2	2				! 2 !	3	2		2			! 3 !	2				3		5		! 5 !	15.8
486	N	6Uma					2	4											! 4 !	3						! 4 !					2		5		! 5 !	1.4
487	N	6Dyg				2	3	4	3					3					! 4 !	3			3	2		! 4 !	2				2			4	! 4 !	3.1
488	N	6Ucc				2	4	4	5					4					! 5 !				4			! 5 !	2				2		5		! 5 !	0.6
489	N	6Dyf	6Dyf2	20		2	2		2					2					! 2 !	3			2	2		! 3 !	2				2		5		! 5 !	64.6
490	N	6Dyd2				2	2		2					2					! 2 !	3			2			! 3 !	2				2		5		! 5 !	3.0
491	N	6Dyg				2	3	4	3					3					! 4 !	3			3	2	2	! 4 !	2				2			4	! 4 !	2.3
492	N	6Uma					2	4						2	3				! 4 !	3	3		2			! 4 !					2		5		! 5 !	2.1
493	N	6Drb2				2	2							2	3				! 3 !	3			2			! 3 !	2				2		5		! 5 !	10.0
494	N	6Dyd2				2	2		2					2					! 2 !	3			2			! 3 !	2				2		5		! 5 !	7.1
495	N	6Dyf				2	2	4	2					2	3				! 4 !	3	3		2	2		! 4 !	2						5		! 5 !	4.4
496	N	2Dbd	2Dyb	20		2	3		3					2			2		! 3 !	3			2	3		! 3 !	2		2		2		3		! 3 !	55.9
497	N	2 SP									5								! 5 !							! 5 !					5				! 5 !	0.6
498	N	2UgcW				2			2		4			2	4				! 4 !	3	4		2	2		! 4 !	2				3		2		! 3 !	3.0
499	Y	2Dyc	2Dbc	40		2	3		3	2				2					! 3 !	3			2	2		! 3 !	2				2		3		! 3 !	49.8
500	N	2Dyb				2	3		3					3			3		! 3 !	3			3	4	2	! 4 !	2	3			2				! 3 !	9.5
501	N	6Dyg	6Dyg3	25		2	3		3					3			2		! 3 !	3			3	3	2	! 3 !	2	2			2				! 2 !	18.7
502	N	6Dyg2				2	3		3					2	3	2			! 3 !	3	3		2	3	2	! 3 !	2	2					4		! 4 !	8.0
503	N	6Dyd2	6Dyc2	25		2	2		2					2	2				! 2 !	3	2		2			! 3 !	2				3		5		! 5 !	7.3
504	N	6Drb2	6Uma	10	6Ucc	2	2							2					! 2 !	3			2			! 3 !	2				2		5		! 5 !	26.4
505	N	6Ucc				2	4	4	5					4					! 5 !				4			! 5 !	2				2		5		! 5 !	1.1
506	N	6Drb	6Drb2	10		2	2							2					! 2 !	3			2			! 3 !	2				2		5		! 5 !	22.1
507	N	6Dyd2				2	2		2					2	2				! 2 !	3	2		2			! 3 !	2				3		5		! 5 !	3.5
508	N	6Dyg2				2	3	4	3					2					! 4 !	3			2	2	2	! 4 !	2				2		4		! 4 !	5.4
509	N	6Uma					2	4											! 4 !	3						! 4 !					2		5		! 5 !	1.8

C-Complex ST-Soil Type n-fertility m-plant water availability pd-soil distribution complexity id-internal drainage g-microrelief w-wetness e-erosion ss-secondary salinisation r-rockiness/stoniness p-permeability t-gradient so-sodicity sa-salinity ps-soil surface conditions dd-deep drainage

Appendix VII (continued).

UMA	Land Resource Data C	Dom.ST	ST2	%ST2	ST3	Common Limitations n	m	pd	id	g	w	e	ss	Cane(C) r	p	t	so	sa	Suit. C	Maize(Mz) ps	t	r	p	so	sa	Suit Mz	Rice(R) n	sa	so	ss	r	t	g	dd	pd	Suit. R	Area
510	N	6Dyg4				2	3	4	3			3		3	3				4	3	4	3	2	2	4	2					5		4		5	2.4
511	N	6Dyd				2	2		2			3		2	3				3	3	4	2			4	2					5		5		5	2.0
512	N	6Dyg2	6Dba2	25		2	3	4	3					2					4	3		2	2	2	4	2					2		4		4	9.8
513	N	6Dbd				2	2		2					2					2	3		2	2		3	2					2		5		5	6.1
514	N	6Ucc				2	4	4	5					4					5			4			5	2					2		5		5	1.3
515	N	6Drb				2	2							2					2	3		2			3	2					2		5		5	1.6
516	Y	6Dyc	6Umb	40	6Ucc	2	2	4	2										4	3					4	2					2		5		5	6.6
517	N	6Uma2					2	4											4	3					4						2		5		5	3.7
518	N	6Dyf2				2	2		2					3					3	3		3	2		3	2					2		5		5	6.2
519	N	6Dyf				2	2		2					2	2				2	3	2	2	2		3	2					3		5		5	4.9
520	Y	6Dyf	6Ufc	35		2	2	4	2					2	2				4	3	2	3	2		4	2					3		5		5	14.1
521	N	2Ugd				2			2	2				2					2	3		3	2		3	2					2	2	2		2	3.5
522	N	2 SP									5								5						5						5				5	20.6
523	N	2Uge				2			2	2				2					2	3		2	2		3	2					2		2	3	3	11.7
524	N	2Uge				2			2	2				2	3				2	3	3	3	2		3	2						2	2		2	36.1
525	N	2Ugc				2			2					2					2	3		2	2		3	2					2		2		2	8.6
526	N	6Dyd				2	2	4	2					2					4	3		2			4	2					2		5		5	1.2
527	N	6Dyg2	6Dbd	10		2	3		3					3					3	3		3	2	2	3	2					2		4		4	21.1
528	N	6Dyf2				2	2		2					2	3				3	3	3	2	2		3	2					4		5		5	2.5
529	N	6Dyd2				2	2	4	2					2	2				4	3	2	2			4	2					3		5		5	3.2
530	N	6Ucc				2	4	4	5					4					5			4			5	2					2		5		5	1.1
531	N	6Dyf				2	2		2					2					2	3		2	2		3	2					2		5		5	15.6
532	N	6Dyj				3	3	4	3			2		3	3	4	2		4	3	3	3	4	3	4	3	2	4			4					4	2.3
533	N	6Dyf2	6Dyg2	15		2	2		2					2					2	3		2	2		3	2					2		5		5	22.4
534	N	6Dyb2	6Dyb	25		2	3	4	2					2	2				4	3	2	2			4	2					3		5		5	13.5
535	N	6Ucc				2	4	4	5					4	3				5		3	4			5	2					2		5		5	2.6
536	N	6Dyd	6Dyd2	25		2	2		2					2	2				2	3	2	2			3	2					3		5		5	10.3
537	N	6Ucc				2	4	4	5					4					5			4			5	2					2		5		5	0.5
538	N	6Drb2				2	2							2					2	3		2			3	2					2		5		5	1.7
539	N	6Dyg				2	3		3					3					3	3		3	2	2	3	2					2			4	4	5.4
540	N	6Dyg2	6Ucc	5		2	3		3					2		2			3	3		2	3	2	3	2		2			2		4		4	38.9
541	N	6Dyj				3	3		3					3	3	4	2		4	3	3	3	4	3	4	3	2	4							4	1.3
542	N	6Dyj				3	3		3					3	3	4	2		4	3	3	3	4	3	4	3	2	4						4	4	3.7
543	N	6Dyg				2	3		3					3	2				3	3	2	3	2	2	3	2					2				2	8.9
544	N	2Dyb	2Dbe	10		2	3		3					3	3	3			3	3	3	3	4	2	4	2		3							3	55.0
545	N	6Ugc				2			2					2	3				3	3	3	3	2		3	2							2		2	1.5
546	Y	2Dbd	2Dbc	35		2	3		3					2		2			3	3		2	3		3	2		2			2		3		3	15.4
547	N	6Umb	6Dyd2	25			2	4							2				4	3	2				4	3					3		5		5	2.1
548	N	2Ugd				2			2	2				2	3				3	3	3	3	2		3	2						2	2	3	3	2.8

C-Complex ST-Soil Type n-fertility m-plant water availability pd-soil distribution complexity id-internal drainage g-microrelief w-wetness e-erosion ss-secondary salinisation r-rockiness/stoniness p-permeability t-gradient so-sodicity sa-salinity ps-soil surface conditions dd-deep drainage

Appendix VII (continued).

UMA	Land Resource Data C	Dom.ST	ST2	%ST2	ST3	Common Limitations n	m	pd	id	g	w	e	ss	Cane(C) r	p	t	so	sa	Suit. ! C !	Maize(Mz) ps	t	r	p	so	sa	Suit! Mz!	Rice(R) Limitations n	sa	so	ss	r	t	g	dd	pd	Suit. ! R !	Area
549	N	6Dyg				2	3		3					3					! 3 !	3		3	2	2	! 3 !	2				2			3	! 3 !	4.3
550	N	6Dyf2	6Dyf	25		2	2	4	2					2					! 4 !	3		2	2		! 4 !	2				2		5		! 5 !	7.0
551	N	2Ugd				2			2	2				2					! 2 !	3		3	2		! 3 !	2				2	2	2		! 2 !	212.8
552	N	6Dyf2	6Dyf	25		2	2		2					2	2				! 2 !	3	2	2	2		! 3 !	2				3		5		! 5 !	10.5
553	N	6Ugc				2		4	2	2				2	3				! 4 !	3	3	3	2		! 4 !	2					2	2	4	! 4 !	0.4
554	N	6Drb2				2	2	4						2	2				! 4 !	3	2	2			! 4 !	2				3		5		! 5 !	0.7
555	N	6Uma					2	4											! 4 !	3					! 4 !	1				2		5		! 5 !	1.8
556	N	6Dyf				2	2	4	2					2					! 4 !	3		2	2		! 4 !	2				2		5		! 5 !	1.6
557	N	6Dyj2				3	3		3					3	3	4	2		! 4 !	3	3	3	4	3	! 4 !	3	2	4				4		! 4 !	4.1
558	N	6Dyc2				2	2	4	2										! 4 !	3					! 4 !	2				2		5		! 5 !	1.4
559	N	2Dyb				2	3	4	3					3		3			! 4 !	3		3	4	2	! 4 !	2		2		2				! 2 !	14.6
560	N	2UgdW				2		4	2		4			2					! 4 !	3		3	2		! 4 !	2				2		2	4	! 4 !	1.0
561	N	6Dyg	6Dyg2	25		2	3	4	3					3					! 4 !	3		3	2	2	! 4 !	2				2		4		! 4 !	9.3
562	N	2UgdW				2			2	2	4			2	3				! 4 !	3	3	3	2		! 4 !	2					2	2		! 2 !	6.8
563	N	2Uge				3			2	2				2	3				! 3 !	3	3	3	2		! 3 !	3					2	2		! 3 !	8.7
564	N	2Dyb	2Dbd	15		2	3	4	3					3	2	3			! 4 !	3	2	3	4	2	! 4 !	2		3		3				! 3 !	21.0
565	N	6Dda2				2	3		3					3	2	2			! 3 !	3	2	3	3		! 3 !	2		2		3		4		! 4 !	5.1
566	N	6Ucc				2	4	4	5					4	2				! 5 !		2	4			! 5 !	2				3		5		! 5 !	4.3
567	N	6Ucc				2	4	4	5					4	3				! 5 !		3	4			! 5 !	2				5		5		! 5 !	1.1
568	N	6Dda	6Dba2	10		2	3	4	3					2	2	2			! 4 !	3	2	2	3		! 4 !	2		2		3		3	4	! 4 !	10.6
569	N	6Dbd				2	2		2					2	3				! 3 !	3	3	2	2		! 3 !	2				4		5		! 5 !	12.8
570	N	6Dbc	6Umb	10		2	2		2					2	3				! 3 !	3	3	2			! 3 !	2				5		5		! 5 !	133.5
571	Y	6Dbc	6Uca	40		2	4	4	5			2		4	3				! 5 !	3	3	4			! 5 !	2				5		5		! 5 !	8.4
572	N	6Dyg	6Dyg2	10		2	3		3			2		3	3				! 3 !	3	3	3	2	2	! 3 !	2				4		4		! 4 !	17.3
573	N	6Dbd				2	2		2			2		2	3				! 3 !	3	3	2	2		! 3 !	2				5		5		! 5 !	7.5
574	N	2Dyb				2	3	4	3					3	2	3			! 4 !	3	2	3	4	2	! 4 !	2		3		3				! 3 !	7.6
575	N	2Ugd				2			2	2				2					! 2 !	3		3	2		! 3 !	2				2	2	2		! 2 !	12.2
576	N	6Dba				2	3	4	3			2		3	3	2			! 4 !	3	3	3	3		! 4 !	2		2		5		3		! 5 !	12.7
577	Y	6DbcE	6UfdW	35		2	2	4	2		4	4		2	5				! 5 !	3	5	2			! 5 !	2				5		5		! 5 !	65.2
578	N	6Dbd				2	2	4	2			2		2	3				! 4 !	3	3	2	2		! 4 !	2				4		5		! 5 !	50.6
579	N	2UgdW				2		4	2		4			2	3				! 4 !	3	3	3	2		! 4 !	2						2	4	! 4 !	6.5
580	N	2UgdW				2			2		4			2	3				! 4 !	3	3	3	2		! 4 !	2				3		2		! 3 !	0.6
581	N	6Dyg	6Dda	15		2	3		3					3		2			! 3 !	3		3	3	2	! 3 !	2		2		2		2		! 2 !	6.7
582	N	2Uge				2			2	2				2	3				! 3 !	3	3	3	2		! 3 !	2					2	2		! 2 !	36.3
583	N	2Dyb	2Dbd	20		2	3	4	3					3		3			! 4 !	3		3	4	2	! 4 !	2		3		2				! 3 !	12.5
584	N	6Drb2				2	2	4				2		2	3				! 4 !	3	3	2			! 4 !	2				5		5		! 5 !	6.5
585	N	2Ugd				2			2	2				2	3				! 3 !	3	3	3	2		! 3 !	2					2	2		! 2 !	1.8
586	N	2Uge				2			2	2				2	3				! 3 !	3	3	3	2		! 3 !	2					2	2		! 2 !	15.4
587	N	2Dyb				2	3		3			2		3	3	3			! 3 !	3	3	3	4	2	! 4 !	2		3		4				! 4 !	28.6

C-Complex ST-Soil Type n-fertility m-plant water availability pd-soil distribution complexity id-internal drainage g-microrelief w-wetness e-erosion ss-secondary salinisation r-rockiness/stoniness p-permeability t-gradient so-sodicity sa-salinity ps-soil surface conditions dd-deep drainage

Appendix VII (continued).

UMA	Land Resource Data C	Dom.ST	ST2	%ST2	ST3	Common Limitations n	m	pd	id	g	w	e	ss	Cane(C) r	p	t	so	sa	Suit. ! C !	Maize(Mz) ps	t	r	p	so	sa	Suit! Mz!	Rice(R) Limitations n	sa	so	ss	r	t	g	dd	pd	Suit. ! R !	Area
588	N	2Ugd2				2			2	2				2	2				! 2 !	3	2		3	2		! 3 !	2				3	2	4		! 4 !	7.0
589	N	6Dbd				2	2	4	2					2					! 4 !	3			2	2		! 4 !	2				2		5		! 5 !	5.5
590	N	6Dbc				2	2	4	2					2					! 4 !	3			2			! 4 !	2				2		5		! 5 !	2.2
591	N	2Uge				2			2	2				2	2				! 2 !	3	2		3	2		! 3 !	2				3	2	2		! 3 !	8.7
592	N	6Dyf				2	2	4	2					2	2				! 4 !	3	2		2	2		! 4 !	2				3		5		! 5 !	6.0
593	N	6Dyd				2	2	4	2					2	2				! 4 !	3	2		2			! 4 !	2				3		5		! 5 !	2.1
594	N	2Uge				2			2	2				2	3				! 3 !	3	3		3	2		! 3 !	2					2	2		! 2 !	6.2
595	N	6Dbd				2	2	4	2					2					! 4 !	3			2	2		! 4 !	2				2		5		! 5 !	3.3
596	N	6 P									4								! 4 !							! 4 !							5		! 5 !	0.4
597	N	6Dyj				3	3		3					3	2	4	2		! 4 !	3	2		3	4	3	! 4 !	3	2	4		3				! 4 !	2.5
598	N	6Dbd				2	2	4	2					2	2				! 4 !	3	2		2	2		! 4 !	2				3		5		! 5 !	1.4
599	N	2Ddb				3	3		3					3		4	2		! 4 !	3			3	4	3	! 4 !	3		4		2				! 4 !	6.1
600	N	2Ugk				3			2	2				2	2				! 3 !	3	2		3	2		! 3 !	3				3	2	2		! 3 !	1.4
601	N	2Ugf				2			2	2				2	2				! 2 !	3	2		3	2		! 3 !	2				3	3	2		! 3 !	10.2
602	N	6Dyf2				2	2	4	2					2					! 4 !	3			2	2		! 4 !	2				2		5		! 5 !	3.1
603	N	2Uge2				3			2					2	3	2			! 3 !	3	3		2	3		! 3 !	3		2				4		! 4 !	3.6
604	N	6Dyg				2	3		3					3	2	2			! 3 !	3	2		3	3	2	! 3 !	2		2		3			3	! 3 !	6.3
605	N	6Umb2					2	4							2				! 4 !	3	2					! 4 !					3		5		! 5 !	1.7
606	N	6Dyg2				2	3		3					3		2			! 3 !	3			3	3	2	! 3 !	2		2		2		4		! 4 !	1.6
607	N	6Ucc				2	4	4	5					4					! 5 !				4			! 5 !	2				2		5		! 5 !	1.0
608	N	6Dyg2				2	3		3					2					! 3 !	3			2	2	2	! 3 !	2				2		4		! 4 !	7.7
609	N	6 P									4								! 4 !							! 4 !							5		! 5 !	0.8
610	N	2Dyc				2	3		3	2				2		2			! 3 !	3			2	3		! 3 !	2		2		2		3		! 3 !	6.5
611	N	2Dbd				2	3		3					2	3	2			! 3 !	3	3		2	3		! 3 !	2		2				3		! 3 !	12.5
612	N	2UgcW				2			2	2	4			2	3				! 4 !	3	3		3	2		! 4 !	2					2	2		! 2 !	3.2
613	N	2Dbe				2	3		3					3					! 3 !	3			3	2		! 3 !	2				2		2		! 2 !	7.1
614	Y	2Ddb	2Uge	35		3	3		3					3		4	2		! 4 !	3			3	4	3	! 4 !	3		4		2				! 4 !	14.7
615	Y	2Ddb	2UgeW	35		3	3		3		4			3	3	4	2		! 4 !	3	3		3	4	3	! 4 !	3		4						! 4 !	30.5
616	N	2Ddb2	2UgeW	40		3	3		3		4			3	3	4	2		! 4 !	3	3		3	4	3	! 4 !	3		4				4		! 4 !	17.1
617	N	2Uge				2			2					2	2				! 2 !	3	2		2	2		! 3 !	2				3		2		! 3 !	3.0
618	N	6Dyg2				2	3	4	3			2		2	3				! 4 !	3	3		2	2	2	! 4 !	2				5		4		! 5 !	12.9
619	N	6Dbc				2	2		2					2	3				! 3 !	3	3		2			! 3 !	2				5		5		! 5 !	6.6
620	N	6Dbd	6Dyg2	20		2	2		2			2		2	3				! 3 !	3	3		2	2		! 3 !	2				4		5		! 5 !	32.2
621	N	6Dbd	6Dbc	15		2	2		2			2		2	3				! 3 !	3	3		2	2		! 3 !	2				5		5		! 5 !	7.6
622	N	6Dda	6Dbc2	15		2	3		3			2		3	3	2			! 3 !	3	3		3	3		! 3 !	2		2		5				! 5 !	4.9
623	N	2Uge				2			2					2	3				! 3 !	3			3	2		! 3 !	2						2		! 2 !	2.7
624	N	2Uge				3			2	2				2	3				! 3 !	3	3		3	2		! 3 !	3					2	2		! 3 !	2.6
625	N	2Uge				2			2	2				2	3				! 3 !	3	3		3	2		! 3 !	2					2	2		! 2 !	1.9
626	N	2Ugd2				2			2					2	3				! 3 !	3	3		3	2		! 3 !	2						4		! 4 !	2.2

C-Complex ST-Soil Type n-fertility m-plant water availability pd-soil distribution complexity id-internal drainage
g-microrelief w-wetness e-erosion ss-secondary salinisation r-rockiness/stoniness p-permeability t-gradient so-sodicity
sa-salinity ps-soil surface conditions dd-deep drainage

Appendix VII (continued).

UMA	Land Resource Data C	Dom.ST	ST2	%ST2	ST3	Common Limitations n	m	pd	id	g	w	e	ss	Cane(C) r	p	t	so	sa	Suit. C	Maize(Mz) ps	t	r	p	so	sa	Suit. Mz	Rice(R) Limitations n	sa	so	ss	r	t	g	dd	pd	Suit. R	Area
627	N	2Dyb				2	3		3					3	3	3			3	3	3		3	4	2	4	2		3							3	1.1
628	N	2Uge				2			2	2				2	2				2	3	2		3	2		3	2					3	2	2		3	15.0
629	N	6Ucc				2	4	4	5					4	2				5		2		4			5	2					3		5		5	0.7
630	N	6 SP									5								5							5	2					5				5	0.8
631	N	6Dbd				2	2	4	2					2					4	3		2	2			4	2					2		5		5	2.5
632	N	6Ugc	6Ucc	5		2		4	2					2					4	3		3	2			4	2					2		2	4	4	1.8
633	N	6Uma					2	4							2				4	3	2					4	2					3		5		5	4.2
634	N	6 SP									5								5							5	2					5				5	0.2
635	Y	2UgeW	2 SP	35		2			2		4			2	2				4	3	2		3	2		4	2					3		2	4	4	1.3
636	N	6Dyg2				2	3		3			2		3	3				3	3	3		3	2	2	3	2					4		4		4	18.9
637	N	6Dbd				2	2	4	2			3		2	3				4	3	4		2	2		4	2					5		5		5	3.3
638	Y	6Dbc4	6Uca4	30		2	2	4	5			4		4					5	3	4		4			5	2					5		5		5	13.4
639	N	6Uma					2					3			3				3	3	4					4						5		5		5	10.9
640	N	6 SP									5								5							5						5				5	1.6
641	N	6Dbd				2	2		2			2		2	3				3	3	3		2	2		3	2					5		5		5	2.3
642	N	6Dyd2				2	2		2			3		2	3				3	3	4		2			4	2					5		5		5	0.9
643	N	6Dyf2				2	2		2					2	3				3	3	3		2	2		3	2					5		5		5	5.1
644	Y	6Dyf	6 SP	35		2	2	4	2		4	2		2	3				4	3	3		2	2		4	2					5		4		5	1.7
645	N	2UgeW				2			2		4			2	3				4	3	3		2	2		4	2					5		4		5	1.1
646	N	6Dda2				2	3		3			2		3	3	2			3	3	3		3	3		3	2		2			5		4		5	6.8
647	N	6Uma					2					2			3				3	3	3					3	1					5		5		5	7.1
648	N	6 SP									5								5							5	1					5				5	5.2
649	N	6Dbd				2	2		2			2		2	3				3	3	3		2	2		3	2					5		5		5	5.6
650	N	6Ufc					2	4	2		4	4		2	5				5	3	5		2	2		5	1					5		2		5	0.8
651	N	6Jfc					2	4	2		4	4		2	5				5	3	5		2	2		5	1					5		2		5	1.3
652	N	2 P									4								4							4	1					4				4	0.8
653	N	6 SP									5								5							5	1					5				5	7.4
654	N	6Dbc	6Umb	10		2	2		2					2	3				3	3	3		2			3	1	2				5		5		5	3.5
655	N	2Ugd				2			2	2				2					2	3			3	2		3	1	2				2	2	2		2	28.5

C-Complex ST-Soil Type n-fertility m-plant water availability pd-soil distribution complexity id-internal drainage g-microrelief w-wetness e-erosion ss-secondary salinisation r-rockiness/stoniness p-permeability t-gradient so-sodicity sa-salinity ps-soil surface conditions dd-deep drainage

Appendix VIII Suitability of each UMA for capsicums and mangoes, Haughton Section, Stage III, BRIA

UMA	Land Resource Data C	Dom.ST	ST2	%ST2	ST3	Capsicum(Cap) Limitations n	m	id	ps	t	g	w	e	ss	pd	r	p	so	sa	Suit !Cap!	Mango(Mg) Limitations so	ss	r	sa	d	id	w	Suit. !Mg !	Area
276	N	6Dbc	6Dbf	15	6Dyf	2	2	2	3	3							2			3						2	2	2		210.3
277	N	6UfdW	6UgcW	10	6UmaW		2	2	3	5		4	5				4			5	2				4	5	5		26.3
278	Y	6Uma	6UfdW	40			2	2	3	4		4								4					4	5	5		11.8
279	N	6UfcW	6 SP	10			2	2	3	5		4	5				4	3		5	3				4	5	5		7.7
280	N	6DygE				2	3	3	3	5		4	5		4		3	3		5	4		4	2	4	5	5		1.1
281	N	6Umb	6Uma	20	6Gnd		2		3	3										3					2	2	2		12.8
282	N	6UmbC	6Uma	20	6Dda		2		3	3	3									3					2	2	2		37.7
283	Y	6Dga	6Uma	40	6Dyj3	2	2	2	3	5		5	5		4		2	4		5	4				4	5	5		2.7
284	N	6Umb2	6Uma2	20	6Umb		2	3	3	2										3	4		2		5	3	5		20.5
285	N	6Dbf	6Dbc	20		2	2	2	3	2							2			3					2	3	3		10.0
286	N	6Dyg	6Dyg3	25	6Dyg2	2	3	3	3	2							3	4		4			4	2	4	3	4		18.2
287	N	6UmbC	6Umb2	20	6Gnd		2	3	3	2	3									3	4		2		5	3	5		8.9
288	N	6Umb2	6Uma	15	6Gnd		2	3	3	2										3	4		2		5	3	5		29.2
289	N	6Gnc2				2	2	3	3	2	3				4		2	4		4	4				4	3	4		2.4
290	N	2Ugd				2		2	3	2	3				3		4	3		4	4		2		4	4	4		2.3
291	N	6Umb	6Umb2	15	6Dbf2		2		3	2										3					2	3	3		30.8
292	N	2Dbc	2Ugd	15	2Dbd2	2	3	3	3								2	4		4	4		3	2	4	3	4		9.8
293	N	6Dbc				2	2	2	3						4		2			4	4				2	3	3		1.3
294	N	6UfcW	6 SP	20			2	2	3		2	4			4		4	3		4	3				4	5	5		3.5
295	N	6Dyg	6Ugc	20		2	3	3	3	2							3	4		4	4		4	2	4	3	4		3.0
296	N	6Dbb	6Dyg3	25	6Ugc	2	3	3	3	2							2	3		3	4		3		4	3	4		25.1
297	N	6Dbf	6Dbf2	25		2	2	2	3	2							2			3					2	3	3		6.2
298	N	6Dbf				2	2	2	3	2							2			3					2	3	3		1.9
299	N	6Umb	6Uma	15	6UfdW		2		3	2										3					2	3	3		31.3
300	Y	6Uma	6UfdW	40	6UfcW		2	2	3	5		4	5							5					4	5	5		33.8
301	N	6Uma					2		3						4					4					2	3	3		3.9
302	N	6Dbe	6Dbh2	15	6Dbd	2	2	2	3	2							3	3		3	3				3	3	3		32.5
303	N	6Dyg3	6Dyg	20	6Dbb	2	3	3	3	3			2				2	3		3	4		4	2	4	2	4		6.8
304	N	6Dyf				2	2	2	3	2					4		2	3		4	3				3	3	3		3.2
305	N	6UfdW	6Dda3	10			2	2	3	4	4	4					4			4	2				4	5	5		5.6
306	N	6DbcC	6DbcW	15		2	2	2	3	4	4	4	3				2			4					2	5	5		2.6
307	N	6Dbf	6Dbc	10		2	2	2	3								2			3					2	3	3		13.1
308	N	6UgcW	6 SP	10		2		2	3	5		4	5		4		4	3		5	3		3		4	5	5		11.0
309	N	6Dyf2	6Drb2	10		2	2	2	3	2							2	3		3	3				3	3	3		7.3

C-Complex ST-Soil Type n-fertility m-plant water availability id-internal drainage ps-soil surface conditions t-gradient g-microrelief w-wetness e-erosion ss-secondary salinisation pd-soil distribution complexity r-rockiness/stoniness so-sodicity sa-salinity d-soil depth p-permeability

Appendix VIII (continued).

UMA	Land Resource Data C	Dom.ST	ST2	%ST2	ST3	Capsicum(Cap) Limitations n	m	id	ps	t	g	w	e	ss	pd	r	p	so	sa	Suit !Cap!	Mango(Mg) Limitations so	ss	r	sa	d	id	w	Suit. !Mg !	Area
310	N	6Ucc				2	4	5		3					4		4			! 5 !						2	2	! 2 !	1.4
311	N	6Dbf	6Dbc	10		2	2	2	3	3							2			! 3 !						2	2	! 2 !	2.0
312	N	6Uma	6Umb	10	6Ucc		2		3	2										! 3 !						2	3	! 3 !	12.4
313	N	2Ugd2	2Ugc	10	2 SP	2		2	3		2	4			4		4	3		! 4 !	4		2			4	5	! 5 !	8.9
314	N	6Umb	6Uma	15	6Gnd		2		3	3										! 3 !						2	2	! 2 !	16.2
315	N	6Uma	6Umb	10	6UmaC		2		3	3										! 3 !						2	2	! 2 !	26.6
316	N	6Dbf	6Dbc	10		2	2	2	3	2							2			! 3 !						2	3	! 3 !	4.0
317	N	6Dbc	6Dyf	10	6Dbf	2	2	2	3	2							2			! 3 !						2	3	! 3 !	13.2
318	N	6Dyg3	6Dba2	10	6Dbb	2	3	3	3	2							2	3		! 3 !	4		4	2		4	3	! 4 !	26.8
319	N	6UgcW				2		2	3			4			4		4	3		! 4 !	3		3			4	5	! 5 !	0.8
320	N	6Dbc	6Dyf2	10	6Dbf	2	2	2	3	3							2			! 3 !						2	2	! 2 !	146.6
321	N	6DdaW				2	3	3	3	5		4	5		4		2	4		! 5 !	4		4	2		4	5	! 5 !	3.0
322	N	6UgcW	6 SP	10		2		2	3			4			4		4	3		! 4 !	3		3			4	5	! 5 !	1.8
323	N	6Ucb	6Ucc	10	6Dra3	2	4	5		3					4		4			! 5 !						2	2	! 2 !	6.7
324	N	6Dyg2				2	3	3	3	2							3	4		! 4 !	4		4	2		4	3	! 4 !	6.0
325	N	6Dyj				3	3	3	4	2							3	4	3	! 4 !	4		4	4		4	3	! 4 !	6.3
326	N	6Ugc				3		2	3	2	2						4	4		! 4 !	3		3			4	4	! 4 !	4.8
327	N	6Dyj	6Ugc	20		3	3	3	4	2							3	4	3	! 4 !	4		4	4		4	3	! 4 !	30.6
328	Y	6Gna2	6Ufc	40		2	2	3	3	2	3						2	4		! 4 !	4					4	3	! 4 !	2.7
329	N	6Dbh2	6Dbh	20		3	3	3	3								3	4		! 4 !	4		4	4		4	3	! 4 !	11.2
330	N	6Ugc2				2		2	3		3				4		4	3		! 4 !	3		3			4	4	! 4 !	1.5
331	N	6Dba2				2	3	3	3	2					4		3	4		! 4 !	4		4	2		4	3	! 4 !	2.0
332	N	6Ugc				2		2	3	2	3						4	3		! 4 !	3		3			4	4	! 4 !	1.5
333	N	6Dbc				2	2	2	3	2							2			! 3 !						2	3	! 3 !	17.2
334	N	6Dyg2				2	3	3	3	2							3	4		! 4 !	4		4	2		4	3	! 4 !	4.4
335	Y	6Ufd	6Ugc	35			2	2	3	2	4						4			! 4 !	2					4	5	! 5 !	2.4
336	N	6Dbd				2	2	2	3	2							2	3		! 3 !	3					2	3	! 3 !	14.4
337	N	6Dbc				2	2	2	3	3			2				2			! 3 !						2	2	! 2 !	82.1
338	N	6Dda3	6Ufe	25		2	3	3	3	5		4	5		4		2	3		! 5 !	4		4	2		4	5	! 5 !	10.3
339	N	6Uma	6Ucc	25			4	5	3	2							4			! 5 !						2	3	! 3 !	13.9
340	N	6Gnc				2	2	3	3	4	4		3				2	4		! 4 !	4					4	2	! 4 !	2.4
341	N	2Dyb	2Ugc	25	2Ddb	2	3	3	3								3	4		! 4 !	4		4	2		4	3	! 4 !	20.4
342	N	6Dbc2				2	2	2	3	3							2			! 3 !	4			3		5	2	! 5 !	3.2
343	N	6Dyf				2	2	2	3	3							2	3		! 3 !	3					3	2	! 3 !	3.5

C-Complex ST-Soil Type n-fertility m-plant water availability id-internal drainage ps-soil surface conditions t-gradient g-microrelief w-wetness e-erosion ss-secondary salinisation pd-soil distribution complexity r-rockiness/stoniness so-sodicity sa-salinity d-soil depth p-permeability

Appendix VIII (continued).

UMA	Land Resource Data C	Dom.ST	ST2	%ST2	ST3	Capsicum(Cap) Limitations n	m	id	ps	t	g	w	e	ss	pd	r	p	so	sa	Suit ! Cap	Mango(Mg) Limitations so	ss	r	sa	d	id	w	Suit. ! Mg	Area
344	N	6Ugc				3		2	3	2	2						4	4		4		3				4	4	4	
345	N	6Dyg2				2	3	3	3	2							3	4		4		4			2	4	3	4	
346	N	2Uge	2Ugh	20	2Ugg2	3		2	3	2	2						4	4		4		4				4	4	4	
347	N	6Dbf				2	2	2	3	2					4		2			4						2	3	3	
348	N	6Ufc					2	2	3	2	3				4		4	3		4		3				4	5	5	
349	N	6Dyj	6Dyg	20		3	3	3	4	2							3	4	3	4		4			4	4	3	4	
350	Y	2Dya	2Ugc	40		3	3	3	3	2	3						4	4		4		4			4	2	4	3	4	
351	N	2UgcW	2 SP	20	2UggW	2		2	3	4	2	4					4	3		4		4			2		4	5	5	
352	N	6Dyg2	6Dyg	10		2	3	3	3	2							3	4		4		4			4	2	4	3	4	
353	N	6Dyf				2	2	2	3	3							2	3		3		3					3	2	3	
354	Y	6UgcW	6Dbc	40	6Uma2	2	2	2	3	5		4	5		4		4	3		5		3			3		4	5	5	
355	N	6Dda	6Dyg2	20		2	3	3	3	5		4	5		4		3	4		5		4			4	2	4	5	5	
356	N	6 E								5		5	5							5							5	5	
357	N	6UgcW	6SP	10		2		2	3	3	3	4					4	3		4		3			3		4	5	5	
358	N	6Dyg2	6Dba2	10		2	3	3	3	2							2	4		4		4			4	2	4	3	5	
359	N	2Dyb2	2Dbe	15	2Dbd2	2	3	3	3	2							3	4		4		4			4	2	4	3	4	
360	N	6Dbf	6Dyf3	15	6Dyd	2	2	2	3	2							2			3							2	3	3	
361	N	6Dbd	6Dbd3	15		2	2	2	3	2							2	3		3		3					3	3	3	
362	N	6UfdW					2	2	3	2		4			4		4			4		2					4	5	5	
363	N	6Dbf	6Gna	10		2	2	2	3	2							2			3							2	3	3	
364	N	6Umb2	6Dbf2	10	6Uma2		2	3	3	3										3		4				2	5	2	5	
365	N	6Umb	6Uma	10	6Gnd		2		3	3										3							2	2	2	
366	N	6Dbf2				2	2	2	3	3							2			3							2	2	2	
367	N	6Dbd3				2	2	2	3	3			2				3	3		3		3					3	2	3	
368	N	6Ucc				2	4	5		3					4		4			5							2	2	2	
369	N	6Gna	6Umb2	10		2	2	3	3	3							2	3		3		4					4	2	4	
370	N	6Gna				2	2	3	3	3					3		2	4		4		4					4	2	4	
371	N	2Uge	2Ugd	10	2Dyb	2		2	3		2						3	3		3		4			3		4	4	4	
372	N	6Dyg	6Dyj3	10	6Dyg3	2	3	3	3	3			2				3	4		4		4			4	2	4	2	4	
373	N	6Dyf2				2	2	2	3	3							2	3		3		3					3	2	3	
374	N	6Ucc				2	4	5		3					4		4			5							2	2	2	
375	N	6Umb	6Drb	10	6Gnd		2		3	3										3							2	2	2	
376	N	2Dbd	2Dyb	15		2	3	3	3	2					3		2	3		3		4			3	2	4	3	4	
377	N	6UmbC	6Umb2	20	6Gnd2		2	3	3	3	3									3		4					5	2	5	

C-Complex ST-Soil Type n-fertility m-plant water availability id-internal drainage ps-soil surface conditions t-gradient g-microrelief w-wetness e-erosion ss-secondary salinisation pd-soil distribution complexity r-rockiness/stoniness so-sodicity sa-salinity d-soil depth p-permeability

Appendix VIII (continued).

UMA	Land resource Data C	Dom.ST	ST2	%ST2	ST3	Capsicum(Cap) Limitations n	m	id	ps	t	g	w	e	ss	pd	r	p	so	sa	Suit ! Cap !	Mango(Mg) Limitations so	ss	r	sa	d	id	w	Suit. ! Mg !	Area
378	N	6Umb	6Uma	20	6Dbc		2		3	3										3						2	2	2	35.2
379	N	2Dbc	2Dbd	20	2Dyb3	2	3	3	3	2							2	4		4	4			3	2	4	3	4	28.8
380	N	2Dyb				2	3	3	3	3			2				3	4		4	4			4	2	4	2	4	6.9
381	N	6Dyg3	6Dyg2	10	6Dbb	2	3	3	3	3			2				2	4		4	4			4	2	4	2	4	15.5
382	N	2DbeW	2 SP	20		2	3	3	3	3		4					3	3		4	4			3		4	5	5	1.2
383	N	6Umb	6Gnd	15	6Gna2		2		3	3					4					4						2	2	2	5.8
384	N	2Dbc	2Dbc2	15	2Dbd	2	3	3	3								2	4		4	4			3	2	4	3	4	14.2
385	N	2Ugd				2		2	3		2				3		4	3		4	4			2		4	4	4	3.1
386	N	2UgcW	2 SP	10		2		2	3		2	4					4	3		4	4			2		4	5	5	3.9
387	N	2Dbc	2Dbc2	15	2Dyb	2	3	3	3								2	4		4	4			3	2	4	3	4	13.1
388	N	6Dbf				2	2	2	3						4		2			4						2	3	3	1.5
389	N	2Dba	2Uge	15		3	3	3	4								3	4	3	4	4			4	4	4	3	4	4.2
390	N	6Dda				2	3	3	3						4		2	4		4	4			4	2	4	3	4	1.2
391	N	6Gna2				2	2	3	3	2					4		2	3		4	4			4		4	3	4	3.9
392	N	2Ddb				3	3	3	4								3	4	3	4	4			4	4	4	3	4	21.2
393	N	6Ucb				2	4	5		2					4		4			5						2	2	2	8.2
394	N	6Dyj				3	3	3	4	2		4					3	4	3	4	4			4	4	4	5	5	5.9
395	Y	6Dyg	6Uga	40		2	3	3	3	2	3						3	4		4	4			4	2	4	3	4	2.9
396	N	6Dbf	6Dbc5	10	6Dbc6	2	2	2	3	3							2			3						2	2	2	10.8
397	N	6Dbd	6Dyg	20		2	2	2	3	3							2	3		3		3				3	2	3	8.7
398	N	6Ucb	6Ucc	10		2	4	5		3					4		4			5						2	2	2	10.2
399	Y	6Dyj	6Ugc	40		3	3	3	4	3	3		2				3	4	3	4	4			4	4	4	2	4	6.2
400	N	6DdaW				2	3	3	3	5		4	5		4		2	4		5	4			4	2	4	5	5	2.2
401	Y	6Dyg	6Ucc	40	6Ugc	2	4	5	3	5		4	5		4		4	4		5	4			4	2	4	5	5	2.0
402	N	6Dyg				2	3	3	3	3			2				3	4		4	4			4	2	4	2	4	1.8
403	N	2Dyb2				2	3	3	3	2							3	4		4	4			4	2	4	3	4	1.2
404	N	6Dbd	6Dyg	20		2	2	2	3	3			2				2	3		3	3					3	2	3	20.6
405	Y	2Dyb	2UgcW	40		2	3	3	3		3	4					3	4		4	4			4	2	4	5	5	3.4
406	N	6Dyg	6Ugc	20	6Dyg2	2	3	3	3	2							3	4		4	4			4	2	4	3	4	17.1
407	N	6Gna				2	2	3	3	4			3		4		2	4		4	4			4		4		4	4.8
408	N	6UgcW				2		2	3	5		4	5		4		4	3		5	5			3		4	5	5	3.9
409	N	6Uma	6Ucc	20			4	5	3	4			2				4			5	5					2	2	2	15.0
410	N	6Ucc				2	4	5		5		4	5		4		4			5	5					2	5	5	1.0
411	N	2Dyb	2Ddb	20	2Uge	2	3	3	3								3	4		4	4			4	2	4	3	4	5.7

C-Complex ST-Soil Type n-fertility m-plant water availability id-internal drainage ps-soil surface conditions t-gradient g-microrelief w-wetness e-erosion ss-secondary salinisation pd-soil distribution complexity r-rockiness/stoniness so-sodicity sa-salinity d-soil depth p-permeability

Appendix VIII (continued).

UMA	Land Resource Data C	Dom.ST	ST2	%ST2	ST3	Capsicum(Cap) Limitations n	m	id	ps	t	g	w	e	ss	pd	r	p	so	sa	Suit !Cap!	Mango(Mg) Limitations so	ss	r	sa	d	id	w	Suit. !Mg !	Area
412	N	6Dyg				2	3	3	3	2							3	4		4	4			4	2	4	3	4	5.5
413	Y	6UgcW	6Dbc	40		2	2	2	3	5		4	5		4		4	3		5	2			3		4	5	5	3.4
414	Y	2UgcW	2Dyb	35	2UgdW	3	3	3	3		3	4					4	4		4	4			4	2	4	5	5	4.6
415	N	2Dyb				2	3	3	3	2							3	4		4	4			4	2	4	3	4	7.3
416	N	2Ugc	2UgcE	20		2		2	3	3		4	5		4		4	3		5	2			2		4	5	5	2.1
417	N	6Dyg				2	3	3	3	3			2				3	4		4	4			4	2	4	2	4	5.0
418	Y	2Ddb	2Uge	45	6Ucc	3	3	3	4		3						3	4	3	4	4			4	4	4	3	4	17.2
419	N	6Dbc	6Ucb	15	6Ugc	2	2	2	3								2			3	3					2	3	3	105.3
420	N	6Ucb				2	4	5							4		4			5	2					2	2	2	4.0
421	N	6Dyg2				2	3	3	3						4		2	4		4	4			4	2	4	3	4	1.3
422	N	2Uge				3		2	3						4		4	3		4	4			3		4	4	4	1.6
423	N	6Dbf2				2	2	2	3						4		2			4	3					2	3	3	1.1
424	N	6Dyg	6Dyg2	10		2	3	3	3								3	4		4	4			4	2	4	3	4	6.4
425	Y	2Uge	2Dyb	40		3	3	3	3								4	4		4	4			4	2	4	4	4	2.1
426	N	2Uge				2		2	3								4	3		4	4			3		4	4	4	13.9
427	N	6Dba2	6Dyj	15		2	3	3	3	3			2		4		2	4		4	4			4	2	4	2	4	6.9
428	Y	6Dyj2	6Dyb	35	6Dga	3	3	3	4	4			2		4		3	4	3	4	4			4	4	4	5	5	2.9
429	N	6Dyb	6Ucc	20		2	3	2	3	2					4		2			4	4			3		3	3	4	2.5
430	N	6UgcW				2		2	3	3		4			4		4	3		4	4			3		4	5	5	1.8
431	N	6Ucb				2	4	5		3					4		4			5	2					2	2	2	0.7
432	N	6Dba				2	3	3	3	3			2				2	4		4	4			4	2	4	2	4	10.8
433	N	6Dyg	6Dyg2	10	6Dyg3	2	3	3	3	3			2				3	4		4	4			4	2	4	2	4	12.0
434	N	6Dyb2				2	3	2	3	3			2				2			3	3					3	2	3	7.0
435	N	6Ugc				2		2	3	2	2						4	3		4	4			3		4	4	4	3.5
436	N	6Dyj				3	3	3	4	3			2				3	4	3	4	4			4	4	4	2	4	4.6
437	N	2Uge				2		2	3	4	2						4	3		4	4			3		4	5	5	11.3
438	Y	2Uge	2Ddb	45		3	3	3	4	2	2						3	4	3	4	4			4	4	4	4	4	9.9
439	N	6Ugc				2		2	3	4		3					4	3		4	4			3		4	5	5	4.1
440	N	2Dyb				2	3	3	3	2							3	4		4	4			4	2	4	3	4	44.9
441	N	6Dyg3	6Dbb	15		2	3	3	3	2							2	4		4	4			4	2	4	3	4	2.9
442	N	6Dyj				3	3	3	4	2							3	4	3	4	4			4	4	4	3	4	8.1
443	N	6Umb	6Gnd	15	6Uma		2		3	2					4					4	4					2	3	3	0.9
444	N	2Ugg	2Ugh	25		3		2	3	3					2		4	4		4	4			4		4	5	5	3.7
445	N	6Dyg	6Dyj	15		2	3	3	3	2							3	4		4	4			4	2	4	3	4	38.5

C-Complex ST-Soil Type n-fertility m-plant water availability id-internal drainage ps-soil surface conditions t-gradient g-microrelief w-wetness e-erosion ss-secondary salinisation pd-soil distribution complexity r-rockiness/stoniness so-sodicity sa-salinity d-soil depth p-permeability

Appendix VIII (continued).

UMA	Land Resource Data C	Dom.ST	ST2	%ST2	ST3	Capsicum(Cap) Limitations n	m	id	ps	t	g	w	e	ss	pd	r	p	so	sa	Suit ! Cap !	Mango(Mg) Limitations so	ss	r	sa	d	id	w	Suit. ! Mg !	Area
446	N	2Uge				2		2	3	3							4	3		4			3		4	5		5	3.2
447	N	6Dyf				2	2	2	3	2							2	3		3					3	3		3	7.0
448	N	2Ugd	2Dyc	25	2Dya	2		2	3		2						4	3		4			2		4	4		4	91.9
449	N	2Dyb	2Uge	15	2Ugd	2	3	3	3								3	4		4			4	2	4	3		4	18.6
450	N	6Dbc				2	2	2	3	2					4		2								2	3		3	2.1
451	N	6Dbc	6Dbf	15		2	2	2	3	2							2			3					2	3		2	24.5
452	N	6Dyg3	6Dyg	20	6Dyf5	2	3	3	3	2							2	3		3		4		4	2	4	3		4	13.0
453	N	6DbgW				2	2	2		5		4	5							5						2	5		5	1.0
454	N	6Dyf				2	2	2	3	2							2	3		3		3				3	3		3	9.3
455	N	6Dyg3	6Dbb	15	6Dyg	2	3	3	3	2							2	4		4		4		4	2	4	3		4	6.6
456	N	6Dyd	6Dyc	20	6Dbc	2	2	2	3	3							2			3						2	2		2	22.5
457	N	6Dyf				2	2	2	3	3								3		3		3				3	2		3	6.0
458	N	6Umb	6Uma2	15	6Umb2		2		3	3										3						2	3		3	48.8
459	N	6Dyg				2	3	3	3	3			2		4		3	4		4		4		4	2	4	2		4	1.5
460	N	6Dyf				2	2	2	3	2							2	3		3		3				3	3		3	7.4
461	N	6Uma	6Uma2	10			2		3											3						2	3		3	16.6
462	N	6Dyg	6Dyg2	15	6Dyg3	2	3	3	3	2							3	4		4		4		4	2	4	3		4	39.6
463	N	6Dyf				2	2	2	3	2							2	3		3		3				3	3		3	3.2
464	N	6Dyg				2	3	3	3	2							3	4	2	4		4		4	2	4	3		4	1.0
465	N	6Dda3				2	3	3	3	2								3		3		4		4	2	4	3		4	4.9
466	N	6Dyf	6Dyf3	20	6Dyf2	2	2	2	3	2							2	3		3		3				3	3		3	98.9
467	N	6Uma	6Ucc	25			2		3	3	3									3						2	2		2	6.7
468	N	6Dyc2	6Ucc2	25	6Umb2	2	2	2	3	2	3									3		4		2	5	3		5	66.4
469	N	6Dyc				2	2	2	3											3					2	3		3	43.7
470	N	6Uma2	6Ucc2	25			2		3	3	3									3					2	2		2	13.7
471	N	6 E								5		4	5							5						5		5	14.1
472	N	6UmaC	6Ucc	5			2		3	4	4	4	4							4					2			2	14.9
473	N	6Dyd	6Ucc	5		2	2	2	3	5			4				2			5					2			2	9.1
474	N	6Drb2				2	2		3								2			3						3		3	3.9
475	Y	6Dyf	6Drc	40		2	2	2	3	2							2	3		3		3				3	3		3	11.9
476	N	6Drb	6Dyd	20		2	2		3								2			3						3		3	55.7
477	N	6Dyf				2	2	2	3								2	3		3		3				3	3		3	1.4
478	N	6Dyg	6Dyg3	15		2	3	3	3								3	3		3		4		4	2	4	3		4	19.7
479	N	6Umb					2		3											3						2	3		3	11.2

C-Complex ST-Soil Type n-fertility m-plant water availability id-internal drainage ps-soil surface conditions t-gradient g-microrelief w-wetness e-erosion ss-secondary salinisation pd-soil distribution complexity r-rockiness/stoniness so-sodicity sa-salinity d-soil depth p-permeability

Appendix VIII (continued).

UMA	Land Resource Data C	Dom.ST	ST2	%ST2	ST3	Capsicum(Cap) Limitations n	m	id	ps	t	g	w	e	ss	pd	r	p	so	sa	Suit ! Cap	!	Mango(Mg) Limitations so	ss	r	sa	d	id	w	Suit. Mg	!	Area
480	N	6Dyg2				2	3	3	3						4		3	3		4	!	4					4	2	4	3	4	!	1.7
481	N	6Dyb2				2	2	2	3	2							2			3	!	3		3					3	3	3	!	5.3
482	N	6Dyg				2	3	3	3								3	4		4	!	4		4			4	2	4	3	4	!	7.7
483	N	6Drc	6Drb	20		2	2	2	3	2							2	3		3	!	3		3					3	3	3	!	11.0
484	N	6Dyd				2	2	2	3	2							2				!	3	!				4	2	2	3	3	!	4.0
485	N	6Drb2	6Drb	20		2	2		3	2							2				!	3	!							3	3	!	15.8
486	N	6Uma					2		3						4						!	4	!						2	3	3	!	1.4
487	N	6Dyg				2	3	3	3								3	3			!	3	!	4					4	3	4	!	3.1
488	N	6Ucc				2	4	5							4		4				!	5	!						2	2	2	!	0.6
489	N	6Dyf	6Dyf2	20		2	2	2	3								2	3		3	!	3	!	3					3	3	3	!	64.6
490	N	6Dyd2				2	2	2	3								2				!	3	!						2	3	3	!	3.0
491	N	6Dyg				2	3	3	3								3	3		4	!	3	!	4			4	2	4	3	4	!	2.3
492	N	6Uma					2		3	3							2				!	3	!						2	3	3	!	2.1
493	N	6Drb2				2	2		3								2				!	3	!							3	3	!	10.0
494	N	6Dyd2				2	2	2	3								2				!	3	!						2	3	3	!	7.1
495	N	6Dyf				2	2	2	3	3							2	3		3	!	3	!	3					3	5	5	!	4.4
496	N	2Dbd	2Dyb	20		2	3	3	3								2	4		4	!	4	!	4			3	2	4	3	4	!	55.9
497	N	2 SP										5									!	5	!							5	5	!	0.6
498	N	2UgcW				2		2	3	4		4					3	3			!	4	!	4			2		4	5	5	!	3.0
499	Y	2Dyc	2Dbc	40		2	3	3	3		2						2	3		4	!	3	!	4			3	2	4	3	4	!	49.8
500	N	2Dyb				2	3	3	3								3	4		4	!	4	!	4			4	2	4	3	4	!	9.5
501	N	6Dyg	6Dyg3	25		2	3	3	3								3	4		4	!	4	!	4			4	2	4	3	4	!	18.7
502	N	6Dyg2				2	3	3	3	3							2	4		4	!	4	!	4			4	2	4	5	5	!	8.0
503	N	6Dyd2	6Dyc2	25		2	2	2	3	2							2				!	3	!						2	3	3	!	7.3
504	N	6Drb2	6Uma	10	6Ucc	2	2		3								2				!	3	!							3	3	!	26.4
505	N	6Ucc				2	4	5							4		4				!	5	!						2	2	2	!	1.1
506	N	6Drb	6Drb2	10		2	2		3								2				!	3	!							3	3	!	22.1
507	N	6Dyd2				2	2	2	3	2							2				!	3	!						2	3	3	!	3.5
508	N	6Dyg2				2	3	3	3								2	3			!	3	!	4			4	2	4	3	4	!	5.4
509	N	6Uma					2		3						4						!	4	!						2	3	3	!	1.8
510	N	6Dyg4				2	3	3	3	4			3				3	3			!	4	!	4			4	2	4	2	4	!	2.4
511	N	6Dyd				2	2	2	3	4			3				2				!	4	!						2	2	2	!	2.0
512	N	6Dyg2	6Dba2	25		2	3	3	3								2	3			!	3	!	4			4	2	4	3	4	!	9.8
513	N	6Dbd				2	2	2	3								2	3			!	3	!	3					3	3	3	!	6.1

C-Complex ST-Soil Type n-fertility m-plant water availability id-internal drainage ps-soil surface conditions t-gradient g-microrelief w-wetness e-erosion ss-secondary salinisation pd-soil distribution complexity r-rockiness/stoniness so-sodicity sa-salinity d-soil depth p-permeability

Appendix VIII (continued).

UMA	Land Resource Data C	Dom.ST	ST2	%ST2	ST3	Capsicum(Cap) Limitations n	m	id	ps	t	g	w	e	ss	pd	r	p	so	sa	Suit ! Cap !	Mango(Mg) Limitations so	ss	r	sa	d	id	w	Suit. ! Mg !	Area
514	N	6Ucc				2	4	5							4		4			5						2	2	2	
515	N	6Drb				2	2		3								2			3							3	3	
516	Y	6Dyc	6Umb	40	6Ucc	2	2	2	3						4					4						2	3	3	
517	N	6Uma2					2		3											3	4					4	3	4	
518	N	6Dyf2				2	2	2	3								3	3		3	3					3	3	3	
519	N	6Dyf				2	2	2	3	2							2	3		3	3					3	3	3	
520	Y	6Dyf	6Ufc	35		2	2	2	3	2					4		2	3		4	3					3	3	3	
521	N	2Ugd				2		2	3		2						4	3		4	3			2		4	4	4	
522	N	2 SP										5								5	5						5	5	
523	N	2Uge				2		2	3		2						3	3		3	4		3			4	4	4	
524	N	2Uge				2		2	3	3	2						4	3		4	3		3			4	4	4	
525	N	2Ugc				2		2	3								3	3		3	4		2			4	4	4	
526	N	6Dyd				2	2	2	3						4		2			4	3					2	3	3	
527	N	6Dyg2	6Dbd	10		2	3	3	3								3	3		3	4		4	2		4	3	4	
528	N	6Dyf2				2	2	2	3	3							2	3		3	3					3	2	3	
529	N	6Dyd2				2	2	2	3	2					4		2			4						2	3	3	
530	N	6Ucc				2	4	5							4		4			5						2	2	2	
531	N	6Dyf				2	2	2	3								2	3		3	3					3	3	3	
532	N	6Dyj				3	3	3	3	3			2				3	4	3	4	4		4	3		4	2	4	
533	N	6Dyf2	6Dyg2	15		2	2	2	3								2	3		3	3					3	3	3	
534	N	6Dyb2	6Dyb	25		2	3	2	3	2							2			3	3					3	3	3	
535	N	6Ucc				2	4	5		3					4		4			5						2	2	2	
536	N	6Dyd	6Dyd2	25		2	2	2	3	2							2			3						2	3	3	
537	N	6Ucc				2	4	5							4		4			5						2	2	2	
538	N	6Drb2				2	2		3								2			3							3	3	
539	N	6Dyg				2	3	3	3								3	3		3	4		4	2		4	3	4	
540	N	6Dyg2	6Ucc	5		2	3	3	3								2	4		4	4		4	2		4	3	4	
541	N	6Dyj				3	3	3	3	3							3	4	3	4	4		4	3		4	5	5	
542	N	6Dyj				3	3	3	3	3							3	4	3	4	4		4	3		4	5	5	
543	N	6Dyg				2	3	3	3	2							3	3		4	4		4	2		4	3	4	
544	N	2Dyb	2Dbe	10		2	3	3	3	3							3	4		4	4		4	2		4	5	5	
545	N	6Ugc				2		2	3	3							4	3		3	4		3			4	4	4	
546	Y	2Dbd	2Dbc	35		2	3	3	3								2	4		4	4		3	2		4	3	4	
547	N	6Umb	6Dyd2	25			2		3	2										4	4					2	3	3	

C-Complex ST-Soil Type n-fertility m-plant water availability id-internal drainage ps-soil surface conditions t-gradient g-microrelief w-wetness e-erosion ss-secondary salinisation pd-soil distribution complexity r-rockiness/stoniness so-sodicity sa-salinity d-soil depth p-permeability

Appendix VIII (continued).

UMA	Land Resource Data C	Dom.ST	ST2	%ST2	ST3	Capsicum(Cap) Limitations n	m	id	ps	t	g	w	e	ss	pd	r	p	so	sa	Suit !Cap!	Mango(Mg) Limitations so	ss	r	sa	d	id	w	Suit. !Mg !	Area
548	N	2Ugd				2		2	3	3	2						4	3		4		4			2		4	4	4	2.8
549	N	6Dyg				2	3	3	3								3	3		3		4			4	2	4	3	4	4.3
550	N	6Dyf2	6Dyf	25		2	2	2	3								2	3		3		3					3	3	3	7.0
551	N	2Ugd				2		2	3		2						4	3		4		4			2		4	4	4	212.8
552	N	6Dyf2	6Dyf	25		2	2	2	3	2							2	3		3		3					3	3	3	10.5
553	N	6Ugc				2		2	3	3	2						4	3		4		3			3		4	4	4	0.4
554	N	6Drb2				2	2		3	2							2			4								3	3	0.7
555	N	6Uma					2		3						4					4							2	3	3	1.8
556	N	6Dyf				2	2	2	3						4		2	3		4		3					3	3	3	1.6
557	N	6Dyj2				3	3	3	3	3							3	4	3	4		4			4	3	4	5	5	4.1
558	N	6Dyc2				2	2	2	3						4					4							2	3	3	1.4
559	N	2Dyb				2	3	3	3								3	4		4		4			4	2	4	3	4	14.6
560	N	2UgdW				2		2	3			4					4	3		4		4			2		4	5	5	1.0
561	N	6Dyg	6Dyg2	25		2	3	3	3								3	3		3		4			4	2	4	3	4	9.3
562	N	2UgdW				2		2	3	3	2	4					4	3		4		4			2		4	5	5	6.8
563	N	2Uge				3		2	3	3	2						4	3		4		4			3		4	4	4	8.7
564	N	2Dyb	2Dbd	15		2	3	3	3	2							3	4		4		4			4	2	4	3	4	21.0
565	N	6Dda2				2	3	3	3	2							3	4		4		4			4	2	4	3	4	5.1
566	N	6Ucc				2	4	5		2					4		4			5							2	2	2	4.3
567	N	6Ucc				2	4	5		3					4		4			5							2	2	2	1.1
568	N	6Dda	6Dba2	10		2	3	3	3	2							2	4		4		4			4	2	4	3	4	10.6
569	N	6Dbd				2	2	2	3	3							2	3		3		3					3	2	3	12.8
570	N	6Dbc	6Umb	10		2	2	2	3	3							2			3							2	2	2	133.5
571	Y	6Dbc	6Uca	40		2	4	5	3	3			2		4		4			5							2	2	2	8.4
572	N	6Dyg	6Dyg2	10		2	3	3	3	3			2				3	3		3		4			4	2	4	2	4	17.3
573	N	6Dbd				2	2	2	3	3			2				2	3		3		3					3	2	3	7.5
574	N	2Dyb				2	3	3	3	2							3	4		4		4			4	2	4	3	4	7.6
575	N	2Ugd				2		2	3		2						4	3		4		4			2		4	4	4	12.2
576	N	6Dba				2	3	3	3	3			2				3	4		4		4			4	2	4	2	4	12.7
577	Y	6DbcE	6UfdW	35		2	2	2	3	5		4	4		4		3			5							4	5	5	65.2
578	N	6Dbd				2	2	2	3	3			2				2	3		4		3					3	2	3	50.6
579	N	2UgdW				2		2	3	3		4					4	3		4		4			2		4	5	5	6.5
580	N	2UgdW				2		2	3	3		4					4	3		4		4			2		4	5	5	0.6
581	N	6Dyg	6Dda	15		2	3	3	3								3	4		4		4			4	2	4	3	4	6.7

C-Complex ST-Soil Type n-fertility m-plant water availability id-internal drainage ps-soil surface conditions t-gradient g-microrelief w-wetness e-erosion ss-secondary salinisation pd-soil distribution complexity r-rockiness/stoniness so-sodicity sa-salinity d-soil depth p-permeability

Appendix VIII (continued).

UMA	Land Resource Data C	Dom.ST	ST2	%ST2	ST3	Capsicum(Cap) Limitations n	m	id	ps	t	g	w	e	ss	pd	r	p	so	sa	Suit ! Cap !	Mango(Mg) Limitations so	ss	r	sa	d	id	w	Suit. ! Mg !	Area
582	N	2Uge				2		2	3	3	2						4	3		4	4		3		4	4	4		36.3
583	N	2Dyb	2Dbd	20		2	3	3	3								3	4		4	4		4	2	4	3	4		12.5
584	N	6Drb2				2	2		3	3			2				2				2					2	2		6.5
585	N	2Ugd				2		2	3	3	2						4	3		4	4		4		2	4	4		1.8
586	N	2Uge				2		2	3	3	2						4	3		4	4		4		3	4	4		15.4
587	N	2Dyb				2	3	3	3	3			2				3	4		4	4		4	2	4	2	4		28.6
588	N	2Ugd2				2		2	3	2	2						4	3		4	4		4		2	4	4		7.0
589	N	6Dbd				2	2	2	3								2	3		3	3		3			3	3		5.5
590	N	6Dbc				2	2	2	3								2			2	3		3			2	3		2.2
591	N	2Uge				2		2	3	2	2						4	3		4	4		4		3	4	4		8.7
592	N	6Dyf				2	2	2	3	2							2	3		3	3		3			3	3		6.0
593	N	6Dyd				2	2	2	3	2					4		2			2	3		3			2	3		2.1
594	N	2Uge				2		2	3	3	2						4	3		4	4		4		3	4	4		6.2
595	N	6Dbd				2	2	2	3								2	3		3	3		3			3	3		3.3
596	N	6 P										4								4	5		5						0.4
597	N	6Dyj				3	3	3	3	2							3	4	3	4	4		4	2	4	3	4		2.5
598	N	6Dbd				2	2	2	3	2					4		2	3		4	4		3			3	3		1.4
599	N	2Ddb				3	3	3	3								3	4	3	4	4		4	4	4	3	4		6.1
600	N	2Ugk				3		2	3	2	2						4	3		4	4		3		3	4	4		1.4
601	N	2Ugf				2		2	3	2	2						4	3		4	4		3			4	4		10.2
602	N	6Dyf2				2	2	2	3								2	3		4	4		3			3	3		3.1
603	N	2Uge2				3		2	3	3							3	4		4	4		4		3	4	4		3.6
604	N	6Dyg				2	3	3	3	2							3	4		4	4		4	2	4	3	4		6.3
605	N	6Umb2					2		3	2					4					4	4					2	3		1.7
606	N	6Dyg2				2	3	3	3								3	4		4	4		4	2	4	3	4		1.6
607	N	6Ucc				2	4	5							4		4			4	5					2	2		1.0
608	N	6Dyg2				2	3	3	3								2	3		4	4		4	2	4	3	4		7.7
609	N	6 P										4								4	5		5						0.8
610	N	2Dyc				2	3	3	3		2						2	4		4	4		4		3	4	4		6.5
611	N	2Dbd				2	3	3	3	3							2	4		4	4		4	2	4	5	5		12.5
612	N	2UgcW				2		2	3	3	2	4					4	3		4	4		4		2	4	5		3.2
613	N	2Dbe				2	3	3	3								3	3		4	3		4		3	4	4		7.1
614	Y	2Ddb	2Uge	35		3	3	3	3								3	4	3	4	4		4	4	4	3	4		14.7
615	Y	2Ddb	2UgeW	35		3	3	3	3	3		4					3	4	3	4	4		4	4	4	5	5		30.5

C-Complex ST-Soil Type n-fertility m-plant water availability id-internal drainage ps-soil surface conditions t-gradient g-microrelief w-wetness e-erosion ss-secondary salinisation pd-soil distribution complexity r-rockiness/stoniness so-sodicity sa-salinity d-soil depth p-permeability

Appendix VIII (continued).

UMA	Land Resource Data C	Dom.ST	ST2	%ST2	ST3	Capsicum(Cap) Limitations n	m	id	ps	t	g	w	e	ss	pd	r	p	so	sa	Suit !Cap!	Mango(Mg) Limitations so	ss	r	sa	d	id	w	Suit. !Mg !	Area
616	N	2Ddb2	2UgeW	40		3	3	3	3	3		4					3	4	3	4	4			4	4	4	5	5	17.1
617	N	2Uge				2		2	3	2							3	3		3	4			3		4	4	4	3.0
618	N	6Dyg2				2	3	3	3	3			2				2	3		3	4			4	2	4	2	4	12.9
619	N	6Dbc				2	2	2	3	3							2			3						2	2	2	6.6
620	N	6Dbd	6Dyg2	20		2	2	2	3	3			2				2	3		3	3					3	2	3	32.2
621	N	6Dbd	6Dbc	15		2	2	2	3	3			2				2	3		3	3					3	2	3	7.6
622	N	6Dda	6Dbc2	15		2	3	3	3	3			2				3	4		4	4			4	2	4	2	4	4.9
623	N	2Uge				2		2	3								4	3		4	4			3		4	4	4	2.7
624	N	2Uge				3		2	3	3	2						4	3		4	4			3		4	4	4	2.6
625	N	2Uge				2		2	3	3	2						4	3		4	4			3		4	4	4	1.9
626	N	2Ugd2				2		2	3	3							4	3		4	4			2		4	4	4	2.2
627	N	2Dyb				2	3	3	3	3							3	4		4	4			4	2	4	5	5	1.1
628	N	2Uge				2		2	3	2	2						4	3		4	4			3		4	4	4	15.0
629	N	6Ucc				2	4	5		2					4		4			5	2					2	2	2	0.7
630	N	6 SP										5								5	5						5	5	0.8
631	N	6Dbd				2	2	2	3								2	3		3	3					3	3	3	2.5
632	N	6Ugc	6Ucc	5		2		2	3								4	3		4	4			3		4	4	4	1.8
633	N	6Uma					2		3	2										3	2					2	3	3	4.2
634	N	6 SP										5								5	5						5	5	0.2
635	Y	2UgeW	2 SP	35		2		2	3	2		4					4	3		4	4			3		4	5	5	1.3
636	N	6Dyg2				2	3	3	3	3			2				3	3		4	4			4	2	4	2	4	18.9
637	N	6Dbd				2	2	2	3	4			3		4		2	3		4	3					3	2	3	3.3
638	Y	6Dbc4	6Uca4	30		2	2	5	3	4			4				4			5	2				2	2		2	13.4
639	N	6Uma					2		3	4			3							4	2					2		2	10.9
640	N	6 SP										5								5	5						5	5	1.6
641	N	6Dbd				2	2	2	3	3			2				2	3		3	3					3	2	3	2.3
642	N	6Dyd2				2	2	2	3	4			3				2			4	2					2		2	0.9
643	N	6Dyf2				2	2	2	3	3							2	3		3	3					3	2	3	5.1
644	Y	6Dyf	6 SP	35		2	2	2	3	3		4	2		4		2	3		4	3					3	5	5	1.7
645	N	2UgeW				2		2	3	3		4					3	3		4	4			3		4	5	5	1.1
646	N	6Dda2				2	3	3	3	3			2				3	4		4	4			4	2	4	2	4	6.8
647	N	6Uma					2		3	3			2							3	2					2	2	2	7.1
648	N	6 SP										5								5	5						5	5	5.2
649	N	6Dbd				2	2	2	3	3			2				2	3		3	3					3	2	3	5.6

C-Complex ST-Soil Type n-fertility m-plant water availability id-internal drainage ps-soil surface conditions t-gradient g-microrelief w-wetness e-erosion ss-secondary salinisation pd-soil distribution complexity r-rockiness/stoniness so-sodicity sa-salinity d-soil depth p-permeability

Appendix VIII (continued).

UMA	Land Resource Data C	Dom.ST	ST2	%ST2	ST3	Capsicum(Cap) Limitations n	m	id	ps	t	g	w	e	ss	pd	r	p	so	sa	! Suit ! Cap !	Mango(Mg) Limitations so	ss	r	sa	d	id	w	! Suit. ! Mg !	Area
650	N	6Ufc				2	2	3	5		4	4				3	3			! 5 !	2				4	5	! 5 !		0.8
651	N	6Ufc				2	2	3	5		4	4				3	3			! 5 !	3				4	5	! 5 !		1.3
652	N	2 P									4									! 4 !						5	! 5 !		0.8
653	N	6 SP									5									! 5 !						5	! 5 !		7.4
654	N	6Dbc	6Umb	10		2	2	2	3	3							2			! 3 !					2	2	! 2 !		3.5
655	N	2Ugd				2		2	3		2						4	3		! 4 !	4		2		4	4	! 4 !		28.5

C-Complex ST-Soil Type n-fertility m-plant water availability id-internal drainage ps-soil surface conditions t-gradient g-microrelief w-wetness e-erosion ss-secondary salinisation pd-soil distribution complexity r-rockiness/stoniness so-sodicity sa-salinity d-soil depth p-permeability