

Agricultural Land Suitability Series – Report 2

DLRM Technical Report 2/2016D

Soil and Land Suitability Assessment for Irrigated Agriculture in the Wildman River area, Northern Territory February 2016



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The map series accompanying this report can be downloaded from the NR Maps website.

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Executive Summary

A soil and land suitability investigation for irrigated agriculture was undertaken on lands east of Darwin in the Wildman River region of the Northern Territory covering 34 304 ha. Land capability assessment identified 8 994 ha as high class land for agriculture. These high class agricultural soil landscapes are predominantly deep, sandy or loamy surfaced red earths on level to gently undulating plains.

Suitability findings for seventy four specific crops were determined using the '*Darwin-Tiwi Islands Agricultural Land Suitability Framework*' (Version 1 2016). This framework was developed in collaboration with representatives from the Northern Territory Farmers Association. This framework will be updated as new crops, technologies and information become available. Potential crops identified tropical citrus, cucurbits, fruiting vegetable crops, and leafy vegetables and herbs as highly suitable on the level to gently undulating plains with red earths.

A surface and ground water investigation is ongoing with a water resources drilling program planned for 2016/17.

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List of Acronyms

ADMC	Air Dry Moisture Content
ASC	Australian Soil Classification
ASL	Above Sea Level
BoM	Bureau of Meteorology
CEC	Cation Exchange Capacity
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DEM	Digital Elevation Model
DLRM	Department of Land Resource Management
DPIF	Department of Primary Industries and Fisheries
DSITIA	Department of Science, Information, Technology, Innovation and the Arts
EC	Electrical Conductivity
ECEC	Effective Cation Exchange Capacity
ERD	Effective Rooting Depth
ESCP	Erosion and Sediment Control Plan
ESCAVI	Executive Steering Committee for Australian Vegetation Information
ESP	Exchangeable Sodium Percentage
GDE	Groundwater Dependant Ecosystem
NT	Northern Territory
NTG	Northern Territory Government
NATA	National Association of Testing Authorities (Australia)
NCST	National Committee on Soil and Terrain
NVIS	National Vegetation Information System
OC	Organic Carbon
OM	Organic Matter
PAWC	Plant Available Water Content
PSA	Particle Size Analysis
RUSLE	Revised Universal Soil Loss Equation
SALInfo	Soil and Land Information System (NT)
SBA	Stand Basal Area
SWS	Soil Water Storage
VSDNT	Vegetation Site Database Northern Territory

1. Introduction

1.1 Background

This project forms part of a four year program that aims to identify and promote areas of the Northern Territory's soil, land and water resource assets with potential for irrigated agriculture. The program aims to investigate agricultural development opportunities across a range of land tenures, including Pastoral, Indigenous, Crown and Private lands.

The Wildman River project, undertaken in 2015 directly aligns with the Northern Territory Governments '*Framing the Future*' strategy and supports the goals and objectives identified in DLRM's Strategic Plan (2014-2017). Objectives 2 and 3 of the strategic plan relating to economic development and balanced environmental outcomes are directly relevant to the proposed investigation:

- **Prosperous Economy, Objective 2:** An economy that unlocks the potential of our regions and encourages new investments and the growth of existing businesses in the pastoral, resources, energy, fisheries, agriculture, parks, tourism, arts and culture and construction sectors; and
- **Balanced Environment, Objective 3:** An environment that is supported through research, information and knowledge (DCM 2014)

This report provides baseline soil data and interpretation to assist development decisions within the survey area.

1.2 Objectives

The specific objectives of this investigation were to:

1. Map and describe the soil and land resources of the defined study area at a resolution of 1:25 000;
2. Develop a land suitability framework for irrigated agriculture for the Darwin-Tiwi Islands Region, in consultation with relevant stakeholders and industry representatives;
3. Generate land suitability outcomes following assessment of soil and landscape attributes against agricultural land suitability criteria for the Darwin-Tiwi Islands Region; and
4. Produce a technical report, spatial data and map products detailing soil and landscape findings and land suitability outcomes for irrigated agriculture at Wildman River.

1.3 Survey area

The Wildman River survey area is located approximately 140 km south-east of Darwin and 125 km west of Jabiru township. The area of surveyed land is approximately 34 304 ha and lies between latitudes 12° 28' and 12° 45' south and longitudes 131° 45' and 131° 55' east. A locality map showing the survey area and regional context is provided in Figure 1.1.

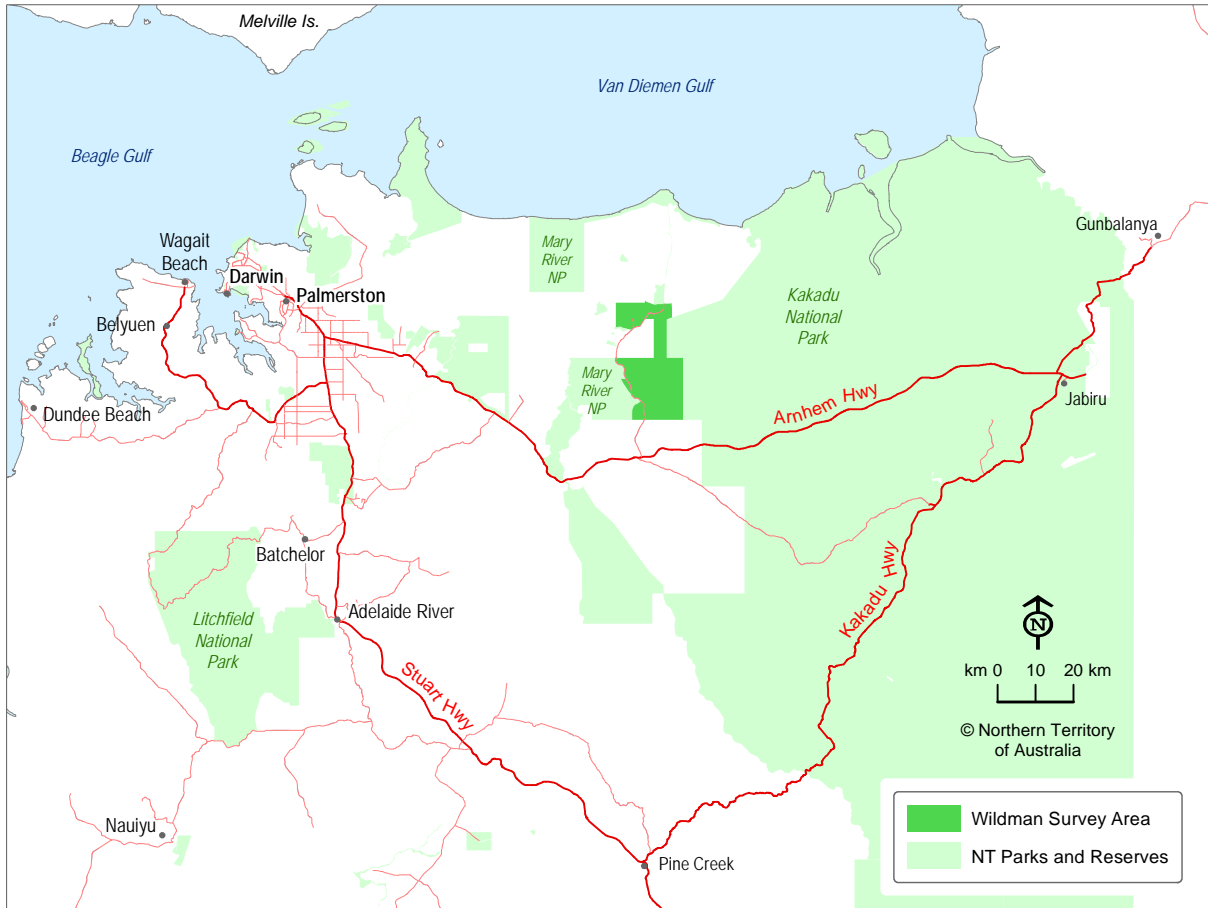


Figure 1.1: Locality map showing the survey area and regional context

Previous investigations at a broader scale by Robinson *et al.* (1973) and Day *et al.* (1979) indicated potential horticultural land during the planning stages. Consideration was also given to access constraints such as creek crossings, terrain etc. which would impact on potential future development.

1.3.1 Climate

Climate data from Middle Point (BoM station No. 014041) located 60 km west of the survey area was used. During the Dry season (May to September) temperatures range from 15°C-36°C, while temperatures range from 22°C-37°C during the Wet season (October to April). High temperatures are consistent year round, with lower minimum temperatures and lower humidity during the Dry season months. The average monthly temperature reaches a maximum of 37.4°C in October, and a minimum temperature of 14.4°C in July.

The annual average rainfall recorded for the period 2001-2015 was 1 410 mm. Mean monthly rainfall was highest during the Wet season months from October to April. February was the highest rainfall month, averaging 303 mm. In comparison, Darwin's Wet season annual average rainfall is 1 730 mm (Darwin Airport, BoM station No. 014015).

Average monthly rainfall data and average monthly maximum and minimum temperature data recorded from 2001-2015 is provided in Figure 1.2.

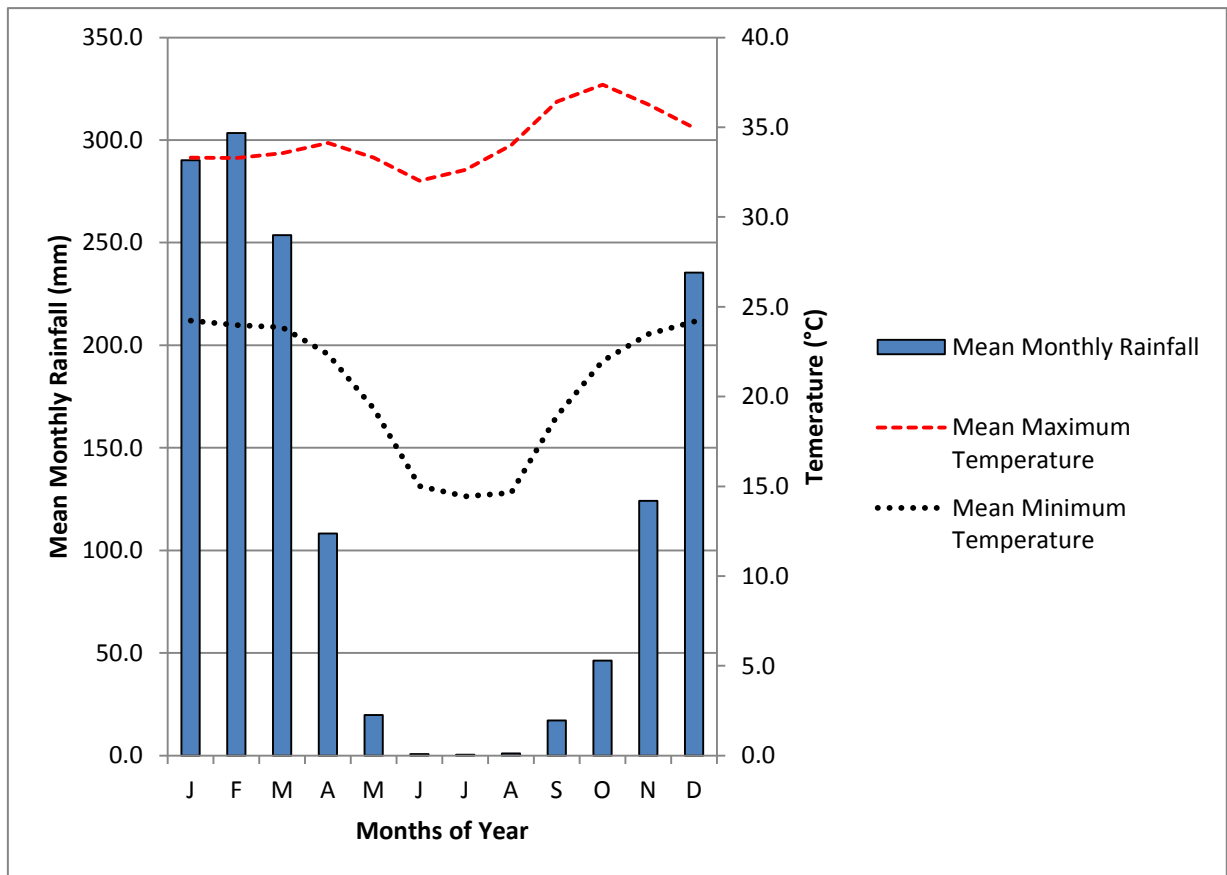


Figure 1.2: Average monthly rainfall, maximum and minimum temperatures (BoM, 2015).

1.3.2 Groundwater

Previous investigations in this region indicated that high yielding bores (>50 L/s) are possible in the underlying fractured and cavernous Koolpinyah Dolomite and Cretaceous sandstone environments. A surface water assessment program is currently underway, and once finalised will inform a groundwater drilling program planned for the 2016/17 financial year. The work is expected to span approximately two years due to the need to gather seasonal response data. This work will delineate the groundwater environments and investigate its connectivity to the surface water regime, and broadly map the groundwater dependent ecosystems (GDEs). The water resource assessment will aim to identify the possible yield from the system considering potential groundwater recharge, without exceeding the sustainable limit of impact on GDEs.

1.3.3 Drainage Network

The majority of the survey area was divided by Swim Creek which drains northwards to Van Diemen Gulf. The central eastern boundary is drained by Ben Bunga Creek and Cattle Creek which meet with Alligator Creek a tributary of Wildman River. The centre of the survey area was characterised by a number of isolated lagoons filling during the Wet season months and drying slowly as a result of evaporation. The most predominant being the Twin Sisters Billabong adjacent to the cashew plantation (NT Por 5088). Both remain wet for longer periods and support aquatic vegetation. The extent to which the swamp system expands during the Wet season and the depth of inundation has not been investigated. In addition, the

south-west corner of the survey area is drained by Soda Creek during the Wet season months, forming part of the Mary River Catchment.

1.3.4 Existing Land Use

The majority of the survey area is currently utilised for commercial cattle grazing. Vegetation within the survey area was still intact with minor areas cleared for grazing and to a lesser extent irrigated cashew plantations. Fires are an annual occurrence during the Dry season. Feral animals in particular buffalo and wild pigs have impacted some areas of the landscape.

1.4 Previous land resource investigations

Land resource mapping projects have been undertaken across the Wildman River catchment area since 1953 where the first land system survey was completed at the very broad scale of 1:1 000 000 in the Katherine-Darwin region. A land system is defined as '*an area or group of areas throughout which there is a recurring pattern of topography, vegetation and soils*' Christian *et al.* (1953). Subsequent mapping of parts of this region in greater detail was undertaken by Story *et al.* (1969) although still at the relatively broad scale of 1:250 000 (Lynch & Wilson 1998).

Two land system surveys have been undertaken in the region;

- Christian, CS, Blake, ST, Nokes, LC & Stewart, GA (1953). *General Report on Survey of Katherine-Darwin Region, 1946*. CSIRO Land Research Series No.1 Scale 1:1 000 000; and
- Story, R, Williams, MAJ, McAlpine, JR, O'Ferrall, RE & Hooper ADL (1969) *Lands of the Adelaide-Alligator Area, Northern Territory*. CSIRO Land Research Series No.25 Scale 1:250 000.

Two Land unit surveys in the region that provided critical information were as follows;

- Day, KJ, Harrison, CJ & van-Cuylenburg, HRM (1979) *Land Resources of the Wildman River Station, Northern Territory*. Land Conservation Unit, Territory Parks and Wildlife Commission, Darwin NT. Technical Report LRD79006; and
- Robinson, CS & Howe, DF (1973) *Land Resources of Point Stuart Station, Northern Territory*. Conservation Commission of the Northern Territory. Land Conservation Section;

Further information collated and used to assist the project is detailed below;

- Calder, GJ & Day, KJ (1982) *Fertility Studies on Four Soils of the Northern Lateritic Uplands, Northern Territory*. Land Conservation Unit, Conservation Commission of the N.T. Technical Bulletin No. 48;
- Mangion, C & Flitton, R (2011). *Soil Investigation-Regrowth Trials NTAG*, Northern Territory (unpublished);
- Mcleod, P (1984) *Soil Investigation of the Wildman River Cashew Trial*, Northern Territory (unpublished);
- Stuart-Smith, PG, Wallace, DA & Roarty, MJ (1984) 1:100 000 Geological Map Commentary Mary River Point Stuart Region, Northern Territory. Bureau of Mineral Resources, Geology and Geophysics; and

- Woodroffe, CD & Mulrennan, ME (1993) *Geomorphology of the Lower Mary River Plains Northern Territory*. Australian National University North Australia Research Unit and the Conservation Commission of the Northern Territory.

2. Methodology

2.1 Land unit mapping

A land unit mapping methodology was adopted for this project to address the objectives requiring soil and land resources to be mapped. A land unit is described as “*a reasonably homogenous part of a land surface, distinct from surrounding terrain, with consistent properties in landform, soils or vegetation*” (Hooper, 1970).

A preliminary map was developed using the following resources and techniques:

- Aerial photo interpretation of Katherine-South Alligator River (1964) 1:80 000 (Run 20a-31) black and white aerial photographs;
- WorldView-2 satellite imagery with a resolution of 0.5 m pixels captured between 25/08/2013 and 28/06/2014; and
- SRTM derived digital elevation model and 5 m pixel resolution digital elevation model over the Wildman River and Mary River Catchments.

Due to inaccessibility in the central and south eastern part of the survey area; a range of Low Hills, Rises and Drainage Systems was mapped based on the above resources and techniques and extrapolated from other described land units.

2.1.1 Mapping scale

Although 1:50 000 land resource mapping was published over the survey area in 1973 and 1979, it was considered that agricultural suitability information at a higher resolution was required to underpin successful agricultural and horticultural development.

Therefore a minimum published mapping scale of 1:25 000 was deemed appropriate due to the degree of landscape complexity expected within the survey area and the time and resources available to the project. Field survey intensities to validate spatial outcomes at this scale were considered both achievable and sufficiently thorough to satisfy the technical specifications required by the investigations terms of reference.

2.1.2 Site density

Schoknecht *et al.* (2008) recommend that mapping at a scale of 1:25 000 requires a minimum acceptable ground observation density of 1 observation per 25 ha. This equates to about 1 372 field observations across the survey area. Schoknecht *et al.* (2008) further suggest that at large mapping scales (such as 1:25 000), data collection should include 10-30% detailed soil profile descriptions and a further 1-5% representative sampling sites for full laboratory analysis.

The survey density complies with the current recommended sampling densities as summarised in Table 2.1.

Table 2.1: Compliance with minimum acceptable ground observation density

Item	Recommendations	Actual	Compliance
Total survey area	1 observation per 25 ha	34 304 ha	-
Total number of observation sites	1 372 sites		-
Soil morphology and previous surveyed sites	10-30% (137-412 sites)	272 sites	Yes
Soil laboratory analysis	1-5% (14-69 sites)	21 sites	Yes
Mapping observations	60-88% (823-1 207)	35 - plus many observations not recorded	Yes

2.2 Field survey

The field survey was undertaken over seven weeks from May to late August 2015 encompassing a total of 147 sites, and includes 176 previous surveyed sites as listed in Table 2.2. A landscape description was recorded at all sites, including landform and general soil observations. Soil profiles (morphology) and vegetation communities were described at 112 sites using national guidelines and the methods detailed below. Additionally, soil chemical and physical analysis was conducted on 16 of these sites. The distribution of sites is shown in Figure 2.1.

The land unit boundaries that had been initially drawn from aerial photography and satellite data were manually refined by referring to field data and observations.

Table 2.2: Data collected during field survey

Site Type	Site Description	Number of Sites
Soil morphology	Landscape description, soil morphology, vegetation description	96
Soil morphology and laboratory analysis	Landscape description, soil morphology, soil laboratory analysis, vegetation description	16
Landscape	Landscape description	35 - plus many observations not recorded
Previous soil morphology	Soil and Landscape Information (SALInfo)	171
Previous soil morphology and laboratory analysis	Soil and Landscape Information (SALInfo) and soil laboratory analysis	5
Total		323

2.3 Soil sampling and descriptions

Soil morphology was described from samples obtained from a hand auger to a maximum depth of 150 cm. Profile descriptions were compiled in accordance with the Australian Soil and Land Survey Field Handbook (NCST, 2009), The Australian Soil Classification (Isbell, 2002). Landscape sites were described with identified changes in vegetation, soil and surface gravels.

2.3.1 Laboratory analysis of soils

Sixteen soil profiles were sampled at depths of 0-10, 10-20, 20-30, 50-60, 80-90, 110-120, 140-150 cm for laboratory analysis. This is on top of five sites previously analysed in the survey area. The sites of these samples are listed in Table 2.3 and their distribution shown in Figure 2.1. National Association of Testing Authorities (NATA) accredited testing of all soil samples was conducted by The Queensland Department of Science, Information Technology, Innovation and the Arts. Soil laboratory testing was undertaken according to methods of Rayment and Lyons (2011). Refer to Appendix A for analytical methodologies used in the investigation.

Table 2.3: Soil analytical sampling sites

Soil Order	Site No. (WILDM)
Kandosols	15, 68, 91, 96, 98
Tenosols	29, 34, 101
Rudosols	108
Hydrosols	4, 102, 104, 106, 109
Kurosols	81
Vertosols	103

Chemical and physical properties of each soil order are presented in Appendix B with representative soil profiles presented in Chapter 4 of this report.

2.4 Vegetation sampling and descriptions

Vegetation descriptions and communities were compiled using the National Vegetation Information System classification (ESCAVI 2003). Vegetation floristic data were collected from a 20 m x 20 m quadrat at 112 sites at the same location as the soil landscape sites. Vegetation strata were identified and the average height, height ranges, predominant growth form and percentage covers recorded for each stratum. Percentage cover was recorded for each species in each stratum, plus a basal count to determine stand basal area (SBA). Species recorded in these sites are provided in Appendix G.

2.5 Data storage and availability

Field site records describing landform, soil morphology, soil chemistry and physical soil data are stored in the Northern Territory's Soil and Land Information system (SALInfo). Vegetation information from each site is stored in the Northern Territory Vegetation Site Database (VSDNT).

Spatial data and map products are stored in DLRM's corporate spatial library and are available upon request. The report for this project is available electronically from the Northern Territory library, while technical data, project findings and derived map products can be accessed and downloaded from the Department's web enabled data and information centre, *NR Maps*. <http://nrmaps.nt.gov.au/>

The metadata for the spatial dataset is at:

http://www.ntlis.nt.gov.au/metadata/export_data?type=html&metadata_id=25420B7D7CE9C3E1E050CD9B21442808

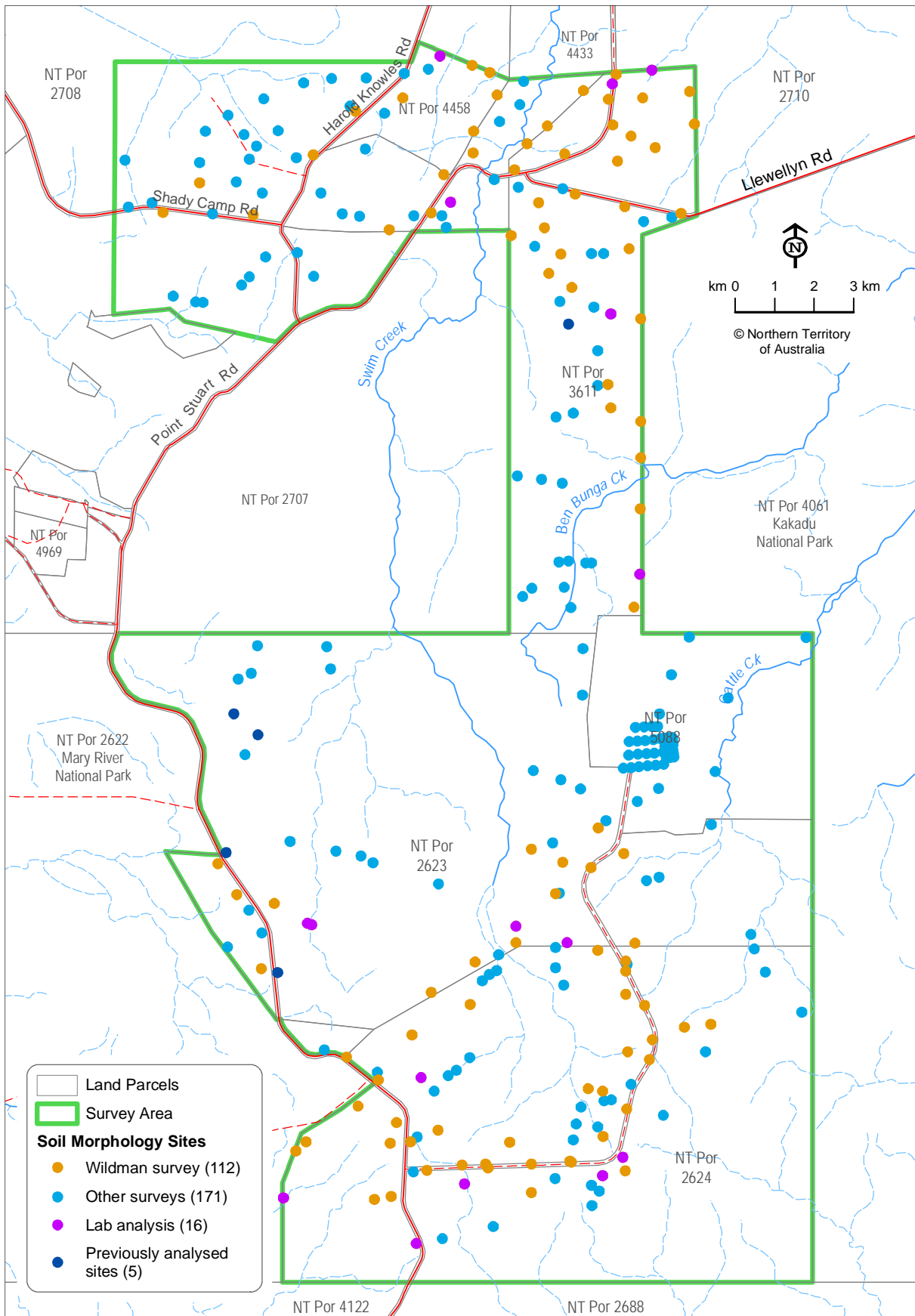


Figure 2.1: Soil morphology and laboratory analysis sites

3. Landscapes

The description of soil origins and their formation in the landscape are based on the following resources:

- Stuart-Smith, PG, Wallace, DA & Roarty, MJ (1984). Australia 1:100 000 Geological series Mary River/Point Stuart map sheet 5272. Department of Mines and Energy, Northern Territory;
- Williams, MAJ, Hooper, ADL & Story, R (1969). 1:500 000 *Geomorphology and Soils of the Adelaide-Alligator Area*, Northern Territory. Land Research Series No. 25, CSIRO, Melbourne; and
- Woodroffe, CD & Mulrennan, ME (1993). *Geomorphology of the Lower Mary River Plains*, Northern Territory. North Australian Research Unit, Australian National University.

3.1 Geology

There are two major geological formations of significance summarised in Stuart-Smith *et al.* (1984). These are the Wildman Siltstone and Mundogie Sandstone; both formation beds of the early Proterozoic aged Mount Partridge Group.

The Wildman Siltstone is comprised of medium to coarse sandstone and siltstone overlying deeply weathered ferruginous volcanics. This unit is poorly exposed throughout the region occurring mostly as low undulating rises south west of the survey area. Stuart-Smith *et al.* (1984) later subdivided this unit into a lower shale dominated member and an upper shale-sandstone member. The high yielding Koolpinyah Dolomite caps the Wildman Siltstone in low lying areas, underlying a series of interconnected swamps and perennial billabongs.

The Mundogie Sandstone dominates the rugged terrain south-east of the survey area. It has been described by Stuart-Smith *et al.* (1984) as the oldest exposed unit in the region consisting of interbedded sequence of quartz sandstone, quartzite, arkose, and minor conglomerate, shale and siltstone. The Mundogie Sandstone is conformably overlain by the Wildman siltstone and in places the Koolpin Formation or by Tertiary lateritic cappings.

The Petrel Formation of Cretaceous and Cainozoic aged unconsolidated sediments, covers a majority of the survey area. The Cretaceous aged Bathurst Island formation consists of unconsolidated quartz sandstone and is summarised by Stuart-Smith *et al.* (1984). The fine to very fine sub-labile sandstone inter-bedded with grey carbonaceous clay and siltstone with calcareous and limontic concretions laid down under shallow marine conditions. This unit distinctly crops out in the middle of the survey area (Figure 3.1). A thin veneer of Cainozoic unconsolidated sand and laterite covers a majority of the upland and lower slope plains. While the transported Quaternary age sediments consists mostly of alluvial silt, sand and clay deposited by active river systems.

The surface geology map presented in Figure 3.1 (Geological series Mary River/Point Stuart map sheet 5272) shows lithological descriptions of the survey area which are also summarised in Table 3.1.

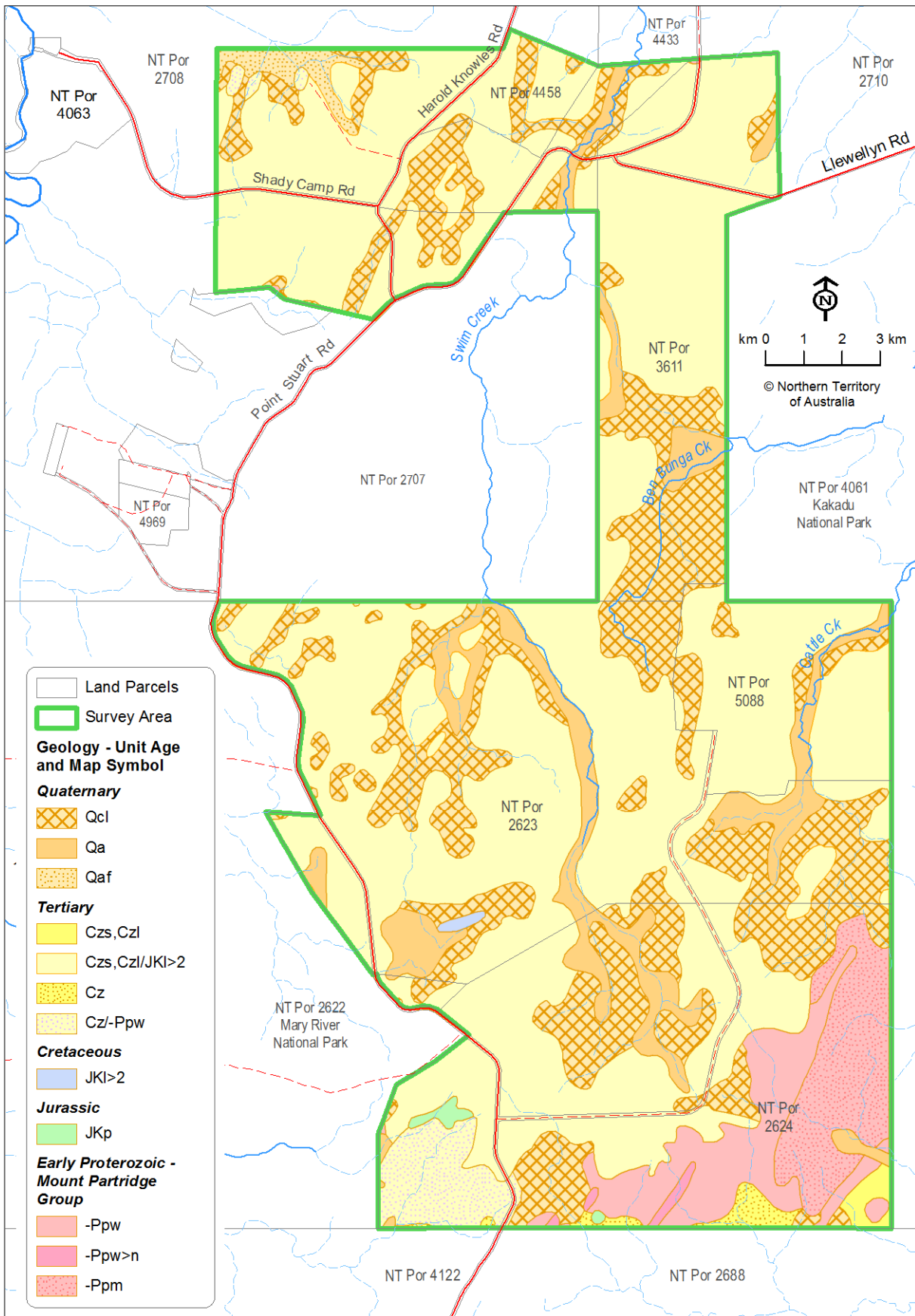
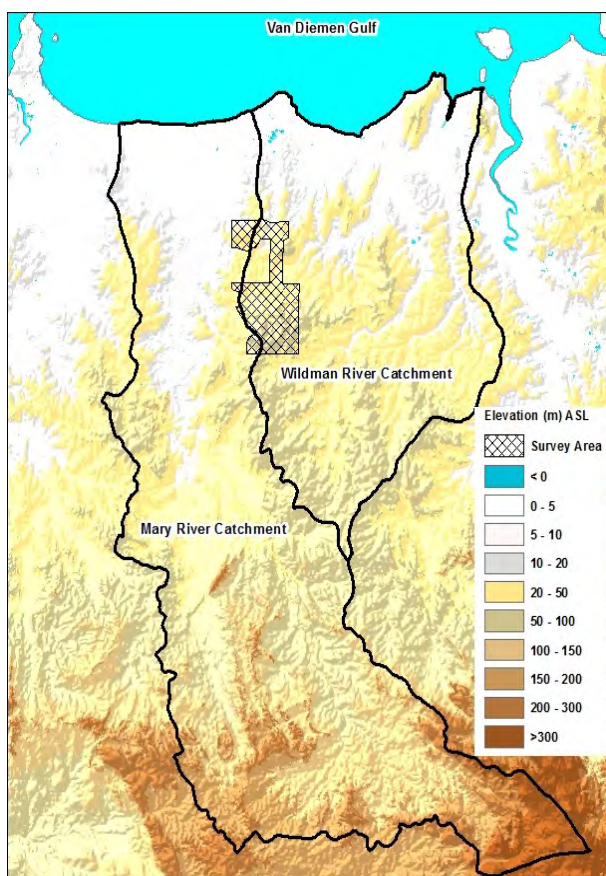


Figure 3.1: Surface Geology (refer to Table 3.1 for lithological descriptions) (Stuart-Smith et al.1984)

Table 3.1: Geology descriptions of the survey area (Stuart-Smith *et al.*1984)

Age	Map Label	Lithological Description
Quaternary	Qcl	Sand; silt and clay
	Qa	Silt; sand and clay
	Qaf	Clay; mud and silt
Tertiary	Czl	Pisolitic and mottled laterite
	Czs	Coarse unconsolidated quartz sand
	Cz	Soil; rubble gravel and sand
Cretaceous - Bathurst Island Formation	Jkl>2	Unconsolidated quartzose sandstone
Jurassic	JKp	Friable quartz sandstone; quartz-pebble conglomerate; conglomeratic sandstone and ferruginous sandstone
Early Proterozoic - Mount Partridge Group		
Koolpinyah Dolomite	Ppk	Grey silicified dolostone interbedded with chlorite schist; dolomitic marble; dolomitic mica schist; dolomitic limestone and calcareous quartzite
Wildman Siltstone (<2000 m)	Ppw	Laminated colour-banded shale; minor silicified dolomite and medium to coarse quartz sandstone
Wildman Siltstone (<2000 m)	Ppw>n	Deeply weathered ferruginous volcanics
Mundogie Sandstone (<5000 m)	Ppm	Fine to coarse quartz sandstone; quartzite and arkose and minor graded bedding

3.2 Geomorphology



The Mary River and Wildman River catchments cover an area of approximately 12 900 km². A majority of both catchments consist of low relief lateritised plains and undulating rises (<100 m ASL) dissected by drainage channels which flow northwards across extensive alluvial and coastal flood plains (Figure 3.2). The higher relief hills (>200 m ASL) south of the Mary River catchment also known as the 'Mount Bunday Granites', consists of undulating deeply weathered granites with coarse textured sedimentary quartz-sandstone and siltstone (Stuart-Smith *et al.* 1984).

Figure 3.2: Elevation (m) ASL of the Mary River and Wildman River catchments (generated from Digital Elevation Model)

The north-east section of the survey area contains examples of the geomorphic features summarised by Woodroffe *et al.* (1993) for the Lower Mary River Plains. The low lying (<5 m ASL) coastal plains consist of paleochannels and saline mudflats which are flooded infrequently by tidal waters. These plains have developed as a result of nearshore processes consisting of deposited marine muds and sands. The upper flanking broad levees are important in preventing direct flooding and saline intrusion of backwater swamps (Woodroffe *et al.* 1993).

The central eastern boundary of the survey area is confined by alluvial floodplains which form the upper reaches of Ben Bunga Creek. The floodplain has formed from the accumulation of sandy alluvium and is traversed by a series of incised creeks and channels that connect to isolated swamps and larger perennial billabongs. It is likely that when this system is full that the shallow spillway depressions come into operation and directs surface flow towards the heads of drainage lines. The hydrology of the low lying swamp systems and shallow drainage depressions are attributable to the interaction between the highly permeable Koolpinyah Dolomite overlying the impermeable Wildman Siltstone.

The upland regions (<50 m ASL) consist largely of low relief lateritic plains and sloping margins above low lying drainage floors. The elevation of the plains increases gradually towards the south then drops away as plateau side slopes which have built up as a result of deep weathering and erosion of the Tertiary surface.

Thick bedded, quartz sandstone of the Mundogie Sandstone formation dominates the landscape south-east of the survey area, and includes low hills and steep rocky rises with relief up to 100 metres elevation. The quartz sandstone is highly resistant to erosion and the land surface is predominantly bare rock and large boulders.

3.3 Landform

Landform in the survey area is strongly linked to the underlying geology and geomorphological units. Landform was assessed using a combination of aerial and satellite imagery; digital elevation models (DEM's) and field investigations. Seven landform classes were described including Low Hills, Rises, Low Rises, Plains, Alluvial Plains, Drainage Systems, and Swamps. These are presented in Table 3.2 and Figure 3.3.

Table 3.2: Landform classes identified in the survey area

Land Unit Code	Landform Class	Land Units	Area (ha)
5	Low Hills	5a	1 526
6	Rises	6a	2 257
7	Low Rises	7a, 7a1	3 530
8	Plains	8a, 8b, 8b1, 8c, 8c1	17 005
9	Alluvial Plains	9a, 9a1	1 699
10	Drainage Systems	10a, 10b, 10b1	7 604
11	Swamps	11a	682

3.3.1 Low Hills

Low Hills are landform patterns with moderate relief (30-50 m). Low Hills dominate the landscape along the southern boundary with slopes over 12%. These areas have eroded leaving ridges and slopes exposing lateritic outcrops. They are characterised by their shallow rocky soils.

3.3.2 Rises

Rises are landform patterns of low relief (15-20 m). Slopes range from 5-10% and include foot slopes and plateau side slopes. Incised creeks and channels dissect the rises on the lower slopes. A common feature of the soil landscape is the very gravelly, shallow soils.

3.3.3 Low Rises

Low Rises are landform patterns of very low relief (<9 m). Across the landscape they consist of low gravelly gently inclined slopes of 2-10% including lower pediment slopes. Land unit subdivision was classified based on slope, soil and vegetation differences.

3.3.4 Plains

Also known as the '*Koolpinyah Surface*', plains are the most extensive landform class covering approximately 50% of the survey area. Slopes are gently inclined on the upper slopes to gently undulating on the lower side slopes (1-3%). Five land units were described under this class with two distinct types being upland and lowland plains. Surface gravels are variable and may occur on slopes as gentle as <1%.

3.3.5 Alluvial Plains

Two types of Alluvial Plains are distinguished. Flood plain alluvium deposited by active river systems; and coarse sandy alluvium deposited by inactive streams, restricted to broad depressions and sandy plains. Seasonal flooding covers these plains with heavy clays shrinking and cracking during the Dry season. Slopes are gentle (1-2%) with low relief.

3.3.6 Drainage Systems

Drainage Systems incorporate broad drainage depressions, spillway depressions and open drainage lines including incised creeks and channels. These areas have variable soils and vegetation with negligible slope and relief.

3.3.7 Swamps

Swamps are closed depressions that pond water for extensive periods. The north flowing Swim Creek divides the survey area and distributes water along drainage channels into a series of billabongs and swamps. Ben Bunga Creek to the east distributes water across the floodplains filling the Twin Sister billabongs which can remain wet during the Dry season. Brackish-saline waters are present in the far north-west corner of the survey area and were not further investigated. Slope and relief are very low.

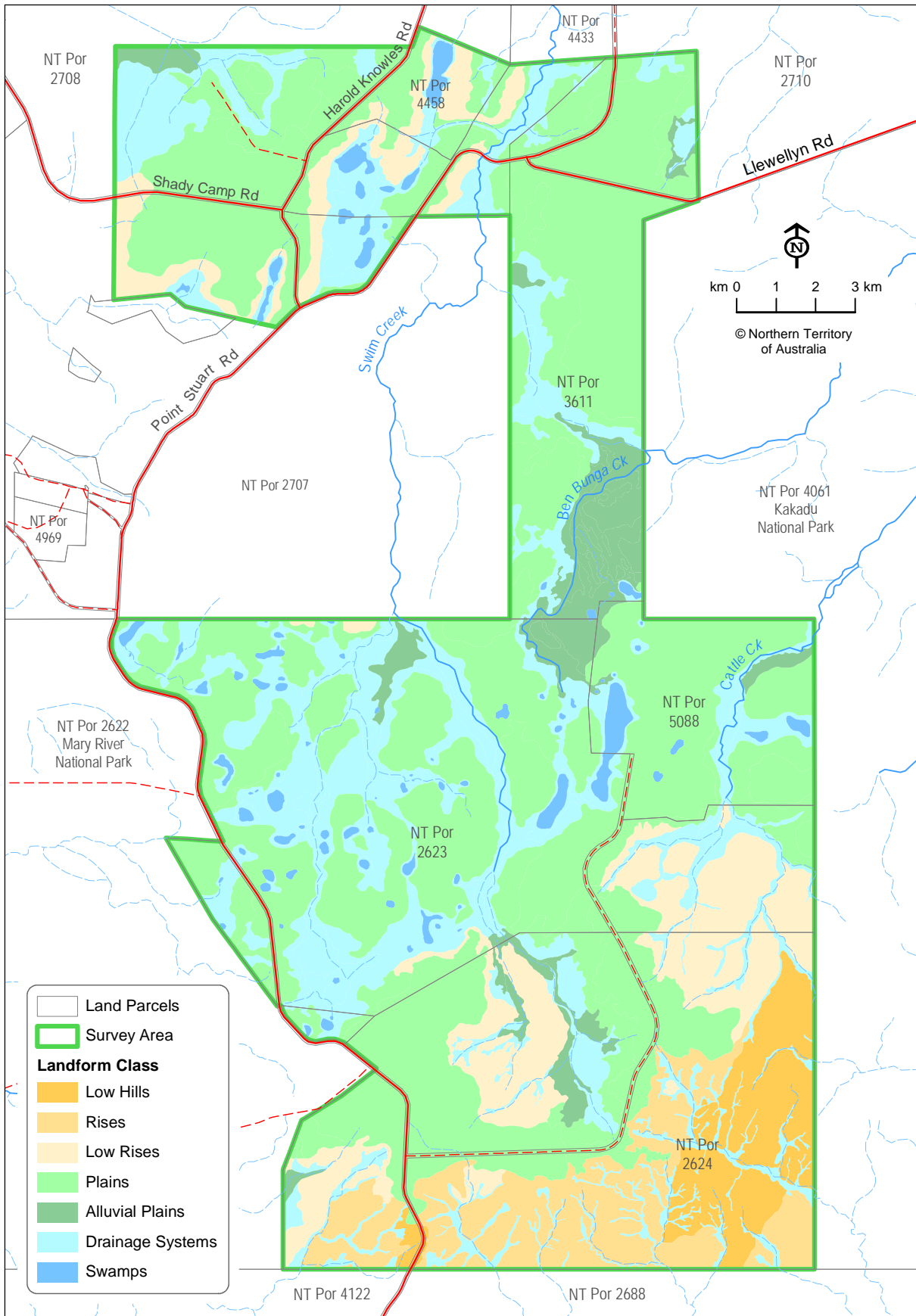


Figure 3.3: Landform classes

4. Land units

Landunits are generally separated on landform and further on soil, vegetation and other important features such as slope, drainage and relief. This allows for a simplification of land types that have a relative degree of homogeneity in often variable and complex landscapes (Napier & Hill, 2012). Land units including their extent have been summarised in Table 4.1. Fifteen land units have been described in the survey area.

Land units have been described according to the Australian Soil and Land Survey Field Handbook (NCST 2009), Australian Soil Classification (Isbell, 2002) and the National Vegetation Information System classification (ESCAVI 2003). Soil family names were first described by Christian *et al.* (1953) for the Katherine-Darwin region. Further detail on each of these components is provided later in this report.

4.1 Land unit descriptions

Table 4.1: Conceptual land unit descriptions for the Wildman River survey area

Land unit	Soil description	Soil order	Vegetation structure	Area (ha)
Soils underlain by coarse grained Early Proterozoic sedimentary rocks				
<i>Undulating low hills; very gravelly massive soils overlying hard rock; local relief 30-50 m; slopes >12%</i>				
5a	Shallow (0.25-0.50 m), well drained, very gravelly, strongly acidic, brown, massive earths, overlying fragmental siltstone and ironstone material.	Rudosols	Mid open woodland.	1 526
Soils underlain by fine and coarse grained Early Proterozoic sedimentary rocks				
<i>Undulating rises; including gently inclined very gravelly foot-slopes above low lying drainage areas; local relief 15-20 m; slopes 5-10%</i>				
6a	Very shallow (<0.25 m), well drained, very-gravelly, strongly acidic, brown, massive earths, overlying a matrix of siltstone and ironstone material.	Tenosols	Mid open woodland	2 257
Soils derived from Tertiary coarse unconsolidated quartz sands overlying fine and coarse grained Proterozoic sedimentary rocks				
<i>Gently undulating low rises; including gently inclined gravelly pediment slopes; local relief 5-6 m; slopes 2-5%</i>				
7a	Shallow to deep (0.25-1.5 m), well drained, gravelly, strongly acidic, red and brown, massive earths, overlying siltstone and ironstone gravels.	Kandosols	Mid woodland	3 459
<i>Undulating low rises; sandy colluvial wash slopes above drainage floors; local relief 5-8 m; slopes 6-10%</i>				
7a1	Deep (1.0-1.5 m), imperfectly drained, slightly-gravelly, strongly acidic, red and brown, massive earths, with a strong texture contrast between A and B horizons.	Kurosols	Mid open forest	72
Soils derived from Tertiary coarse unconsolidated quartz sands				
<i>Level to very gently undulating plains; deep massive red earths; local relief <2 m; slopes <1%</i>				
8a	Very deep (>1.5 m), well drained, non-gravelly, strongly acidic, massive red gradational earths.	Kandosols	Mid woodland	8 994
<i>Level to gently undulating plains; upland gravelly massive earths; local relief <2 m; slopes <1%</i>				

Land unit	Soil description	Soil order	Vegetation structure	Area (ha)
8b	Shallow to deep (0.25-1.5 m), well drained, gravelly, strongly acidic, red and brown, massive earths, overlying weathered ironstone and ferruginised sandstone gravels.	Kandosols	Mid woodland	2 888
<i>Level to gently undulating plains; deep sandy earths including upland margins of broad drainage floors; local relief 1-2 m; slopes <1%</i>				
8b1	Shallow to deep (0.25-1.5 m), well drained, gravelly, strongly acidic, brown, uniform earthy sands, overlying weathered ironstone and ferruginised sandstone gravels.	Tenosols	Mid woodland	2 960
<i>Gently undulating plains; gravelly earths on lower slopes; local relief 1-2 m; slopes 1-3%</i>				
8c	Moderate to deep (0.5-1.5 m), well drained, gravelly, strongly acidic, red and brown, massive gradational earths, overlying ironstone and ferruginised sandstone gravels.	Kandosols	Mid woodland	695
<i>Gently undulating plains; sandy wash soils on lowland plains; local relief 1-2 m; slopes 1-3%</i>				
8c1	Moderate to very deep (0.5->1.5 m), imperfectly drained, gravelly, strongly acidic, brown, sandy wash soils, overlying weathered ironstone and ferruginised sandstone gravels.	Tenosols	Mid woodland	1 468
Soils derived from Quaternary transported sediments/colluvium and Quaternary alluvium				
<i>Alluvial Plains; local relief <1 m; slopes <1%</i>				
9a	Very deep (>1.5 m), poorly drained, non-gravelly, strongly acidic, structured, duplex soils with swamp hummock surface.	Hydrosols	Tussock grassland	816
<i>Alluvial Plains; sandy wash soils bordering clay plains; local relief <1 m; slopes <1%</i>				
9a1	Very deep (>1.5 m), poorly drained, gravelly, strongly acidic to strongly alkaline at depth, brown, depositional, sandy wash earths overlying a clay subsoil, well rounded ironstone gravels throughout.	Hydrosols	Low open woodland	883
<i>Open drainage lines, including incised creeks and channels; local relief 1-2 m; slopes <1%</i>				
10a	Very deep (>1.5 m), very poorly drained, non-gravelly, strongly acidic, grey or brown, structured clay soils, hard setting and cracking when dry.	Hydrosols	Mid woodland	1 564
<i>Low-lying spillway depressions, including minor edges of flooded depressions and perennial billabongs; local relief <1 m; slopes <1%</i>				
10b	Very deep (>1.5 m), poorly drained, non-gravelly, strongly acidic, grey or brown, uniform earthy siliceous sands, with depositional loose surface horizon.	Hydrosols	Mid woodland	1 587
<i>Gently sloping broad drainage floors; local relief <1 m; slopes <1%</i>				
10b1	Moderate to very deep (1.0->1.5 m), poorly drained, gravelly, strongly acidic, brown, earthy siliceous sands.	Hydrosols	Mid open woodland	4 453
<i>Swamps, wetlands, flooded depressions and perennial billabongs; local relief <1 m; slopes <1%</i>				
11a	Very deep (>1.5 m), very poorly drained, non-gravelly, strongly acidic, grey, seasonally or permanently wet, gleyed soils.	Hydrosols	Closed sedgeland/mid open forest	682

Land unit 5a**Low Hills**

Sites: 1

Area: 1 526 ha

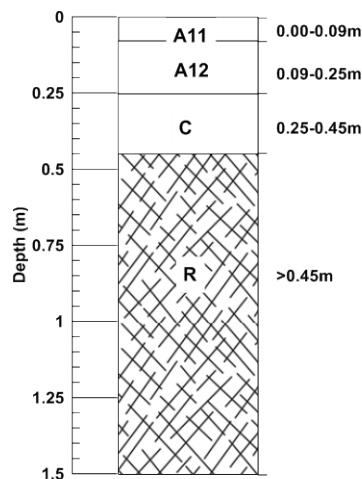
Summary: Undulating low hills with shallow very gravelly soils; mid open woodland.
Geology: Coarse grained sedimentary rocks.
Landform: Undulating low hills.
Vegetation: *Eucalyptus tectifica*, +/- *E. tetradonta*, *E. miniata* mid open woodland.

Landscape

Slope: >12%
Surface gravels: 80-90%
Rock outcrop: 0-2%
Drainage: Well drained
Runoff: Very rapid
Permeability: Moderate

**Dominant Soil**

Classification: Leptic Rudosols
(Minor Tenosols)
Family: Skeletal Soils

General Soil Profile Description

Shallow, well drained, very gravelly, strongly acidic, brown, massive earths, overlying fragmental siltstone and ironstone material.

Surface soil: (A11) Grey; sandy loam; massive structure; earthy fabric; with 60-80% siltstone and ironstone gravels; field pH 5.4-5.5; with a gradual horizon change.

(A12) Brown; light clay loam; massive structure; earthy fabric; with 60-80% siltstone and ironstone gravels; field pH 5.0-5.2; with a gradual horizon change.

Substrate layer: (C) Brown; clay loam; massive structure; earthy fabric; with 80-90% siltstone and ironstone gravels; field pH 5.0-5.3.

(R) Moderately strong; partially weathered fragmental siltstone and ironstone material.

Soil Analytical Properties (Appendix B WILD M 108)

Low fertility and nutrient holding capacity. Total nitrogen is high (>0.25%) at the surface. Clay content increases down the profile (19-30%). Soil profiles are strongly acidic (5.4-5.0), salinity levels are negligible (EC <0.07 dS/m, Cl <20 mg/kg) throughout. ECEC levels (1.76-10.5 cmol/kg) are low. Dispersion is minimal (0.57-0.82) with profiles non-dispersive (non sodic - ESP <6%).

General Land Capability Class (refer to section 7)**Class 4**

Class	Irrigated Crop Suitability
1	Not Recorded
2	Not Recorded
3	Not Recorded
4	Not Recorded
5	Unsuitable for tree crops (Gp. 1-4), row crops (Gp. 5-7), root crops (Gp. 8) and forestry (Gp. 10)

Land unit 6a	Rises	Sites: 1	Area: 2 257 ha
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Summary: Undulating rises and footslopes with very shallow gravelly soils; mid open woodland.

Geology: Fine and coarse grained sedimentary rocks.

Landform: Undulating rises; including gently inclined very gravelly footslopes above low lying drainage areas.

Vegetation: *Eucalyptus tectifica*, +/- *E. tetradonta*, *E. miniata* mid open woodland.

Landscape

Slope: 5-10%

Surface gravels: 80-90%

Rock outcrop: 0-2%

Drainage: Well drained

Runoff: Rapid

Permeability: Moderate

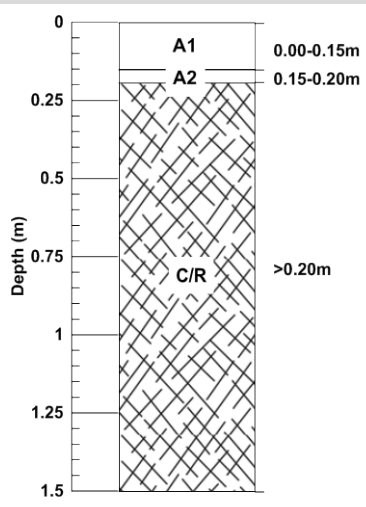


Dominant Soil

Classification: Brown-Orthic Tenosols (Subdominant Rudosols)

Family: Cahill

General Soil Profile Description



Very shallow, well drained, very gravelly, strongly acidic, brown, massive earths, overlying a matrix of fragmental siltstone and ironstone material.

Surface soil: (A1) Grey; sandy loam; massive structure; earthy fabric; with 80-90% siltstone and ironstone gravels; field pH 5.4-5.5; with a gradual horizon change.

Sub-surface layer: (A2) Brown; sandy clay loam; massive structure; earthy fabric; with 60-70% siltstone and ironstone gravels; field pH 5.4-5.5; with a gradual horizon change.

Substrate layer: (C/R) Brown; sandy clay loam; within a matrix of siltstone and ironstone fragmental material weathering in-situ (80-100%); field pH 5.4-5.5.

Soil Analytical Properties (Appendix B WILDM 34)

Low fertility and nutrient holding capacity. Total nitrogen is very low at the surface (<0.05%). Clay content increases down the profile (9-22%). Soil profiles are strongly acidic (5.3-5.1), salinity levels are negligible (EC <0.02 dS/m, Cl <20 mg/kg) throughout. ECEC levels (0.84-1.57 cmol/kg) are very low. Dispersion is minimal (0.75-0.91) with profiles non-dispersive (non-sodic-ECEC<3 cmol/kg and Exch.Na<0.3 cmol/kg).

General Land Capability Class (refer to section 7) Class 4

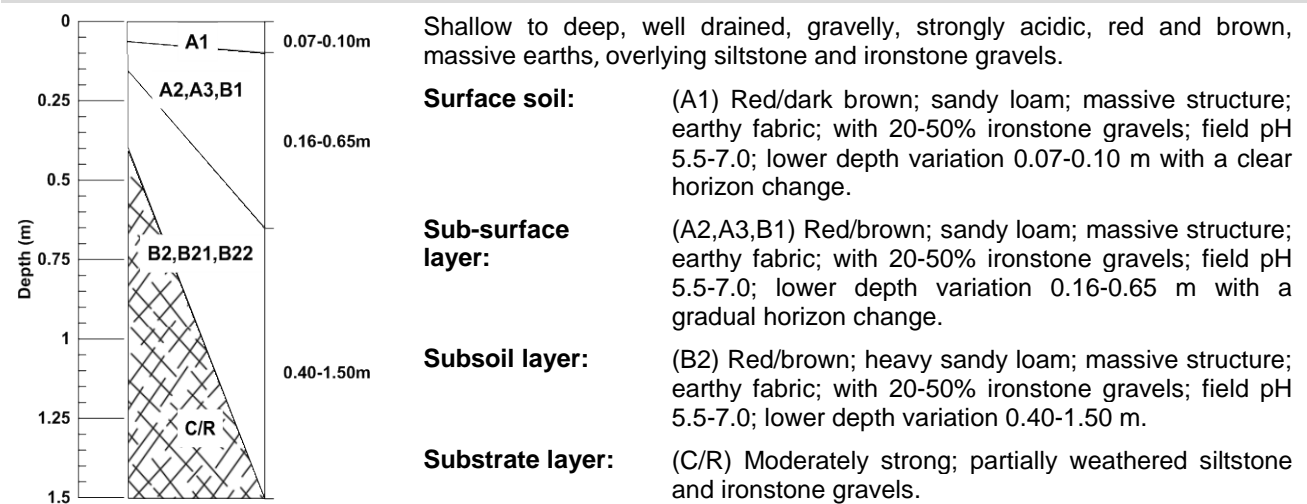
Class	Irrigated Crop Suitability
1	Not Recorded
2	Not Recorded
3	Not Recorded
4	Not Recorded
5	Unsuitable for tree crops (Gp. 1-4), row crops (Gp. 5-7), root crops (Gp. 8) and forestry (Gp. 10)

Land unit 7a	Low Rises	Sites: 6	Area: 3 459 ha
Summary:	Gently undulating low rises and pediment slopes with gravelly massive earths; mid woodland.		
Geology:	Coarse unconsolidated quartz sands.		
Landform:	Gently undulating low rises; including gently inclined gravelly pediment slopes.		
Vegetation:	<i>Eucalyptus miniata</i> , <i>E. tetradonta</i> , +/- <i>Erythrophleum chlorostachys</i> mid woodland.		

Landscape	
Slope:	2-5%
Surface gravels:	10-20%
Rock outcrop:	0-2%
Drainage:	Well drained
Runoff:	Moderately rapid
Permeability:	Moderate
Dominant Soil	
Classification:	Brown or Red Kandosols (Minor Tenosols)
Family:	Cahill



General Soil Profile Description



Soil Analytical Properties (Appendix B WILDM 15)

Low fertility and nutrient holding capacity. Total nitrogen is very low at the surface (<0.05%). Clay content increases down the profile (10-22%). Soil profiles are strongly acidic (5.4-5.5), salinity levels are negligible (EC <0.01 dS/m, Cl <20 mg/kg) throughout. ECEC levels (1.16-2.24 cmol/kg) are very low. Dispersion is minimal (0.15-0.34) with profiles non-dispersive (non-sodic-ECEC<3 cmol/kg and Exch.Na<0.3 cmol/kg).

General Land Capability Class (refer to section 7) Class 3

Class	Irrigated Crop Suitability
1	Not Recorded
2	Not Recorded
3	Not Recorded
4	Unsuitable for tree crops (Gp. 1 and Gp. 3)
5	Unsuitable for tree crops (Gp. 2 and Gp. 4), row crops (Gp. 5-7), root crops (Gp. 8) and forestry (GP. 10)

Land unit 7a1	Low Rises	Sites: 2	Area: 72 ha
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Summary: Undulating low rises with sandy colluvial wash slopes above drainage floors; mid open forest.

Geology: Coarse unconsolidated quartz sands.

Landform: Undulating low rises; colluvial wash slopes above drainage floors.

Vegetation: *Canarium australianum*, *Erythrophleum chlorostachys*, *Acacia auriculiformis* mid open forest.

Landscape

Slope: 6-10%

Surface gravels: Nil

Rock outcrop: Nil

Drainage: Imperfect

Runoff: Rapid

Permeability: High

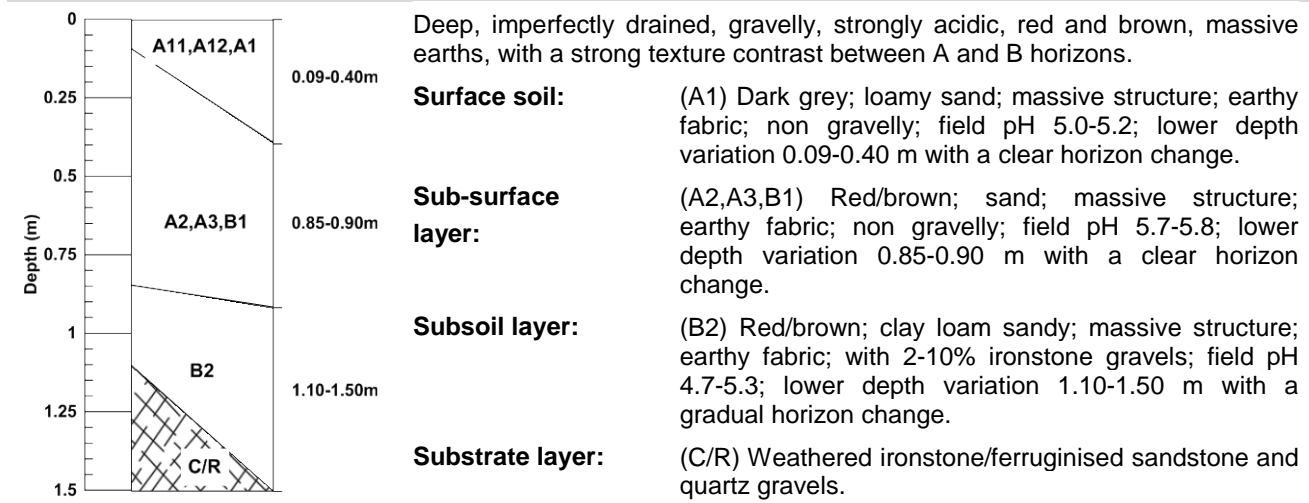


Dominant Soil

Classification: Red Kurosols (Subdominant Kandosols)

Family: Cullen

General Soil Profile Description



Soil Analytical Properties (Appendix B WILDm 81)

Low fertility and nutrient holding capacity. Total nitrogen is low at the surface (<0.15%). Clay content is very low (<2%) in the surface and subsurface layers, sharply increasing in the subsoil layer (30-45%). Soil profiles are strongly acidic (4.9-4.6), salinity levels are negligible (EC <0.01 dS/m, Cl <1 mg/kg) throughout. ECEC levels (0.4-3.12 cmol/kg) are very low. Dispersion in the subsoil is minimal (0.93-0.94) with profiles non-dispersive (non-sodic-ECEC<3 cmol/kg and Exch.Na<0.3 cmol/kg).

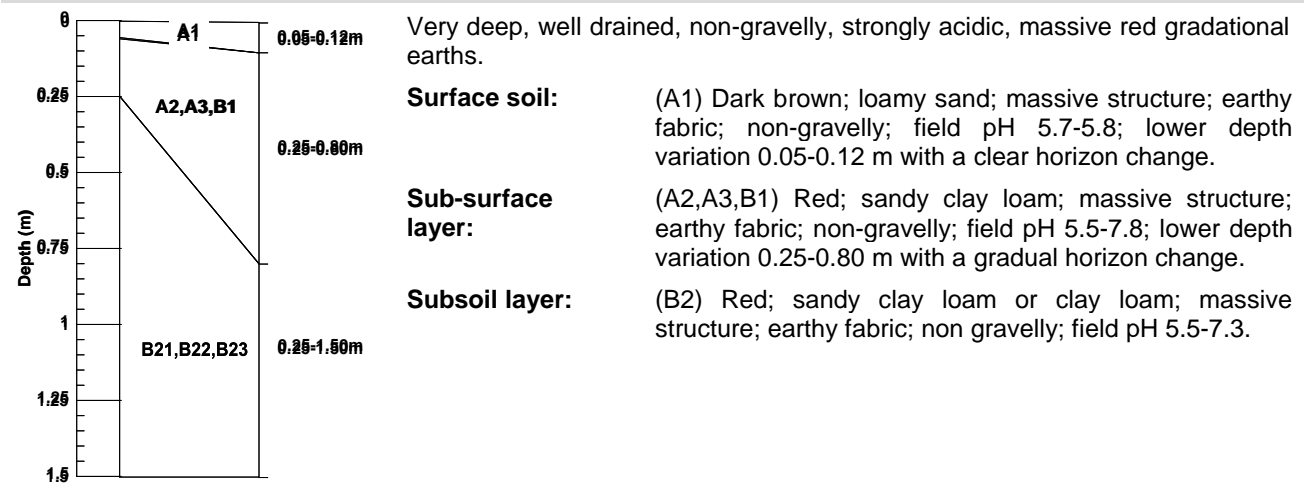
General Land Capability Class (refer to section 7) Class 3

Class	Irrigated Crop Suitability
1	Not Recorded
2	Not Recorded
3	Not Recorded
4	Not Recorded
5	Unsuitable for tree crops (Gp. 1-4), row crops (Gp. 5-7), root crops (Gp. 8) and forestry (Gp. 10)

Land unit 8a	Plains	Sites: 56	Area: 8 994 ha
Summary:	Level to very gently undulating plains with massive red gradational earths; mid woodland.		
Geology:	Coarse unconsolidated quartz sands.		
Landform:	Level to very gently undulating plains.		
Vegetation:	<i>Eucalyptus tetradonta</i> , <i>E. miniata</i> +/- <i>Erythrophleum chlorostachys</i> , <i>Corymbia porrecta</i> mid woodland.		
Landscape			
Slope:	<1%		
Surface gravels:	Nil		
Rock outcrop:	Nil		
Drainage:	Well drained		
Runoff:	Slow		
Permeability:	Moderate		
Dominant Soil			
Classification:	Red Kandosols		
Family:	Killupa		



General Soil Profile Description



Soil Analytical Properties (Appendix B WILDM 68)

Low fertility and nutrient holding capacity. Total nitrogen is very low at the surface (<0.05%). Clay content is uniform throughout (14-26%). Soil profiles are strongly acidic (5.3-5.7), salinity levels are negligible (EC <0.01 dS/m, Cl <20 mg/kg) throughout. ECEC levels (1.0-1.42 cmol/kg) are very low. Dispersion in the subsoil is minimal (0.12-0.55) with profiles non-dispersive (non-sodic-ECEC<3 cmol/kg and Exch.Na<0.3 cmol/kg).

General Land Capability Class (refer to section 7) Class 1

Class	Irrigated Crop Suitability
1	Suitable for tree crops (Gp. 3) and row crops (Gp. 5-7)
2	Suitable for tree crops (Gp. 1 -2 and Gp. 4) root crops (Gp. 8) and forestry (Gp. 10)
3	Not Recorded
4	Not Recorded
5	Not Recorded

Land unit 8b	Plains	Sites: 12	Area: 2 888 ha
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Summary: Level to gently undulating upland plains with massive gravelly earths; mid woodland.

Geology: Coarse unconsolidated quartz sands.

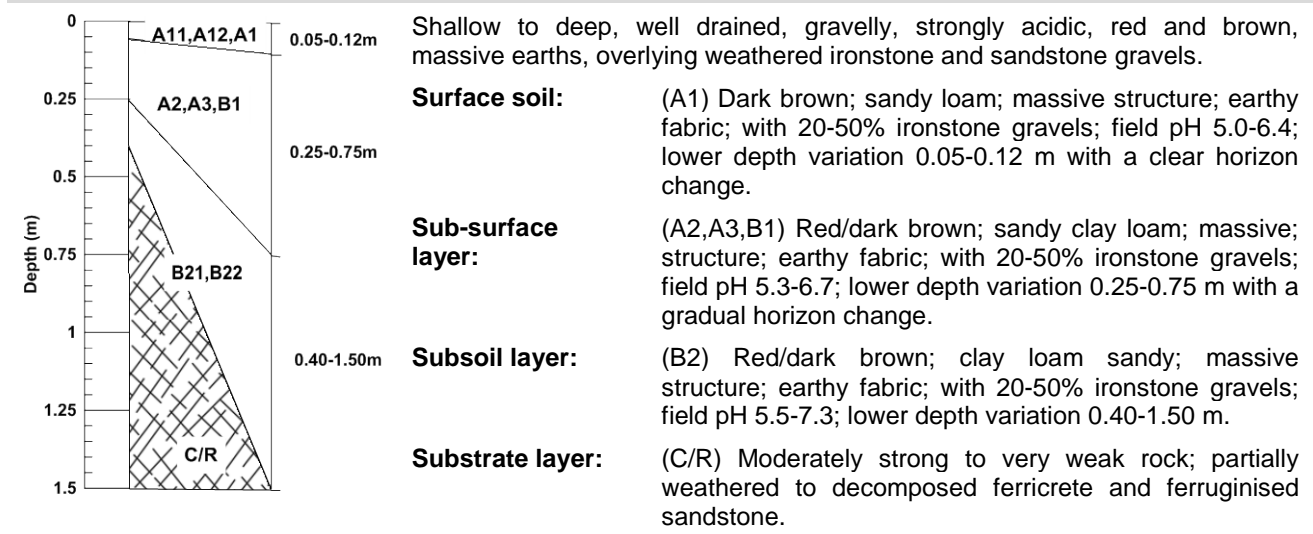
Landform: Level to gently undulating upland plains.

Vegetation: *Eucalyptus miniata*, *E. tetradonta* +/- *Corymbia porrecta*, *Erythrophleum chlorostachys* mid woodland.

Landscape	
Slope:	<1%
Surface gravels:	Nil
Rock outcrop:	Nil
Drainage:	Well drained
Runoff:	Slow
Permeability:	Moderate
Dominant Soil	
Classification:	Brown or Red Kandosols
Family:	Koolpinyah



General Soil Profile Description



Soil Analytical Properties (Appendix B WILDm 98)

Low fertility and nutrient holding capacity. Total nitrogen is very low at the surface (<0.05%). Clay content increases down the profile (5-17%). Soil profiles are strongly acidic (5.7-5.1), salinity levels are negligible (EC <0.01 dS/m, Cl <20 mg/kg) throughout. ECEC levels (0.99-1.24 cmol/kg) are very low. Dispersion in the subsoil is minimal (0.18-0.45) with profiles non-dispersive (non-sodic-ECEC<3 cmol/kg and Exch.Na<0.3 cmol/kg).

General Land Capability Class (refer to section 7) Class 2

Class	Irrigated Crop Suitability
1	Not Recorded
2	Not Recorded
3	Suitable for row crops (Gp. 5) and root crops (Gp. 8)
4	Not suitable for tree crops (Gp. 1 and Gp. 3) and row crops (Gp. 6)
5	Not suitable for tree crops (Gp. 2 and Gp. 4) row crops (Gp. 7) and forestry (Gp. 10)

Land unit 8b1**Plains**

Sites: 6

Area: 2 960 ha

Summary:

Level to gently undulating sandy plains including upland margins of broad drainage floors; mid woodland.

Geology:

Coarse unconsolidated quartz sands.

Landform:

Level to gently undulating plains; including upland margins of broad drainage floors.

Vegetation:*Eucalyptus tetradonta*, *E. miniata*, *Erythrophleum chlorostachys*, +/- *Corymbia porrecta* mid woodland.**Landscape****Slope:**

<1%

Surface gravels:

Nil

Rock outcrop:

Nil

Drainage:

Well drained

Runoff:

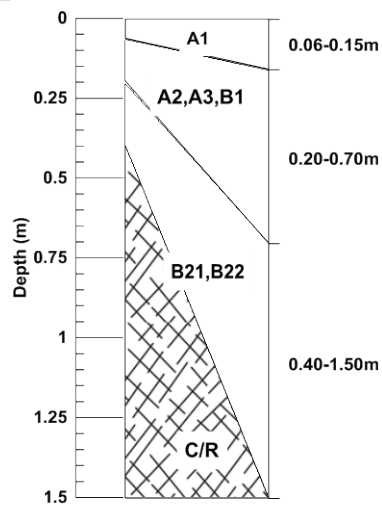
Slow

Permeability:

Moderate

Dominant Soil**Classification:**Brown-Orthic
Tenosols**Family:**

Kalpaga

**General Soil Profile Description**

Shallow to deep, well drained, gravelly, strongly acidic, brown, uniform earthy sands, overlying weathered ironstone and ferruginised sandstone gravels.

Surface soil:

(A1) Dark grey; loamy sand; massive structure; earthy fabric; with 20-50% ironstone gravels; field pH 5.8-6.3; lower depth variation 0.06-0.15 m with a clear horizon change.

Sub-surface layer:

(A2,A3,B1) Brown; loamy sand; massive structure; earthy fabric; with 20-50% ironstone gravels; field pH 6.0-6.5; lower depth variation 0.20-0.70 m with a gradual horizon change.

Subsoil layer:

(B2) Brown; clayey sand or sand; massive or single grain; earthy fabric; with 20-50% ironstone gravels; field pH 5.5-7.3; lower depth variation 0.40-1.50 m.

Substrate layer:

(C/R) Moderately strong; partially weathered ironstone and ferruginised sandstone.

Soil Analytical Properties (Appendix B WILDM 101)

Low fertility and nutrient holding capacity. Total nitrogen is low at the surface (<0.15%). Clay content is low and uniform throughout (4-6%). Soil profiles are strongly acidic (5.1-5.6), salinity levels are negligible (EC <0.04 dS/m, Cl <20 mg/kg) throughout. ECEC levels (0.61-3.69 cmol/kg) are very low. Dispersion in the subsoil is minimal (0.88-1.2) with profiles non-dispersive (non-sodic-ECEC<3 cmol/kg and Exch.Na<0.3 cmol/kg).

General Land Capability Class (refer to section 7)**Class 2****Class****Irrigated Crop Suitability**

1

Not Recorded

2

Not Recorded

3

Suitable for row crops (Gp. 5) and root crops (Gp. 8)

4

Not suitable for tree crops (Gp. 1 and Gp. 3) and row crops (Gp. 6)

5

Not suitable for tree crops (Gp. 2 and Gp. 4) row crops (Gp.7) and forestry (Gp. 10)

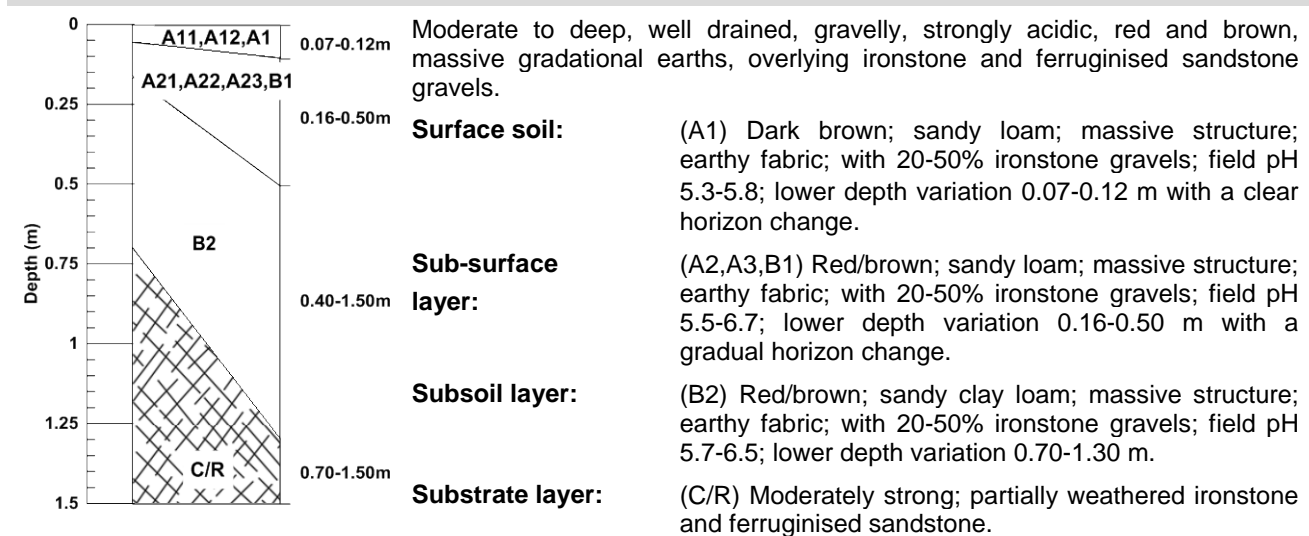
Land unit 8c	Plains	Sites: 3	Area: 695 ha
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Summary:	Gently undulating lowland plains with gravelly massive earths; mid woodland.
Geology:	Coarse unconsolidated quartz sand.
Landform:	Gently undulating lowland plains.
Vegetation:	<i>Eucalyptus tetrodonta</i> , <i>E. miniata</i> +/- <i>Erythrophleum chlorostachys</i> , <i>Corymbia porrecta</i> mid woodland.

Landscape	
Slope:	1-3%
Surface gravels:	Nil
Rock outcrop:	Nil
Drainage:	Well drained
Runoff:	Slow
Permeability:	Moderate
Dominant Soil	
Classification:	Brown or Red Kandosols
Family:	Koolpinyah



General Soil Profile Description



Soil Analytical Properties (Appendix B WILDM 96)

Low fertility and nutrient holding capacity. Total nitrogen is very low at the surface (<0.05%). Clay content is uniform throughout (10-17%). Soil profiles are strongly acidic (5.4-5.3), salinity levels are negligible (EC <0.02 dS/m, Cl <20 mg/kg) throughout. ECEC levels (0.98-2.33 cmol/kg) are very low. Dispersion in the subsoil is minimal (0.16-0.71) with profiles non-dispersive (non-sodic-ECEC<3 cmol/kg and Exch.Na<0.3 cmol/kg).

General Land Capability Class (refer to section 7) Class 2

Class	Irrigated Crop Suitability
1	Not Recorded
2	Not Recorded
3	Suitable for tree crops (Gp. 1-3)
4	Not Recorded
5	Not suitable for tree crops (Gp. 4), row crops (Gp. 5-7) root crops (Gp. 8) and forestry (Gp. 10)

Land unit 8c1	Plains	Sites: 7	Area: 1 468 ha
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Summary: Gently undulating lower sandy wash slopes; mid woodland.

Geology: Coarse unconsolidated quartz sands.

Landform: Gently undulating sandy wash soils on lowland plains.

Vegetation: *Eucalyptus tetradonta*, *E. miniata*, *Erythrophleum chorostachys*, +/- *Corymbia porrecta* and *C. polysciada* mid woodland.

Landscape

Slope: 1-3%

Surface gravels: Nil

Rock outcrop: Nil

Drainage: Imperfect

Runoff: Slow

Permeability: High

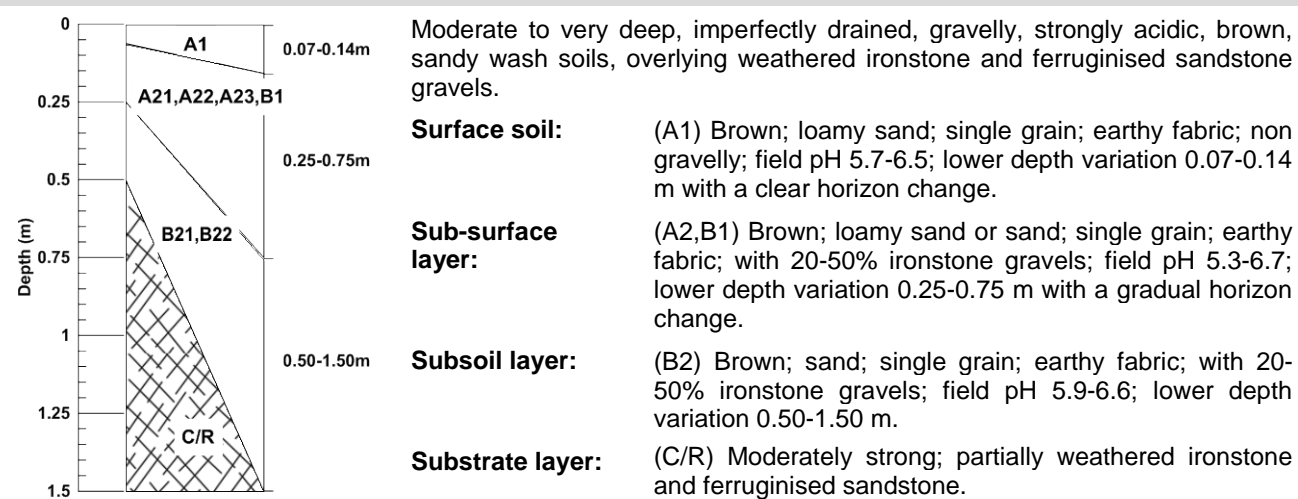


Dominant Soil

Classification: Brown-Orthic Tenosols (Minor Kandosols)

Family: Baroalba

General Soil Profile Description



Soil Analytical Properties (Appendix B WILDM 29)

Low fertility and nutrient holding capacity. Total nitrogen is very low at the surface (<0.05%). Clay content is low and uniform throughout (4-8%). Soil profiles are strongly acidic (5.0-5.4), salinity levels are negligible (EC <0.01 dS/m, Cl <20 mg/kg) throughout. ECEC levels (0.53-1.09 cmol/kg) are very low. Dispersion in the subsoil is minimal (0.4-0.61) with profiles non-dispersive (non-sodic-ECEC<3 cmol/kg and Exch.Na<0.3 cmol/kg).

General Land Capability Class (refer to section 7) Class 3

Class	Irrigated Crop Suitability
1	Not Recorded
2	Not Recorded
3	Suitable for tree crops (Gp. 1-3)
4	Not Recorded
5	Not suitable for tree crops (Gp. 4), row crops (Gp.5-7), root crops (Gp. 8) and forestry (Gp. 10)

Land unit 9a	Alluvial Plains	Sites: 1	Area: 816 ha
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Summary: Alluvial Plains; seasonally or permanently wet structured duplex soils; tall sedgeland.

Geology: Transported sediments/colluvium and alluvium.

Landform: Level to very gently undulating Alluvial Plains.

Vegetation: Open to closed *Eriachne burkitti* grassland / *Cyperus spp.* sedgeland.

Landscape

Slope: <1%

Surface gravels: Nil

Rock outcrop: Nil

Drainage: Poor

Runoff: Very slow

Permeability: Moderate

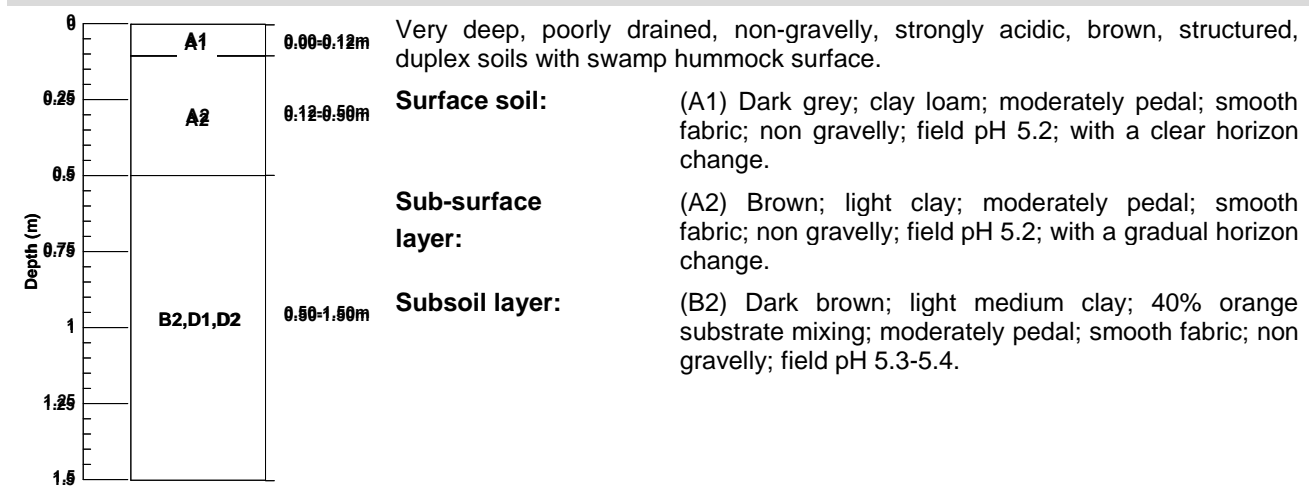


Dominant Soil

Classification: Oxyaquic Hydrosols (Subdominant Vertosols)

Family: Margaret

General Soil Profile Description



Soil Analytical Properties (Appendix B WILD M 109)

Total nitrogen levels are high (0.309%) reflecting very high organic carbon (3.5%) at the surface. Clay content is uniform throughout (21-38%). Soil profiles are strongly acidic (4.8-5.3), salinity levels are negligible (EC <0.02dS/m, Cl <20 mg/kg) throughout. ECEC levels (4.37-8.04 cmol/kg) are low. Dispersion in the subsoil is moderate to highly (0.79-0.92) dispersive reflecting high levelsof Mg (non sodic-ESP <6%).

General Land Capability Class (refer to section 7) Class 4

Class	Irrigated Crop Suitability
1	Not Recorded
2	Not Recorded
3	Not Recorded
4	Not Recorded
5	Not suitable for tree crops (Gp. 1-4), row crops (Gp. 5-7), root crops (Gp. 8) and forestry (Gp. 10)

Land unit 9a1	Alluvial Plains	Sites: 2	Area: 883 ha
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Summary: Alluvial Plains; seasonally wet siliceous sandy earths bordering clay plains; low open woodland.

Geology: Transported sediments/colluvium and alluvium.

Landform: Depositional sandy wash Alluvial Plains bordering clay plains.

Vegetation: *Melaleuca viridiflora*, *M. nervosa*, +/- *Asteromyrtus symphyocarpa* low open woodland.

Landscape

Slope: <1%

Surface gravels: Nil

Rock outcrop: Nil

Drainage: Poor

Runoff: Very slow

Permeability: High

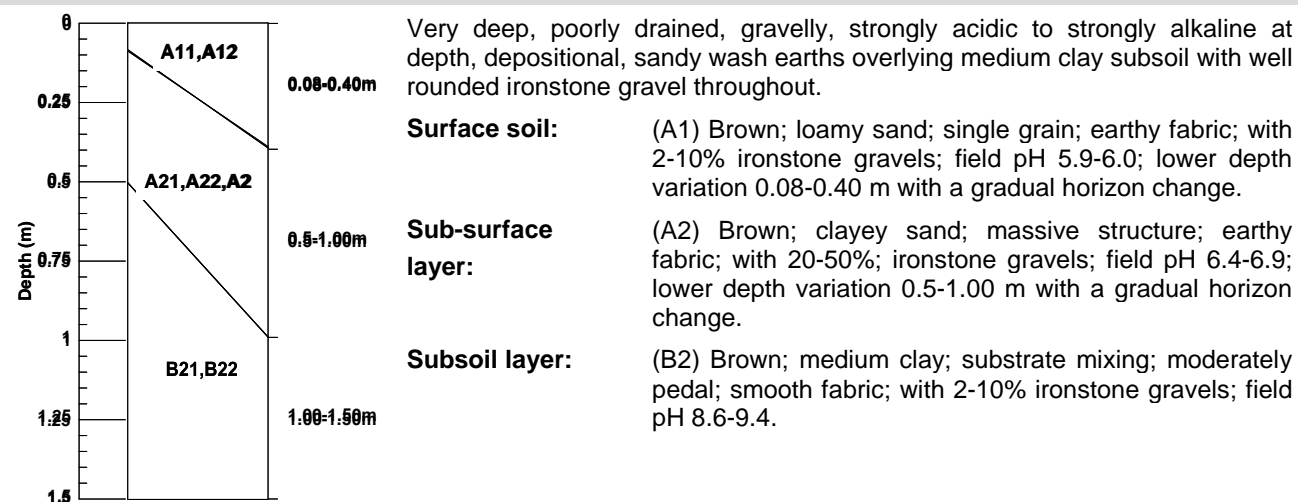


Dominant Soil

Classification: Redoxic Hydrosols

Family: Howard

General Soil Profile Description



Soil Analytical Properties (Appendix B WILDM 106)

Low fertility and nutrient holding capacity. Total nitrogen is very low at the surface (<0.05%). Clay content is very low (<1%) in the subsurface layer increasing in the subsoil layer (>35%). Soil profiles are strongly acidic (5.4-5.5) increasing to strongly alkaline in the subsoil layer (8.9-9.1). Salinity levels are negligible (EC <0.2 dS/m) throughout. ECEC levels (0.54-0.88 cmol/kg) are very low. Dispersion in the subsoil is moderate to highly (0.72-0.91) dispersive (non sodic- ECEC<3 cmol/kg and Exch.Na<0.3 cmol/kg).

General Land Capability Class (refer to section 7) **Class 4**

Class	Irrigated Crop Suitability
1	Not Recorded
2	Not Recorded
3	Not Recorded
4	Not Recorded
5	Not suitable for tree crops (Gp. 1-4), row crops (Gp. 5-7), root crops (Gp. 8) and forestry (Gp. 10)

Land unit 10a	Drainage Systems	Sites: 3	Area: 1 564 ha
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Summary: Open drainage lines including incised creeks and channels, seasonally wet, structured soils; mid woodland.

Geology: Transported sediments/colluvium and alluvium.

Landform: Open drainage lines including incised creeks and channels.

Vegetation: *Melaleuca viridifolia*, *M. cajuputi* +/- *Lophostemon lactifluus* mid woodland.

Landscape

Slope: <1%

Surface gravels: Nil

Rock outcrop: Nil

Drainage: Very poor

Runoff: Slow

Permeability: Moderate

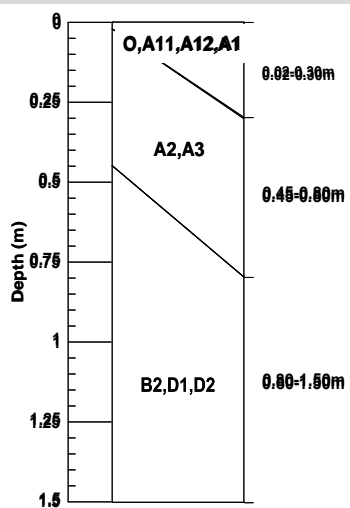
Dominant Soil

Classification: Oxyaquic Hydrosols (Subdominant Vertosols)

Family: Wildman



General Soil Profile Description



Very deep, very poorly drained, non-gravelly, strongly acidic, grey or brown, structured clay soils, hard setting and occasionally cracking when dry.

Surface soil: (O,A1) Brown; clay loam to light clay; moderately pedal; non gravelly; field pH 4.7-5.5; lower depth variation 0.02-0.30 m with a gradual horizon change.

Sub-surface layer: (A2,A3) Brown; clay loam to light medium clay; moderately pedal; non gravelly; field pH 4.9-5.6; lower depth variation 0.45-0.80 m with a gradual horizon change.

Subsoil layer: (B2) Dark grey; heavy clay; moderately pedal; non gravelly; field pH 5.5-5.9.

Soil Analytical Properties (Appendix B WILDM 103)

Low fertility and nutrient holding capacity. Total nitrogen is low at the surface (<0.15%). Clay content increases down the profile (25-60%). Soil profiles are strongly acidic (4.9-3.4) salinity levels are non saline (EC <0.2 dS/m) throughout. ECEC levels (4.7-12.6 cmol/kg) are low. Dispersion in the subsoil is minimal (0.38-0.39) with profiles non-dispersive (ESP <6%).

General Land Capability Class (refer to section 7) Class 4

Class	Irrigated Crop Suitability
1	Not Recorded
2	Not Recorded
3	Not Recorded
4	Not Recorded
5	Not suitable for tree crops (Gp. 1-4), row crops (Gp. 5-7), root crops (Gp. 8) and Forestry (Gp. 10)

Land unit 10b	Drainage Systems	Sites: 3	Area: 1 587 ha
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Summary: Low lying spillway depressions with uniform earthy siliceous sands; mid woodland.

Geology: Transported sediments/colluvium and alluvium.

Landform: Low-lying spillway depressions.

Vegetation: *Melaleuca nervosa*, *Lophostemon lactifluus* +/- *Eucalyptus alba*, *Asteromyrtus symphyocarpa* mid woodland.

Landscape

Slope: <1%

Surface gravels: Nil

Rock outcrop: Nil

Drainage: Poor

Runoff: Very slow

Permeability: High

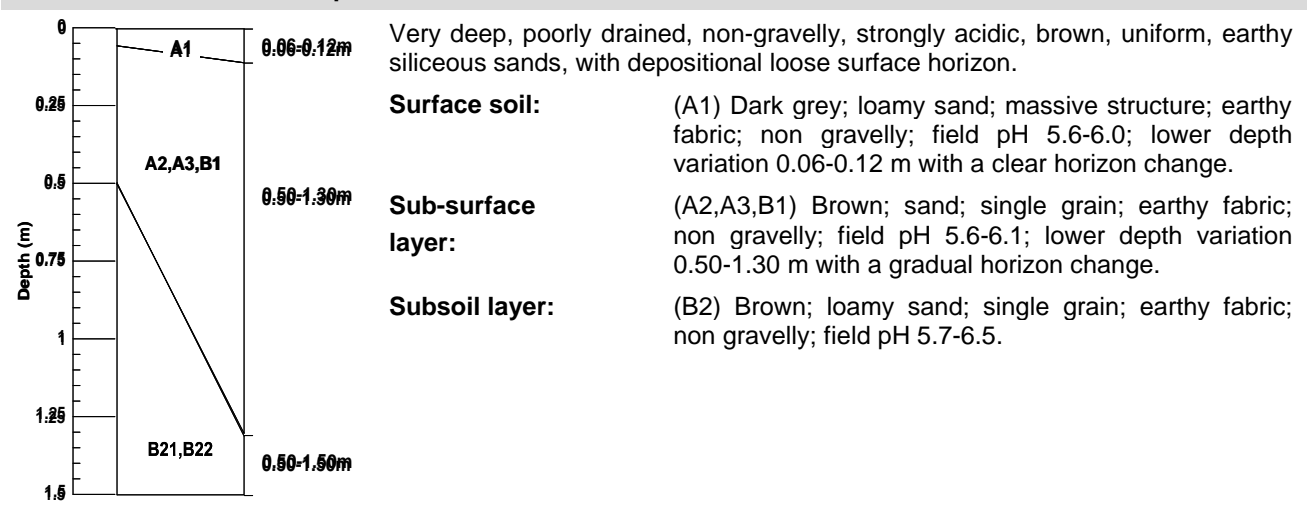


Dominant Soil

Classification: Redoxic Hydrosols

Family: Kapalga

General Soil Profile Description



Soil Analytical Properties (Appendix B WILD M 4)

Low fertility and nutrient holding capacity. Total nitrogen is very low at the surface (<0.05%). Clay content increases down the profile (4-12%). Soil profiles are strongly acidic (5.1-4.7), salinity levels are negligible (EC <0.03 dS/m, Cl <20 mg/kg) throughout. ECEC levels (0.58-1.1 cmol/kg) are very low. Dispersion in the subsoil is minimal (0.25-0.27) and non-dispersive (non-sodic-ECEC <3 cmol/kg and Exch.Na <0.3 cmol/kg).

General Land Capability Class (refer to section 7) Class 4

Class	Irrigated Crop Suitability
1	Not Recorded
2	Not Recorded
3	Not Recorded
4	Not Recorded
5	Not suitable for tree crops (Gp. 1-4), row crops (Gp. 5-7), root crops (Gp. 8) and Forestry (Gp. 10)

Land unit 10b1	Drainage Systems	Sites: 7	Area: 4 453 ha
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Summary: Gently sloping broad drainage floors with uniform earthy siliceous sands; mid open woodland.

Geology: Transported sediments/colluvium and alluvium.

Landform: Gently sloping broad drainage floors.

Vegetation: *Melaleuca nervosa*, *M. viridiflora*, +/- *Corymbia confertiflora*, *C. foelscheana* and *Asteromyrtus symphyocarpa* mid open woodland.

Landscape

Slope: <1%

Surface gravels: Nil

Rock outcrop: Nil

Drainage: Poor

Runoff: Slow

Permeability: High

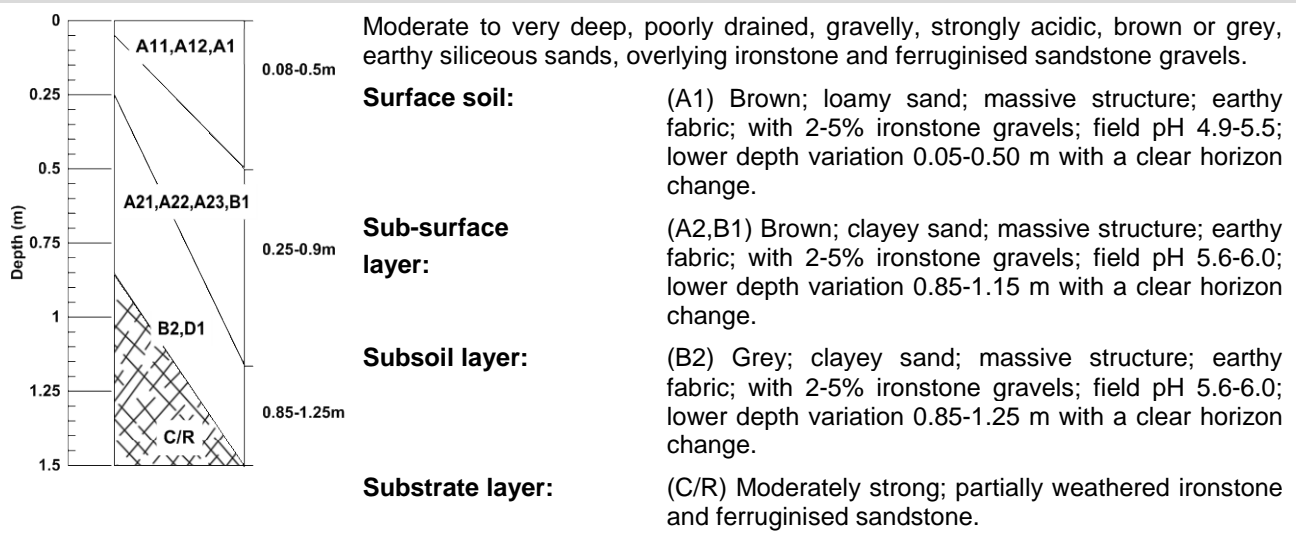
Dominant Soil

Classification: Oxyaquic Hydrosols
(Minor Tenosols)

Family: Kapalga



General Soil Profile Description



Soil Analytical Properties (Appendix B WILDm 102)

Low fertility and nutrient holding capacity. Total nitrogen is very low at the surface (<0.05%). Clay content is low (3-8%). Soil profiles are strongly acidic (5.4-4.9), salinity levels are negligible (EC <0.03 dS/m, Cl <20 mg/kg) throughout. ECEC levels (0.71-1.0 cmol/kg) are very low. Dispersion in the subsoil is minimal (0.53-0.67) with profiles non-dispersive (non-sodic-ECEC<3 cmol/kg and Exch.Na<0.3 cmol/kg).

General Land Capability Class (refer to section 7) **Class 4**

Class	Irrigated Crop Suitability
1	Not Recorded
2	Not Recorded
3	Not Recorded
4	Not Recorded
5	Not suitable for tree crops (Gp. 1-4), row crops (Gp. 5-7), root crops (Gp. 8) and Forestry (Gp. 10)

Land unit 11a	Swamps	Sites: 2	Area: 682 ha
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Summary: Swamps, wetlands, flooded depressions and perennial billabongs with gleyed soils; grassland/sedgeland to open forest.

Geology: Transported sediments/colluvium and alluvium.

Landform: Swamps, wetlands, flooded depressions and perennial billabongs.

Vegetation: *Lophostemon lactifluus* +/- *Corymbia bella*, *Eucalyptus alba* open forest/mixed species low grassland/mixed species sedgeland.

Landscape

Slope: <1%

Surface gravels: Nil

Rock outcrop: Nil

Drainage: Very poor

Runoff: Very slow

Permeability: Moderate

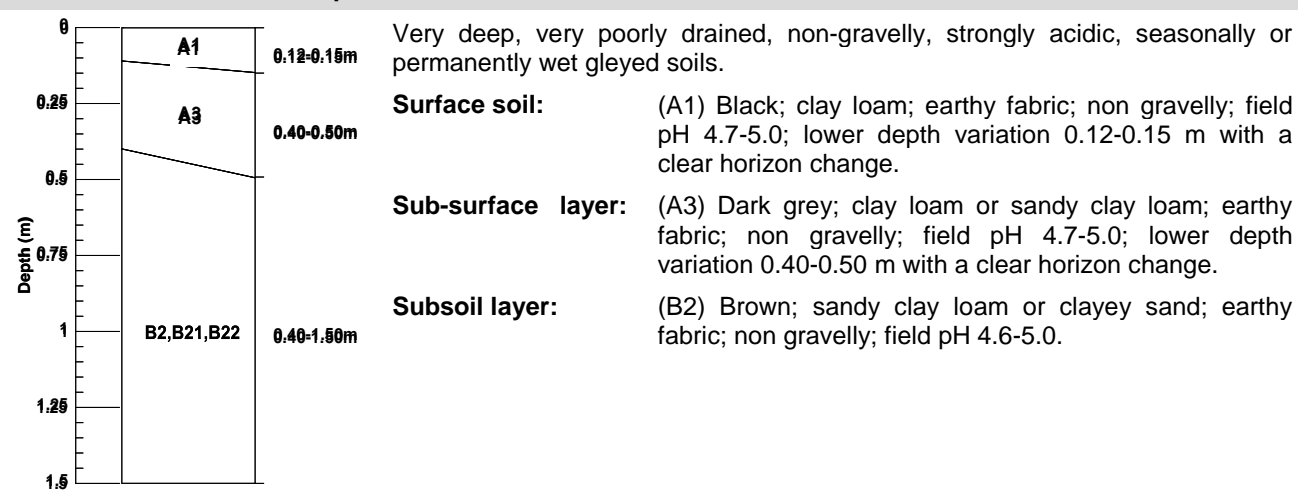


Dominant Soil

Classification: Redoxic Hydrosols

Family: Dashwood

General Soil Profile Description



Soil Analytical Properties (Appendix B WILDM 104)

Low fertility and nutrient holding capacity. Total nitrogen is high (<0.5%) reflecting very high organic carbon at the surface. Clay content is uniform throughout (15-20%). Soil profiles are strongly acidic (3.9-4.0), salinity levels are negligible (EC <0.03 dS/m, Cl <20 mg/kg) throughout. ECEC levels (1.7-2.65 cmol/kg) are very low. Dispersion in the subsoil is minimal (0.18-0.2) with profiles non-dispersive (ESP <6%).

General Land Capability Class (refer to section 7) Class 4

Class	Irrigated Crop Suitability
1	Not Recorded
2	Not Recorded
3	Not Recorded
4	Not Recorded
5	Not suitable for tree crops (Gp. 1-4), row crops (Gp. 5-7), root crops (Gp. 8) and Forestry (Gp. 10)

5. Soil

5.1 Soil Morphology

The survey identified five dominant soil orders; Kandosols, Tenosols, Rudosols, Hydrosols and Kurosols as presented in Table 5.1. Vertosols have been recorded as sub-dominant in the land unit descriptions, as shown in Table 5.2. Full descriptions of soil profiles that are representative of the range of soils are provided in Appendix B. A list of all Australian Soil Classifications (Isbell, 2002) is provided in Appendix C.

Table 5.1: Dominant soil orders in the survey area and their extent

Soil Order	Area (ha)
Kandosols	16 108
Tenosols	6 686
Rudosols	1 526
Hydrosols	9 985
Kurosols	72
Vertosols	Sub-dominant occurrence within land units 9a & 10a

Table 5.2: Occurrence of soil orders in land units. D = dominant, S = sub-dominant, M = minor

Landform Class	Land Unit	Kandosols	Tenosols	Rudosols	Hydrosols	Kurosols	Vertosols
Low Hills	5a		M	D			
Rises	6a		D	S			
Low Rises	7a	D	M				
	7a1	S				D	
Plains	8a	D					
	8b	D					
	8b1		D				
	8c	D					
	8c1	M	D				
Alluvial Plains	9a				D		S
	9a1				D		
Drainage Systems	10a				D		S
	10b				D		
	10b1		M		D		
Swamps	11a				D		

5.1.1 Kandosols

Kandosols lack strong texture contrast with massive or only weakly structured B horizons and are not calcareous throughout (Isbell, 2002).

Red and Brown Kandosols were widespread in the survey area and associated with a variety of landforms. They are very deep, massive in structure, strongly acidic with texture grading from sandy loam to a maximum subsoil texture of clay loam. Gravels occur throughout the profile and are more common on the lowland plains.

A majority of analysed soils were classified as dystrophic, with base status less than 5 cmol/kg clay at the great group level in the Australian Soil Classification system (land units 8a and 8b). One site was classified as petro-ferric with a B horizon either containing or directly underlain by ferricrete or cemented ferruginous nodules or concretions.

The dominant subgroup was Ferric, displaying more than 20% visual abundance of ferruginous nodules or concretions which are mostly uncemented. Ferric-Acidic and Haplic subgroups were also common in the profiles classified. One site was classified as Bleached.

Kandosols are the dominant soil order covering an area of 16 108 ha. The Kandosols on minimal slopes (land unit 8a) have been classified as the most suitable for agriculture in this survey area.

5.1.2 Tenosols

Tenosols are soils with a weak pedological development apart from the A horizon (Isbell 2002).

The dominant suborder classified was Brown-Orthic. The uniform sandy texture soil profiles without obvious horizons have a weakly developed B horizon, or a B2 horizon not exceeding 15% clay content. The dominant great group for Tenosols was Ferric, with 20% or more visual abundance of ferruginous nodules or concretions. One site was classified as Paralithic, soils which overlie partially weathered or decomposed rock or saprolite. Four sites have been classified as unknown at the great group level due to incomplete soil profile information.

Of the three sites analysed (land units 6a, 8b1 and 8c1) all had weakly developed A and B horizons with minimal accumulation of organic matter at the surface. Soils on the steeper elevated slopes of land unit 6a were very shallow, gravelly and strongly acidic.

Tenosols represent 6 686 ha of the survey area dominant across the Rises and Plains. Land unit 6a has been classified as not suitable for agriculture, due to very shallow soil depth. Land units 8b1 and 8c1 are moderate and marginal respectively.

5.1.3 Rudosols

Rudosols have negligible pedological organisation apart from minimal development of an A1 horizon or the presence of less than 10% of B horizon material in fissures in the parent rock or saprolite (Isbell, 2002).

The one site analysed (land unit 5a) was classified as Leptic in the suborder, underlain within 0.5 m of the surface by partially weathered rock. The great group was classified as lithic, soil material that directly overlies hard rock. Soil profile development is generally restricted on the steeper exposed slopes due to the natural erosion process.

Rudosols represent 1 526 ha of the survey area dominant in the higher elevated Low Hills and Rises. Land unit 5a has been classified as not suitable for agriculture, due to excessive slope.

5.1.4 Hydrosols

Hydrosols are defined as seasonally or permanently wet soils (Isbell, 2002). These poorly and very poorly drained soils typically occur in tidal areas and locations prone to flooding and seasonal waterlogging.

Hydrosols are the dominant soil order in six of the fifteen land units. The two common suborders were oxyaquic and redoxic. Mottled Hydrosols (redoxic) indicating oxidising and reducing conditions were identified around the lower lying areas including spillway depressions (land unit 10b) and swamps (land unit 11a). Five sites were not classified past suborder due to soil wetness. Four sites were classified as Bleached.

Hydrosols represent 9 985 ha of the survey area and are dominant across low lying Alluvial Plains, Drainage Systems and Swamps. Hydrosols have been classified as not suitable for agriculture, due to poor to very poor soil drainage.

5.1.5 Kurosols

Kurosols are soils with strong texture contrast between A horizons and strongly acid B horizons (Isbell, 2002).

Kurosols are the least common of the six soils found across the survey area. These acidic duplex soils generally form in situ or on transported parent material including alluvium and colluvium. One site was analysed as dystrophic with base status less than 5 cmol/kg clay at the great group level in the Australian Soil Classification system.

Kurosols represent 72 ha of the survey area dominant across the Low Rises. Land unit 7a1 has been classified as marginal for agriculture, due to substantial slope and imperfect soil drainage.

5.1.6 Vertosols

Vertosols are clay soils with shrink-swell properties that exhibit strong cracking when dry and at depth have slickensides and/or lenticular structural aggregates (Isbell, 2002). They generally occupy extensive floodplains of inland creeks, and are derived from alluvial clay sediments, shales, mudstones, limestone and basalts (McKenzie *et al.*, 2004).

One site was analysed (land unit 10a) and suborder classified as Aquic, where part of the upper 0.5 m of the profile is saturated for at least 2-3 months of the year. The subgroup was Epipedal, characterised by stronger than weaker grade blocky or polyhedral A horizon and no surface crusting horizon.

Moist soil conditions and hand augured profiles made classification difficult to distinguish soil physical features, including structure, cutans and voids.

Vertosols were sub-dominant across Alluvial Plains and Drainage Systems. Land unit 10a has been classified as not suitable for agriculture, due to poor or very poor soil drainage.

5.2 Soil Fertility

Physical and chemical properties for each soil order are summarised below with representative soil profiles summarised in Appendix B. A full suite of soil chemical analysis is provided in Appendix A.

5.2.1 Kandosols

Physical properties:

- Clay content moderate, increasing down the profile (5-26%);
- Silt content very low (<4%); and
- Sand fraction accounts for 70-75% of total particles

Chemical properties:

- Low levels of nutrients - including Phosphorus and Nitrogen;
- Trace elements and major cations low (ECEC<3 cmol/kg);
- Strongly acidic pH range (pH<5.5);
- Non-saline (<2 ds/m); and
- Profile non-dispersive (non-sodic ECEC<3 cmol/kg and Exch.Na<0.3 cmol/kg)

5.2.2 Tenosols

Physical properties:

- Clay content very low and uniform throughout (<10%);
- Silt content very low (<4%); and
- Sand fraction accounts for 70-80% of total particles

Chemical properties:

- Low levels of nutrients - including Phosphorus and Nitrogen;
- Trace elements low, and major cations very low (ECEC<3 cmol/kg);
- Strongly acidic pH range (pH<5.5);
- Non-saline (<2 ds/m); and
- Profile non-dispersive (non-sodic ECEC<3 cmol/kg and Exch.Na<0.3 cmol/kg)

5.2.3 Rudosols

Physical properties:

- Clay content moderate, increasing down the profile (19-30%);
- Silt content moderate (20-25%); and
- Sand fraction accounts for 50-60% of total particles

Chemical properties:

- Moderate levels of nutrients - including Phosphorus and Nitrogen;
- Trace elements and dominant cations Calcium and Magnesium at moderate levels (ECEC<10 cmol/kg) reflecting low Potassium and Sodium levels;
- Strongly acidic pH range (pH<5.5);
- Non saline (<2 ds/m); and
- Profile non-dispersive (non-sodic ESP<6%)

5.2.4 Hydrosols

Physical properties:

- Clay content increases down the profile (5-26%);
- Silt content low throughout the profile (<4%); and
- Sand fraction accounts for 70-80% of total particles

Chemical properties:

- Low to moderate levels of nutrients - including Phosphorus and Nitrogen;
- Trace elements and major cations low (ECEC<3 cmol/kg);
- Strongly acidic pH range (pH<5.5), Aluminium toxicity may occur (pH<4.5) in some areas;
- Non saline (<2 ds/m); and
- Profiles non-dispersive (non-sodic ECEC<3 cmol/kg, ESP<6%)

5.2.5 Kurosols

Physical properties:

- Clay content increases down the profile (<1-47%);
- Silt content increases down the profile (2-36%);
- A horizon sand fraction accounts for 85-95% of total particles; and
- Clay and silt dominated the B horizon total particles (60-80%)

Chemical properties:

- Very low levels of nutrients - including Phosphorus and Nitrogen;
- Trace elements and major cations very low (ECEC<3 cmol/kg);
- Strongly acidic pH range (pH<5.5);
- Non saline (<2 ds/m); and
- Profiles non-dispersive (non-sodic ECEC<3 cmol/kg and Exch.Na<0.3 cmol/kg)

5.2.6 Vertosols

Physical properties:

- Clay content dominated A and B horizons (25-26%) of total particles;
- Silt content moderate throughout the profile (17-27%);
- Coarse sand fraction low, fine sand fraction decreased down the profile (38-16%); and
- Clay and silt dominated the B horizon total particles (60-80%)

Chemical properties:

- Low levels of nutrients - including Phosphorus and Nitrogen;
- Trace elements and major cations low (ECEC<12 cmol/kg);
- Strongly acidic pH range (pH<5.5), Aluminium toxicity may occur (pH<4.5) in some areas;
- Non saline (<2 ds/m); and
- Profiles non-dispersive (non-sodic ESP <6%)

5.3 Soil Families

Soil families are groupings of soil profile descriptions which have similar properties. The use of soil families does not necessarily have a taxonomic standing but is based on convenient and easily recognisable characteristics that have pedological or practical significance (van de Graaff, 1965). This description is different to the soil 'Family Criteria' in The Australian Soil Classification (Isbell, 2002).

Soil families were first described by Christian *et al.* (1953) for the Katherine-Darwin region, then later by A.D.L. Hooper *et al.* (1969). The fifteen soil families across the survey area are summarised in Table 5.3.

Table 5.3: Soil families in the survey area

Soil Family	Description	Extent	Soil Order (Isbell, 2002)	Area (ha)
Soils with Gradational Texture Profiles				
<i>Non-calcareous with earthy fabric in subsoils</i>				
Killupa	Very deep, red coloured, sandy loams grading to sandy clay loams to clay loams at depth. Massive and earthy soil structure throughout the profile. Non-gravelly, well drained, acidic profiles.	Land unit 8a: Level to very gently undulating plains	Kandosols	8 994
Koolpinyah	Shallow to very deep soils, red and brown coloured, sandy loams grading to sandy clay loams to clay loam sandy at depth. Massive and earthy with abundant (>50%) siltstone and ironstone gravels throughout. Well drained, slightly acidic profiles.	Land unit 8b: Level to gently undulating upland plains Land unit 8c: Gently undulating lowland plains	Kandosols	3 583
Cullen	Deep, dark brown to red coloured, loamy sands grading to clay sandy at depth. Massive and earthy with quartz and ironstone gravels at depth (<10%). Imperfectly drained and strongly acidic throughout the profile.	Land unit 7a1: Undulating low rises; colluvial wash slopes above drainage floors.	Kandosols; Kurosols	72
Soils with Uniform Texture Profiles				
<i>Coarse or medium soils with no pedological organisation</i>				
Skeletal Soils	Shallow, brown coloured, sandy loams grading to light clay loams. Massive and earthy with abundant (>50%) siltstone and ironstone gravels throughout. Well drained, strongly acidic profiles.	Land unit 5a: Undulating low hills with shallow gravelly soils.	Rudosols; Tenosols	1 526
<i>Coarse textured soils with little or no pedological organisation</i>				
Kapalga	Shallow to very deep, dark to brown coloured, loamy sand grading to clayey sand at depth. Massive to single grain earthy siliceous sands, with occasional ironstone gravels throughout the profile. Well drained upper slopes to poorly drained low lying depressions. Strongly acidic throughout the profile.	Land unit 8b1: Level to gently undulating plains; including upland margins of broad drainage floors. Land unit 10b: Low-lying spillway depressions.	Kandosols; Tenosols; Hydrosols	9 000

Soil Family	Description	Extent	Soil Order (Isbell, 2002)	Area (ha)
		Land unit 10b1: Gently sloping broad drainage floors.		
<i>Coarse textured soils with pedological organisation</i>				
Baroalba	Shallow to moderately deep, brown coloured, loamy sand grading to clay loam sandy at depth. Massive and earthy with abundant (>50%) ironstone and ferruginised sandstone gravels at depth. Imperfectly drained, strongly acidic soil profiles.	Land unit 8c1: Gently undulating sandy wash soils on lowland plains.	Kandosols; Tenosols	1 468
Cahill	Shallow, brown sandy loams within a matrix of siltstone and ironstone fragmental material weathering in-situ. Well drained, strongly acidic soil profiles.	Land unit 6a: Undulating rises; including gently inclined very gravelly footslopes above low lying drainage areas. Land unit 7a: Gently undulating low rises; including gently inclined gravelly pediment slopes.	Kandosols; Tenosols; Rudosols	5 716
<i>Fine textured soils showing seasonal cracking, with pedological organisation characterised by smooth face peds</i>				
Wildman	Very deep, brown to dark grey coloured, light clay grading to heavy clay at depth. Non-gravelly moderately pedal, hard-setting cracking soils. Poorly drained, strongly acidic throughout the soil profile.	Land unit 10a: Open drainage lines including incised creeks and channels.	Vertosols; Hydrosols	1 564
Howard	Very deep, brown, loamy sand to medium clay at depth. Single grain and earthy grading to moderately pedal in the subsoil layer. Well rounded gravels throughout, with high amounts (>50%) in the subsurface layer. Imperfect to poorly drained seasonally wet, depositional sandy wash earths. Strongly acidic at the surface to strongly alkaline in the clay subsoil layer.	Land unit 9a1: Depositional sandy wash alluvial plains bordering clay plains.	Hydrosols	883
<i>Fine textured soils with pedological organisation</i>				
Dashwood	Very deep, dark grey to brown coloured, clay loams grading to heavy clay at depth. Non-gravelly, earthy, seasonally or permanently wet soils. Poorly drained and strongly acidic throughout the profile (pH<4).	Land unit 11a: Swamps, wetlands, flooded depressions and perennial billabongs.	Hydrosols	682
Soils with Duplex Profiles				

Soil Family	Description	Extent	Soil Order (Isbell, 2002)	Area (ha)
<i>Duplex soils with clayey mottled subsoils, hardsetting surface horizons</i>				
Margaret	Very deep, dark grey to dark brown coloured, clay loam grading to light medium clay at depth. Non-gravelly, strongly acidic, hard pedal duplex soils with swamp hummock surface.	Land unit 9a: Level to very gently undulating alluvial plains.	Hydrosols; Vertosols	816

6. Vegetation

6.1 Overview

One hundred and twelve field sites were assessed during the course of field work. Full floristics were undertaken for all sites with the majority of sites being unburnt. Field work occurred during the Dry season of 2015. Due to the objectives of the project, sites were concentrated on the soils-landscapes with the most agricultural potential. For this reason some vegetation communities in non-agricultural landscapes such as drainage lines and swamps were not described to the same level as the landscapes with agricultural potential.

Fifteen land units were described, resulting in twenty two distinct vegetation community types.

Open forest communities and aquatic communities accounted for < 1% of the mapped area respectively. Eucalyptus and/or Melaleuca woodlands accounted for 70% of the area. Open woodlands accounted for approximately 20% of the area. Grasslands and sedge lands accounted for approximately 7%.

6.2 Vegetation descriptions

This section presents detailed structural and floristic descriptions for each land unit. Most land units are relatively homogeneous although three land units have more than one vegetation type present. Percentage cover and heights are provided for each stratum. Dominant species and species frequencies (occurrence) are also provided for each stratum.

Structural classification follows the NVIS classification (ESCAVI 2003). Vegetation communities including their extent have been summarised in Table 6.1. Species by growth form for taxa found during field survey is provided in Appendix G. A Northern Territory Herbarium Holtz database listing of species collected in the Wildman River area by other people is provided in Appendix H.

Table 6.1: Land unit vegetation summary

Land Unit	Description	Area (ha)	Area%
Open Forest: <1%			
7a1-Com1	<i>Canarium australianum</i> , <i>Erythrophleum chlorostachys</i> , <i>Acacia auriculiformis</i> mid open forest over tussock grassland	12	0.03
11a-Com1	<i>Lophostemon lactifluus</i> +/- <i>Corymbia bella</i> , <i>Eucalyptus alba</i> open forest over tussock grassland and/or sedgeland.	40-68	0.1-0.2
11a-Com2	<i>Melaleuca viridiflora</i> , <i>M.cajuputi</i> , +/- <i>M. leucadendra</i> open forest to open woodlands over grasslands/ forblands	40-68	0.1-0.2
Woodland: 70.5%			
7a	<i>Eucalyptus miniata</i> , <i>E. tetradonta</i> , +/- <i>Erythrophleum chlorostachys</i> mid woodland over a mid tussock grassland	3 459	10
7a1-Com2	<i>Grevillea pteridifolia</i> , <i>Xanthostemon eucalyptoides</i> mid woodland (mid open woodland) over closed tussock grassland	60	0.17
8a	<i>Eucalyptus tetradonta</i> , <i>E. miniata</i> , +/- <i>Erythrophleum chlorostachys</i> , +/- <i>Corymbia porrecta</i> mid woodland to open woodland over a mid tussock grassland or low open shrubland	8 994	26.2

8b	<i>Eucalyptus miniata</i> , <i>E. tetradonta</i> +/- <i>Corymbia porrecta</i> , <i>Erythrophleum chlorostachys</i> mid woodland over mid tussock grassland or low shrubland	2 907	8.5
8b1	<i>Eucalyptus tetradonta</i> , <i>Erythrophleum chlorostachys</i> +/- <i>Eucalyptus miniata</i> , <i>Corymbia porrecta</i> mid woodland over a mixed tussock grassland	2 961	8.6
8c	<i>Eucalyptus tetradonta</i> , <i>E. miniata</i> +/- <i>Erythrophleum chlorostachys</i> , <i>Corymbia porrecta</i> mid woodland over mid open tussock grassland	690	2
10a	<i>Melaleuca viridifolia</i> , +/- <i>M. cajuputi</i> , <i>Lophostemon lactifluus</i> mid woodland to open forest over tussock grassland	1 526	4.4
10b	Mixed species <i>Melaleuca</i> , <i>Eucalyptus</i> mid woodland to mid open woodland over open tussock grassland/ low open shrubland	1 585	4.6
10b1-Com1	Mid woodland to low open woodland of <i>Melaleuca nervosa</i> , <i>M. viridiflora</i> , +/- <i>Corymbia confertiflora</i> , <i>C. foelscheana</i> and <i>Asteromyrtus symphyocarpa</i>	2 004	5.8
Open Woodland: 19.8%			
5a	<i>Eucalyptus tectifica</i> , +/- <i>E. tetradonta</i> , <i>E. miniata</i> mid open woodland over sparse tussock grassland	1 526	4.4
6a	<i>Corymbia bleeseri</i> , <i>Eucalyptus tetradonta</i> mid open woodland over a low tussock grassland	2 257	6.6
8c1	Mixed <i>Eucalyptus</i> , <i>Corymbia</i> species mid woodland to open woodland over a low tussock grassland	1 465	4.3
9a1	<i>Melaleuca viridiflora</i> , <i>M. nervosa</i> , +/- <i>Asteromyrtus symphyocarpa</i> low open woodland over open tussock grassland	883	2.6
10b1-Com3	<i>Petalostigma pubescens</i> low open woodland with scattered emergent <i>Eucalyptus tetradonta</i> and <i>Erythrophleum chlorostachys</i>	668	1.9
Grasslands/Sedgeland: 7.1-7.3%			
9a	Open to closed mixed species tussock grassland/sedgeland	813	2.4
10b1-Com2	Open <i>Dapsilanthus spathaceus</i> rushland and/or <i>Germainia truncatiglumis</i> open tussock grassland	1 336	3.9
11a-Com3	Open to closed grasslands/sedgelands	40-680	0.1-0.2
11a-Com4	<i>Eleocharis</i> spp. tall closed/open reedlands	238-280	0.7-0.8
Open water Aquatics : <1%			
11a-Com5	Open water areas with aquatics	238-280	0.7-0.8

Land unit 5a

Eucalyptus tectifica, +/- *E. tetradonta*, *E. miniata* mid open woodland on low hills.

Eucalyptus tectifica, +/- *E. tetradonta*, *E. miniata* mid open woodland over a sparse shrubland, low open woodland of *Terminalia canescens*, *Acacia lamprocarpa*, *Ficus aculeata* and *Erythrophleum chlorostachys*. The ground stratum is a sparse tussock grassland with characteristic grass species including *Sorghum intrans*, *Heteropogon triticeus*, *Mnesithea roettboelliodes* and the shrub *Petalostigma quadriloculare*.



Structural and Floristic Summary				
Number of sites: 1		Approximate coverage across total land unit area: 80%		Area: 1 526 ha
Strata	Growth form	Cover % (range)	Mean Height m (range)	Basal area (m ² /ha)
Upper 1	Tree	15	15	6.7
Upper 2	Tree	10	8	
Mid	Shrub	4	1.5	
Ground	Tussock Grass	15	0.5	
Frequency of Dominant Species				
Upper 1	100%: <i>Eucalyptus tectifica</i> , <i>E. tetradonta</i> , <i>E. miniata</i> , <i>Corymbia polysciada</i> , <i>Erythrophleum chlorostachys</i>			
Upper 2	100%: <i>Eucalyptus tectifica</i> , <i>E. miniata</i> , <i>Erythrophleum chlorostachys</i> , <i>Eucalyptus tetradonta</i>			
Mid	100%: <i>Acacia lamprocarpa</i> , <i>Ficus aculeata</i> , <i>Terminalia canescens</i> , <i>Dolichandrone filiformis</i> , <i>Buchanania obovata</i> , <i>Alphitonia excelsa</i> .			
Ground	100%: <i>Sorghum intrans</i> , <i>Heteropogon triticeus</i> , <i>Mnesithea roettboelliodes</i> , <i>Petalostigma quadriloculare</i> , <i>Chrysopogon latifolius</i>			
Other communities present			Approximate coverage across total land unit extent	
6a: <i>Corymbia bleeseri</i> , <i>Eucalyptus tetradonta</i> mid open woodland			10%	
7a: <i>Eucalyptus miniata</i> , <i>E. tetradonta</i> , +/- <i>Erythrophleum chlorostachys</i> mid woodland			10%	

Land unit 6a

Corymbia bleeseri, *Eucalyptus tetradonta* mid open woodland on rises.

Corymbia bleeseri, *E. tetradonta* mid open woodland. Mid stratum is absent or when present is sparse low open woodland with *Gardenia megasperma* and/or *Calytrix achaeta*. The ground stratum is a low tussock grassland or sparse shrubland. Grass species include *Eriachne avenacea*, *Heteropogon triticeus* and *Sorghum plumosum*. Shrub species include *Petalostigma pubescens*, *Erythrophleum chlorostachys* regeneration and/or *Livistona humilis*.



Structural and Floristic Summary				
Number of sites: 1		Approximate coverage across total land unit area: 85%		Area: 2 257 ha
Strata	Growth form	Cover % (range)	Mean height m (range)	Basal area (m ² /ha)
Upper	Tree	15	13	7
Mid	Tree	1	3	
Ground	Tussock Grass	38	0.4	
Frequency of Dominant Species				
Upper	100%: <i>Corymbia bleeseri</i> , <i>E. tetradonta</i>			
Mid	100%: <i>Gardenia megasperma</i> , <i>Calytrix achaeta</i>			
Ground	100%: <i>Eriachne avenacea</i> , <i>Heteropogon triticeus</i> , <i>Sorghum plumosum</i> , <i>Corymbia bleeseri</i> , <i>Petalostigma pubescens</i> , <i>P. quadriloculare</i> , <i>Corymbia porrecta</i> , <i>Erythrophleum chlorostachys</i> , <i>Indigofera saxicola</i> , <i>Livistona humilis</i>			
Other communities present			Approximate coverage across total land unit extent	
10b1: Mid Open Woodland-Open Sedgeland/Grassland			5%	
5a: <i>Eucalyptus tectifica</i> , +/- <i>E. tetradonta</i> , <i>E. miniata</i> mid open woodland			10%	

Land Unit 7a

Eucalyptus miniata, *E. tetradonta*, +/- *Erythrophleum chlorostachys* mid woodland on low rises.

Eucalyptus miniata, *E. tetradonta*, +/- *Erythrophleum chlorostachys* mid woodland over a low open woodland of upper storey species with the addition of *Gardenia megasperma*, *Pandanus spiralis*, *Livistona humilis* and *Planchonia careya*. The ground stratum is mid-tussock grassland with characteristic species including *Pseudopogonatherum contortum*, *Eriachne triseta* and *Schizachyrium fragile*. Shrubs in the ground stratum include *Petalostigma quadriloculare*, *Planchonia careya* and the herb *Hibbertia caudice* and *H.cistifolia*.



Structural and Floristic Summary				
Number of sites: 5		Approximate coverage across total land unit area: 80%		Area: 3 459 ha
Strata	Growth form	Cover % (range)	Mean height m (range)	Basal area (m ² /ha)
Upper	Tree	20 (5-42)	16 (9-20)	9 (5.5-15)
Mid	Tree/Palm	9 (1-18)	3.1 (1.5-6)	
Ground	Tussock Grasses	62 (34-88)	0.7 (0.5-0.9)	
Frequency of Dominant Species			Frequency of Other Species	
Upper	67%: <i>Eucalyptus miniata</i> , <i>E. tetradonta</i> , <i>Erythrophleum chlorostachys</i>		17%: <i>Acacia lamprocarpa</i> , <i>Buchanania obovata</i> , <i>Corymbia polycarpa</i> <i>C.porrecta</i> , <i>Pouteria arnhemica</i> , <i>Terminalia ferdinandeanana</i> , <i>T. platyphylla</i> , <i>T. carpentariae</i> , <i>Grevillea pteridifolia</i> , <i>Xanthostemon paradoxus</i>	
Mid	50%: <i>Gardenia megasperma</i> . 33%: <i>Livistona humilis</i> , <i>Panadanus spiralis</i> , <i>Planchonia careya</i> , <i>Croton arnhemicus</i> , <i>Buchania obovata</i> , <i>Eucalyptus alba</i> , <i>E.tetradonta</i> , <i>E.miniata</i> , <i>Syzygium eucalyptoides</i>		17%: <i>Acacia dimidiata</i> , <i>A. lamprocarpa</i> , <i>Corymbia polycarpa</i> , <i>Denhamia obscura</i> , <i>Grevillea pteridifolia</i> , <i>Personia falcata</i> , <i>Terminanlia ferdinandeanana</i> , <i>T. grandifolia</i> <i>Xanthostemon paradoxus</i>	
Ground	83%: <i>Schizachyrium fragie</i> , <i>Planchonia careya</i> . 67%: <i>Eriachne triseta</i> , <i>Buchnera linearis</i> , <i>Petalostigma quadriloculare</i> , <i>Eucalyptus tetradonta</i> 50%: <i>Pseudopogonatherum contortum</i> , <i>Erythrophleum chlorostachys</i> , <i>Eucalyptus miniata</i> , <i>Heteropogon triticeus</i> , <i>Hibbertia caudice</i> , <i>Kailarsenia suffruticosa</i> , <i>Waltheria indica</i>		33%: <i>Alloteropsis semialata</i> , <i>Chrysopogon fallax</i> , <i>C. latifolius</i> , <i>Livistonia humilis</i> , <i>Pandanus spiralis</i> , <i>Petalostigma pubescens</i> , <i>Spermocce leptoleba</i> , <i>Thaumastochloa major</i>	
Other communities present			Approximate coverage across total land unit extent	
6a: <i>Corymbia bleeseri</i> , <i>Eucalyptus tetradonta</i> mid open woodland			10%	
8c: <i>Eucalyptus tetradonta</i> , <i>E. miniata</i> +/- <i>Erythrophleum chlorostachys</i> , <i>Corymbia porrecta</i>			10%	

Land unit 7a1: Community 1

Mixed unit with two main communities:

Community 1: *Canarium australianum*, *Erythrophleum chlorostachys*, *Acacia auriculiformis* mid open forest on low rises.

Canarium australianum, *Erythrophleum chlorostachys*, *Acacia auriculiformis* mid open forest. Other common upper stratum species include *Lophostemon lactifluus*, *Brachychiton diversifolius* and *Syzygium eucalyptoides* subsp. *bleeseri*. Characteristic species of the sparse shrubland mid stratum include *Timonius timon*, *Milusa traceyi* and *Pandanus spiralis*. Common species in the open tussock grassland ground stratum include *Eriachne trisetata*, *Aristida holathera* and *Sporobolus australasicus*



Structural and Floristic Summary				
Number of sites: 1		Approximate coverage across total land unit area: 17%		Area: 12 ha
Strata	Growth form	Cover % (range)	Mean height m (range)	Basal area (m ² /ha)
Upper 1	Tree	50	13 (10-18)	17
Upper 2	Tree	25	5.5 (4-6)	
Mid	Shrub	3	1 (0.8-5)	
Ground	Tussock Grasses	34 (10-60)	0.4 (0.6)	
Frequency of Dominant Species				
Upper 1	100%: <i>Canarium australianum</i> , <i>Erythrophleum chlorostachys</i> , <i>Acacia auriculiformis</i> , <i>Timonius timon</i> , <i>Xanthostemon eucalyptoides</i> , <i>Brachychiton diversifolius</i> , <i>Ficus virens</i>			
Upper 2	100%: <i>Syzygium eucalyptoides</i> subsp. <i>bleeseri</i> , <i>Lophostemon lactifluus</i> , <i>Timonius timon</i> , <i>Planchonia careya</i>			
Mid	100%: <i>Milusa traceyi</i> , <i>Acacia auriculiformis</i> , <i>A. holosericea</i> , <i>Terminalia carpentariae</i> , <i>Pandanus spiralis</i> , <i>Denhamia obscura</i>			
Ground	100%: <i>Eriachne trisetata</i> , <i>Aristida holathera</i> , <i>Sporobolus australasicus</i> , <i>Heteropogon triticeus</i> , <i>Hyptis suaveolens</i>			
Other communities present			Approximate coverage across total land unit extent	
7a1-Community 2: <i>Grevillea pteridifolia</i> , <i>Xanthostemon eucalyptoides</i> mid woodland (mid open woodland)			83%	

Land unit 7a1: Community 2

Mixed unit with two main communities:

Community 2: *Grevillea pteridifolia*, *Xanthostemon eucalyptoides* mid woodland, mid open woodland on low rises.

Grevillea pteridifolia, *Xanthostemon eucalyptoides* mid woodland. Other common upper stratum species include *Lophostemon lactifluus*, *Eucalyptus alba* and *Melaleuca nervosa*. Common species in the low sparse open woodland mid stratum include *Banksia dentata* and regeneration of upper storey species. Characteristic species of the closed tussock grass ground storey include the grasses *Eriachne trisetata*, *E. burkitti*, the rush *Dapsilanthus spathaceus* and regeneration of *Melaleuca nervosa*, *Xanthostemon eucalyptoides* and *Banksia dentata*.



Structural and Floristic Summary				
Number of sites: 1		Approximate coverage across total land unit area: 83%		Area: 60 ha
Strata	Growth form	Cover % (range)	Mean height m (range)	Basal area (m ² /ha)
Upper 1	Tree	30	8 (5-13)	9.5
Mid	Tree	3	2 (1.5-3)	
Ground	Tussock Grass	82	0.5 (0.1-1.2)	
Frequency of Dominant Species				
Upper 1	100%: <i>Grevillea pteridifolia</i> , <i>Xanthostemon eucalyptoides</i> , <i>Melaleuca nervosa</i> , <i>Lophostemon lactifluus</i> , <i>Pandanus spiralis</i> , <i>Syzygium eucalyptoides</i> subsp. <i>bleeseri</i> , <i>Eucalyptus alba</i> .			
Mid	100%: <i>Xanthostemon eucalyptoides</i> , <i>Syzygium eucalyptoides</i> subsp. <i>bleeseri</i> , <i>Lophostemon lactifluus</i> , <i>Banksia dentata</i>			
Ground	100%: <i>Eriachne trisetata</i> , <i>E. schultzeana</i> , <i>E. burkitti</i> , <i>Tricostularia undulata</i> , <i>Aristida holathera</i> , <i>Sporobolus australasicus</i> , <i>Heteropogon triticeus</i> , <i>Hyptis suaveolens</i> , <i>Germainea truncatiglumis</i> , <i>Xyris</i> sp.			
Other communities present			Approximate coverage across total land unit extent	
7a1-Community 1: <i>Canarium australianum</i> , <i>Erythrophleum chlorostachys</i> , <i>Acacia auriculiformis</i> mid open forest.			17%	

Land unit 8a

Eucalyptus tetrodonta, *E. miniata*, +/- *Erythrophleum chlorostachys*, +/- *Corymbia porrecta* mid woodland to open woodland with some areas of open forest on plains.

Eucalyptus tetrodonta, *E. miniata* +/- *Erythrophleum chlorostachys*, *Corymbia porrecta* mid woodland to open woodland with some areas of open forest. Characteristic species of the low open woodland mid stratum include *Pandanus spiralis*, regeneration of overstorey Eucalypt species, *Acacia oncinocarpa*, *Buchanania obovata*, *Grevillea heliosperma* and *Acacia lamprocarpa*. The ground stratum is a mid tussock grassland or low open shrubland. Common grass species include *Heteropogon triticeus*, *Chrysopogon latifolius*, *Eriachne trisetata* and *Chrysopogon fallax*. Common shrub species include *Petalostigma quadriloculare*, *Acacia oncinocarpa*, *Xanthostemon paradoxus*, *Planchonia careya* and *Parinari nonda*.



Structural and Floristic Summary				
Number of sites: 55		Approximate coverage across total land unit area: 90%		Area: 8 996 ha
Strata	Growth form	Cover % (range)	Mean height m (range)	Basal area (m ² /ha)
Upper	Tree	33 (5-75)	19 (9-25)	9.6 (3.5-16)
Mid	Tree	9 (0-45)	3.7 (1-8)	
Ground	Tussock Grass (Shrub)	61 (32-92)	0.7 (0.2-1)	
Frequency of Dominant Species			Frequency of Other Species	
Upper	86%: <i>E. tetrodonta</i> , 82%: <i>Eucalyptus miniata</i> , 67%: <i>Erythrophleum chlorostachys</i> , 27%: <i>Corymbia porrecta</i>		12%: <i>Pandanus spiralis</i> , <i>Grevillea pteridifolia</i> 6%: <i>Xanthostemon paradoxus</i> 4%: <i>Buchanania obovata</i> , <i>Gardenia megasperma</i> , <i>Alstonia actinophylla</i> 2%: <i>Brachychiton diversifolius</i> , <i>Syzygium eucalyptoides</i> , <i>Denhamia obscura</i> , <i>Dolichandrone filiformis</i> , <i>Livistona humilis</i> , <i>Personia falcata</i>	
Mid	47%: <i>Erythrophleum chlorostachys</i> 41%: <i>Pandanus spiralis</i> 31%: <i>Buchanania obovata</i> 29%: <i>Eucalyptus miniata</i> , <i>E. tetrodonta</i> 24%: <i>Livistona humilis</i> , <i>Grevillea heliosperma</i> , <i>Personia falcata</i> 18%: <i>Petalostigma pubescens</i> , <i>Alphitonia excelsa</i> , <i>Personia falcata</i>		16%: <i>Acacia lamprocarpa</i> , <i>Croton arnhemicus</i> 12%: <i>Planchonia careya</i> , <i>Acacia oncinocarpa</i> , <i>Syzygium suborbiculare</i> , <i>Terminanlia ferdinandean</i> , <i>T. grandifolia</i> <i>Xanthostemon paradoxus</i> 2%: <i>Acacia mimula</i> , <i>Alphitonia excelsa</i> , <i>Ficus aculeata</i>	
Ground	75%-85%: <i>Buchanania obovata</i> , <i>Heteropogon triticeus</i> , <i>Planchonia careya</i> 60%: <i>Pandanus spiralis</i> , <i>Thaumastochloa major</i> , <i>Livistona humilis</i> , <i>Eucalyptus miniata</i> 40%-50%: <i>Eriachne trisetata</i> , <i>Chrysopogon fallax</i> , <i>C. latifolius</i> , <i>Lomandra tropica</i> , <i>Pseudopogonatherum contortum</i> , <i>Personia falcata</i> , <i>Kailarsenia suffruticosa</i> , <i>Setaria apiculata</i> , <i>Spermococce leptoloba</i> , <i>Hibbertia</i>		20%-30%: <i>Gardenia megasperma</i> , <i>Hibbertia juncea</i> , <i>Croton arnhemicus</i> , <i>Denhamia obscura</i> , <i>Goodenia armstrongiana</i> , <i>Sorghum intrans</i> <16%: <i>Corynotheca lateriflora</i> , <i>Eragrostis schultzei</i> , <i>Eriachne schultzeana</i> , <i>Eurybiopsis macrorhiza</i> , <i>Flemingia pauciflora</i> , <i>F. sp sericea</i> , <i>Grevillea heliosperma</i> , <i>Haemodorum brevicaulis</i> , <i>Livistona inermis</i> , <i>Syzygium spp.</i> , <i>Wrightia saligna</i> , <i>Xanthostemon paradoxus</i>	

	<i>cistifolia, Erythrophleum chlorostachys, Eucalyptus tetradonta, Personia falcata</i>	
Other communities present		Approximate coverage across total land unit extent
8c1: Mixed <i>Eucalyptus, Corymbia</i> species mid woodland to open woodland over a low tussock grassland		10%

Land Unit 8b

Eucalyptus miniata, *E. tetradonta* +/- *Corymbia porrecta*, *Erythrophleum chlorostachys* mid woodland on gently undulating upland plains.

Eucalyptus miniata, *E. tetradonta* +/- *Corymbia porrecta*, *Erythrophleum chlorostachys* mid woodland to mid open woodland (some areas of open forest). The mid stratum is a low open woodland with characteristic species including *Petalostigma pubescens* (10%), *Planchonia careya* (7%), *Acacia oncinocarpa* (7%), *Terminalia ferdinandiana* (7%) and regeneration of upper stratum species. The ground stratum is variously a mid-tussock grassland or low shrubland. Characteristic species include the tussock grasses *Pseudopogonatherum contortum* (16%), *Eriachne trisetata* (16%), *Chrysopogon latifolius* (7%) and the shrubs *Petalostigma quadriloculare*, *P. pubescens* and *Xanthostemon paradoxus*.



Structural and Floristic Summary				
Number of sites: 12		Approximate coverage across total land unit area: 90%		Area: 2 921 ha
Strata	Growth form	Cover % (range)	Mean height m (range)	Basal area (m ² /ha)
Upper	Tree	29 (8-55)	17 (11-20)	9.8 (5.5 – 16)
Mid	Tree	10 (1-40)	3.3 (2-5)	
Ground	Tussock Grass (shrub)	56 (14-90)	0.6 (0.2-1)	
Frequency of Dominant Species			Frequency of Other Species	
Upper	94%: <i>Eucalyptus miniata</i> 75%: <i>Eucalyptus tetradonta</i> 50%: <i>Corymbia porrecta</i> 25%: <i>Erythrophleum chlorostachys</i>		19%: <i>Xanthostemon paradoxus</i> 6%: <i>Alphitonia excelsa</i> , <i>Alstonia actinophylla</i> , <i>Personia falcata</i> , <i>Corymbia polysciada</i>	
Mid	44%: <i>Erythrophleum chlorostachys</i> , <i>Eucalyptus tetradonta</i> , <i>Terminalia ferdinandiana</i> , <i>Personia falcata</i> 31%: <i>Pandanus spiralis</i> , <i>Petalostigma pubescens</i> 25%: <i>Planchonia careya</i> , <i>Buchanania obovata</i>		19%: <i>Corymbia porrecta</i> , <i>Acacia oncinocarpa</i> , <i>Livistona humilis</i> , <i>Terminalia carpentariae</i> , <i>Xanthostemon paradoxus</i> 13%: <i>Acacia lamprocarpa</i> , <i>Alphitonia excelsa</i> , <i>Brachychiton diversifolius</i> , <i>Calytrix exstipulata</i> , <i>Croton arnhemicus</i> , <i>Livistona inermis</i> , <i>Syzygium eucalyptoides</i>	
Ground	≥ 75%: <i>Eriachne trisetata</i> , <i>Pseudopogonatherum contortum</i> , <i>Kailarsenia suffruticosa</i> , <i>Buchanania obovata</i> , <i>Eucalyptus miniata</i> , <i>E. tetradonta</i> , <i>Erythrophleum chlorostachys</i> , <i>Planchonia careya</i> 40%-50%: <i>Eragrostis schutzii</i> , <i>Alphitonia excelsa</i> , <i>Brachychiton diversifolius</i> , <i>Hibbertia cistifolia</i> , <i>Lomandra tropica</i> , <i>Pandanus spiralis</i> , <i>Setaria apiculata</i> , <i>Spermocce leptoloba</i> , <i>Thaumastochloa major</i> , <i>Schizachryium fragile</i>		25%: <i>Acacia lamprocarpa</i> , <i>Chrysopogon latifolius</i> , <i>Goodenia armstrongiana</i> , <i>Heteropogon triticeus</i> , <i>Hibbertia juncea</i> , <i>Livistona humilis</i> , <i>Livistona inermis</i> , <i>Terminalia ferdinandiana</i> , <i>Xanthostemon paradoxus</i>	
Other communities present			Approximate coverage across total land unit extent	
7a: <i>Eucalyptus miniata</i> , <i>E. tetradonta</i> , +/-			6%	

<i>Erythrophleum chlorostachys</i> mid woodland	
8a: <i>Eucalyptus tetradonta</i> , <i>E. miniata</i> , +/- <i>Erythrophleum chlorostachys</i> , +/- <i>Corymbia porrecta</i> mid woodland	4%

Land Unit 8b1

Eucalyptus tetradonta, *Erythrophleum chlorostachys* +/- *Eucalyptus miniata*, *Corymbia porrecta* mid woodland on plains.

The upper stratum comprises an *E. tetradonta*, *Erythrophleum chlorostachys* +/- *Eucalyptus miniata*, *Corymbia porrecta* mid woodland to 23 m. In some instances there is a second upper stratum to 14 m composed of the same overstorey species. The mid stratum is a low open woodland / tall open shrubland with characteristic species including *Pandanus spiralis*, *Petalostigma pubescens*, *Acacia lamprocarpa* *Terminalia grandifolia*, *T. ferdinandean* and regeneration of upper storey species. The ground stratum is a mixed species tussock grassland with common species including the grasses *Eriachne triset*, *E. schultzi*, *Setaria apiculata*, *Pseudopogonatherum contortum* and forbs *Spermacoce calliantha*, *Goodenia holtzeana* and *Kailarsenia suffruticosa*.



Structural and Floristic Summary				
Number of sites: 6		Approximate coverage across total land unit area: 90%		Area: 2 961 ha
Strata	Growth form	Cover % (range)	Mean height m (range)	Basal area (m ² /ha)
Upper 1	Tree	23 (12-40)	17.5 (15-20)	10.7 (5-12)
Upper 2	Tree	14 (10-18)	7	
Mid	Tree (shrub)	15.5 (5-40)	4 (2.5-6)	
Ground	Tussock Grass (shrub)	45 (14-70)	0.6 (0.2-1)	
Frequency of Dominant Species			Frequency of Other Species	
Upper 1	100%: <i>Eucalyptus tetradonta</i> 83%: <i>Erythrophleum chlorostachys</i> 67%: <i>Eucalyptus miniata</i> 50%: <i>Corymbia porrecta</i>		17%: <i>Acacia lamprocarpa</i> , <i>Terminalia grandiflora</i>	
Upper 2	33%: <i>Eucalyptus tetradonta</i> <i>Erythrophleum chlorostachys</i>		16%: <i>Eucalyptus miniata</i> , <i>Acacia lamprocarpa</i> , <i>Terminalia grandiflora</i>	
Mid	100%: <i>Pandanus spiralis</i> , <i>Eucalyptus tetradonta</i> 83%: <i>Erythrophleum chlorostachys</i> 67%: <i>Eucalyptus miniata</i> 50%: <i>Petalostigma pubescens</i>		33%: <i>Acacia lamprocarpa</i> , <i>A. oncinocarpa</i> , <i>Corymbia porrecta</i> , <i>Terminalia grandifolia</i> 16%: <i>Alphitonia excelsa</i> , <i>Melaleuca viridiflora</i> , <i>Brachychiton paradoxus</i>	
Ground	100%: <i>Eriachne triset</i> 83%: <i>Pandanus spiralis</i> 66%: <i>Buchanania obovata</i> , <i>Personia falcate</i> , <i>Planchonia careya</i> , <i>Eucalyptus miniata</i> , <i>E. tetradonta</i> 50%: <i>Eriachne schultzi</i> , <i>Pseudopogonatherum contortum</i> , <i>Spermacoce calliantha</i> , <i>Schizachyrium fragile</i> , <i>Goodenia holtzeana</i> , <i>Kailarsenia suffruticosa</i>		33%: <i>Arthrostylis aphylla</i> , <i>Acacia lamprocarpa</i> , <i>A. oncinocarpa</i> , <i>Chrysopogon latifolius</i> , <i>Setaria apiculata</i> , <i>Hibbertia cistifolia</i> , <i>Pouteria arnhemica</i> , <i>Waltheria indica</i>	
Other communities present			Approximate coverage across total land unit extent	
8a: <i>Eucalyptus tetradonta</i> , <i>E. miniata</i> , +/- <i>Erythrophleum chlorostachys</i> , +/- <i>Corymbia porrecta</i> mid woodland			10%	

Land Unit 8c

Eucalyptus tetradonta, *E. miniata* +/- *Erythrophleum chlorostachys*, *Corymbia porrecta* mid woodland on plains.

Eucalyptus tetradonta, *E. miniata* +/- *Erythrophleum chlorostachys*, *Corymbia porrecta* mid woodland. The tall sparse shrubland mid stratum is characterised by *Acacia oncinocarpa*, *A. mimula* and *A. lamprocarpa*. Common species in the mid open tussock grassland include *Eriachne trisetata*, *Heteropogon triticeus*, *Chrysopogon latifolius* and the forbs *Hibbertia cistifolia* and *H. juncea*.



Structural and Floristic Summary				
Number of sites: 2		Approximate coverage across total land unit area: 95%		Area: 691 ha
Strata	Growth form	Cover % (range)	Mean height m (range)	Basal area (m ² /ha)
Upper	Tree	26 (18-35)	18 (16-20)	11.5 (11-12)
Mid	Shrub	6 (5-7)	4	
Ground	Tussock Grass	48 (26-70)	0.6 (0.2-1)	
Frequency of Dominant Species				
Upper	100%: <i>Eucalyptus tetradonta</i> , <i>E. miniata</i> 50%: <i>Erythrophleum chlorostachys</i> , <i>Corymbia porrecta</i> , <i>Brachychiton diversifolius</i> , <i>Terminalia ferdinandeanana</i> , <i>Xanthostemon paradoxus</i>			
Mid	50%: <i>Acacia lamprocarpa</i> , <i>A. mimula</i> , <i>A. oncinocarpa</i> , <i>Alphitonia excelsa</i> , <i>Buchanania obovata</i> , <i>Croton arnhemicus</i> , <i>Gardenia megasperma</i> , <i>Personia falcata</i> , <i>Terminalia ferdinandeanana</i> , <i>Xanthostemon paradoxus</i>			
Ground	100%: <i>Buchanania obovata</i> , <i>Eucalyptus miniata</i> , <i>Erythrophleum chlorostachys</i> , <i>Planchonia careya</i> 50%: <i>Alloteropsis semialata</i> , <i>Pseudopogonatherum contortum</i> , <i>A. mimula</i> , <i>A. oncinocarpa</i> , <i>Alphitonia excelsa</i> , <i>Chrysopogon latifolius</i> , <i>Croton arnhemicus</i> , <i>Flemingia parviflora</i> , <i>Flemingia trifoliastrum</i> , <i>Hibbertia juncea</i> , <i>H. cistifolia</i> , <i>Heteropogon triticeus</i> , <i>Goodenia holtzeana</i> , <i>Kailarsenia suffruticosa</i> , <i>Pandanus spiralis</i> , <i>Petalostigma quadriloculare</i> , <i>Thaumastochloa major</i>			
Other communities present			Approximate coverage across total land unit extent	
8a: <i>Eucalyptus tetradonta</i> , <i>E. miniata</i> , +/- <i>Erythrophleum chlorostachys</i> , +/- <i>Corymbia porrecta</i> mid woodland			5%	

Land Unit 8c1

Mixed Eucalypt mid woodland to open woodland on plains.

Mixed species mid woodland to open woodland of *Eucalyptus tetradonta*, *E. miniata*, *Erythrophleum chlorostachys*, +/- *Corymbia porrecta* and *C. polysciada*. The low open woodland mid stratum is characterised by the species *Pandanus spiralis*, *Petalostigma pubescens*, *Acacia oncinocarpa* and *Syzygium eucalyptoides* subsp. *bleeseri*. The ground stratum is a low tussock grassland with characteristic grass species *Eriachne trisetata*, *Chrysopogon latifolius*, *C. fallax*, *Eriachne schultziiana* and *E. burkittii*. Forbs in the ground stratum include *Xyris complanata*, *Hibbertia Juncea*, *H. cistifolia* and *Arthrostylis aphylla*.



Structural and Floristic Summary				
Number of sites: 5		Approximate coverage across total land unit area: 95%		Area: 1 465 ha
Strata	Growth form	Cover % (range)	Mean height m (range)	Basal area (m ² /ha)
Upper	Tree	17 (2-40)	14 (12-18)	8.4 (4-16)
Mid	Palm (shrub)	9 (5-15)	3.1 (1.7-5)	
Ground	Tussock Grass	54 (10-84)	0.3 (0.1-0.6)	
Frequency of Dominant Species			Frequency of Other Species	
Upper	100%: <i>Eucalyptus tetradonta</i> , <i>Eucalyptus miniata</i> 50%: <i>Corymbia porrecta</i> , <i>Erythrophleum chlorostachys</i> , 40%: <i>Terminalia ferdinandean</i>		20%: <i>Acacia lamprocarpa</i> , <i>Personia falcata</i> , <i>Pouteria arnhemica</i> , <i>Terminalia grandiflora</i> , <i>T. carpentariae</i> , <i>T. grandifolia</i> , <i>Xanthostemon paradoxus</i> , <i>Brachychiton diversifolius</i>	
Mid	90%: <i>Pandanus spiralis</i> , <i>Petalostigma pubescens</i> , 50%: <i>Acacia lamprocarpa</i> , <i>A. dimidiata</i> 40%: <i>Acacia holosericea</i>		20%: <i>Acacia oncinocarpa</i> , <i>Buchanania obovate</i> , <i>Croton arnhemicus</i> , <i>Eucalyptus miniata</i> , <i>Livistona humilis</i> , <i>Melaleuca viridiflora</i> , <i>Planchonia careya</i> , <i>Syzygium eucalyptoides</i>	
Ground	90%: <i>Xyris complanata</i> , <i>Thaumastochloa major</i> 80%: <i>Chrysopogon latifolius</i> , <i>Pandanus spiralis</i> , <i>Arthrostylis aphylla</i> , <i>Buchanania obovata</i> , <i>Buchnera linearis</i> , <i>Erythrophleum chlorostachys</i> , <i>Petalostigma pubescens</i> , <i>Hibbertia juncea</i> , <i>Planchonia careya</i> 50%: <i>Eriachne schultziiana</i> , <i>Heteropogon triticeus</i> , <i>Lomandra tropica</i> , <i>Sorghum intrans</i> , <i>Flemingia parviflora</i> , <i>F. trifoliatrum</i> , <i>Gardenia megasperma</i> , <i>Goodenia holtzeanna</i> , <i>Spermocce calliantha</i> 40%: <i>Chrysopogon fallax</i> , <i>Eucalyptus miniata</i> , <i>E. tetradonta</i> , <i>Livistona humilis</i> , <i>Personia falcata</i> <i>Xyris complanata</i>		20%: <i>Acacia dimidiata</i> , <i>A. lamprocarpa</i> <i>Alloteropsis semialata</i> , <i>Croton arnhemicus</i> , <i>Aristida holathera</i> , <i>Eriachne burkitti</i> , <i>Ficus aculeata</i> , <i>Kailarsenia suffruticosa</i> , <i>Goodenia armstrongiana</i> , <i>Melaleuca viridiflora</i> , <i>M. nervosa</i> , <i>Setaria apiculata</i> , <i>Hibbertia cistifolia</i> , <i>Xanthostemon paradoxus</i> , <i>X. eucalyptoides</i>	
Other communities present			Approximate coverage across total land unit extent	
8a: <i>Eucalyptus tetradonta</i> , <i>E. miniata</i> , +/- <i>Erythrophleum chlorostachys</i> , +/- <i>Corymbia porrecta</i> mid woodland			5%	

Land Unit 9a

Open to closed tussock grassland/sedgeland on alluvial plains.

An open to closed *Eriachne burkitti* grassland / *Cyperus spp.* sedgeland with sparsely scattered *Pandanus spiralis*.



Structural and Floristic Summary				
Number of sites: 1		Approximate coverage across total land unit area: 90%		Area: 813 ha
Strata	Growth form	Cover % (range)	Mean height m (range)	Basal area (m ² /ha)
Upper	Tree	1	6	0 or rarely 1.5
Ground	Tussock Grass (Sedge)	90	0.7	
Frequency of Dominant Species				
Upper	0-10%: <i>Pandanus spiralis</i> 0-5%: <i>Lophostemon lactifluus</i> , <i>Grevillea pteridifolia</i> , <i>Melaleuca viridiflora</i> , <i>Verticordia cunninghamii</i> , <i>Eucalyptus alba</i>			
Ground	100%: <i>Eriachne burkitti</i> , <i>Fimbristylis densa</i> 20%: <i>Osbeckia australiana</i> , <i>Chrysopogon oliganthus</i> , <i>Xyris complanata</i> , <i>Ectrosia schultzei</i> , <i>Fimbristylis densa</i> , <i>Eriachne trisetata</i>			
Other communities present			Approximate coverage across total land unit extent	
Fringing communities				
7a1 comm2: <i>Grevillea pteridifolia</i> , <i>Xanthostemon eucalyptoides</i> mid woodland (mid open woodland)			5%	
9a1: <i>Melaleuca viridiflora</i> , <i>M. nervosa</i> , +/- <i>Asteromyrtous symphyocarpa</i> low open woodland			5%	

Land Unit 9a1

Melaleuca viridiflora, *M. nervosa*, +/- *Asteromyrtus symphyocarpa* low open woodland on sandy Alluvial Plains.

Melaleuca viridiflora, *M. nervosa*, +/- *Asteromyrtus symphyocarpa* low open woodland. Mid stratum absent or when present a low sparse open woodland of *Grevillea pteridifolia* and/or *Calytrix exstipulata*. The ground stratum is a mid open reedland/tussock grassland with species such as *Dapsilanthus spathaceus*, *Eriachne trisetata*, *E. burkittii*, *Cartonema parviflorum* and *Fimbristylis spp.* Generally found in the middle section of mapped area.



Structural and Floristic Summary				
Number of sites: 2		Approximate coverage across total land unit area: 95%		Area: 883 ha
Strata	Growth form	Cover % (range)	Mean height m (range)	Basal area (m ² /ha)
Upper	Tree	14 (8-20)	8 (6-9)	3.5 (1.75-5.25)
Mid	Tree	4 (0-8)	2	
Ground	Tussock Grass	48 (40-55)	0.5 (0.4-0.6)	
Frequency of Dominant Species				
Upper	100%: <i>Melaleuca viridiflora</i> , <i>M. nervosa</i> , <i>Acacia spp.</i> 50%: <i>Asteromyrtus symphyocarpa</i> , <i>Hakea arborescens</i>			
Mid	0-50%: <i>Pandanus spiralis</i> , <i>Calytrix exstipulata</i> , <i>Grevillea pteridifolia</i> , <i>Melaleuca viridiflora</i>			
Ground	90%: <i>Dapsilanthus spathaceus</i> , <i>Eriachne trisetata</i> , <i>Drosera petiolaris</i> , <i>Buchnera linearis</i> , <i>Fimbristylis macrantha</i> 50%: <i>Eriachne burkitti</i> , <i>E. schultzeana</i> , <i>Xyris complanata</i> , <i>Cartonema parviflorum</i> , <i>Spermococce calliantha</i> , <i>Xyris complanata</i>			
Other communities present			Approximate coverage across total land unit extent	
9a: Open to closed tussock grassland/sedgeland.			5%	

Land Unit 10a

Melaleuca viridifolia, +/- *M. cajuputi*, *Lophostemon lactifluus* mid woodland to open forest on open drainage lines. A variable unit species and structurally.

Variously a *Melaleuca viridifolia*, *M. cajuputi* +/- *Lophostemon lactifluus* mid woodland to open forest. Closed paperbark forest in some areas. The mid stratum is a low open woodland with *Pandanus spiralis*, *Xanthostemon eucalyptoides* and/or regeneration of overstorey species. The ground stratum is variously sparse tussock grassland and/or an open sedge land. Grass species include *Eriachne burkittii*, *E. trisetata*, *Chrysopogon oliganthus* and *Sacciolepis indica*. Sedge species include *Fimbristylis nutans*, *F. simplex* and *Scleria rugosa*.



Structural and Floristic Summary				
Number of sites: 3		Approximate coverage across total land unit area: 100%		Area: 1 526 ha
Strata	Growth form	Cover % (range)	Mean height m (range)	Basal area (m ² /ha)
Upper	Tree	36 (12-62)	18 (13-22)	30.8 (13.5-57)
Mid	Tree	15 (3-35)	5 (2-8)	
Ground	Tussock Grass (sedge)	33 (10-60)	0.5 (0.2-0.8)	
Frequency of Dominant Species			Frequency of Other Species	
Upper	67%: <i>Melaleuca viridiflora</i>		33%: <i>Melaleuca cajuputi</i> , <i>Lophostemon lactifluus</i> , <i>L. grandiflorus</i> , <i>Eucalyptus alba</i> , <i>Melicope elleryana</i> , <i>Corymbia polycarpa</i>	
Mid	67%: <i>Melaleuca viridiflora</i>		33%: <i>Pandanus spiralis</i> , <i>Lophostemon lactifluus</i> , <i>L. grandiflorus</i> , <i>Xanthostemon eucalyptoides</i> , <i>Terminalia ferdinandea</i> , <i>Eucalyptus alba</i>	
Ground	67%: <i>Eriachne trisetata</i> , <i>Fimbristylis simplex</i> , <i>Lindsaea ensifolia</i>		33%: <i>Eriachne burkitti</i> , <i>Chrysopogon oliganthus</i> , <i>Barringtonia acutangula</i> , <i>Fimbristylis nutans</i> , <i>Germainia truncatiglumis</i> , <i>Heteropogon contortus</i> , <i>Lycopodiella cernua</i> , <i>Pandanus spiralis</i> , <i>Panicum mindanaense</i> , <i>Sacciolepis indica</i> , <i>Scleria levis</i> , <i>S. rugosa</i>	

Land Unit 10b

Mixed species mid woodland to mid open woodland on drainage depressions.

Melaleuca nervosa, *Lophostemon lactiflorus* +/- *Eucalyptus alba*, *Asteromyrtus symphyocarpa* mid woodland to open woodland. There is often an emergent layer composed of similar species. The mid stratum is low open palmland/open woodland with characteristic species *Pandanus spiralis*, *Petastigma pubescens*, *Alstonia actinophylla* and regeneration of overstorey species. The ground stratum is a mid open tussock grassland to mid tussock grassland. Grass species include *Eriachne trisetata*, *Chrysopogon latifolius*, *Thaumastochloa major* and *Schizachyrium fragile*. Shrubs include *Planchonia careya*, *Pandanus spiralis* and regeneration of overstorey species. Herbs include *Cartonema spicatum*, *Spermococe calliantha*, *Xyris complanata* and *Lomandra tropica*.



Structural and Floristic Summary				
Number of sites: 3		Approximate coverage across total land unit area: 90 %		Area: 1 585 ha
Strata	Growth form	Cover % (range)	Mean height m (range)	Basal area (m ² /ha)
Upper 1	Tree	10 (1-15)	10.5 (9-12)	10.5 (9.5-11.5)
Upper 2	Tree	25	4.5 (4-5)	
Mid	Tree (palm)	15 (10-20)	2	
Ground	Tussock Grass	49 (5-72)	0.2 (0.1-0.3)	
Frequency of Dominant Species			Frequency of Other Species	
Upper 1	66%: <i>Erythrophleum chlorostachys</i>		33%: <i>Melaleuca nervosa</i> , <i>Asteromyrtus symphyocarpa</i> , <i>Alstonia actinophylla</i> , <i>Eucalyptus alba</i> , <i>Lophostemon grandiflorus</i> , <i>Pandanus spiralis</i>	
Upper 2	100%: <i>Lophostemon lactiflorus</i> 50%: <i>Melaleuca nervosa</i> , <i>Verticordia cunninghamii</i> , <i>Petalostigma pubescens</i>			
Mid	100%: <i>Pandanus spiralis</i> , <i>Melaleuca nervosa</i> 50%: <i>Lophostemon lactiflorus</i> , <i>Alstonia actinophylla</i> , <i>Personia falcata</i> , <i>Petalostigma pubescens</i> , <i>Calytrix exstipulata</i>			
Ground	66%: <i>Eriachne trisetata</i> , <i>Thaumastochloa major</i> , <i>Spermococe calliantha</i> , <i>Pandanus spiralis</i> , <i>Melaleuca nervosa</i>		33%: <i>Chrysopogon latifolius</i> , <i>Acacia dimidiata</i> , <i>Germainia truncatiglumis</i> , <i>Planchonia careya</i> , <i>Fimbristylis simplex</i> , <i>Cartonema spicatum</i> , <i>Osbeckia australiana</i> , <i>Utricularia involvens</i> , <i>Pseudopogonatherum contortum</i> , <i>Sowerbea alliacea</i> , <i>Xyris complanata</i> , <i>Schizachyrium fragile</i> , <i>oncinocarpa</i> , <i>Chrysopogon latifolius</i> , <i>Setaria apiculata</i> , <i>Hibbertia cistifolia</i> , <i>Pouteria arnhemica</i> , <i>Waltheria indica</i>	
Other communities present			Approximate coverage across total land unit extent	
8b1: <i>Eucalyptus tetrodonta</i> , <i>Erythrophleum chlorostachys</i> +/- <i>Eucalyptus miniata</i> , <i>Corymbia porrecta</i> mid woodland			10%	

Land Unit 10b1: Community 1

Mixed unit with four main communities:

Community 1: A mixed unit varying from *melaleuca*, *eucalyptus* woodlands, open woodlands to grassland and/or sedgeland in Drainage Systems. Within this community there are areas of open sedgeland/open grassland without any overstorey species and with similar ground species as listed below.

Mid woodland to low open woodland of *Melaleuca nervosa*, *M. viridiflora*, +/- *Corymbia confertiflora*, *C. foelscheana* and *Asteromyrtus symphyocarpa*. In some instances a second upper storey might be present composed of similar species to the overstorey. Common mid stratum species include *Verticordia cunninghamii* and *Grevillea pteridifolia*. The ground stratum is variable with tussock grasses *Eriachne trisetata*, *E. burkittii*, *Panicum mindanaense* and/or *Dapsilanthus spathaceus* open rushland and/or an open to closed sedgeland of *Fimbristylis macrantha*, *F. simulans* and *Tricostularia undulata*.



Structural and Floristic Summary				
Number of sites: 4		Approximate coverage across total land unit area: 45%		Area: 2 230 ha
Strata	Growth form	Cover % (range)	Mean height m (range)	Basal area (m ² /ha)
Upper 1	Tree	31.5 (2-42)	10.6 (8.5-13)	0-6.5 (3.5-13)
Upper 2	Tree	20	7	
Mid	Tree (shrub)	9.8 (2-15)	3.3 (1.7-5)	
Ground	Tussock Grass (shrub)	73 (66-84)	0.4 (0.1-0.6)	
Frequency of Dominant Species			Frequency of Other Species	
Upper 1	50%: <i>Melaleuca nervosa</i>		25%: <i>Corymbia bella</i> , <i>C. confertiflora</i> , <i>C. foelscheana</i> , <i>Erythrophleum chlorostachys</i> , <i>Terminalia grandifolia</i> .	
Upper 2	100%: <i>Melaleuca nervosa</i> , <i>M. viridiflora</i> , <i>Grevillea pteridifolia</i> , <i>Acacia latescens</i> , <i>Asteromyrtus symphyocarpa</i>			
Mid	50%: <i>Pandanus spiralis</i> , <i>Melaleuca viridiflora</i> , <i>Verticordia cunninghamii</i>		25%: <i>Melaleuca nervosa</i> , <i>Acacia dimidiata</i> , <i>Syzygium eucalyptoides</i>	
Ground	75%: <i>Eriachne trisetata</i> , <i>Cartonemum parviflorum</i> , <i>Xyris compalnata</i> , <i>Rhyncosphora spp.</i> <i>Ectrosia leporina</i> , 50%: <i>Drosera petiolaris</i> , <i>Panicum mindanaense</i> , <i>Stylidium tenerrium</i> , <i>Tricostularia undulata</i>		25%: <i>Eriachne burkitti</i> , <i>Fimbristylis macrantha</i> , <i>F. simulans</i> , <i>Lindernia sp. Hann River</i> , <i>Verticordia cunninghamii</i> , <i>Pandanus spiralis</i> , <i>Alloteropsis semialata</i> , <i>Dapsilanthus spathaceous</i> , <i>Lobelia douglasiana</i> , <i>Phyllanthus eutaxioides</i>	
Other communities present			Approximate coverage across total land unit extent	
8b1: <i>Eucalyptus tetradonta</i> , <i>Erythrophleum chlorostachys</i> +/- <i>Eucalyptus miniata</i> , <i>Corymbia porrecta</i> mid woodland			10%	

Land Unit 10b1: Community 2

Mixed unit with four main communities:

Community 2:

Open *Dapsilanthus spathaceus* rushland and/or *Germainia truncatiglumis* open tussock grassland with scattered sparse low open woodland of *Banksia dentata*, *Verticordia cunninghamii* +/- *Lophostemon grandiflorus*.



Structural and Floristic Summary				
Number of sites: 1		Approximate coverage across total land unit area: 30%		Area: 1 335 ha
Strata	Growth form	Cover % (range)	Mean height m (range)	Basal area (m ² /ha)
Upper	Tree	5	8	8.5
Mid	Tree	12	3.5	
Ground	Sedge	72	0.9	
Frequency of Dominant Species				
Upper	100%: <i>Banksia dentata</i> , <i>Grevillea pteridifolia</i> , <i>Lophostemon grandiflorus</i>			
Mid	100%: <i>Banksia dentata</i>			
Ground	100%: <i>Dapsilanthus spathaceus</i> , <i>Germainia truncatiglumis</i> , <i>Verticordia cunninghamii</i> , <i>Melaleuca nervosa</i> , <i>Grevillea pteridifolia</i> , <i>Eriocaulon fistulosum</i> , <i>Utricularia involvens</i> , <i>Drosera petiolaris</i> , <i>Sowerbea alliacea</i>			

Land Unit 10b1: Community 3

Mixed unit with four main communities:

Community 3:

Petalostigma pubescens low open woodland with scattered emergent *Eucalyptus tetradonta*, *Erythrophleum chlorostachys*+/-*Terminalia ferdinandean*.

Other mid stratum species includes *Livistona humilis* and *Acacia dimidiata*. The ground stratum is open tussock grassland, open forbland of *Eriachne triset*, *Schizachyrium fragile*, *Xyris complanta* and *Lomandra tropica* respectively.



Structural and Floristic Summary				
Number of sites: 1		Approximate coverage across total land unit area: 15%		Area: 668 ha
Strata	Growth form	Cover % (range)	Mean height m (range)	Basal area (m ² /ha)
Upper	Tree	3	14	5.5
Mid	Tree	25	6	
Ground	Tussock Grass (sedge)	10	0.8	
Frequency of Dominant Species				
Upper	100%: <i>Eucalyptus tetradonta</i> , <i>Erythrophleum chlorostachys</i>			
Mid	100%: <i>Petalostigma pubescens</i> , <i>Terminalia ferdinandean</i> , <i>Eucalyptus tetradonta</i> , <i>Livistona humilis</i> , <i>Personia falcata</i> , <i>Buchanania obovata</i>			
Ground	100%: <i>Eriachne triset</i> , <i>Xyris complanata</i> , <i>Panadanus spiralis</i> , <i>Lomandra tropica</i> , <i>Melaleuca nervosa</i> , <i>Pseudopogonatherum contortum</i> , <i>Arthrostylis aphylla</i>			

Land Unit 10b1: Community 4

Mixed unit with four main communities:

Community 4: as per 8b1

	Approximate coverage across total land unit extent
8b1: <i>Eucalyptus tetradonta</i> , <i>Erythrophleum chlorostachys</i> +/- <i>Eucalyptus miniata</i> , <i>Corymbia porrecta</i> mid woodland	10% (445 ha)

Land Unit 11a:

Mixed unit varying spatially, structurally and floristically. The vegetation in the billabongs and seasonal Swamps typically forms a series of concentric zones, reflecting changes in water depth and period of inundation, each reflecting different vegetation structural formations and species. Total area within map boundaries = 682 ha.

Community 1	Approximate coverage across total land unit extent % estimate only
Landward edge abutting dryland. A <i>Lophostemon lactifluus</i> +/- <i>Corymbia bella</i> , <i>Eucalyptus alba</i> open forest with a sparse low open woodland mid stratum of <i>Lophostemon</i> over tussock grassland and/or sedge land. Tussock grasses include <i>Eriachne trisetata</i> , <i>Sporobolus virginicus</i> and/or <i>Pseudoraphis spinescens</i> . Sedges include <i>Fimbristylis simplex</i> , <i>Fimbristylis nutans</i> and <i>Scleria rugosa</i> .	6-10%
Community 2	
Fringing open water regions or <i>Eleocharis spp.</i> reedlands between landward edge and water areas. <i>Melaleuca viridiflora</i> , <i>M.cajuputi</i> , +/- <i>M. leucadendra</i> , <i>Lophostemon lactifluus</i> mid open forest, mid woodland with/or without a low open woodland mid stratum with <i>Barringtonia acutangula</i> and/or regeneration of upper storey species. Ground stratum a tussock grassland of <i>Pseudoraphis spinescens</i> and <i>Eragrostis tenellula</i> or various sedge or herb species. Herb species include <i>Stylidium tenerrimum</i> , <i>Heliotropium indica</i> and <i>Sowerbea alliace</i> . Sedge species in <i>Fimbristylis simplex</i> and <i>Fimbristylis nutans</i> .	6-10%
Community 3	
Occupying a similar position to community 2. A mixture of grasses and sedges in open grassland areas without any overstorey trees. Species as for ground stratum of community 2.	6-10%
Community 4	
<i>Eleocharis spp.</i> tall closed/open reedland covering large areas of the centre of the swamps. No overstorey trees.	35-41%
Community 5	
Open water areas on margins of <i>Eleocharis</i> reedlands, or in the centre of the swamp, with aquatics including <i>Ludwigia adscendens</i> , <i>Najas</i> , <i>Ceratophyllum</i> , <i>Hydrilla</i> and water lilies <i>Nymphaea violacea</i> and <i>Nymphoides indica</i> .	35-41%

Structural Summary for wooded communities (1 and 2)				
Number of sites: 2		Approximate coverage across total land unit area: 15%		Area: 40-68 ha
Strata	Growth form	Cover % (range)	Mean height m (range)	Basal area (m ² /ha)
Upper	Tree	55 (45-65)	12 (11-13)	10.8 (0-14.5)
Mid	Tree	4 (2-5)	4.6 (3-6)	
Ground	Tussock Grass (sedge, reed)	52 (15-80)	0.2 (0.1-0.4)	

7. Land Evaluation

7.1 General land capability

Land capability assessment involves an evaluation of land unit characteristics that could influence the general use of the land (Napier & Hill 2012).

The five key land characteristics considered important for land evaluation in the survey area are;

- Slope;
- Rock outcrop;
- Soil depth;
- Soil drainage; and
- Acid sulfate soils;

For each of these five land characteristics, each land unit was assigned to a limitation class. Limitation classes are numbered one to four. Class four has the highest degree of limitation. The lower the limitation the more capable the land is to support a range of land uses.

7.1.1 Slope

Slope is a critical element that influences runoff and soil erosion. It reduces the productivity of agricultural land with rainfall driving the erosion process during the Wet season. The risk of soil loss from water erosion increases with slope, particularly in the survey area where rainfall intensities are high. Use of any land with a slope greater than 0.5% in the survey area could pose a threat to long term productivity of the land. Table 7.1 provides limitation classes for slope and Figure 7.1 displays an overview of the slope limitations for the survey area.

Table 7.1: Limitation classes according to slope

Limitation Class	Slope (%)	Slope Class	Land Units	Area (ha)
1	0-1%	Level	8a, 8b, 8b1, 9a, 9a1, 10a, 10b, 10b1, 11a	24 827
2	1-3%	Gentle	8c, 8c1	2 163
3	3-10%	Substantial	6a, 7a, 7a1	5 788
4	>10%	Excessive	5a	1 526

7.1.2 Rock outcrop

The presence of rock outcrop reduces the area and volume of soil and creates unfavourable conditions for agricultural practices and other land uses. Rock outcrop in the survey area was exposed on low hills and undulating rises, with small isolated patches on the lower slopes. There was no evidence of rock outcrop on the upland plains, lowland plains, drainage systems, and swamps. Table 7.2 provides the limitation classes for rock outcrop and Figure 7.2 displays an overview of the rock outcrop limitations for the survey area.

Table 7.2: Limitation classes according to rock outcrop

Limitation Class	Rock Outcrop	Rock Class	Land Units	Area (ha)
1	nil	None	7a1, 8a, 8b, 8b1, 8c, 8c1, 9a, 9a1, 10a, 10b, 10b1, 11a	27 062
2	0-2%	Negligible	5a, 6a, 7a	7 242
3	2-10%	Rocky	-	-
4	>10%	Abundant	-	-

7.1.3 Soil depth

Soil depth can restrict root penetration and the effective volume of soil that can be utilised by plants. Soil depth is a crucial element in most agricultural activities, and can play a key role in the determination of vegetation communities and species composition (Napier & Hill 2012). Table 7.3 provides the limitations for soil depth and Figure 7.3 displays an overview of the soil depth limitations for the survey area.

Table 7.3: Limitation classes according to soil depth

Limitation Class	Soil Depth	Soil Class	Land Units	Area (ha)
1	>1.5 m	Very Deep	8a, 8c1, 9a, 9a1, 10a, 10b, 11a	15 994
2	1.0-1.5 m	Deep	7a, 7a1, 8b, 8b1, 10b1	13 832
	0.5-1.0 m	Moderate	8c	695
3	0.25-0.5 m	Shallow	5a	1 526
4	<0.25 m	Very Shallow	6a	2 257

7.1.4 Soil drainage

Drainage is used to summarise local soil wetness conditions using the six classes defined by NCST (2009). These were adapted into four limitation classes used in this investigation (Table 7.6). The subsoil horizons within the survey area contained more clay than the topsoil horizons and hence were intrinsically less permeable than the topsoil. When rainfall rates exceed the permeability of the subsoil water will perch in the soil. This was evident in the poorly drained areas. Table 7.4 provides the limitations for soil drainage and Figure 7.4 displays an overview of the soil drainage limitations for the survey area.

Table 7.4: Limitation classes according to soil drainage

Limitation Class	Soil Drainage	Drainage Class	Land Units	Area (ha)
1	Rapid	No horizon is normally wet for more than several hours after water addition	-	-
	Well	Soil may remain wet for several days after water addition	5a, 6a, 7a, 8a, 8b, 8b1, 8c	22 779
2	Moderate	Soil remains wet for up to a week after water addition	-	-
3	Imperfect	Soil saturation for several weeks after water	7a1, 8c1	1 540

Limitation Class	Soil Drainage	Drainage Class	Land Units	Area (ha)
		addition		
4	Poor	Ponding and soil saturation for several months after	9a1, 10b, 10b1	6 923
	Very Poor	Water table remains at or near the surface for most of the year	9a, 10a, 11a	3 062

7.1.5 Acid Sulfate Soils

Acid sulfate soils (ASS) in the Top End are largely restricted to intertidal environments and coastal plains where elevation is less than 5m Australian Height Datum (AHD). When disturbed the soils can become highly acidic and can release significant acidity and heavy metals into the environment. Acid sulfate soils in the survey area have been mapped as a low probability of occurrence for alluvial plains, drainage systems and the wetter inland swamps. Although these areas generally indicate signs of ASS no further investigation was recorded. There was no evidence of ASS on upland plains, or the lower slopes. Table 7.5 provides the limitation classes for acid sulfate soils and Figure 7.5 displays an overview of the acid sulfate soil limitations for the survey area.

Table 7.5: Limitation classes according to acid sulfate soils

Limitation Class	Land Units	Area (ha)
Not Present	5a, 6a, 7a, 7a1, 8a, 8b, 8b1, 8c, 8c1, 10b, 10b1	31 242
Probable	9a, 10a, 11a (further investigation required)	3 062

7.1.6 Overall land capability

A final limitation class was assigned to each land unit by selecting the highest limitation class that had been assigned to it in any of the five land characteristics considered above; these are listed in Table 7.6. This translates into an overall land capability class where class 1 has the highest degree of capability and class 4 has the lowest capability for a range of land uses.

Table 7.6: General land capability of each land unit

Land Unit	Slope	Rock Outcrop	Soil Depth	Soil Drainage	Acid Sulfate Soils*	Land Capability Class
5a	4	2	3	1	Not present	4
6a	3	2	4	1	Not present	4
7a	3	2	2	1	Not present	3
7a1	3	1	2	3	Not present	3
8a	1	1	1	1	Not present	1

Land Unit	Slope	Rock Outcrop	Soil Depth	Soil Drainage	Acid Sulfate Soils*	Land Capability Class
8b	1	1	2	1	Not present	2
8b1	1	1	2	1	Not present	2
8c	2	1	2	1	Not present	2
8c1	2	1	1	3	Not present	3
9a	1	1	1	4	Probable	4
9a1	1	1	1	4	Not present	4
10a	1	1	1	4	Probable	4
10b	1	1	1	4	Not present	4
10b1	1	1	2	4	Not present	4
11a	1	1	1	4	Probable	4

* ASS's has been mapped as a low probability of occurrence. Further investigation is required for land units 9a, 10a and 11a.

Table 7.7 has been modified from FAO (1976 in Van Gool *et al.* 2008) and provides a description of the four land capability classes and the total area of land in each class. General land capability classes have been mapped in Figure 7.6.

Table 7.7: General land capability class description

Land Capability Class	Land Capability	Description	Land Units	Area (ha)
1	High	Land with minimal limitations. Highly productive requiring only low management practices. (Slope 0-1%; rock outcrop nil; soil depth >1.5 m; soil drainage rapid to well; erosion risk low)	8a	8 994
2	Moderate	Land with only moderate limitations. Will require minor management practices. (Slope 1-3%; and/or rock outcrop 0-2%; and/or soil depth 0.5-1.5 m; and/or soil drainage moderate; and/or erosion risk minor)	8b, 8b1, 8c	6 543
3	Marginal	Land having severe limitations. Will require major management practices. (Slope 3-10%; and/or rock outcrop 2-10%; and/or soil depth 0.25-0.5 m; and/or soil drainage imperfect; and/or erosion risk high)	7a, 7a1, 8c1	4 999

Land Capability Class	Land Capability	Description	Land Units	Area (ha)
4	Not Suitable	Land not suitable for agriculture, having extreme limitations. This includes erosion risk due to steep slopes, soil depth, rocky outcrops, and poor drainage. (Slope >10%; and/or rock outcrop >10%; and/or soil depth <0.25 m; and/or soil drainage poor to very poor; and/or erosion risk very high)	5a, 6a, 9a, 9a1,10a,10b, 10b1, 11a	13 768

The survey area has identified all four agricultural land capability classes. Land mapped as Class 1 (Land unit 8a) covering 8 994 ha of the survey area, is considered highly suitable for agricultural production and requires only low management practices. Class 2 land is moderately suitable and will require minor management practices. Class 3 (marginally suitable) is not considered suitable for agricultural production because high rainfall in the region combined with substantial long slopes presents a high risk of erosion.

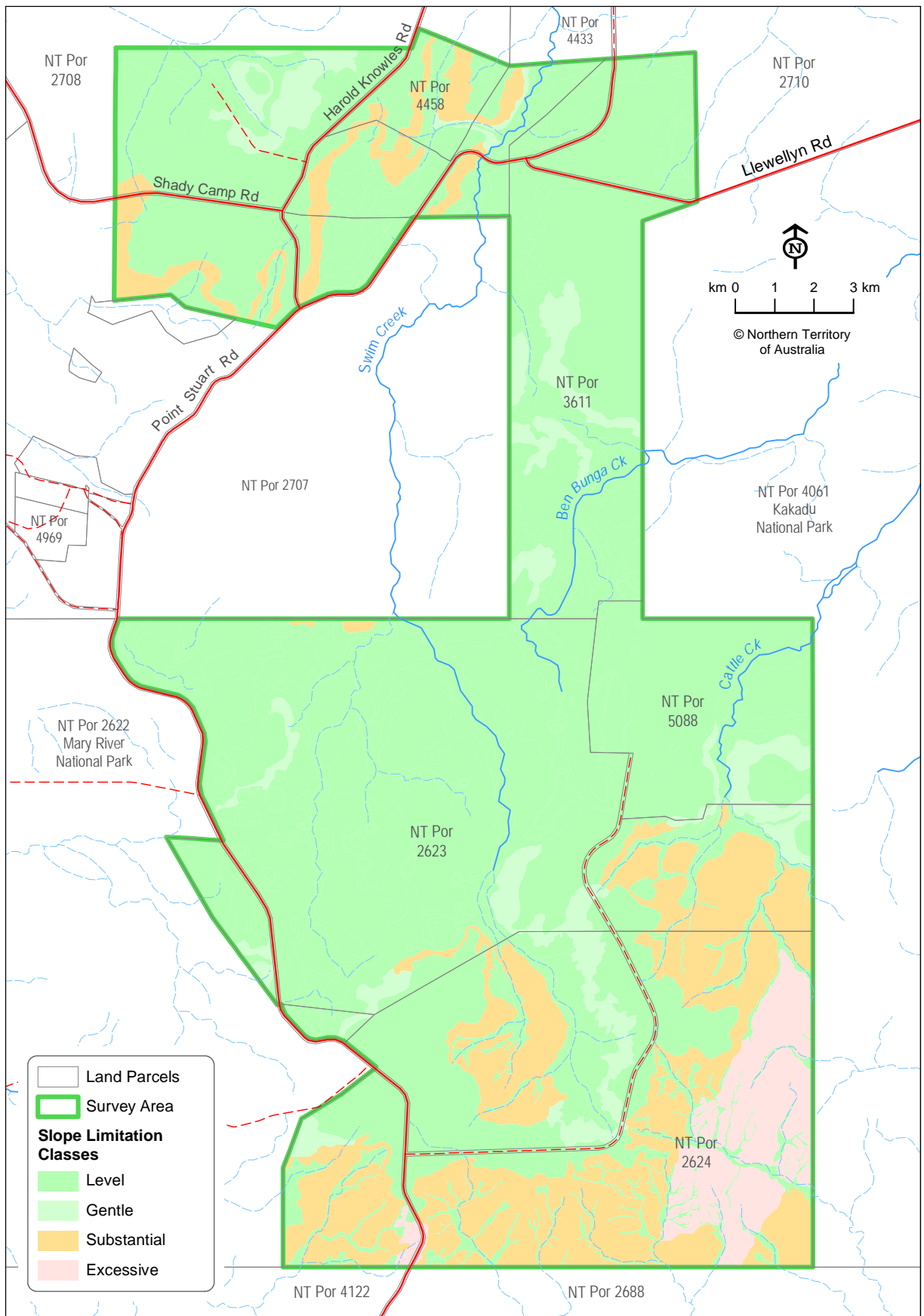


Figure 7.1: Slope classes

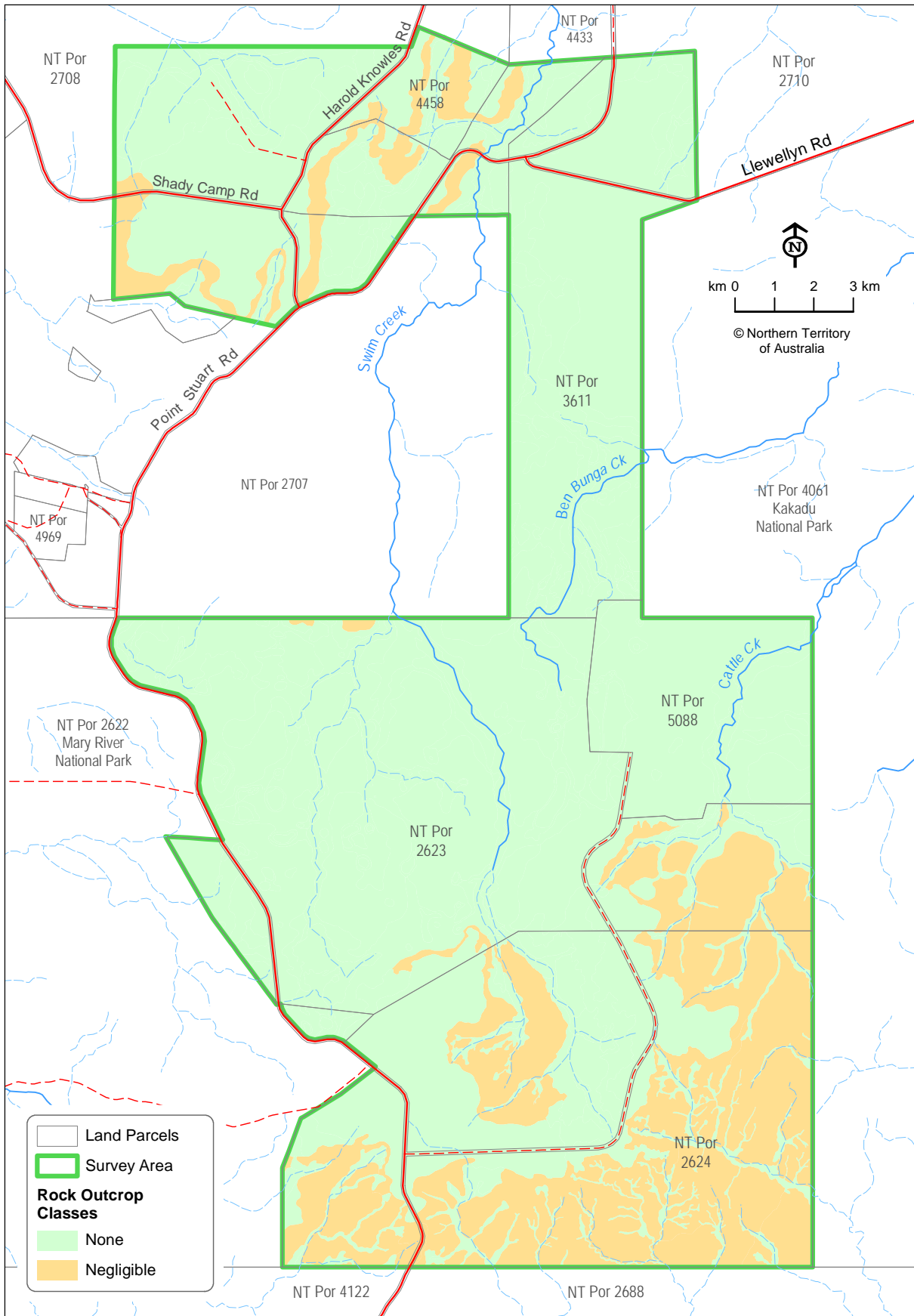


Figure 7.2: Rock outcrop classes

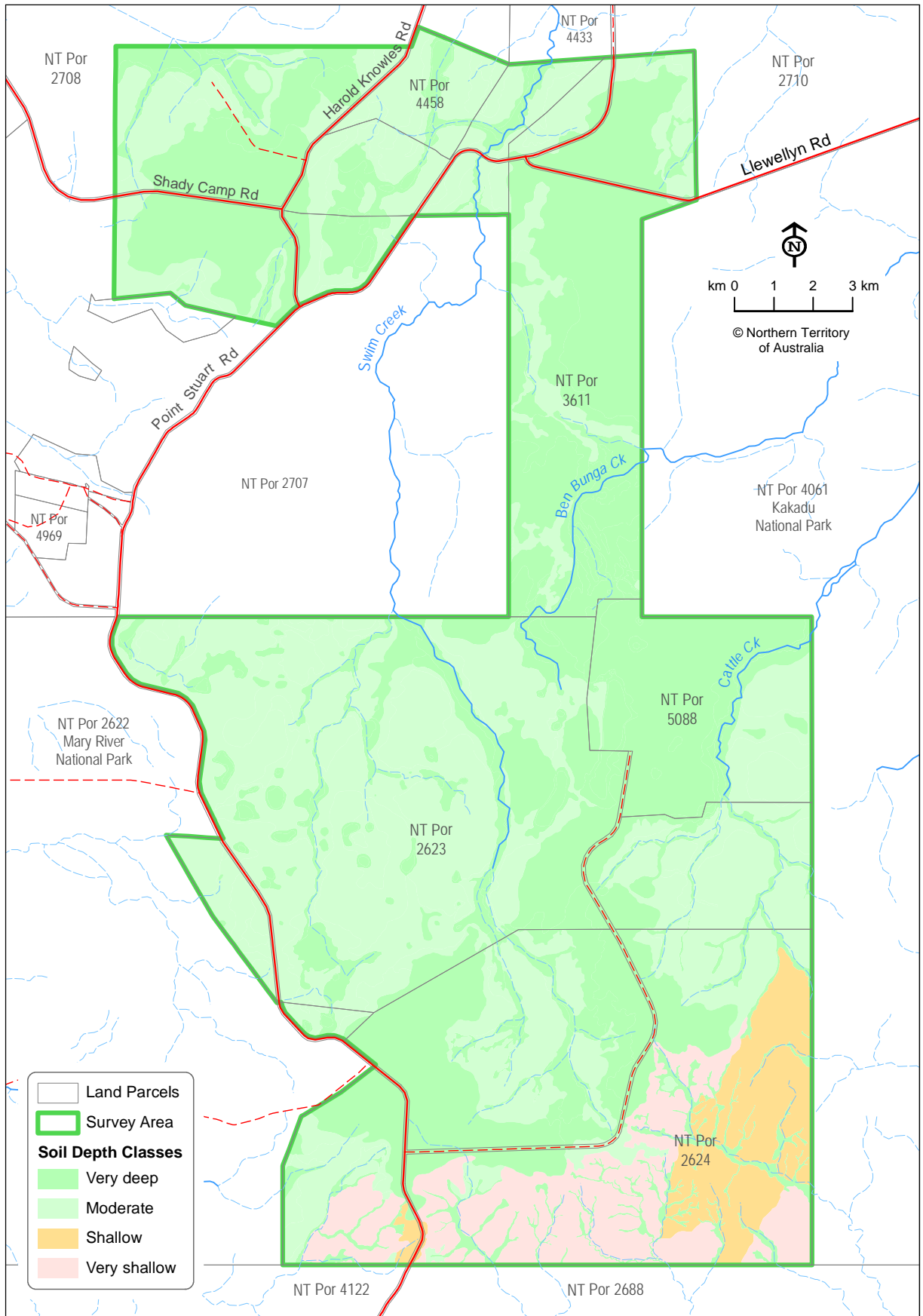


Figure 7.3: Soil depth classes

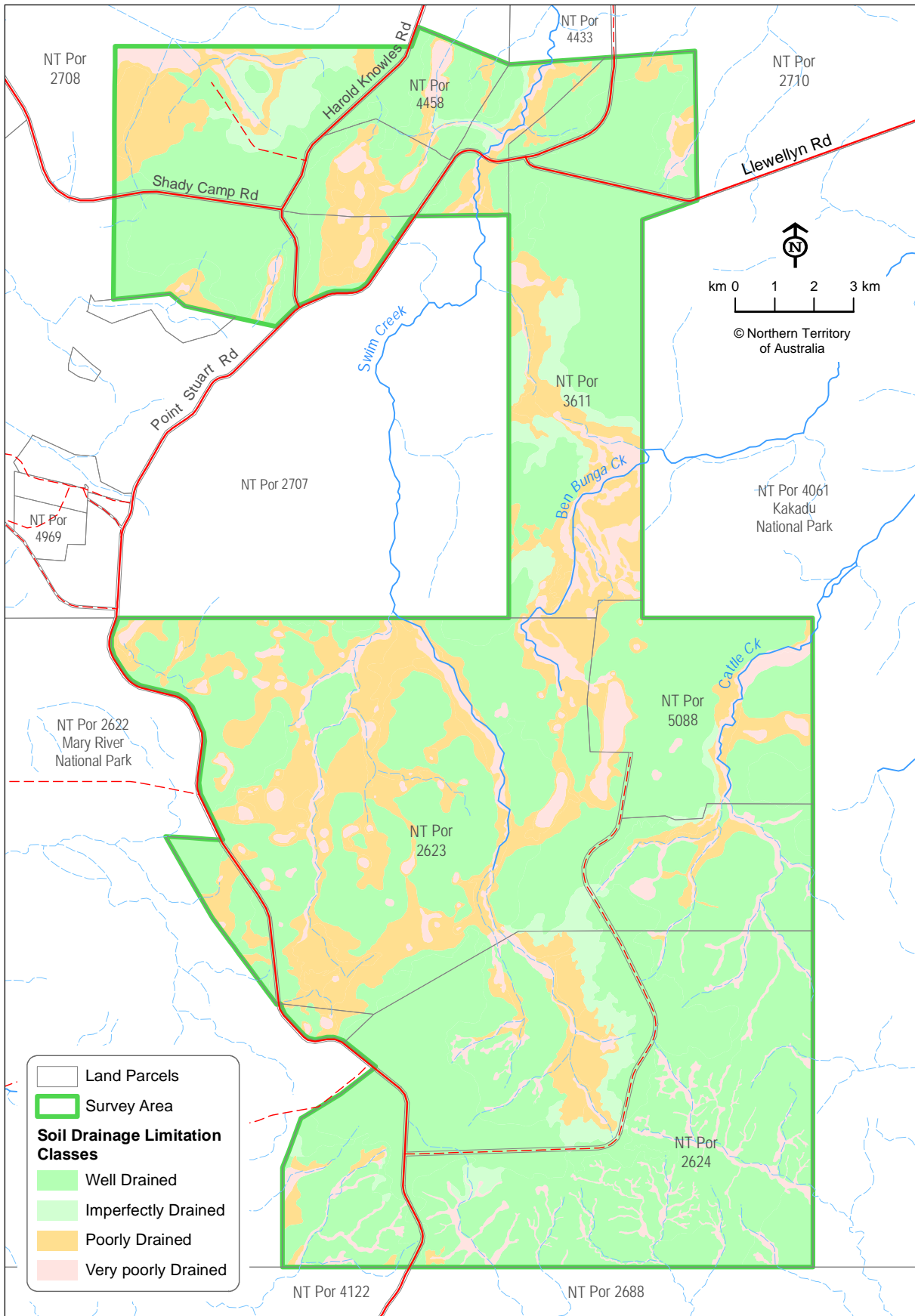


Figure 7.4: Soil drainage classes

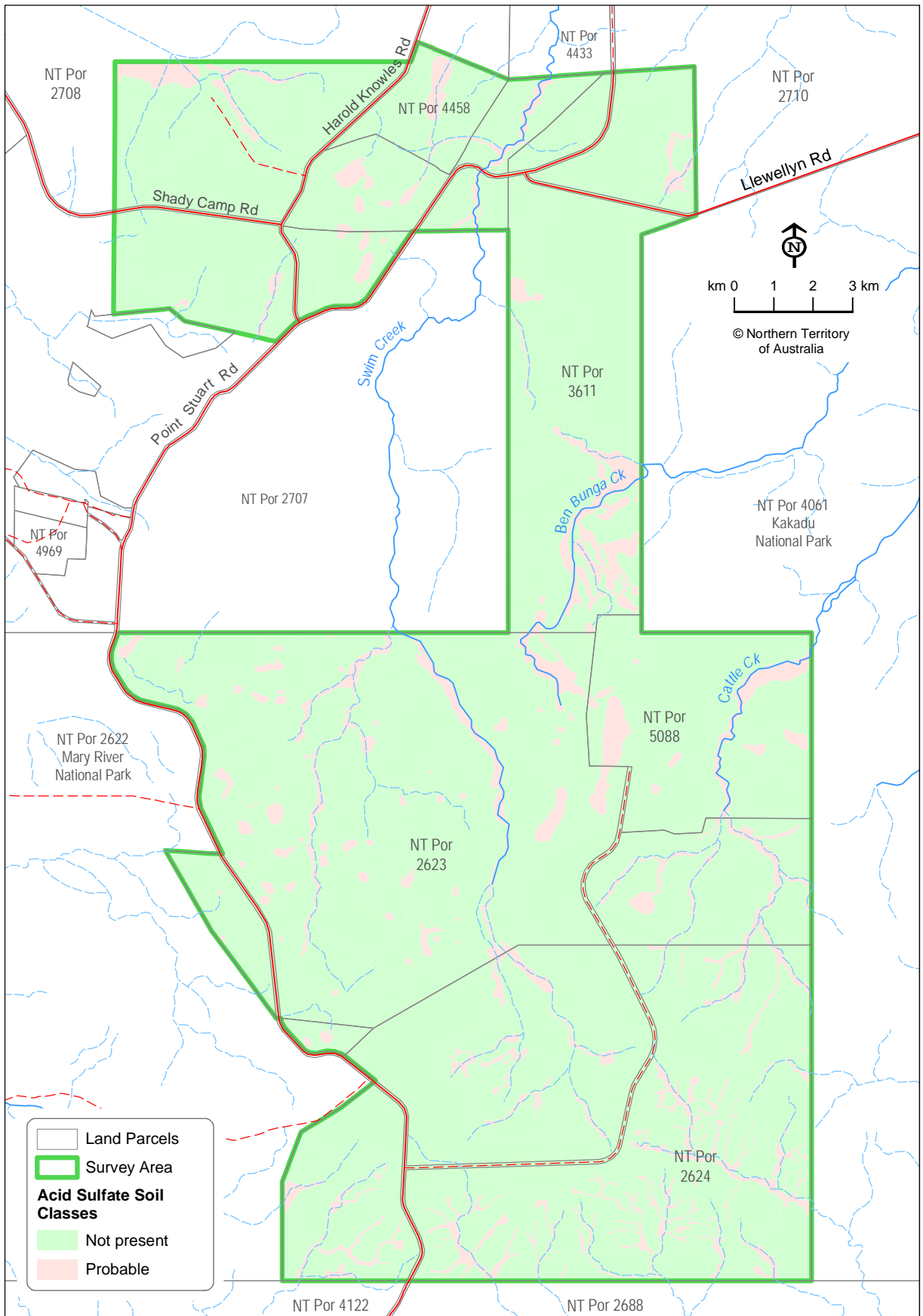


Figure 7.5: Acid sulfate soil classes

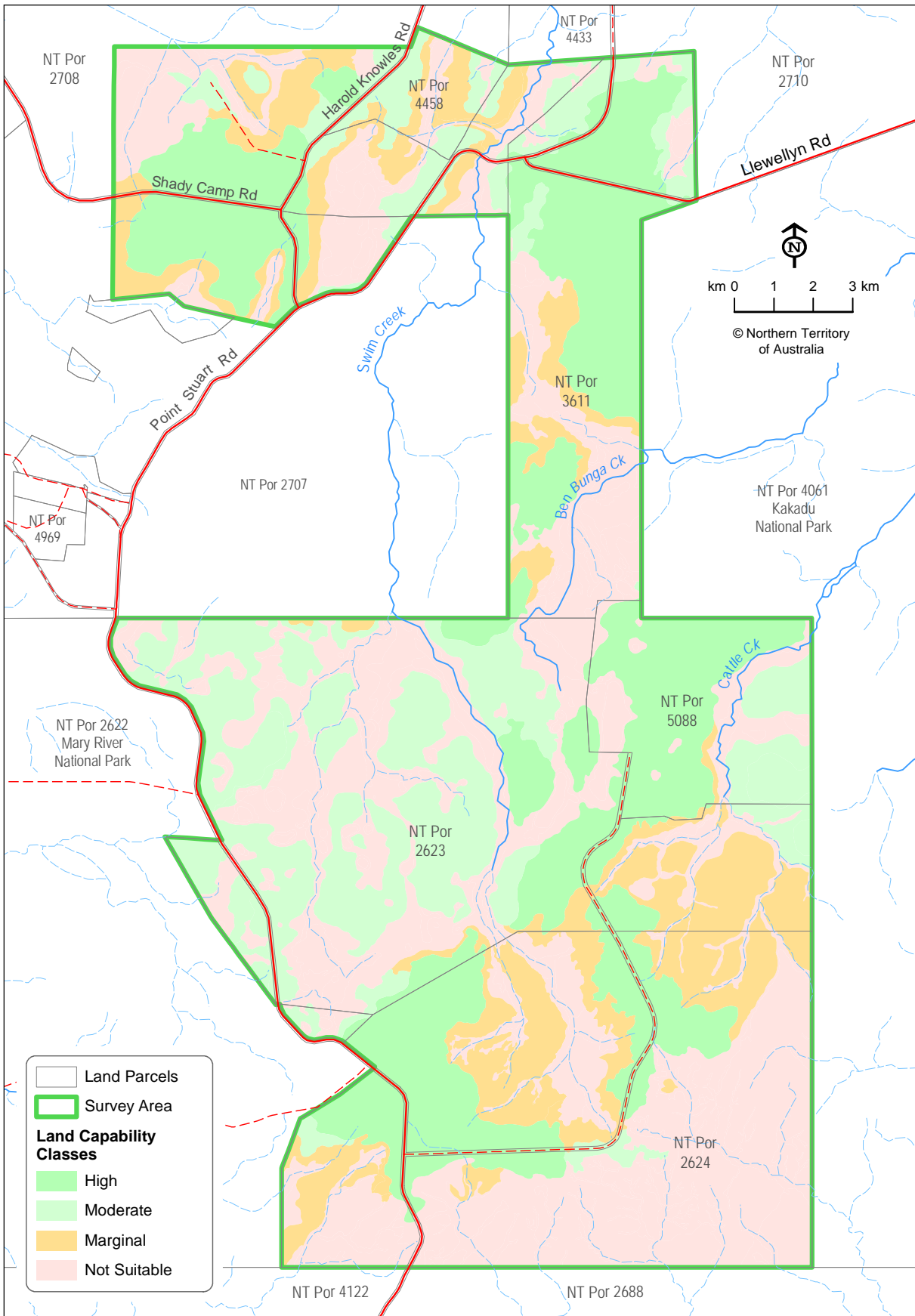


Figure 7.6: General land capability classes

7.2 Land suitability for irrigated agriculture

Land suitable for irrigated agriculture within the Wildman River survey area has been identified following assessment against the land evaluation limitations. The '*Darwin-Tiwi Islands Land Suitability Framework*' (Version 1, 2016) has been developed in consultation with representatives from the Department of Primary Industries and Fisheries (DPIF) and NT Farmers Association.

7.2.1 Land suitability methodology

Land suitability assessment involves an evaluation of the land units according to their potential suitability for a range of specific uses. This investigation used a standard five class land suitability scheme (DNRM/DSITIA 2013) based on a common set of attributes and limitations, but with separate decision rules defined for each potential land use. Table 7.8 summarises these land suitability classes.

Table 7.8: Land suitability classes as defined by DNRM/DSITIA (2013).

Class	Description
1	Suitable land with negligible limitations. This is highly productive land requiring only simple management practices to maintain sustainable production.
2	Suitable land with minor limitations which either physically reduce or constrain production; or require more than the simple management practices of Class 1 land to maintain sustainable production.
3	Suitable land with moderate limitations which either further constrain production or require more than the management practices of Class 2 land to maintain sustainable production.
4	Marginal land that is currently unsuitable due to severe limitations that preclude the sustainable economic use of the land in the manner proposed. The limitations may (or may not) be surmountable over time with changes to knowledge, economics or technology potentially leading to changes in the future suitability class for this category.
5	Unsuitable land with extreme limitations that preclude any possibility of successful, sustainable use of the land in the manner proposed.

7.2.2 Potential irrigated agricultural crops

For the purposes of this investigation, the potential land uses for the survey area are considered to be the irrigated agricultural crops listed in Table 7.9. These have been summarised into groups according to similarities in crop requirements and agronomic management.

Table 7.9: Potential irrigated agricultural crops for the survey area

Irrigated group	Group	Individual crops assessed
Tree crops	1	Monsoonal Tropical – Mango, Cashew, Jackfruit, Tamarind, Coconut, Dragonfruit, Bamboo, Billy Goat plum, Morinda citrifolia
	2	Rainforest Tropical and Sub-Tropical – Rambutan, Durian, Longan, Carambola, Avocado, Sapote, Soursop, etc.
	3	Tropical Citrus – Lime, Lemon, Mandarin, Pommelo, Lemonade, Grapefruit
	4	Fruit row crops – Banana, Papaya, Pineapple, Passionfruit
Row crops	5	Cucurbits – Watermelon, Honeydew melon, Rockmelon, Pumpkin, Cucumber, Asian melons, Zucchini, Squash
	6	Fruiting vegetable crops – Solanaceae (Capsicum, Chilli, Eggplant, Tomato), Okra, Snake bean, Drumstick tree
	7	Leafy vegetables and herbs – Kangkong, Amaranth, Lettuce,

Irrigated group	Group	Individual crops assessed
		Chinese cabbage, Bok Choy, Pak Choy, Choy Sum, Spring onions, Basil, Coriander, Dill, Mint, Spearmint, Chives, Oregano, Lemon grass
Root crops	8	Carrot, Onion, Sweet potato, Shallots, Ginger, Turmeric, Galangal, Yam bean, Taro
Forestry	9	Sandalwood
	10	Irrigated flower crops – Cucurma, Heliconia, Etlingera, Globba, Alpinia, Zingibar

7.2.3 Land suitability assessment

Each land unit was assessed for crop group suitability according to a range of criteria summarised in Table 7.10. Effective rooting depth (ERD) and soil water storage (SWS) calculations are provided in Appendix D and land use attribute values explained in Appendix E. The final suitability of each land unit for each crop group is provided in Appendix F and summarised in Table 7.11, where the highest limitation class in any of the criteria is applied. A summary of the extent of land in each land suitability class for irrigated agricultural crop groups in the survey area is presented in Table 7.12.

Table 7.10: Assessment criteria for land suitability

Land use requirements	Limitations	Soil and landscape attributes used to assess each limitation
Section 1 – Landscape limitations		
Minimal soil loss from water erosion	E Water erosion	Slope – % slope and slope length; inherent soil erodibility (RUSLE ‘K factor’); slope/soil type stability groups; quantity, intensity, distribution and frequency of erosive rainfall; soil surface condition; infiltration
Minimal impact from damaging floods	F Flooding	Average Recurrence Interval (ARI); period of inundation; landform, proximity to stream/watercourse; rainfall intensity/duration; depth and velocity of erosive flood flows
Sufficient soil drainage to avoid seasonal/permanent waterlogging and ensure adequate soil aeration	W Wetness	Site drainage and profile permeability classes (or measurement); depth and degree of soil mottling and segregations; soil colour, texture and structure; profile salinity; vegetation characteristics; period of water saturation; soil structure and texture
Predictable soil distribution to provide uniform production areas with managerially similar soils	Xs Soil complexity	Level of soil landscape complexity (\pm topographic dissection), degree of soil variability; size and shape of mapped soil units and intensity of fragmentation
Section 2 – Soil profile limitations		
Soil infiltration characteristics that promote timely and efficient overhead irrigation (pivots, laterals) (does not apply to micro or trickle irrigation)	Ir Infiltration/recharge	Infiltration and permeability rates; soil surface condition, surface horizon thickness, texture and structure; depth to impermeable subsoils
Adequate water storage in the soil profile to maintain optimal plant growth (affects only frequency of irrigation scheduling)	M Soil water availability	Plant available water capacity (PAWC); soil profile texture; soil structure; depth to physical and chemical barriers of root growth; effective rooting depth (ERD)

Land use requirements	Limitations	Soil and landscape attributes used to assess each limitation
Adequate soil depth for physical plant support	Pd Soil depth	Depth to C/R horizon, hardpan, continuous gravel layer or other impenetrable features; depth to high salinity levels (>0.8dS/m), very low pH (<4.0) or strong sodicity are not relevant to the Top End of the NT
Minimal impact from gravel, stone or rock outcrop	R Rockiness	Size (mm) and abundance (%) of surface coarse fragments; abundance of rock outcrop (%)
Section 3 – Soil physical limitations		
Ability to harvest underground crops	Pa Soil adhesiveness	Surface soil texture, structure and consistence; particle size distribution (dominance of coarse sand, fine sand, silt and clay); clay mineralogy (surface soil to 0.3 m)
Soil profile characteristics that limit deep drainage and promote efficient overhead irrigation (pivots, laterals) (does not apply to micro or trickle irrigation)	Pp Excessive permeability	Infiltration and permeability rates; soil surface condition, surface horizon thickness, texture and structure; depth to impermeable subsoils
Ease of seedbed preparation and lack of germination restrictions with overhead irrigation (pivots, laterals) (does not apply to micro or trickle irrigation)	Ps Soil surface condition	Surface condition; surface soil structure, texture and consistence; ESP of surface soil (and plough zone if relevant)
Section 4 – Soil nutrient limitations		
Adequate capacity to retain nutrients against leaching with deep drainage	Nd Nutrient deficiency	Nutrient levels, texture, cation exchange capacity (CEC) in the surface soil (N, P, K, cations, micronutrients)

Table 7.11: Land suitability classes for irrigated agricultural cropping within the survey area

Land unit	Irrigated group									
	Tree Crops				Row Crops			Root Crops	Forestry	
	Group									
	1	2	3	4	5	6	7	8	9	10
5a	5	5	5	5	5	5	5	5	tba	5
6a	5	5	5	5	5	5	5	5	tba	5
7a	4	5	4	5	5	5	5	5	tba	5
7a1	5	5	5	5	5	5	5	5	tba	5
8a	2	2	1	2	1	1	1	2	tba	2
8b	4	5	4	5	3	4	5	3	tba	5
8b1	4	5	4	5	3	4	5	3	tba	5
8c	3	3	3	5	5	5	5	5	tba	5
8c1	3	3	3	5	5	5	5	5	tba	5
9a	5	5	5	5	5	5	5	5	tba	5
9a1	5	5	5	5	5	5	5	5	tba	5
10a	5	5	5	5	5	5	5	5	tba	5
10b	5	5	5	5	5	5	5	5	tba	5
10b1	5	5	5	5	5	5	5	5	tba	5
11a	5	5	5	5	5	5	5	5	tba	5

Note 1: Cells have been highlighted to indicate land suitable for irrigated agricultural cropping within the survey area (refer to Table 7.8 of this report for land suitability class descriptions).

Note 2: Refer to Table 7.9 of this report for potential individual crops within the survey area.

Note 3: Refer to Appendix E for constraining limitation classes and Appendix F for each land unit suitability classification within the survey area.

Table 7.12: Summary of the extent (ha) of land in each land suitability class for irrigated agricultural crop groups within the survey area

Land Suitability Class	Irrigated group									
	Tree Crops				Row Crops			Root Crops	Forestry	
	Group									
	1	2	3	4	5	6	7	8	9	10
Class 1	0	0	8 994	0	8 994	8 994	8 994	0	tba	0
Class 2	8 994	8 994	0	8 994	0	0	0	8 994	tba	8 994
Class 3	2 163	2 163	2 163	0	5 848	0	0	5 848	tba	0
Class 4	9 307	23 147	9 307	0	0	5 848	0	0	tba	0
Class 5	13 840	0	13 840	25 310	19 461	19 461	25 310	19 461	tba	25 310

Note 1: Refer to Table 7.8 of this report for land suitability class descriptions.

Note 2: Refer to Table 7.9 of this report for potential individual crops within the survey area.

8. Management Considerations

A number of issues should be taken into account in the management of the area featured in this investigation. Table 8.1 outlines the major issues in the survey area.

Table 8.1: Land management considerations for the survey area

Issue	More information
Erosion	A 2011 Department of Resources (now Department of Primary Industries and Fisheries) report on sustainable agriculture in the NT identified soil loss by erosion to be a major threat (Smith and Hill, 2011). Soil erosion can disrupt the progress of development works, create additional land management costs, damage cropping lands and infrastructure and cause sediment discharge to waterways and wetlands. Additionally, sheet erosion can remove the most biologically active and fertile portion of the soil, and cause reduced crop productivity, failed revegetation and affect the productive value of the land.
Acid Sulfate Soils	Acid sulfate soils (ASS) in the Top End are largely restricted to intertidal environments and coastal plains where elevation is less than 5 m Australian Height Datum (AHD) and drainage is very poor (Hill & Edmeades, 2008). When disturbed the soils become highly acidic and can release significant acidity and heavy metals into the environment.
Saline Intrusion	Intrusion of saltwater through tidal-creek extension into the freshwater meadows and billabongs of low-lying floodplains has been identified as a major coastal management problem (Bayliss et al.1995). These areas may be lost through localised sea-level rise destroying the associated vegetation and causing dieback of large areas.
Nutrient Deficiency	Sandy soils can develop nutrient deficiency due to loss by leaching. Exchangeable cations (Na, Ca, Mg, K) are held in the soil by negatively charged surfaces and the total amount that can be held is designated by the cation exchange capacity (CEC). Soils with CEC <3cmol/kg are often low in fertility and susceptible to soil acidification (P. Hazelton, B. Murphy, 2007).
Significant Vegetation	Significant vegetation communities are best described as having high diversity values by containing flora or a suite of species that have conservation significance as identified by <i>The International Union for the Conservation of Nature</i> (IUCN), or support large populations of wildlife, have important wetland values, concentrations of threatened or endemic species or are considered botanical hot spots (Ward and Harrison 2009; Environment Australia DIWA 2001).

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Appendix A Sampling depths and analytical methodologies

Sampling depths and analytical methodologies used in the investigation.

1. Profile analyses		
Sample depths (m) – 0-0.1, 0.1-0.2, 0.2-0.3, 0.5-0.6, 0.8-0.9, 1.1-1.2, 1.4-1.5	Method ¹	Moisture Status
Analyses		
Particle size analysis (coarse sand, fine sand, silt, clay (%))	2Z2	Oven dry @ 105°C
Total Organic Carbon- DUMAS Combustion (%)	6B2	Air dry @ 40°C
Air dry moisture content (ADMC)	2A1	Oven dry @ 105°C
Exchangeable cations pH 8.5 (Ca, Mg, Na, K, cmol/kg)	15C1	Oven dry @ 40°C
ECEC	15J1	Oven dry @ 40°C
Exchangeable acidity (Al, H cmol/kg)	15G1	Oven dry @ 40°C
Exchangeable Sodium percentage (ESP)	15N1	NA
Ca/Mg ratio	15M1	NA
15 bar moisture retention (pressure plate/gravimetric)	-	Oven dry @ 40°C
Dispersion ratio (R1)	2Z1	Oven dry @ 40°C
2. pH and salinity analyses		
Sample depths (m) – 0-0.1, 0.1-0.2, 0.2-0.3, 0.5-0.6, 0.8-0.9, 1.1-1.2, 1.4-1.5	Method ¹	Moisture Status
Analyses		
Soil pH _{1:5}	4A1	Oven dry @ 40°C
Electrical conductivity (EC _{1:5} dS/m)	3A1	Oven dry @ 40°C
Soluble Chloride (Cl mg/kg)	5A2	Oven dry @ 40°C
Nitrate Nitrogen (NO ₃ -N mg/kg)	7B1	Oven dry @ 40°C
3. pH and salinity analyses		
Sample depths (m) – selected to represent mid-horizon depths	Method	Moisture Status
Analyses		
Soil pH _{1:5}	field test	NA
Electrical conductivity (EC _{1:5} dS/m)	field test	NA
4. Surface soil fertility analyses		
Sample depths (m) – 0-0.1	Method ¹	Moisture Status
Analyses		
Kjedahl Nitrogen (%)	7A2	Air dry @ 40°C
Available Phosphorous-Bicarb (Colwell)(mg/kg)	9B2	Oven dry @ 40°C
Available Phosphorous-Acid (mg/kg)	9G2	Oven dry @ 40°C
Ammonium chloride – (pH 7.0) Extractable Potassium (cmol/kg)	15A1	Oven dry @ 40°C
Calcium dihydrogen phosphate (pH 4.0) Extractable Sulfur (mg/kg)	10B3	Oven dry @ 40°C
Trace elements extractable (Cu, Fe, Mn, Zn) 0.005M DTPA ICPOES (mg/kg)	12A1	Oven dry @ 40°C

¹Note 1: Method codes from Rayment and Lyons (2011).

Analyses testing undertaken by the Chemistry Centre, Queensland Department of Science, Information, Technology and Innovation, Ecosciences Precinct, Dutton Park, Brisbane, Queensland.

Appendix B Soil profile descriptions and analytical data for representative sites

The following pages provide full soil descriptions for one representative site in each land unit.

Land Unit 5a

Low Hills

Representative site: 108

Australian Soil Classification: Acidic Lithic Leptic Rudosol

Depth (m)	Horizon	Description
Surface	-	Firm; dry; 60-80% angular platy and angular ironstone and siltstone fragments.
0-0.09	A11	Very dark grey (7.5YR 3/1); sandy loam; massive; earthy; dry; loose; 70% angular ironstone and siltstone fragments; 0% mottles; field pH 5.4-5.5.
0.09-0.25	A12	Brown (7.5YR 4/3); clay loam; massive; earthy; dry; loose; 70% angular platy ironstone and siltstone fragments; 0% mottles; field pH 5.0-5.2.
0.25-0.45	C	Reddish brown (5YR 4/4); clay loam; massive; earthy; dry; loose; 55% sub-angular ironstone and siltstone fragments; 0% mottles; field pH 5.0-5.3.



Site Location: MGA94 Zone 52 808004mE 8588376mN

Physical Properties

Depth (m)	Coarse Sand	Fine Sand	Silt	Clay
	200-2000 (um) %	20-200 (um) %	>2-<20 (um) %	<2 (um) %
0-0.09	35.4	28.8	20.2	19.0
0.10-0.20	26.6	32.5	23.3	22.2
0.25-0.30	23.1	33.4	19.8	29.0
0.30-0.40	23.0	25.2	26.6	30.7

Chemical Properties

Depth (m)	Total. N (%)	Available P		Ext. K (Cmol/kg)	Sulfate S (mg/kg)	Extractable Micronutrients			
		Bicarb P (mg/kg)	Acid P (mg/kg)			Cu (mg/kg)	Zn (mg/kg)	Mn (mg/kg)	Fe (mg/kg)
0-0.09	7A2 (0.279)	9B2 (14.0)	9G2 (20.0)	15A1_K (0.41)	10B3 (10.0)	12A1_Cu (0.5)	12A1_Zn (1.0)	12A1_Mn (126.0)	12A1_Fe (99.4)

Description: Undulating low hills with relief to 50m. Soils are shallow, well drained, very gravelly, strongly acidic, brown, massive earths, overlying ironstone and siltstone gravels. Profiles are characterised by a sandy loam surface grading to clay loam. Mottles are absent.

Depth (m)	pH _{1:5} H ₂ O	EC _{1:5} H ₂ O	Cl _{1:5}	Nitrate Nitrogen	Organic Carbon	Air Dry Moisture Content	Exchangeable Cations				ECEC	Exch. Al	Base Status	ESP	Ca/Mg Ratio	15 Bar	R1 Disp. Ratio
	pH	EC	Cl	NO ₃ -N	OC	ADMC	Ca	Mg	Na	K							
0-0.09	5.4	0.07	<20.0	3.0	5.31	2.2	15C1_Ca (6.93)	15C1_Mg (2.86)	15C1_Na (<0.080)	15C1_K (0.412)	15J1 (10.5)	15G1_Al (0.09)	54.1	15N1 (0.76)	15M1_Ca/Mg (2.4)	13.8	0.57
0.10-0.20	5.1	0.01	<20.0	<1.0	1.37	<1.5	0.441	0.657	<0.080	0.088	2.25	0.81	5.7	3.56	0.7	11.0	0.79
0.25-0.30	5.0	0.01	<20.0	<1.0	1.20	<1.5	0.322	0.646	<0.080	0.088	2.11	0.82	3.9	3.8	0.5	12.9	0.82
0.30-0.40	5.1	0.01	<20.0	<1.0	0.74	<1.5	<0.140	0.617	<0.080	0.093	1.76	0.7	3.0	4.54	0.2	7.7	0.76

Land Unit 6a

Rises

Representative site: 34

Australian Soil Classification: Acidic Ferric Brown-Orthic Tenosol

Depth (m)	Horizon	Description
Surface	-	Firm; dry; 95% sub-angular and angular ironstone and siltstone fragments.
0-0.10	A1	Grey (7.5YR 6/1); sandy loam; massive; earthy; dry; very weak; 60% sub-angular and angular platy ironstone and siltstone fragments; 0% mottles; field pH 5.4-5.5.
0.20-0.30	A2	Brown (7.5YR 4/2); sandy clay loam; massive; earthy; dry; very weak; 65% angular platy ironstone and siltstone fragments; 0% mottles; field pH 5.4-5.5.



Site Location: MGA94 Zone 52 812643mE 8590044mN

Physical Properties

Depth	Coarse Sand	Fine Sand	Silt	Clay
(m)	200-2000 (um) %	20-200 (um) %	>2-<20 (um) %	<2 (um) %
0-0.10	40.9	45.7	9.1	9.5
0.10-0.20	33.0	47.1	11.1	10.9
0.20-0.30	32.2	40.2	7.7	22.8

Chemical Properties

Depth	Total. N	Available P		Ext. K	Sulfate S	Extractable Micronutrients			
		Bicarb P	Acid P			Cu	Zn	Mn	Fe
(m)	7A2 (%)	9B2 mg/kg	9G2 mg/kg	15A1_K Cmol/kg	10B3 mg/kg	12A1_Cu mg/kg	12A1_Zn mg/kg	12A1_Mn mg/kg	12A1_Fe mg/kg
0-0.10	0.048	4.0	4.0	0.12	3.0	0.2	0.2	8.5	35.3

Description: Undulating rises and footslopes with relief to 20m. Soils are very shallow, well drained, strongly acidic, brown, massive earths, over a matrix of ironstone and siltstone gravels. Profiles are characterised by a sandy loam surface grading to sandy clay loam. Mottles are absent.

Depth	pH _{1:5}	EC _{1:5}	Cl _{1:5}	Nitrate Nitrogen	Organic Carbon	Air Dry Moisture Content	Exchangeable Cations				ECEC	Exch. Al	Base Status	ESP	Ca/Mg Ratio	15 Bar	R1 Disp. Ratio
	pH	EC	Cl	NO ₃ -N	OC	ADMC	Ca	Mg	Na	K							
(m)	4A1	3A1 dS/m	5A2 mg/kg	7B1 mg/kg	6B2 (%)	2A1 (%)	15C1_Ca Cmol/kg	15C1_Mg Cmol/kg	15C1_Na Cmol/kg	15C1_K Cmol/kg	15J1 Cmol/kg	15G1_Al Cmol/kg		15N1 (%)	15M1_Ca/Mg	(%)	2Z1
0-0.10	5.3	0.02	<20.0	<1.0	1.19	<1.5	0.725	0.511	<0.080	0.122	1.57	0.11	15.1	5.1	1.4	2.5	0.75
0.10-0.20	5.1	0.01	<20.0	<1.0	0.65	<1.5	0.157	0.259	<0.080	0.050	0.84	0.24	5.0	9.7	0.6	2.7	0.91
0.25-0.30	5.1	0.01	<20.0	<1.0	0.77	<1.5	<0.140	0.332	<0.080	0.037	1.15	0.44	2.6	6.96	0.4	4.7	0.86

Depth (m)	Horizon	Description
Surface	-	Firm; dry.
0-0.09	A1	Dark brown (10YR 3/3); sandy loam; massive; earthy; dry; weak; 0% gravels; 0% mottles; field pH 5.5-7.0.
0.09-0.30	A2	Dark yellowish brown (10YR 4/6); heavy sandy loam; massive; earthy; dry; weak; 0% gravels; 0% mottles; field pH 5.5-7.0.
0.30-0.50	B21	Strong brown (7.5YR 4/6); sandy clay loam; massive; earthy; dry; weak; 5-10% sub-rounded ironstone gravels; 0% mottles; field pH 5.5-7.0.
0.50-1.50	B22	Strong brown (7.5YR 5/8); sandy clay loam; massive; earthy; moderately moist; weak; 5-10% sub-rounded ironstone gravels; 0% mottles; field pH 5.5-7.0.



Site Location: MGA94 Zone 52 809137mE 8614692mN

Physical Properties

Depth (m)	Coarse Sand	Fine Sand	Silt	Clay
	200-2000 (um) %	20-200 (um) %	>2-<20 (um) %	<2 (um) %
0-0.09	41.5	46.3	4.3	10.7
0.10-0.20	39.7	46.0	4.3	12.4
0.20-0.30	43.6	42.7	2.6	14.1
0.50-0.60	39.8	42.1	4.3	15.8
0.80-0.90	36.3	40.8	2.5	22.6
1.10-1.20	37.9	38.5	2.5	22.6
1.40-1.50	39.2	39.0	2.6	20.9

Chemical Properties

Depth (m)	Total. N (%)	Available P		Ext. K (Cmol/kg)	Sulfate S (mg/kg)	Extractable Micronutrients			
		Bicarb P (mg/kg)	Acid P (mg/kg)			Cu (mg/kg)	Zn (mg/kg)	Mn (mg/kg)	Fe (mg/kg)
0-0.09	7A2 (0.041)	9B2 (2.0)	9G2 (2.0)	15A1_K (<0.1)	10B3 (2.0)	12A1_Cu (0.1)	12A1_Zn (<0.1)	12A1_Mn (<0.2)	12A1_Fe (22.2)

Description: Low Rises including gently inclined pediment slopes with relief up to 6m. Soils are shallow to deep, gravelly, strongly acidic, red and brown, massive earths. Profiles are characterised by sandy loam grading to sandy clay loam subsoil. Mottles are absent.

Depth (m)	pH _{1:5} H ₂ O	EC _{1:5} H ₂ O	Cl _{1:5}	Nitrate Nitrogen	Organic Carbon	Air Dry Moisture Content	Exchangeable Cations				ECEC	Exch. Al	Base Status	ESP	Ca/Mg Ratio	15 Bar	R1 Disp. Ratio
	pH	EC	Cl	NO ₃ -N	OC	ADMC	Ca	Mg	Na	K							
0-0.09	5.4	0.01	<20.0	<1.0	1.03	<1.5	1.40	0.608	<0.080	<0.030	2.24	0.11	19.7	3.58	2.3	10.2	0.32
0.10-0.20	5.4	0.01	<20.0	1.0	0.75	<1.5	0.726	0.414	<0.080	<0.030	1.54	0.24	10.1	5.19	1.7	4.7	0.29
0.25-0.30	5.4	0.01	<20.0	1.0	0.55	<1.5	0.504	0.429	<0.080	<0.030	1.3	0.22	7.4	6.14	1.2	4.3	0.34
0.50-0.60	5.5	<0.01	<20.0	<1.0	0.35	<1.5	0.366	0.386	<0.080	<0.030	-	-	5.5	-	0.9	5.4	0.34
0.80-0.90	5.4	<0.01	<20.0	<1.0	0.34	<1.5	0.244	0.767	<0.080	<0.030	1.16	0.04	5.0	6.89	0.3	6.8	0.15
1.10-1.20	5.5	<0.01	<20.0	<1.0	0.34	<1.5	<0.140	0.990	<0.080	<0.030	-	-	5.5	-	0.1	7.2	0.15
1.40-1.50	5.5	<0.01	<20.0	<1.0	0.31	<1.5	<0.140	0.940	<0.080	<0.030	-	-	5.7	-	0.1	6.5	0.16

Depth (m)	Horizon	Description
Surface	-	Firm; dry.
0-0.09	A1	Grey (7.5YR 6/1); loam; fine sand; massive; earthy; dry; very weak; 0% gravels; 0% mottles; field pH 5.0-5.2.
0.09-0.80	A3	Pale brown (10YR 6/3); sand; massive; earthy; dry; loose; 2-5% quartz gravels; 0% mottles; field pH 5.7-5.8.
0.80-1.10	B1	White (2.5Y 8/1); light medium clay; massive; earthy; moist; weak; 2-5% sub rounded and sub-angular quartz and ironstone gravels; 20% red and 5% orange prominent mottles; field pH 5.7-5.8.
1.10-1.30	B2	Red (2.5YR 5/6); light medium clay; massive; earthy; moist; weak; 2-5% sub rounded and sub-angular quartz and ironstone gravels; 20% prominent red and orange mottles; field pH 4.7-5.3.



Site Location: MGA94 Zone 52 809213mE 8589864mN

Physical Properties

Depth (m)	Coarse Sand	Fine Sand	Silt	Clay
	200-2000 (um) %	20-200 (um) %	>2-<20 (um) %	<2 (um) %
0-0.09	13.4	78.1	7.3	2.5
0.10-0.20	50.5	49.7	2.3	<1.0
0.20-0.30	49.8	48.4	4.1	<1.0
0.50-0.60	52.3	48.4	4.1	<1.0
0.80-0.90	51.2	10.1	15.9	29.5
1.10-1.20	3.9	17.7	36.7	47.1

Chemical Properties

Depth (m)	Total. N (%)	Available P		Ext. K (Cmol/kg)	Sulfate S (mg/kg)	Extractable Micronutrients			
		Bicarb P (mg/kg)	Acid P (mg/kg)			Cu (mg/kg)	Zn (mg/kg)	Mn (mg/kg)	Fe (mg/kg)
0-0.09	0.064	9B2 (2.0)	9G2 (2.0)	15A1_K (<0.1)	10B3 (2.0)	12A1_Cu (<0.1)	12A1_Zn (<0.1)	12A1_Mn (<2.0)	12A1_Fe (63.3)

Description: Undulating Low Rises including sandy colluvial wash slopes above drainage floors with relief up to 8m. Soils are deep, imperfectly drained, slightly gravelly, strongly acidic, red and brown, massive earths. Profiles are characterised by a sandy A horizon texture increasing in clay content down the profile. Mottles present at depth.

Depth (m)	pH _{1:5} H ₂ O	EC _{1:5} H ₂ O	Cl _{1:5}	Nitrate Nitrogen	Organic Carbon	Air Dry Moisture Content	Exchangeable Cations				ECEC (Cmol/kg)	Exch. Al (Cmol/kg)	Base Status	ESP (15N1 (%))	Ca/Mg Ratio (15M1_Ca/Mg)	15 Bar (%)	R1 Disp. Ratio (2Z1)
	pH	EC	Cl	NO ₃ -N	OC	ADMC	Ca (Cmol/kg)	Mg (Cmol/kg)	Na (Cmol/kg)	K (Cmol/kg)							
0-0.09	4.6	0.02	<1.0	<1.0	1.50	<1.5	15C1_Ca (<0.140)	15C1_Mg (0.282)	15C1_Na (<0.080)	15C1_K (<0.030)	15J1 (1.29)	15G1_Al (0.49)	21.3	15N1 (6.19)	15M1_Ca/Mg (0.5)	15 Bar (3.4)	R1 Disp. Ratio (0.71)
0.10-0.20	4.8	<0.01	<1.0	<1.0	0.58	<1.5	<0.140	<0.030	<0.080	<0.030	0.4	0.08	28.0	20.0	4.7	<1.5	2.5
0.20-0.30	4.7	<0.01	<1.0	<1.0	0.70	<1.5	<0.140	0.034	<0.080	<0.030	0.52	0.17	28.4	15.3	4.1	<1.5	1.1
0.50-0.60	4.9	<0.01	<1.0	<1.0	0.73	<1.5	<0.140	<0.030	<0.080	<0.030	0.41	0.11	28.0	19.5	4.7	<1.5	1.1
0.80-0.90	4.7	0.01	<1.0	<1.0	0.39	<1.5	<0.140	0.240	<0.080	<0.030	2.86	1.96	1.7	2.8	0.6	11.4	0.93
1.10-1.20	4.6	0.01	<1.0	<1.0	0.39	2.8	<0.140	0.319	<0.080	<0.030	3.12	2.17	1.2	2.57	0.4	17.8	0.94

Land Unit 8a

Plains

Representative site: 68

Australian Soil Classification: Acidic Dystrophic Red Kandosol

Depth (m)	Horizon	Description
Surface	-	Firm; sandy veneer; dry.
0-0.08	A1	Dark reddish brown (5YR 3/3); sandy loam; massive; earthy; dry; very weak; 0% gravels; 0% mottles; field pH 5.7-5.8.
0.08-0.60	A3	Dark reddish brown (2.5YR 3/4); heavy sandy loam; massive; earthy; dry; very weak; 0% gravels; 0% mottles; field pH 5.5-7.8.
0.60-1.00	B21	Dark red (2.5YR 3/6); sandy clay loam; massive; earthy; moderately moist; weak; 0% gravels; 0% mottles; field pH 5.5-7.3.
1.00-1.50	B22	Dark red (2.5YR 3/6); heavy sandy clay loam; massive; earthy; moderately moist; weak, 0% gravels; 0% mottles; field pH 5.5-7.3.



Site Location: MGA94 Zone 53 813093mE 8611823mN

Physical Properties

Depth	Coarse Sand	Fine Sand	Silt	Clay
(m)	200-2000 (um) %	20-200 (um) %	>2-<20 (um) %	<2 (um) %
0-0.08	44.9	36.1	7.7	14.3
0.10-0.20	48.6	34.4	5.9	16.1
0.20-0.30	46.8	34.5	4.1	17.8
0.50-0.60	46.0	35.2	3.7	17.9
0.80-0.90	47.1	33.7	3.9	17.7
1.10-1.20	49.2	30.2	2.3	19.4
1.40-1.50	44.4	29.2	3.9	26.2

Chemical Properties

Depth	Total. N	Available P		Ext. K	Sulfate S	Extractable Micronutrients			
		Bicarb P	Acid P			Cu	Zn	Mn	Fe
(m)	7A2 (%)	9B2 mg/kg	9G2 mg/kg	15A1_K Cmol/kg	10B3 mg/kg	12A1_Cu mg/kg	12A1_Zn mg/kg	12A1_Mn mg/kg	12A1_Fe mg/kg
0-0.08	0.047	<2.0	3.0	<0.1	5.0	<0.1	<0.1	<2.0	10.5

Description: Level to very gently undulating upland plains with low relief. Soils are very deep, well drained, non-gravelly, strongly acidic, red gradational earths. Profiles are characterised by a sandy loam surface grading to heavy sandy clay loam subsoil. Mottles are absent.

Depth	pH _{1:5}	EC _{1:5}	Cl _{1:5}	Nitrate Nitrogen	Organic Carbon	Air Dry Moisture Content	Exchangeable Cations				ECEC	Exch. Al	Base Status	ESP	Ca/Mg Ratio	15 Bar	R1 Disp. Ratio
	H ₂ O	H ₂ O	Cl	NO ₃ -N	OC	ADMC	Ca	Mg	Na	K							
(m)	4A1	3A1	5A2	7B1	6B2	2A1	15C1_Ca	15C1_Mg	15C1_Na	15C1_K	15J1	15G1_Al		15N1	15M1_Ca/Mg		2Z1
	-	dS/m	mg/kg	mg/kg	(%)	(%)	Cmol/kg	Cmol/kg	Cmol/kg	Cmol/kg	Cmol/kg	Cmol/kg		(%)		(%)	
0-0.08	5.3	0.01	<20.0	<1.0	1.82	1.6	0.279	0.412	<0.080	<0.030	1.42	0.5	5.6	5.63	0.7	7.0	0.49
0.10-0.20	5.7	<0.01	<20.0	<1.0	1.51	2.1	<0.140	0.219	<0.080	<0.030	-	-	2.9	-	0.6	7.1	0.36
0.20-0.30	5.5	<0.01	<20.0	<1.0	1.38	2.0	<0.140	0.383	<0.080	<0.030	-	-	3.6	-	0.4	7.3	0.45
0.50-0.60	5.4	<0.01	<20.0	<1.0	0.99	<1.5	<0.140	0.683	<0.080	<0.030	1.31	0.32	5.2	6.09	0.2	6.5	0.55
0.80-0.90	5.3	<0.01	<20.0	<1.0	0.71	<1.5	<0.140	0.598	<0.080	<0.030	1.12	0.22	4.8	7.15	0.2	6.4	0.51
1.10-1.20	5.3	<0.01	<20.0	<1.0	0.62	<1.5	<0.140	0.694	<0.080	<0.030	1.0	0.05	4.9	7.97	0.2	6.4	0.18
1.40-1.50	5.3	<0.01	<20.0	<1.0	0.60	<1.5	<0.140	0.880	<0.080	<0.030	1.16	<0.03	4.3	6.9	0.2	7.7	0.12

Land Unit 8a

Plains

Representative site: 91

Australian Soil Classification: Acidic Dystrophic Red Kandosol

Depth (m)	Horizon	Description
Surface	-	Firm; sandy veneer; dry.
0-0.05	A1	Dark reddish brown (2.5YR 3/4); sandy loam; massive; earthy; dry; very weak; 0% gravels; 0% mottles; field pH 5.7-5.8.
0.05-0.70	A3	Dark red (2.5YR 3/6); sandy loam; heavy; massive; earthy; dry; very weak; 0% gravels; 0% mottles; field pH 5.5-7.8.
0.70-1.10	B21	Dark red (2.5YR 3/6); sandy clay loam; massive; earthy; dry; very weak; 0% gravels; 0% mottles; field pH 5.5-7.3.
1.10-1.50	B22	Dark red (2.5YR 3/6); sandy clay loam; massive; earthy; moderately moist; weak; 0% gravels; 0% mottles; field pH 5.5-7.3.



Site Location: MGA94 Zone 52 808173mE 8592566mN

Physical Properties

Depth	Coarse Sand	Fine Sand	Silt	Clay
(m)	200-2000 (um) %	20-200 (um) %	>2-<20 (um) %	<2 (um) %
0-0.05	39.2	45.0	5.8	14.3
0.10-0.20	37.3	42.2	5.9	17.5
0.20-0.30	40.2	41.4	4.2	17.5
0.50-0.60	41.5	40.9	2.5	17.5
0.80-0.90	42.6	38.3	2.4	17.5
1.10-1.20	43.0	37.4	3.0	17.3
1.40-1.50	42.9	37.4	2.9	17.4

Chemical Properties

Depth	Total. N	Available P		Ext. K	Sulfate S	Extractable Micronutrients			
		Bicarb P	Acid P			Cu	Zn	Mn	Fe
(m)	7A2 (%)	9B2 mg/kg	9G2 mg/kg	15A1_K Cmol/kg	10B3 mg/kg	12A1_Cu mg/kg	12A1_Zn mg/kg	12A1_Mn mg/kg	12A1_Fe mg/kg
0-0.05	0.030	<2.0	2.0	<0.1	3.0	<0.1	<0.1	<2.0	12.6

Description: Level to very gently undulating upland plains with low relief. Soils are very deep, well drained, non-gravelly, strongly acidic, red gradational earths. Profiles are characterised by a sandy loam surface grading to sandy clay loam subsoil. Mottles are absent.

Depth	pH _{1:5}	EC _{1:5}	Cl _{1:5}	Nitrate Nitrogen	Organic Carbon	Air Dry Moisture Content	Exchangeable Cations				ECEC	Exch. Al	Base Status	ESP	Ca/Mg Ratio	15 Bar	R1 Disp. Ratio
	pH	EC	Cl	NO ₃ -N	OC	ADMC	Ca	Mg	Na	K							
(m)	4A1	3A1 dS/m	5A2 mg/kg	7B1 mg/kg	6B2 (%)	2A1 (%)	15C1_Ca Cmol/kg	15C1_Mg Cmol/kg	15C1_Na Cmol/kg	15C1_K Cmol/kg	15J1 Cmol/kg	15G1_Al Cmol/kg	15N1 (%)	15M1_Ca/Mg	(%)	221	
0-0.05	5.5	0.01	<20.0	<1.0	1.28	<1.5	0.880	0.745	<0.080	0.039	-	-	12.2	1.2	6.3	0.49	
0.10-0.20	5.4	0.01	<20.0	<1.0	1.37	<1.5	0.145	0.451	<0.080	<0.030	1.19	0.4	4.0	6.75	0.3	7.7	0.33
0.20-0.30	5.4	<0.01	<20.0	<1.0	1.12	<1.5	<0.140	0.446	<0.080	<0.030	1.15	0.39	4.0	6.98	0.3	7.1	0.37
0.50-0.60	5.4	<0.01	<20.0	<1.0	0.75	<1.5	0.145	0.481	<0.080	<0.030	1.13	0.33	4.2	7.1	0.3	6.7	0.45
0.80-0.90	5.3	<0.01	<20.0	<1.0	0.71	<1.5	<0.140	0.398	<0.080	<0.030	1.05	0.34	0.4	7.64	0.4	6.4	0.5
1.10-1.20	5.4	<0.01	<20.0	<1.0	1.08	<1.5	<0.140	0.455	<0.080	<0.030	1.37	0.57	4.1	5.82	0.3	6.8	0.59
1.40-1.50	5.4	<0.01	<20.0	<1.0	0.70	<1.5	<0.140	0.521	<0.080	<0.030	1.2	0.36	4.4	6.66	0.3	6.5	0.54

Depth (m)	Horizon	Description
Surface	-	Firm; dry.
0-0.08	A1	Very dark grey (10YR 3/1); loamy sand; massive; earthy; very weak; 10-20% ironstone gravels; 0% mottles; field pH 5.0-6.4.
0.08-0.20	A21	Dark grey brown (10YR 4/2); sandy loam; massive; earthy; very weak; 20-30% ironstone gravels; 0% mottles; field pH 5.3-6.7.
0.20-0.50	A22	Brown (10YR 4/3); sandy loam; massive; earthy; 30-40% ironstone gravels; field pH 5.3-6.7.
0.50-1.00	B21	Brown (7.5YR 5/6); sandy clay loam; massive; earthy; 30-40% ironstone gravels; 0% mottles; field pH 5.5-7.3.
1.00-1.40	B22	Strong brown (7.5YR 5/6); sandy clay loam; massive; earthy; moderately moist; 30-40% ironstone gravels; 0% mottles; field pH 5.5-7.3.



Site Location: MGA94 Zone 52 813152mE 8590498mN

Physical Properties

Depth (m)	Coarse Sand	Fine Sand	Silt	Clay
	200-2000 (um) %	20-200 (um) %	>2-<20 (um) %	<2 (um) %
0-0.08	29.7	61.1	6.6	5.0
0.10-0.20	29.3	60.3	4.9	6.7
0.20-0.30	27.2	58.8	6.6	10.1
0.50-0.60	31.7	49.4	3.0	17.1
0.80-0.90	31.5	47.5	4.7	17.1
1.10-1.20	30.2	48.8	4.7	17.1
1.30-1.40	29.7	47.8	5.0	16.8

Chemical Properties

Depth (m)	Total. N (%)	Available P		Ext. K	Sulfate S	Extractable Micronutrients			
		Bicarb P	Acid P			Cu	Zn	Mn	Fe
	7A2	9B2	9G2	15A1_K	10B3	12A1_Cu	12A1_Zn	12A1_Mn	12A1_Fe
	(%)	mg/kg	mg/kg	Cmol/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
0-0.08	0.032	3.0	4.0	<0.1	3.0	<0.1	<0.1	5.6	21.2

Description: Level to very gently undulating upland plains with low relief. Soils are shallow to deep, well drained, gravelly, strongly acidic, red and brown, massive, gradational earths. Profiles are characterised by a sandy loam surface grading to sandy clay loam subsoil. Mottles are absent.

Depth (m)	pH _{1:5} H ₂ O	EC _{1:5} H ₂ O	Cl _{1:5}	Nitrate Nitrogen	Organic Carbon	Air Dry Moisture Content	Exchangeable Cations				ECEC	Exch. Al	Base Status	ESP	Ca/Mg Ratio	15 Bar	R1 Disp. Ratio
	pH	EC	Cl	NO ₃ -N	OC	ADMC	Ca	Mg	Na	K							
	4A1	3A1	5A2	7B1	6B2	2A1	15C1_Ca	15C1_Mg	15C1_Na	15C1_K	15J1	15G1_Al		15N1	15M1_Ca/Mg		221
	-	dS/m	mg/kg	mg/kg	(%)	(%)	Cmol/kg	Cmol/kg	Cmol/kg	Cmol/kg	Cmol/kg	Cmol/kg		(%)		(%)	
0-0.08	5.7	0.01	<20.0	<1.0	1.15	<1.5	0.891	0.478	<0.080	0.037	-	-	29.7	-	1.8	4.1	0.67
0.10-0.20	5.4	0.01	<20.0	<1.0	0.69	<1.5	<0.140	0.346	<0.080	<0.030	1.02	0.36	8.9	7.87	0.4	3.8	0.58
0.20-0.30	5.4	0.01	<20.0	<1.0	0.62	<1.5	<0.140	0.379	<0.080	<0.030	0.99	0.3	6.2	8.09	0.4	4.9	0.6
0.50-0.60	5.4	<0.01	<20.0	<1.0	0.45	<1.5	<0.140	0.551	<0.080	<0.030	1.11	0.25	4.7	7.2	0.3	6.9	0.45
0.80-0.90	5.3	<0.01	<20.0	<1.0	0.42	<1.5	<0.140	0.694	<0.080	<0.030	1.24	0.24	5.5	6.43	0.2	8.2	0.18
1.10-1.20	5.2	<0.01	<20.0	<1.0	0.22	<1.5	<0.140	0.580	<0.080	<0.030	1.02	0.1	4.9	7.84	0.2	8.0	0.18
1.30-1.40	5.1	<0.01	<20.0	<1.0	0.39	<1.5	<0.140	0.458	<0.080	<0.030	1.01	0.19	4.2	7.93	0.3	8.7	0.18

Land Unit 8b1

Plains

Representative site: 101

Australian Soil Classification: Acidic Ferric Brown-Orthic Tenosol

Depth (m)	Horizon	Description
Surface	-	Soft; dry; 10% sub-angular ironstone gravels.
0-0.10	A1	Greyish brown (10YR 3/2); loamy sand; massive; earthy; very weak; 10-15% ironstone gravels; 0% mottles; field pH 5.8-6.3.
0.10-0.75	A3	Strong brown (7.5YR 5/6); loamy sand; massive; earthy; dry; very weak; 10-15% sub-angular ironstone gravels; 0% mottles; field pH 6.0-6.5.
0.75-1.30	B21	Strong brown (7.5YR 5/6); clayey sand; massive; earthy; dry; very weak; 30-40% sub-angular ironstone gravels; 0% mottles; field pH 5.5-7.3.
1.30-1.50	B22	Yellowish red (5YR 4/6); clayey sand; massive; earthy; moderately moist; very weak; 30-40% sub-angular ironstone gravels; 0% mottles; field pH 5.5-7.3.



Site Location: MGA94 Zone 52 813184mE 8617650mN

Physical Properties

Depth	Coarse Sand	Fine Sand	Silt	Clay
(m)	200-2000 (um) %	20-200 (um) %	>2-<20 (um) %	<2 (um) %
0-0.10	48.1	43.0	6.5	3.5
0.10-0.20	49.4	43.7	8.1	3.5
0.20-0.30	48.0	44.3	8.1	3.5
0.50-0.60	47.7	43.4	8.3	5.0
0.80-0.90	46.8	45.9	8.2	1.6
1.10-1.20	47.5	43.5	8.2	5.0
1.40-1.50	49.4	38.3	8.3	6.5

Chemical Properties

Depth	Total. N	Available P		Ext. K	Sulfate S	Extractable Micronutrients			
		Bicarb P	Acid P			Cu	Zn	Mn	Fe
(m)	7A2 (%)	9B2 mg/kg	9G2 mg/kg	15A1_K Cmol/kg	10B3 mg/kg	12A1_Cu mg/kg	12A1_Zn mg/kg	12A1_Mn mg/kg	12A1_Fe mg/kg
0-0.10	0.087	3.0	3.0	<0.1	2.0	0.2	<0.1	17.3	44.6

Description: Level to gently undulating lowland plains with low relief. Soils are shallow to deep, well drained, gravelly, strongly acidic, brown, uniform, earthy sands. Profiles are characterised by a massive loamy sand surface grading to clayey sand or sand subsoil. Mottles are absent.

Depth	pH _{1:5} H ₂ O	EC _{1:5} H ₂ O	Cl _{1:5}	Nitrate Nitrogen	Organic Carbon	Air Dry Moisture Content	Exchangeable Cations				ECEC	Exch. Al	Base Status	ESP	Ca/Mg Ratio	15 Bar	R1 Disp. Ratio
	pH	EC	Cl	NO ₃ -N	OC	ADMC	Ca	Mg	Na	K							
(m)	4A1 -	3A1 ds/m	5A2 mg/kg	7B1 mg/kg	6B2 (%)	2A1 (%)	15C1_Ca Cmol/kg	15C1_Mg Cmol/kg	15C1_Na Cmol/kg	15C1_K Cmol/kg	15J1 Cmol/kg	15G1_Al Cmol/kg	15N1 (%)	15M1_Ca/Mg			2Z1
0-0.10	5.1	0.04	<20.0	9.0	1.82	<1.5	2.83	0.612	<0.080	0.040	3.69	0.07	101.8	2.17	4.6	3.7	0.69
0.10-0.20	5.2	0.01	<20.0	2.0	0.81	<1.5	0.769	0.202	<0.080	<0.030	1.28	0.17	30.9	6.24	3.8	3.1	0.59
0.20-0.30	5.3	0.01	<20.0	1.0	0.46	<1.5	0.426	0.156	<0.080	<0.030	0.87	0.16	19.8	9.18	2.7	2.9	0.51
0.50-0.60	5.4	<0.01	<20.0	<1.0	0.42	<1.5	0.513	0.170	<0.080	<0.030	0.97	0.15	15.9	8.22	3.0	4.4	0.9
0.80-0.90	5.4	<0.01	<20.0	<1.0	0.30	<1.5	0.338	0.098	<0.080	<0.030	0.61	0.06	34.1	13.2	3.4	3.6	1.2
1.10-1.20	5.5	<0.01	<20.0	<1.0	0.60	<1.5	0.551	0.206	<0.080	<0.030	-	-	17.3	-	2.7	4.2	0.91
1.40-1.50	5.6	0.01	<20.0	<1.0	0.58	<1.5	0.639	0.344	<0.080	<0.030	-	-	16.8	-	1.9	5.2	0.88

Land Unit 8c

Plains

Representative site: 96

Australian Soil Classification: Ferric-Acidic Mesotrophic Brown Kandosol

Depth (m)	Horizon	Description
Surface	-	Soft; dry; 5% sub-angular ironstone gravels.
0-0.05	A1	Very dark grey (10YR 3/1); loamy sand; massive; earthy; very weak; 10-15% ironstone gravels; 0% mottles; field pH 5.3-5.8.
0.05-0.15	A2	Brown (10YR 4/3); sandy loam; massive; earthy; dry; very weak; 10-15% sub-angular ironstone gravels; 0% mottles; field pH 5.5-6.7.
0.15-0.75	A3	Strong brown (7.5YR 5/6); sandy loam; massive; earthy; dry; very weak; 10-15% sub-angular ironstone gravels; 0% mottles; field pH 5.5-6.7.
0.75-1.00	B21	Strong brown (7.5YR 4/6); sandy loam; massive; earthy; moderately moist; weak; 20-35% sub-angular and angular ironstone gravels; 0% mottles; field pH 5.7-6.5.
1.00-1.10	B22	Yellowish red (5YR 4/6); sandy clay loam; massive; earthy; moderately moist; weak; 20-35% sub-angular ironstone gravels; 0% mottles; field pH 5.7-6.5.



Site Location: MGA94 Zone 52 810568mE 8596374mN

Physical Properties

Depth	Coarse Sand	Fine Sand	Silt	Clay
(m)	200-2000 (um) %	20-200 (um) %	>2-<20 (um) %	<2 (um) %
0-0.05	38.8	49.4	8.0	7.2
0.10-0.15	37.3	47.1	9.8	10.5
0.20-0.30	36.9	45.7	10.0	12.0
0.50-0.60	36.6	47.1	9.9	8.6
0.80-0.90	40.4	48.1	4.8	12.0
1.00-1.10	37.5	39.1	6.7	16.9

Chemical Properties

Depth	Total. N	Available P		Ext. K	Sulfate S	Extractable Micronutrients			
		Bicarb P	Acid P			Cu	Zn	Mn	Fe
(m)	7A2 (%)	9B2 mg/kg	9G2 mg/kg	15A1_K Cmol/kg	10B3 mg/kg	12A1_Cu mg/kg	12A1_Zn mg/kg	12A1_Mn mg/kg	12A1_Fe mg/kg
0-0.05	0.047	3.0	3.0	0.12	2.0	0.1	<0.1	<2.0	12.6

Description: Gently undulating lowland plains with low relief. Soils are moderate to deep, well drained, gravelly, strongly acidic, red and brown, massive gradational earths. Profiles are characterised by a sandy loam surface grading to sandy clay loam subsoil. Mottles are absent.

Depth	pH _{1:5} H ₂ O	EC _{1:5} H ₂ O	Cl _{1:5}	Nitrate Nitrogen	Organic Carbon	Air Dry Moisture Content	Exchangeable Cations				ECEC	Exch. Al	Base Status	ESP	Ca/Mg Ratio	15 Bar	R1 Disp. Ratio
	pH	EC	Cl	NO ₃ -N	OC	ADMC	Ca	Mg	Na	K							
(m)	4A1 -	3A1 dS/m	5A2 mg/kg	7B1 mg/kg	6B2 (%)	2A1 (%)	15C1_Ca Cmol/kg	15C1_Mg Cmol/kg	15C1_Na Cmol/kg	15C1_K Cmol/kg	15J1 Cmol/kg	15G1_Al Cmol/kg	15N1 (%)	15M1_ Ca/Mg			221
0-0.05	5.4	0.02	<20.0	<1.0	1.55	<1.5	1.20	0.724	<0.080	0.105	2.33	0.18	29.3	3.43	1.7	3.5	0.65
0.10-0.15	5.4	0.01	<20.0	<1.0	0.87	<1.5	<0.140	0.370	<0.080	<0.030	1.07	0.38	5.9	7.47	0.4	7.0	0.74
0.20-0.30	5.4	0.01	<20.0	<1.0	0.82	<1.5	<0.140	0.419	<0.080	<0.030	1.14	0.39	5.6	7.03	0.3	7.6	0.79
0.50-0.60	5.3	0.01	<20.0	<1.0	0.63	<1.5	<0.140	0.271	<0.080	0.034	0.99	0.38	6.1	8.12	0.5	6.1	0.98
0.80-0.90	5.4	<0.01	<20.0	<1.0	0.44	<1.5	<0.140	0.585	<0.080	<0.030	0.98	0.12	7.0	8.2	0.2	5.9	0.71
1.00-1.10	5.4	<0.01	<20.0	<1.0	0.44	<1.5	<0.140	1.29	<0.080	<0.030	1.57	<0.03	9.1	5.1	0.1	10.1	0.16

Depth (m)	Horizon	Description
Surface	-	Firm; sandy veneer; dry.
0-0.07	A1	Dark grey (7.5YR 4/1); loamy sand; single grain; dry; very weak; 0% gravels; 0% mottles.
0.07-0.50	A2	Light brown (7.5YR 6/3); loamy sand; single grain; dry; very weak; 0% gravels; 0% mottles; field pH 5.3-6.7.
0.50-0.70	B1	Brown (7.5YR 5/3); sand; single grain; moderately moist; very weak; 0% gravels; 2% prominent orange mottles; field pH 5.3-6.7.
0.70-0.90	B21	Yellowish brown (10YR 6/4); sand; single grain; moist; very weak; 0% gravels; 5% prominent orange mottles; field pH 5.9-6.6.
0.90-1.50	B22	Pale brown (10YR 6/3); sand; single grain; sandy; moist; very weak; 2-5% sub-rounded ironstone gravels; 5% prominent orange mottles; field pH 5.9-6.6.



Site Location: MGA94 Zone 52 811820mE 8595942mN

Physical Properties

Depth (m)	Coarse Sand	Fine Sand	Silt	Clay
	200-2000 (um) %	20-200 (um) %	>2-<20 (um) %	<2 (um) %
0-0.07	50.4	43.9	2.4	4.2
0.10-0.20	50.4	44.5	3.9	6.0
0.20-0.30	51.6	41.9	4.1	5.9
0.50-0.60	53.5	43.1	2.6	4.0
0.80-0.90	50.4	43.5	2.5	3.8
1.10-1.20	54.1	38.1	2.5	3.8
1.40-1.50	52.5	37.5	2.4	7.3

Chemical Properties

Depth (m)	Total. N	Available P		Ext. K	Sulfate S	Extractable Micronutrients			
		Bicarb P	Acid P			Cu	Zn	Mn	Fe
	7A2 (%)	9B2 mg/kg	9G2 mg/kg	15A1_K Cmol/kg	10B3 mg/kg	12A1_Cu mg/kg	12A1_Zn mg/kg	12A1_Mn mg/kg	12A1_Fe mg/kg
0-0.07	0.026	2.0	4.0	<0.1	2.0	<0.1	<0.1	<2.0	11.3

Description: Gently undulating lower sandy wash slopes with low relief. Soils are moderate to very deep, imperfectly drained, gravelly, strongly acidic, brown, earthy sands. Profiles are characterised by a loamy sand surface grading to sand subsoil. Mottles present at depth.

Depth (m)	pH _{1:5} H ₂ O	EC _{1:5} H ₂ O	Cl _{1:5}	Nitrate Nitrogen	Organic Carbon	Air Dry Moisture Content	Exchangeable Cations				ECEC	Exch. Al	Base Status	ESP	Ca/Mg Ratio	15 Bar	R1 Disp. Ratio
	pH	EC	Cl	NO ₃ -N	OC	ADMC	Ca	Mg	Na	K							
	4A1	3A1 dS/m	5A2 mg/kg	7B1 mg/kg	6B2 (%)	2A1 (%)	15C1_Ca Cmol/kg	15C1_Mg Cmol/kg	15C1_Na Cmol/kg	15C1_K Cmol/kg	15J1 Cmol/kg	15G1_Al Cmol/kg	15N1 (%)	15M1_Ca/Mg			2Z1
0-0.07	5.3	0.01	<20.0	<1.0	0.90	<1.5	0.471	0.200	<0.080	0.031	1.09	0.24	18.6	7.33	2.4	2.1	0.57
0.10-0.20	5.0	<0.01	<20.0	<1.0	0.37	<1.5	<0.140	0.037	<0.080	<0.030	0.6	0.26	4.8	13.4	3.8	1.7	0.37
0.20-0.30	5.1	<0.01	<20.0	<1.0	0.37	<1.5	<0.140	0.058	<0.080	<0.030	0.58	0.22	5.2	13.8	2.4	2.2	0.39
0.50-0.60	5.3	<0.01	<20.0	<1.0	0.30	<1.5	<0.140	0.121	<0.080	<0.030	0.53	0.13	9.2	15.1	1.2	1.9	0.59
0.80-0.90	5.4	<0.01	<20.0	<1.0	0.29	<1.5	<0.140	0.227	<0.080	<0.030	0.62	0.11	12.6	13	0.6	2.3	0.61
1.10-1.20	5.4	<0.01	<20.0	<1.0	0.29	<1.5	<0.140	0.331	<0.080	<0.030	0.76	0.15	15.3	10.5	0.4	2.7	0.61
1.40-1.50	5.3	<0.01	<20.0	<1.0	0.30	<1.5	<0.140	0.399	<0.080	<0.030	0.98	0.26	8.9	8.17	0.4	3.1	0.4

Depth (m)	Horizon	Description
Surface	-	Firm; dry; swamp hummock.
0-0.12	A1	Very dark greyish brown (10YR 3/2); light clay loam; moderate polyhedral; smooth-peds; dry; firm; 0% gravels; field pH 5.2.
0.12-0.50	A2	Brown (10YR 4/3); light clay; moderate polyhedral; smooth; dry; firm; 0% gravels; field pH 5.2.
0.50-1.00	B2	Dark greyish brown (10YR 4/2); light medium clay; moderate polyhedral smooth-peds; moderately moist; firm; 0% gravels; 0% mottles; field pH 5.3-5.4.
1.00-1.20	D1	Dark greyish brown (10YR 4/2); heavy sandy clay loam; fine sand fraction; moist; 0% gravels; 0% mottles; field pH 5.3-5.4.
1.20-1.50	D2	Dark yellowish brown (10YR 4/6); light clay; moist; 40% prominent orange substrate mixing; 0% gravels; field pH 5.3-5.4.



Site Location: MGA94 Zone 52 804721mE 8589562mN

Physical Properties

Depth (m)	Coarse Sand	Fine Sand	Silt	Clay
	200-2000 (um) %	20-200 (um) %	>2-<20 (um) %	<2 (um) %
0-0.10	5.6	32.0	27.9	32.3
0.12-0.20	7.4	30.5	25.2	38.2
0.20-0.30	8.7	34.2	23.5	36.1
0.50-0.60	19.7	35.8	14.9	32.6
0.80-0.90	21.0	38.6	13.3	28.9
1.10-1.20	26.8	49.5	9.9	15.3
1.40-1.50	26.7	41.5	8.3	21.9

Chemical Properties

Depth (m)	Total. N (%)	Available P		Ext. K (Cmol/kg)	Sulfate S (mg/kg)	Extractable Micronutrients (mg/kg)			
		Bicarb P (mg/kg)	Acid P (mg/kg)			Cu	Zn	Mn	Fe
0-0.10	7A2 (0.309)	9B2 (4.0)	9G2 (6.0)	15A1_K (<0.1)	10B3 (3.0)	12A1_Cu (1.8)	12A1_Zn (0.1)	12A1_Mn (6.5)	12A1_Fe (155.0)

Description: Alluvial Plains with low relief. Soils are very deep, poorly drained, non gravelly, strongly acidic, brown, structured, duplex soils with swamp hummock surface. Profiles are characterised by a clay loam surface grading to sandy clay loam or light clay subsoil. Substrate mixing present at depth.

Depth (m)	pH _{1:5} H ₂ O	EC _{1:5} H ₂ O	Cl _{1:5}	Nitrate Nitrogen	Organic Carbon	Air Dry Moisture Content	Exchangeable Cations				ECEC	Exch. Al	Base Status	ESP	Ca/Mg Ratio	15 Bar	R1 Disp. Ratio
	pH	EC	Cl	NO ₃ -N	OC	ADMC	Ca	Mg	Na	K							
0-0.10	4A1 (4.8)	3A1 (0.02)	5A2 (<20.0)	7B1 (2.0)	6B2 (3.51)	2A1 (6.8)	15C1_Ca (1.18)	15C1_Mg (1.76)	15C1_Na (0.153)	15C1_K (0.126)	15J1 (6.23)	15G1_Al (2.57)	15N1 (10.0)	15N1 (%) (2.45)	15M1_Ca/Mg (0.7)	15 Bar (%) (18.6)	2Z1 (0.54)
0.12-0.20	4.9	0.02	<20.0	2.0	2.43	3.2	1.12	1.48	0.16	0.093	6.13	2.79	7.5	2.61	0.8	17.3	0.5
0.20-0.30	5.0	0.01	<20.0	2.0	1.36	2.2	0.890	1.46	0.159	0.069	5.66	2.61	7.1	2.81	0.6	13.8	0.53
0.50-0.60	5.0	0.01	<20.0	<1.0	0.46	1.7	1.15	2.88	0.174	0.056	7.51	2.74	13.1	2.32	0.4	10.8	0.84
0.80-0.90	5.2	0.01	<20.0	<1.0	0.38	<1.5	1.14	3.12	0.171	0.063	7.27	2.33	15.6	2.36	0.4	9.8	0.79
1.10-1.20	5.3	0.01	<20.0	<1.0	0.34	<1.5	0.927	1.92	0.111	0.043	4.37	1.13	19.6	2.55	0.5	5.5	0.92
1.40-1.50	5.0	0.01	<20.0	<1.0	0.30	1.6	1.81	3.52	0.201	0.072	8.04	1.94	25.6	2.5	0.5	9.3	0.9

Land Unit 9a1

Alluvial Plains

Representative site: 106

Australian Soil Classification: Ferric Chromosolic Redoxic Hydrosol

Depth (m)	Horizon	Description
Surface	-	Loose; soft; dry.
0-0.12	A11	Dark greyish brown (10YR 4/2); sand; dry; 5% ironstone gravels; 0% mottles; field pH 5.9-6.0.
0.12-0.40	A12	Yellowish brown (10YR 5/4); sand; dry; 5% ironstone gravels; 0% mottles; field pH 5.9-6.0.
0.40-0.80	A2	Brown (7.5YR 4/6); clayey sand; dry; 30% ironstone gravels; 0% mottles; field pH 6.4-6.9.
0.80-1.0	A3	Brown (7.5YR 4/3); clayey sand; single grain; dry; 15% ironstone; 0% mottles; field pH 6.4-6.9.
1.00-1.10	B21	Light yellowish brown (10YR 6/4); medium clay; earthy; moist; 2% ironstone gravels; 10% orange mottles; field pH 8.6-9.4.
1.10-1.50	B22	Brownish yellow (10YR 6/6); heavy clay; earthy; moist; 2% ironstone gravels; 10% orange mottles; field pH 8.6-9.4.



Site Location: MGA94 Zone 52 813741mE 8605242mN

Physical Properties

Depth (m)	Coarse Sand	Fine Sand	Silt	Clay
	200-2000 (um) %	20-200 (um) %	>2-<20 (um) %	<2 (um) %
0-0.10	54.9	44.5	1.5	<1.0
0.12-0.20	55.1	45.2	1.3	<1.0
0.20-0.30	55.6	43.3	1.3	<1.0
0.50-0.60	59.4	40.9	1.3	<1.0
0.80-0.90	65.2	30.1	1.6	3.5
1.10-1.20	37.9	20.1	8.4	34.3
1.40-1.50	39.4	17.9	6.7	36.1

Chemical Properties

Depth (m)	Total. N (%)	Available P		Ext. K (Cmol/kg)	Sulfate S (mg/kg)	Extractable Micronutrients			
		Bicarb P (mg/kg)	Acid P (mg/kg)			Cu (mg/kg)	Zn (mg/kg)	Mn (mg/kg)	Fe (mg/kg)
0-0.10	7A2 (0.014)	9B2 (2.0)	9G2 (2.0)	15A1_K (<0.1)	10B3 (<1.0)	12A1_Cu (<0.1)	12A1_Zn (<0.1)	12A1_Mn (<2.0)	12A1_Fe (10.6)

Description: Alluvial Plains with low relief bordering clay plains. Soils are very deep, poorly drained, gravelly, and strongly acidic to strongly alkaline at depth, brown, depositional sandy wash earths over heavier textured subsoil. Profiles are characterised by a single grain loamy sand surface grading to moderately structured medium or heavy clay subsoil. Mottles present at depth.

Depth (m)	pH _{1:5} H ₂ O	EC _{1:5} H ₂ O	Cl _{1:5}	Nitrate Nitrogen	Organic Carbon	Air Dry Moisture Content	Exchangeable Cations				ECEC	Exch. Al	Base Status	ESP	Ca/Mg Ratio	15 Bar	R1 Disp. Ratio
	pH	EC	Cl	NO ₃ -N	OC	ADMC	Ca	Mg	Na	K							
0-0.10	4.9	0.01	<20.0	<1.0	0.33	<1.5	15C1_Ca (0.437)	15C1_Mg (0.242)	15C1_Na (<0.080)	15C1_K (<0.030)	15J1 (0.88)	15G1_Al (0.08)	78.9	15N1 (9.1)	15M1_Ca/Mg (1.8)		2.2
0.12-0.20	5.0	0.01	<20.0	<1.0	0.25	<1.5	0.199	0.184	<0.080	<0.030	0.63	0.12	49.3	12.7	1.1	<1.5	2.4
0.20-0.30	4.9	0.01	<20.0	<1.0	0.22	<1.5	<0.140	0.191	<0.080	<0.030	0.61	0.15	44.1	13.1	0.7	<1.5	2.4
0.50-0.60	5.2	0.01	<20.0	<1.0	0.20	<1.5	0.156	0.201	<0.080	<0.030	0.54	0.07	46.7	14.9	0.8	<1.5	2.3
0.80-0.90	5.9	0.02	<20.0	<1.0	0.30	<1.5	0.637	0.927	0.091	<0.030	-	-	48.1	-	0.7	2.4	1.2
1.10-1.20	8.9	0.19	107.0	<1.0	0.35	2.6	-	-	-	-	-	-	-	-	-	15.2	0.91
1.40-1.50	9.1	0.17	30.0	<1.0	0.27	2.8	-	-	-	-	-	-	-	-	-	16.4	0.72

Land Unit 10a

Drainage Systems

Representative site: 103

Australian Soil Classification: Epiacidic Epipedal Aquic Vertosol

Depth (m)	Horizon	Description
Surface	-	Hard setting; dry.
0-0.30	A1	Greyish brown (2.5Y 5/2); light clay; moderate polyhedral; smooth-peds; dry; strong; 0% gravels; 0% mottles; field pH 4.7-5.5.
0.30-0.45	A2	Greyish brown (2.5Y 5/2); light medium clay; moderate polyhedral; smooth-peds; dry; very strong; 0% gravels; 2% prominent orange mottles; field pH 4.9-5.6.
0.45-0.80	A3	Greyish brown (2.5Y 5/3); heavy clay; moderate polyhedral smooth-peds; dry; very strong; 0% gravels; 2% prominent orange mottles; field pH 4.9-5.6.
0.80-0.90	B2	Greyish brown (10YR 5/2); heavy clay; moderate polyhedral; smooth-peds; dry; very strong; 0% gravels; 5% prominent orange mottles; field pH 5.5-5.9.



Site Location: MGA94 Zone 52 805394mE 8596504mN

Physical Properties

Depth	Coarse Sand	Fine Sand	Silt	Clay
(m)	200-2000 (um) %	20-200 (um) %	>2-<20 (um) %	<2 (um) %
0-0.10	16.3	38.2	22.1	25.9
0.10-0.20	9.4	26.8	27.1	41.1
0.20-0.30	7.1	20.2	25.6	46.3
0.50-0.60	5.3	13.7	17.5	63.9
0.80-0.90	5.3	16.6	18.9	63.3

Chemical Properties

Depth	Total. N	Available P		Ext. K	Sulfate S	Extractable Micronutrients			
		Bicarb P	Acid P			Cu	Zn	Mn	Fe
(m)	7A2 (%)	9B2 mg/kg	9G2 mg/kg	15A1_K Cmol/kg	10B3 mg/kg	12A1_Cu mg/kg	12A1_Zn mg/kg	12A1_Mn mg/kg	12A1_Fe mg/kg
0-0.10	0.082	3.0	3.0	0.12	3.0	0.4	<0.1	18.2	67.1

Description: Open drainage lines, incised creeks and channels with low relief. Soils are very deep, poorly drained, non gravelly, strongly acidic, grey or brown, structured, hard setting and cracking when dry. Profiles are characterised by a light clay surface grading to heavy clay subsoil. Mottles present at depth.

Depth	pH _{1:5} H ₂ O	EC _{1:5} H ₂ O	Cl _{1:5}	Nitrate Nitrogen	Organic Carbon	Air Dry Moisture Content	Exchangeable Cations				ECEC	Exch. Al	Base Status	ESP	Ca/Mg Ratio	15 Bar	R1 Disp. Ratio
	pH	EC	Cl	NO ₃ -N	OC	ADMC	Ca	Mg	Na	K							
(m)	4A1 -	3A1 dS/m	5A2 mg/kg	7B1 mg/kg	6B2 (%)	2A1 (%)	15C1_Ca Cmol/kg	15C1_Mg Cmol/kg	15C1_Na Cmol/kg	15C1_K Cmol/kg	15J1 Cmol/kg	15G1_Al Cmol/kg		15N1 (%)	15M1_Ca/Mg	(%)	2Z1
0-0.10	4.9	0.01	<20.0	<1.0	1.90	1.9	2.89	1.19	0.151	0.125	4.7	0.25	16.8	3.22	2.4	12.0	0.79
0.10-0.20	5.1	0.01	<20.0	<1.0	0.63	<1.5	2.17	1.09	0.094	0.074	5.21	1.44	8.3	1.8	2.0	15.1	0.72
0.20-0.30	4.8	0.01	<20.0	<1.0	0.61	2.1	1.50	0.732	0.111	0.048	6.34	3.36	5.2	1.75	2.0	15.1	0.65
0.50-0.60	4.0	0.07	56.0	<1.0	0.35	5.9	0.566	0.309	0.118	0.038	11.9	9.17	1.6	0.67	1.8	18.9	0.39
0.80-0.90	3.4	0.22	176.0	<1.0	0.39	2.4	0.364	0.265	0.129	0.056	12.6	9.95	1.3	0.63	1.4	19.5	0.38

Land Unit 10b

Drainage Systems Representative site: 4 Australian Soil Classification: Bleached-Acidic Tenosolic Redoxic Hydrosol

Depth (m)	Horizon	Description
Surface	-	Loose; soft; moderately moist.
0-0.06	A1	Brown (10YR 5/3); loamy sand; single grain; sandy; moist; loose; 0% gravels; 0% mottles; field pH 5.6-6.0.
0.06-0.50	A2	Light grey (10YR 7/2); sand; single grain; sandy; moist; loose; 0% gravels; 0% mottles; field pH 5.6-6.1.
0.50-1.10	A3	Pinkish white (7.5YR 8/2); bleached; sand; single grain; sandy; wet; loose; 0% gravels; 5% prominent orange mottles; field pH 5.6-6.1.
1.10-1.50	B2	Pinkish grey (7.5YR 7/2); bleached; clayey sand; single grain; sandy; wet; loose; 0% gravels; 20% prominent orange mottles; field pH 5.7-6.5.



Site Location: MGA94 Zone 52 814184mE 8617981mN

Physical Properties

Depth	Coarse Sand	Fine Sand	Silt	Clay
(m)	200-2000 (um) %	20-200 (um) %	>2-<20 (um) %	<2 (um) %
0-0.06	41.8	52.5	5.8	4.2
0.10-0.20	43.0	52.1	3.4	5.0
0.20-0.30	45.5	49.9	2.4	4.4
0.50-0.60	53.7	41.6	2.4	6.1
0.80-0.90	47.7	42.6	4.3	9.2
1.10-1.20	48.4	39.6	2.6	10.9
1.40-1.50	44.8	41.4	2.6	12.4

Chemical Properties

Depth	Total. N	Available P		Ext. K	Sulfate S	Extractable Micronutrients			
		Bicarb P	Acid P			Cu	Zn	Mn	Fe
(m)	7A2 (%)	9B2 mg/kg	9G2 mg/kg	15A1_K Cmol/kg	10B3 mg/kg	12A1_Cu mg/kg	12A1_Zn mg/kg	12A1_Mn mg/kg	12A1_Fe mg/kg
0-0.06	0.020	2.0	<2.0	<0.1	1.0	<1.0	<1.0	<2.0	20.3

Description: Low lying spillway depressions with low relief. Soils are very deep, poorly drained, non gravelly, strongly acidic, brown or grey, uniform siliceous sands with depositional loose surface. Profiles are characterised by a loamy sand surface grading to bleached sand or clayey sand subsoil. Mottles present at depth.

Depth	pH _{1:5}	EC _{1:5}	Cl _{1:5}	Nitrate Nitrogen	Organic Carbon	Air Dry Moisture Content	Exchangeable Cations				ECEC	Exch. Al	Base Status	ESP	Ca/Mg Ratio	15 Bar	R1 Disp. Ratio
	H ₂ O	H ₂ O	Cl	NO ₃ -N	OC	ADMC	Ca	Mg	Na	K							
(m)	4A1	3A1	5A2	7B1	6B2	2A1	15C1_Ca	15C1_Mg	15C1_Na	15C1_K	15J1	15G1_Al	15N1	15M1_Ca/Mg			221
	-	dS/m	mg/kg	mg/kg	(%)	(%)	Cmol/kg	Cmol/kg	Cmol/kg	Cmol/kg	Cmol/kg	Cmol/kg	(%)	(%)	(%)	(%)	
0-0.06	4.9	0.03	<20.0	13.0	0.44	<1.5	0.197	0.247	<0.080	<0.030	0.87	0.25	13.2	9.15	0.8	2.2	0.47
0.10-0.20	5.0	0.01	<20.0	3.0	0.26	<1.5	<0.140	0.123	<0.080	<0.030	0.64	0.22	7.5	12.4	1.1	1.9	0.44
0.20-0.30	5.1	0.01	<20.0	2.0	0.20	<1.5	<0.140	0.124	<0.080	<0.030	0.58	0.18	8.5	13.7	1.1	1.7	0.54
0.50-0.60	4.9	0.01	<20.0	<1.0	0.23	<1.5	<0.140	0.078	<0.080	<0.030	0.64	0.23	5.4	12.5	1.8	2.4	0.67
0.80-0.90	4.7	0.01	<20.0	<1.0	0.25	<1.5	<0.140	<0.030	<0.080	<0.030	0.82	0.36	3.0	9.76	4.7	3.7	0.42
1.10-1.20	4.6	0.01	<20.0	<1.0	0.26	<1.5	<0.140	<0.030	<0.080	<0.030	0.98	0.53	2.6	8.16	4.7	4.3	0.27
1.40-1.50	4.7	0.01	<20.0	<1.0	0.29	<1.5	<0.140	<0.030	<0.080	<0.030	1.1	0.63	2.3	7.27	4.7	5.1	0.25

Land Unit 10b1

Drainage Systems Representative site: 102

Australian Soil Classification: Acidic Tenosolic Oxyaquic Hydrosol

Depth (m)	Horizon	Description
Surface	-	Firm; sandy veneer; dry.
0-0.10	A1	Dark greyish brown (10YR 4/2); loamy sand; massive; earthy; dry; very weak; 0% gravels; 0% mottles; field pH 4.9-5.5.
0.10-0.40	A21	Pale brown (10YR 6/3); light clayey sand; massive; earthy; dry; weak; 0% gravels; 2% prominent orange mottles; field pH 5.6-6.0.
0.40-0.90	A22	Light yellowish brown (10YR 6/4); clayey sand; massive; earthy; dry; weak; 0% gravels; 2% prominent orange mottles; field pH 5.6-6.0.
0.80-1.00	B2	Brownish yellow (10YR 6/6); clayey sand; massive; earthy; moderately moist; weak; 2-5% ironstone gravels; 5% prominent orange mottles; field pH 5.6-6.0.



Site Location: MGA94 Zone 52 805506mE 8596465mN

Physical Properties

Depth	Coarse Sand	Fine Sand	Silt	Clay
(m)	200-2000 (um) %	20-200 (um) %	>2-<20 (um) %	<2 (um) %
0-0.10	46.8	47.3	4.7	3.3
0.10-0.20	47.9	45.4	4.7	5.0
0.20-0.30	44.2	48.9	1.8	8.8
0.50-0.60	49.1	42.4	1.8	7.1
0.80-0.90	48.7	44.6	1.8	3.7
0.90-1.00	48.4	43.7	1.7	5.5

Chemical Properties

Depth	Total. N	Available P		Ext. K	Sulfate S	Extractable Micronutrients			
		Bicarb P	Acid P			Cu	Zn	Mn	Fe
(m)	7A2 (%)	9B2 mg/kg	9G2 mg/kg	15A1_K Cmol/kg	10B3 mg/kg	12A1_Cu mg/kg	12A1_Zn mg/kg	12A1_Mn mg/kg	12A1_Fe mg/kg
0-0.10	0.028	4.0	5.0	<0.1	2.0	<0.1	<0.1	<2.0	49.4

Description: Gently sloping broad drainage floors with low relief. Soils are moderate to very deep, poorly drained, gravelly, strongly acidic, brown, earthy siliceous sands. Profiles are characterised by a loamy sand surface grading to clayey sand subsoil. Mottles present throughout the profile.

Depth	pH _{1:5} H ₂ O	EC _{1:5} H ₂ O	Cl _{1:5}	Nitrate Nitrogen	Organic Carbon	Air Dry Moisture Content	Exchangeable Cations				ECEC	Exch. Al	Base Status	ESP	Ca/Mg Ratio	15 Bar	R1 Disp. Ratio
	pH	EC	Cl	NO ₃ -N	OC	ADMC	Ca	Mg	Na	K							
(m)	4A1 -	3A1 dS/m	5A2 mg/kg	7B1 mg/kg	6B2 (%)	2A1 (%)	15C1_Ca Cmol/kg	15C1_Mg Cmol/kg	15C1_Na Cmol/kg	15C1_K Cmol/kg	15J1 Cmol/kg	15G1_Al Cmol/kg	15N1 (%)	15M1_Ca/Mg			2Z1
0-0.10	5.4	0.03	26.0	<1.0	0.81	<1.5	<0.140	0.249	<0.080	<0.030	1.0	0.31	17.7	8.04	0.9	2.9	0.48
0.10-0.20	5.1	<0.01	<20.0	<1.0	0.45	<1.5	<0.140	0.144	<0.080	<0.030	0.72	0.27	7.9	11.0	1.0	3.3	0.4
0.20-0.30	5.0	<0.01	<20.0	<1.0	0.47	<1.5	<0.140	0.156	<0.080	<0.030	0.76	0.29	4.6	10.6	0.9	3.5	0.46
0.50-0.40	5.1	<0.01	<20.0	<1.0	0.42	<1.5	<0.140	0.191	<0.080	<0.030	0.79	0.3	6.2	10.1	0.7	3.3	0.65
0.80-0.90	5.0	<0.01	<20.0	<1.0	0.31	<1.5	<0.140	0.110	<0.080	<0.030	0.71	0.27	9.7	11.3	1.3	3.2	0.67
0.90-1.00	4.9	<0.01	<20.0	<1.0	0.25	<1.5	<0.140	0.085	<0.080	<0.030	0.74	0.31	6.1	10.9	1.6	3.1	0.53

Land Unit 11a

Swamps

Representative site: 104

Australian Soil Classification: Acidic Sulfuric Redoxic Hydrosol

Depth (m)	Horizon	Description
Surface	-	Soft; wallows; moist.
0-0.15	A1	Black (10YR 2/1); clay loam with fine sand fraction; earthy; moist; 0% gravels; 0% mottles; field pH 4.7-5.0.
0.15-0.40	A3	Dark grey (7.5YR 4/1); clay loam with fine sand fraction; earthy; moist; 0% gravels; 0% mottles; field pH 4.7-5.0.
0.40-0.85	B21	Light brownish grey (10YR 6/2); sandy clay loam, light; earthy; moist; 0% gravels; 15% prominent orange mottles; field pH 4.6-5.0.
0.85-1.05	B22	Grey (10YR 6/1); clayey sand, heavy; earthy; wet; 0% gravels; 15% prominent orange mottles; field pH 4.6-5.0.



Physical Properties

Depth	Coarse Sand	Fine Sand	Silt	Clay
(m)	200-2000 (um)	20-200 (um)	>2-<20 (um)	<2 (um)
	%	%	%	%
0-0.10	23.3	44.8	14.2	19.2
0.15-0.20	23.7	45.5	14.1	16.0
0.20-0.30	21.7	45.6	15.6	17.5
0.50-0.60	35.1	43.9	3.3	17.3
0.80-0.90	32.7	47.1	3.1	15.5

Chemical Properties

Depth	Total. N	Available P		Ext. K	Sulfate S	Extractable Micronutrients			
		Bicarb P	Acid P			Cu	Zn	Mn	Fe
(m)	7A2 (%)	9B2 mg/kg	9G2 mg/kg	15A1_K Cmol/kg	10B3 mg/kg	12A1_Cu mg/kg	12A1_Zn mg/kg	12A1_Mn mg/kg	12A1_Fe mg/kg
0-0.10	0.261	3.0	25.0	<0.1	5.0	0.2	<0.1	<2.0	20.4

Site Location: MGA94 Zone 52 808920mE 8618389mN

Description: Swamps, seasonally flooded depressions and perennial billabongs, with low relief. Soils are very deep, very poorly drained, non gravelly, strongly acidic, grey earths. Profiles are characterised by clay loam surface grading to heavy clayey sand subsoil. Mottles present at depth.

Depth	pH _{1:5} H ₂ O	EC _{1:5} H ₂ O	Cl _{1:5}	Nitrate Nitrogen	Organic Carbon	Air Dry Moisture Content	Exchangeable Cations				ECEC	Exch. Al	Base Status	ESP	Ca/Mg Ratio	15 Bar	R1 Disp. Ratio
	pH	EC	Cl	NO ₃ -N	OC	ADMC	Ca	Mg	Na	K							
(m)	4A1 -	3A1 dS/m	5A2 mg/kg	7B1 mg/kg	6B2 (%)	2A1 (%)	15C1_Ca Cmol/kg	15C1_Mg Cmol/kg	15C1_Na Cmol/kg	15C1_K Cmol/kg	15I1 Cmol/kg	15G1_Al Cmol/kg		15N1 (%)	15M1_Ca/Mg	(%)	2Z1
0-0.10	3.9	0.03	<20.0	4.0	4.74	3.8	<0.140	<0.030	<0.080	0.037	2.7	2.03	1.5	2.97	4.7	28.8	0.53
0.15-0.20	4.0	0.03	<20.0	3.0	4.97	4.9	<0.140	0.030	<0.080	0.035	2.65	1.98	1.8	3.02	4.7	24.0	0.59
0.20-0.30	4.1	0.02	<20.0	2.0	3.34	3.7	<0.140	<0.030	<0.080	<0.030	2.17	1.57	1.6	3.69	4.7	19.7	0.55
0.50-0.60	3.9	0.02	<20.0	<1.0	0.38	<1.5	<0.140	<0.030	<0.080	<0.030	1.7	1.15	1.6	4.71	4.7	6.8	0.18
0.80-0.90	3.9	0.02	<20.0	<1.0	0.36	<1.5	<0.140	<0.030	<0.080	<0.030	1.62	1.08	1.8	4.94	4.7	7.3	0.2

Appendix C Australian Soil Classification, soils classified within the survey area (Isbell, 2002).

Land Unit	Australian Soil Classification	Order	Suborder	Great Group	Subgroup	Family Criteria 1	Family Criteria 2	Family Criteria 3	Family Criteria 4	Family Criteria 5
5a	RUCYCZAI-IL-U	Rudosols	Leptic	Lithic	Acidic	-	Very gravelly	Loamy	-	Shallow
6a	TEIOGEAIBIL-T	Tenosols	Brown orthic	Ferric	Acidic	Medium	Very gravelly	Loamy	-	Very shallow
7a	KAABAGGWAEELMX	Kandosols	Brown	Mesotrophic	Ferric-acidic	Thin	Non-gravelly	Loamy	Clay loamy	Very deep
7a	KAABYYAIBFKKV	Kandosols	Brown	Unknown	Acidic	Medium	Slightly gravelly	Sandy	Loamy	Moderate
7a	KAABYYBUAHLMU	Kandosols	Brown	Unknown	Ferric	Thin	Moderately gravelly	Loamy	Clay loamy	Shallow
7a	KAABYYBUAHLMW	Kandosols	Brown	Unknown	Ferric	Thin	Moderately gravelly	Loamy	Clay loamy	Deep
7a	KAAAYYCDBELMX	Kandosols	Red	Unknown	Haplic	Medium	Non-gravelly	Loamy	Clay loamy	Very deep
7a	KAAAYYBUAHLMX	Kandosols	Red	Unknown	Ferric	Thin	Moderately gravelly	Loamy	Clay loamy	Very deep
7a1	KUAAAFDQAELOW	Kurosols	Red	Dystrophic	Mottled	Thin	Non-gravelly	Loamy	Clayey	Deep
7a1	KUABYYCDCEKOX	Kurosols	Brown	Unknown	Haplic	Thick	Non-gravelly	Sandy	Clayey	Very deep
8a	KAACYYCDBELMX	Kandosols	Yellow	Unknown	Haplic	Medium	Non-gravelly	Loamy	Clay Loamy	Very deep
8a	KAABEABUAELMX	Kandosols	Brown	Petroferric	Ferric	Thin	Gravelly	Loamy	Clay loamy	Very deep
8a	KAABYYCDAEKLX	Kandosols	Brown	Unknown	Haplic	Thin	Non-gravelly	Sandy	Loamy	Very deep
8a	KAABYYCDBFLMW	Kandosols	Brown	Unknown	Haplic	Medium	Slightly gravelly	Loamy	Clay loamy	Deep
8a	KAAAYYCDBELMX	Kandosols	Red	Unknown	Haplic	Medium	Non-gravelly	Loamy	Clay loamy	Very deep

Land Unit	Australian Soil Classification	Order	Suborder	Great Group	Subgroup	Family Criteria 1	Family Criteria 2	Family Criteria 3	Family Criteria 4	Family Criteria 5
8a	KAAAFGWAEMLX	Kandosols	Red	Dystrophic	Ferric-acidic	Thin	Non-gravelly	Loamy	Clay loamy	Very deep
8a	KAAAYYCDBFLMW	Kandosols	Red	Unknown	Haplic	Medium	Slightly gravelly	Loamy	Clay loamy	Deep
8a	KAAAAFAIAELMX	Kandosols	Red	Dystrophic	Acidic	Thin	Non-gravelly	Loamy	Clay loamy	Very deep
8a	KAAAYYCDAELMX	Kandosols	Red	Unknown	Haplic	Thin	Non-gravelly	Loamy	Clay loamy	Very deep
8a	KAAAYYCDAEKLX	Kandosols	Red	Unknown	Haplic	Thin	Non-gravelly	Sandy	Loamy	Very deep
8a	KAAAYYCDAEKMX	Kandosols	Red	Unknown	Haplic	Thin	Non-gravelly	Sandy	Clay loamy	Very deep
8a	KAAAYYCDBEMMX	Kandosols	Red	Unknown	Haplic	Medium	Non-gravelly	Clay Loamy	Clay loamy	Very deep
8a	KAAAYYCDBELOX	Kandosols	Red	Unknown	Haplic	Medium	Non-gravelly	Loamy	Clayey	Very deep
8b	KAABAFGWAGKMW	Kandosols	Brown	Dystrophic	Ferric-acidic	Thin	Gravelly	Sandy	Clay loamy	Deep
8b	KAAAYYBUAHLMX	Kandosols	Red	Unknown	Ferric	Thin	Moderately gravelly	Loamy	Clay loamy	Very deep
8b	KAAAYYBUBHLMX	Kandosols	Red	Unknown	Ferric	Medium	Moderately gravelly	Loamy	Clay loamy	Very deep
8b	KAAAYYBUAGLMX	Kandosols	Red	Unknown	Ferric	Thin	Gravelly	Loamy	Clay loamy	Very deep
8b	KAAAYYBUAHKMX	Kandosols	Red	Unknown	Ferric	Thin	Moderately gravelly	Loamy	Clay Loamy	Very deep
8b	KAAAYYCDAFLMX	Kandosols	Red	Unknown	Haplic	Thin	Slightly gravelly	Loamy	Clay loamy	Very deep
8b1	TEIODUARBGKKW	Tenosols	Brown orthic	Paralithic	Basic	Medium	Gravelly	Sandy	Sandy	Deep
8b1	TEIOGEARBGKKU	Tenosols	Brown orthic	Ferric	Basic	Medium	Gravelly	Sandy	Sandy	Shallow

Land Unit	Australian Soil Classification	Order	Suborder	Great Group	Subgroup	Family Criteria 1	Family Criteria 2	Family Criteria 3	Family Criteria 4	Family Criteria 5
8b1	TEIOGEAIBFKKW	Tenosols	Brown orthic	Ferric	Acidic	Medium	Slightly gravelly	Sandy	Sandy	Deep
8b1	TEIOBUAIAAGKKX	Tenosols	Brown orthic	Ferric	Acidic	Thin	Gravelly	Sandy	Sandy	Very deep
8b1	TEIOBUAIBGKKX	Tenosols	Brown orthic	Ferric	Acidic	Medium	Gravelly	Sandy	Sandy	Very deep
8b1	TEINYYARBFKLV	Tenosols	Red orthic	Unknown	Basic	Medium	Slightly gravelly	Sandy	Loamy	Moderate
8c	KAABAGGWAGKMW	Kandosols	Brown	Mesotrophic	Ferric-acidic	Thin	Gravelly	Sandy	Clay loamy	Deep
8c	KAAAYYBUBHLMV	Kandosols	Red	Unknown	Ferric	Medium	Moderately gravelly	Loamy	Clay loamy	Moderate
8c	KAAAYYBUAHLMV	Kandosols	Red	Unknown	Ferric	Thin	Moderately gravelly	Loamy	Clay loamy	Moderate
8c1	KAACYATAEKMX	Kandosols	Yellow	Unknown	Bleached	Thin	Non-gravelly	Sandy	Clay loamy	Very deep
8c1	TEIQYYARAEKLX	Tenosols	Grey orthic	Unknown	Basic	Thin	Non-gravelly	Sandy	Loamy	Very deep
8c1	TEIOAOAIAEKKX	Tenosols	Brown orthic	Arenic	Acidic	Thin	Non-gravelly	Sandy	Sandy	Very deep
8c1	TEIOEAARAFKLU	Tenosols	Brown orthic	Ferric	Basic	Thin	Slightly gravelly	Sandy	Loamy	Shallow
8c1	TEIOBUYAIEKLX	Tenosols	Brown orthic	Ferric	Unknown	Thin	Non-gravelly	Sandy	Loamy	Very deep
8c1	TEIOYYARBEKLX	Tenosols	Brown orthic	Unknown	Basic	Medium	Non-gravelly	Sandy	Loamy	Very deep
8c1	TEIOYYAIAEKKX	Tenosols	Brown orthic	Unknown	Acidic	Thin	Non-gravelly	Sandy	Sandy	Very deep
9a	HYDTYYAIBEMOX	Hydrosols	Oxyaquic	Unknown	Acidic	Medium	Non-gravelly	Clay loamy	Clayey	Very deep

Land Unit	Australian Soil Classification	Order	Suborder	Great Group	Subgroup	Family Criteria 1	Family Criteria 2	Family Criteria 3	Family Criteria 4	Family Criteria 5
9a1	HYDTGTYFCFKV	Hydrosols	Oxyaquic	Tenosolic	Unknown	Thick	Slightly gravelly	Sandy	Sandy	Moderate
9a1	HYEDBGBUBEKX	Hydrosols	Redoxic	Chromosolic	Ferric	Medium	Non-gravelly	Sandy	Clayey	Very deep
9a1	HYEDYYYYCEKX	Hydrosols	Redoxic	Unknown	Unknown	Thick	Non-gravelly	Sandy	Clayey	Very deep
10a	VEAMGSGAEQRX	Vertosols	Aquic	Epipedal	Epiacidic	-	Non-gravelly	Fine	Medium fine	Very deep
10a	HYDTYYYYBELOX	Hydrosols	Oxyaquic	Unknown	Unknown	Medium	Non-gravelly	Loamy	Clayey	Very deep
10a	HYDTFQYYCEOOX	Hydrosols	Oxyaquic	Dermosoilc	Unknown	Thick	Non-gravelly	Clayey	Clayey	Very deep
10a	HYDTGTATBELLX	Hydrosols	Oxyaquic	Tenosolic	Bleached	Medium	Non-gravelly	Loamy	Loamy	Very deep
10b	HYEDGTATAEKLX	Hydrosols	Redoxic	Tenosolic	Bleached-acidic	Thin	Non-gravelly	Sandy	Loamy	Very deep
10b	HYEDFRYYBEKMX	Hydrosols	Redoxic	Kandosolic	Unknown	Medium	Non-gravelly	Sandy	Clay loamy	Very deep
10b	HYEDGTYAEEKX	Hydrosols	Redoxic	Tenosolic	Unknown	Thin	Non-gravelly	Sandy	Sandy	Very deep
10b1	HYDTGTATAEKKX	Hydrosols	Oxyaquic	Tenosolic	Bleached	Thin	Non-gravelly	Sandy	Sandy	Very deep
10b1	HYDTGTAVAEKKV	Hydrosols	Oxyaquic	Tenosolic	Bleached-ferric	Thin	Non-gravelly	Sandy	Sandy	Moderate
10b1	HYDTGTBUBEKKV	Hydrosols	Oxyaquic	Tenosolic	Ferric	Medium	Non-gravelly	Sandy	Sandy	Moderate
10b1	HYDTGTYAEEKV	Hydrosols	Oxyaquic	Tenosolic	Unknown	Thin	Non-gravelly	Sandy	Sandy	Moderate
10b1	HYDTGTYBEKKX	Hydrosols	Oxyaquic	Tenosolic	Unknown	Medium	Non-gravelly	Sandy	Sandy	Very deep

Land Unit	Australian Soil Classification	Order	Suborder	Great Group	Subgroup	Family Criteria 1	Family Criteria 2	Family Criteria 3	Family Criteria 4	Family Criteria 5
10b1	HYEDFRYYAEKMW	Hydrosols	Redoxic	Kandosolic	Unknown	Thin	Non-gravelly	Sandy	Clay loamy	Deep
10b1	HYDTGTAIBEKKW	Hydrosols	Redoxic	Tenosolic	Acidic	Medium	Non-gravelly	Sandy	Sandy	Deep
10b1	HYEDYYGWAHKOX	Hydrosols	Redoxic	Unknown	Ferric-acidic	Thin	Moderately gravelly	Sandy	Clayey	Very deep
11a	HYEDFQYYBEMOX	Hydrosols	Redoxic	Dermosolic	Unknown	Medium	Non-gravelly	Clay loamy	Clayey	Very deep
11a	HYEDEVAIBEMMX	Hydrosols	Redoxic	Sulfuric	Acidic	Medium	Non-gravelly	Clay loamy	Clay Loamy	Very deep

Appendix D Effective rooting depth (ERD) and soil water storage (SWS) calculations (DSDIP 2014a)

Land unit	Rep. site	ERD (m)	Soil horizon	Modal horizon depths (m)	Depth factor	Field texture range	Coarse sand (%)	Fine sand (%)	Silt (%)	Clay (%)	PSA derived texture	Texture based SWS (mm/0.1m)	Horizon SWS (mm)	Median gravel content (%)	Adjust horizon SWS (mm)	Profile SWS (mm)	
5a	108	0.25	A11	0.09	0.9	Sandy loam	34	28	20	18	Sandy loam	5	4.5	60-80	0.9-1.8	2-6	
			A12	0.25	1.6	Clay loam	24	32	20	24	Sandy clay loam	6	9.6	60-80	1.9-3.8		
6a	34	0.3	A1	0.1	1.0	Sandy loam	40	45	7	8	Clayey sand	4	4.0	80-90	0.4-0.8	6-9	
			A2	0.3	2.0	Sandy loam	32	43	9	16	Sandy loam	5	10.0	25-40	6.0-7.5		
7a	15	1.5	A1	0.09	0.9	Sandy loam	41	45	4	10	Sandy loam	5	4.5	20-50	2.3-3.6	42-68	
			A2	0.30	2.1	Sandy loam	41	44	3	12	Sandy loam	5	10.5	20-50	5.3-8.4		
			B21	0.50	2.0	Sandy clay loam	40	41	4	15	Sandy loam	5	10.0	20-50	5.0-8.0		
			B22	1.50	10.0	Sandy clay loam	37	39	3	21	Sandy clay loam	6	60.0	20-50	30.0-48.0		
7a1	81	1.3	A1	0.09	0.9	Loam	13	77	7	3	Sand	4	3.6	0	3.6	71-74	
			A3	0.80	7.1	Sand	50	48	2	1	Sand	4	28.4	0	28.4		
			B1	1.10	3.0	Light medium clay	49	8	14	29	Sandy clay loam	6	18.0	0	18.0		
			B2	1.30	2.0	Light medium clay	3	17	35	45	Light medium clay	12	24.0	2-10	21.6-23.5		
8a	68		A1	0.08	0.8	Sandy loam	44	35	8	13	Sandy loam	5	4.0	0	4.0	80	
			A3	0.60	5.2	Sandy loam	47	34	4	15	Sandy loam	5	26.0	0	26.0		
			B21	1.00	4.0	Sandy clay loam	46	33	4	17	Sandy loam	5	20.0	0	20.0		
			B22	1.50	5.0	Sandy clay loam	45	29	3	23	Sandy clay loam	6	30.0	0	30.0		
	91	1.5		A1	0.05	0.5	Sandy loam	37	44	6	13	Sandy loam	5	2.5	0	2.5	75
				A3	0.70	6.5	Sandy loam	38	41	4	17	Sandy loam	5	32.5	0	32.5	
				B21	1.10	4.0	Sandy clay loam	43	37	2	18	Sandy loam	5	20.0	0	20.0	
				B22	1.50	4.0	Sandy clay loam	43	36	3	18	Sandy loam	5	20.0	0	20.0	
8b	98		A1	0.08	0.8	Loamy sand	29	60	6	5	Loamy sand	4	3.2	20-50	1.6-2.6	34-55	
			A21	0.20	1.2	Sandy loam	28	60	5	7	Clayey sand	4	4.8	20-50	2.4-3.8		
			A22	0.50	3.0	Sandy loam	26	58	6	10	Sandy loam	5	15.0	20-50	7.5-12.0		
			B21	1.00	5.0	Sandy clay loam	32	48	3	17	Sandy loam	5	25.0	20-50	12.5-20.0		
			B22	1.40	4.0	Sandy clay loam	29	49	5	17	Sandy loam	5	20.0	20-50	10.0-16.0		

Land unit	Rep. site	ERD (m)	Soil horizon	Modal horizon depths (m)	Depth factor	Field texture range	Coarse sand (%)	Fine sand (%)	Silt (%)	Clay (%)	PSA derived texture	Texture based SWS (mm/0.1m)	Horizon SWS (mm)	Median gravel content (%)	Adjust horizon SWS (mm)	Profile SWS (mm)
8b1	101	1.5	A1	0.10	1.0	Loamy sand	48	42	7	4	Loamy sand	4	4.0	20-50	2.0-3.2	30-48
			A3	0.75	6.5	Loamy sand	47	42	7	4	Loamy sand	4	26	20-50	13.0-20.8	
			B21	1.30	5.5	Clayey sand	46	43	8	3	Sand	4	22	20-50	11.0-17.6	
			B22	1.50	2.0	Clayey sand	48	37	8	7	Clayey sand	4	8.0	20-50	4.0-6.4	
8c	96	1.1	A1	0.05	0.5	Loamy sand	38	48	7	7	Clayey sand	4	2.0	20-50	1.0-1.6	26-43
			A2	0.15	1.0	Sandy loam	36	46	9	9	Clayey sand	4	4.0	20-50	2.0-3.2	
			A3	0.75	6.0	Sandy loam	36	44	9	11	Sandy loam	5	30.0	20-50	15.0-24.0	
			B21	1.00	2.5	Sandy loam	38	47	4	11	Sandy loam	5	12.5	20-50	6.3-10.0	
			B22	1.10	1.0	Sandy clay loam	38	39	7	17	Sandy loam	5	5.0	20-50	2.5-4.0	
8c1	29	>1.5	A1	0.07	0.7	Loamy sand	49	44	2	4	Sand	4	2.8	0	2.8	31-49
			A2	0.50	4.3	Loamy sand	49	42	3	6	Loamy sand	4	17.2	20-50	8.6-13.8	
			B1	0.70	2.0	Sand	53	42	2	3	Sand	4	8.0	20-50	4.0-6.4	
			B21	0.90	2.0	Sand	50	44	3	4	Sand	4	8.0	20-50	4.0-6.4	
			B22	1.50	6.0	Sand	53	38	2	7	Clayey sand	4	24.0	20-50	12.0-19.2	
9a	109		A1	0.12	1.2	Clay loam	6	33	28	33	Clay loam	8	9.6	0	9.6	106
			A2	0.50	3.8	Light clay	7	31	24	38	Light clay	10	38.0	0	38.0	
			B	1.00	5.0	Light medium clay	20	38	13	29	Sandy clay loam	6	30.0	0	30.0	
			D1	1.20	2.0	Sandy clay loam	26	49	10	15	Sandy loam	5	10.0	0	10.0	
			D2	1.50	3.0	Light clay	27	42	8	23	Sandy clay loam	6	18.0	0	18.0	
9a1	106	>1.5	A11	0.12	1.2	Sand	54	44	1	1	Sand	4	4.8	2-10	4.3-4.7	69-82
			A12	0.40	2.8	Sand	56	42	1	1	Sand	4	11.2	2-10	10.0-11.0	
			A2	0.80	4.0	Clayey sand	58	40	1	1	Sand	4	16.0	20-50	8.0-12.8	
			A3	1.00	2.0	Clayey sand	65	30	2	4	Sand	4	8.0	20-50	4.0-6.4	
			B21	1.10	1.0	Medium clay	37	20	8	34	Clay loam	8	8.0	2-10	7.2-7.8	
			B22	1.50	4.0	Heavy clay	39	18	7	36	Light clay	10	40.0	2-10	36.0-39.2	
10a	103	>1.5	A1	0.30	3.0	Light clay	11	30	22	37	Light clay	10	30.0	0	30.0	102
			A2	0.45	1.5	Light medium clay	8	20	26	46	Medium clay	12	18.0	0	18.0	
			A3	0.80	3.5	Heavy clay	5	14	18	64	Heavy clay	12	42.0	0	42.0	
			B2	0.90	1.0	Heavy clay	5	15	18	62	Heavy clay	12	12.0	0	12.0	
10b	4	>1.5	A1	0.06	0.6	Loamy sand	40	52	5	3	Sand	4	2.4	0	2.4	64
			A2	0.50	4.4	Sand	44	49	2	4	Sand	4	17.6	0	17.6	
			A3	1.10	6.0	Sand	51	40	2	6	Loamy sand	4	24.0	0	24.0	
			B2	1.50	4.0	Clayey sand	45	40	3	12	Sandy loam	5	20.0	0	20.0	

Land unit	Rep. site	ERD (m)	Soil horizon	Modal horizon depths (m)	Depth factor	Field texture range	Coarse sand (%)	Fine sand (%)	Silt (%)	Clay (%)	PSA derived texture	Texture based SWS (mm/0.1m)	Horizon SWS (mm)	Median gravel content (%)	Adjust horizon SWS (mm)	Profile SWS (mm)
10b1	102	1.0	A1	0.10	1.0	Loamy sand	46	46	5	3	Sand	4	4.0	20-50	2.0-3.2	20-32
			A21	0.40	3.0	Clayey sand	46	45	4	5	Loamy sand	4	12.0	20-50	6.0-9.6	
			A22	0.90	5.0	Clayey sand	49	42	2	7	Clayey sand	4	20.0	20-50	10.0-16.0	
			B2	1.00	1.0	Clayey sand	49	45	2	5	Loamy sand	4	4.0	20-50	2.0-3.2	
11a	104	>1.5	A1	0.15	1.5	Clay loam	22	45	14	19	Sandy loam	5	7.5	0	7.5	53
			A3	0.40	2.5	Clay loam	24	46	14	17	Sandy loam	5	12.5	0	12.5	
			B21	0.85	4.5	Sandy clay loam	35	44	3	17	Sandy loam	5	22.5	0	22.5	
			B22	1.05	2.0	Clayey sand	33	47	3	17	Sandy loam	5	10.0	0	10.0	

Note 1: Refer to Appendix E Section 2 – Soil profile limitations, for soil water availability (SWS) attribute codes

Appendix E Irrigated Agriculture Land Suitability Framework Darwin – Tiwi Islands Region (Version 1, 2016)

Potential irrigated agricultural crops (Reference Table 7.9 of this report)

Irrigated group	Group	Individual crops assessed
Tree crops	1	Monsoonal Tropical – Mango, Cashew, Jackfruit, Tamarind, Coconut, Dragonfruit, Bamboo, Billy Goat plum, Morinda citrifolia
	2	Rainforest Tropical and Sub-Tropical – Rambutan, Durian, Longan, Carambola, Avocado, Sapote, Soursop, etc.
	3	Tropical Citrus – Lime, Lemon, Mandarin, Pommelo, Lemonade, Grapefruit
	4	Fruit row crops – Banana, Papaya, Pineapple, Passionfruit
Row crops	5	Cucurbits – Watermelon, Honeydew melon, Rockmelon, Pumpkin, Cucumber, Asian melons, Zucchini, Squash
	6	Fruiting vegetable crops – Solanaceae (Capsicum, Chilli, Eggplant, Tomato), Okra, Snake bean, Drumstick tree
	7	Leafy vegetables and herbs – Kangkong, Amaranth, Lettuce, Chinese cabbage, Bok Choy, Pak Choy, Choy Sum, Spring onions, Basil, Coriander, Dill, Mint, Spearmint, Chives, Oregano, Lemon grass
Root crops	8	Carrot, Onion, Sweet potato, Shallots, Ginger, Turmeric, Galangal, Yam bean, Taro
Forestry	9	Sandalwood
	10	Irrigated flower crops – Cucurma, Heliconia, Etlingera, Globba, Alpinia, Zingibar

Section 1 - Landscape limitations

Water erosion (E)		
Attribute Levels – based on recognised slope limits (%) for agricultural development in the Top End		
Slope range 0-0.5 %	All soils	Code: E1
Slope range 0.5-1.0 %	All soils	Code: E2
Slope range 1.0-2.0 %	All soils	Code: E3
Slope range 2.0-3.0 %	All soils	Code: E4
Slope range 3.0-5.0 %	All soils	Code: E5
Slope range >5.0 %	All soils	Code: E6

Wetness (W)			
Drainage class – wetness features relating to internal and external drainage in the existing state.		Permeability – aeration in the profile and the speed of internal soil water movement	
1	Very poorly drained – wet most of the year	V	Very slowly permeable – (Ks <5 mm/day)
2	Poorly drained – wet for several months	S	Slowly permeable – (Ks 5–50 mm/day)
3	Imperfectly drained – wet for about 1 month	M	Moderately permeable – (Ks 50–500 mm/day)

4	Moderately well drained – wet for about 1 week	H	Highly permeable – (Ks >500 mm/day)
5	Well drained – wet for several days		
6	Rapidly drained – wet for <1 day		

Wetness (W)			
Attribute levels – based on standard drainage and permeability class at 0.5 m, 1.0 m and 1.5 m depths			
Rapidly drained – drainage class 6	0.5 m (Wa)	1.0 m (Wb)	1.5 m (Wc)
Highly permeable	Wa1_6H	Wb1_6H	Wc1_6H
Well drained – drainage class 5			
Highly permeable	Wa2_5H	Wb2_5H	Wc2_5H
Moderately permeable	Wa3_5M	Wb3_5M	Wc3_5M
Moderately well drained – drainage class 4			
Highly permeable	Wa4_4H	Wb4_4H	Wc4_4H
Moderately permeable	Wa5_4M	Wb5_4M	Wc5_4M
Slowly permeable	Wa6_4S	Wb6_4S	Wc6_4S
Very slowly permeable	Wa7_4V	Wb7_4V	Wc7_4V
Imperfectly drained – drainage class 3			
Highly permeable	Wa8_3H	Wb8_3H	Wc8_3H
Moderately permeable	Wa9_3M	Wb9_3M	Wc9_3M
Slowly permeable	Wa10_3S	Wb10_3S	Wc10_3S
Very slowly permeable	Wa11_3V	Wb11_3V	Wc11_3V
Poorly drained – drainage class 2			
Highly permeable	Wa12_2H	Wb12_2H	Wc12_2H
Moderately permeable	Wa13_2M	Wb13_2M	Wc13_2M
Slowly permeable	Wa14_2S	Wb14_2S	Wc14_2S
Very slowly permeable	Wa15_2V	Wb15_2V	Wc15_2V
Very poorly drained – drainage class 1			
Highly permeable	Wa16_1H	Wb16_1H	Wc16_1H
Moderately permeable	Wa17_1M	Wb17_1M	Wc17_1M
Slowly permeable	Wa18_1S	Wb18_1S	Wc18_1S
Very slowly permeable	Wa19_1V	Wb19_1V	Wc19_1V

Soil landscape complexity (Xs)		
Attribute levels – based on estimated % of soil variability within a land entity		
Relatively uniform landscape	Spatial extent of managerially different soils is <10% (i.e. less than one tenth of the overall entity)	Code: Xs1
Moderately variable landscape	Spatial extent of managerially different soils is between 10-30% (i.e. less than one quarter of the overall entity)	Code: Xs2
Highly variable landscape	Spatial extent of managerially different soils is between 30-50% (i.e. less than half of the overall entity)	Code: Xs3
Complex landscape	Spatial extent of managerially different soils is >50% (i.e. more than half of the overall entity)	Code: Xs4

Section 1a - Subclass decision rules for landscape limitations

Water Erosion (E)											
Attribute value		Irrigated group									
		Tree crops				Row crops			Root crops	Forestry	
		Group									
		1	2	3	4	5	6	7	8	9	10
E1	0-0.5%	e1	e1	e1	e1	e1	e1	e1	e1	tba	e1
E2	0.5-1.0%	e1	e1	e1	e1	e1	e1	e1	e1	tba	e1
E3	1.0-2.0%	e1	e1	e1	e1	e2	e2	e2	e2	tba	e1
E4	2.0-3.0%	e3	e3	e3	e2	e5	e5	e5	e5	tba	e3
E5	3.0-5. %	e4	e4	e4	e3	e5	e5	e5	e5	tba	e5
E6	>5.0%	e5	e5	e5	e5	e5	e5	e5	e5	tba	e5

Flooding (F)											
Attribute value		Irrigated group									
		Tree crops				Row crops			Root crops	Forestry	
		Group									
		1	2	3	4	5	6	7	8	9	10
F1	None	f1	f1	f1	f1	f1	f1	f1	f1	tba	f1
F2	ARI >1:10	f1	f2	f1	f3	f1	f1	f1	f1	tba	f2
F3	ARI 1:2-1:10	f3	f5	f5	f4	f1	f1	f1	f1	tba	f4
F4	ARI 1:1	f5	f5	f5	f5	f5	f5	f5	f5	tba	f5

Soil Landscape Complexity (Xs)											
Attribute value		Irrigated group									
		Tree crops				Row crops			Root crops	Forestry	
		Group									
		1	2	3	4	5	6	7	8	9	10
Xs1	<10% (<tenth)	xs1	xs1	xs1	xs1	xs1	xs1	xs1	xs1	tba	xs1

Xs2	10-30% (<quarter)	xs1	xs2	xs1	xs3	xs2	xs2	xs2	xs2	tba	xs3
Xs3	30-50% (third to half)	xs2	xs5	xs2	xs5	xs3	xs3	xs3	xs3	tba	xs5
Xs4	>50% (>half)	xs4	xs5	xs4	xs5	xs5	xs5	xs5	xs5	tba	xs5

Surface soil wetness – 0.5 m (Wa)											
Attribute value		Irrigated group									
		Tree crops				Row crops			Root crops	Forestry	
		Group									
		1	2	3	4	5	6	7	8	9	10
Wa1	Rapid/H	wa1	wa2	wa2	wa2	wa2	wa2	wa2	wa2	tba	wa2
Wa2	Well/H	wa1	wa2	wa2	wa2	wa1	wa1	wa1	wa1	tba	wa2
Wa3	Well/M	wa1	wa1	wa1	wa1	wa1	wa1	wa1	wa1	tba	wa1
Wa4	Mod. Well/H	wa1	wa1	wa1	wa1	wa1	wa1	wa1	wa1	tba	wa1
Wa5	Mod. Well/M	wa1	wa1	wa1	wa1	wa2	wa2	wa2	wa2	tba	wa1
Wa6	Mod. Well/S	wa2	wa2	wa1	wa2	wa2	wa2	wa2	wa3	tba	wa2
Wa7	Mod. Well/VS	wa2	wa2	wa2	wa2	wa2	wa2	wa2	wa3	tba	wa2
Wa8	Imperfect/H	wa1	wa2	wa1	wa2	wa2	wa2	wa2	wa2	tba	wa2
Wa9	Imperfect/M	wa1	wa3	wa2	wa2	wa3	wa3	wa3	wa3	tba	wa2
Wa10	Imperfect/S	wa2	wa3	wa3	wa3	wa4	wa4	wa4	wa4	tba	wa3
Wa11	Imperfect/VS	wa2	wa4	wa4	wa4	wa4	wa4	wa4	wa4	tba	wa4
Wa12	Poor/H	wa1	wa2	wa2	wa3	wa5	wa5	wa5	wa5	tba	wa2
Wa13	Poor/M	wa1	wa2	wa3	wa3	wa5	wa5	wa5	wa5	tba	wa3

Surface soil wetness – 0.5 m (Wa)											
Attribute value		Irrigated group									
		Tree crops				Row crops			Root crops	Forestry	
		Group									
		1	2	3	4	5	6	7	8	9	10
Wa14	Poor/S	wa2	wa3	wa4	wa4	wa5	wa5	wa5	wa5	tba	wa4
Wa15	Poor/VS	wa3	wa4	wa5	wa5	wa5	wa5	wa5	wa5	tba	wa5
Wa16	Very poor/H	wa1	wa4	wa4	wa4	wa5	wa5	wa5	wa5	tba	wa4
Wa17	Very poor/M	wa2	wa4	wa4	wa5	wa5	wa5	wa5	wa5	tba	wa4
Wa18	Very poor/S	wa3	wa5	wa5	wa5	wa5	wa5	wa5	wa5	tba	wa5
Wa19	Very poor/VS	wa4	wa5	wa5	wa5	wa5	wa5	wa5	wa5	tba	wa5

Upper subsoil wetness – 1.0 m (Wb)											
Attribute value		Irrigated group									
		Tree crops				Row crops			Root crops	Forestry	
		Group									
		1	2	3	4	5	6	7	8	9	10
Wb1	Rapid/H	wb2	wb2	wb2	wb2	wb2	wb1	wb1	wb1	tba	wb1
Wb2	Well/H	wb1	wb2	wb1	wb2	wb1	wb1	wb1	wb1	tba	wb1
Wb3	Well/M	wb1	wb1	wb1	wb1	wb1	wb1	wb1	wb1	tba	wb1
Wb4	Mod. Well/H	wb1	wb1	wb1	wb1	wb1	wb1	wb1	wb1	tba	wb1
Wb5	Mod. Well/M	wb1	wb1	wb2	wb2	wb1	wb1	wb1	wb1	tba	wb1
Wb6	Mod. Well/S	wb1	wb2	wb3	wb3	wb2	wb1	wb1	wb2	tba	wb2
Wb7	Mod. Well/VS	wb2	wb3	wb4	wb4	wb2	wb2	wb2	wb3	tba	wb2

Upper subsoil wetness – 1.0 m (Wb)											
Attribute value		Irrigated group									
		Tree crops				Row crops			Root crops	Forestry	
		Group									
		1	2	3	4	5	6	7	8	9	10
Wb8	Imperfect/H	wb1	wb1	wb1	wb1	wb1	wb1	wb1	wb1	tba	wb1
Wb9	Imperfect/M	wb1	wb2	wb2	wb2	wb1	wb1	wb1	wb1	tba	wb1
Wb10	Imperfect/S	wb2	wb3	wb3	wb2	wb2	wb1	wb1	wb2	tba	wb2
Wb11	Imperfect/VS	wb3	wb4	wb4	wb3	wb3	wb2	wb2	wb3	tba	wb3
Wb12	Poor/H	wb2	wb2	wb2	wb1	wb1	wb1	wb1	wb2	tba	wb1
Wb13	Poor/M	wb2	wb3	wb3	wb2	wb1	wb1	wb1	wb2	tba	wb1
Wb14	Poor/S	wb3	wb4	wb4	wb3	wb2	wb2	wb2	wb3	tba	wb2
Wb15	Poor/VS	wb4	wb5	wb5	wb4	wb3	wb3	wb3	wb4	tba	wb3
Wb16	Very poor/H	wb3	wb4	wb4	wb2	wb2	wb2	wb2	wb3	tba	wb2
Wb17	Very poor/M	wb4	wb4	wb4	wb3	wb3	wb2	wb3	wb4	tba	wb3
Wb18	Very poor/S	wb5	wb5	wb5	wb4	wb4	wb3	wb4	wb5	tba	wb4
Wb19	Very poor/VS	wb5	wb5	wb5	wb4	wb4	wb4	wb4	wb5	tba	wb5

Lower subsoil wetness – 1.5 m (Wc)											
Attribute value		Irrigated group									
		Tree crops				Row crops			Root crops	Forestry	
		Group									
		1	2	3	4	5	6	7	8	9	10
Wc1	Rapid/H	wc1	wc2	wc2	na	na	na	na	na	tba	na
Wc2	Well/H	wc1	wc1	wc1	na	na	na	na	na	tba	na
Wc3	Well/M	wc1	wc1	wc1	na	na	na	na	na	tba	na
Wc4	Mod. Well/H	wc1	wc1	wc1	na	na	na	na	na	tba	na
Wc5	Mod. Well/M	wc1	wc1	wc2	na	na	na	na	na	tba	na
Wc6	Mod. Well/S	wc2	wc2	wc3	na	na	na	na	na	tba	na
Wc7	Mod. Well/VS	wc3	wc3	wc4	na	na	na	na	na	tba	na
Wc8	Imperfect/H	wc1	wc1	wc2	na	na	na	na	na	tba	na
Wc9	Imperfect/M	wc1	wc1	wc3	na	na	na	na	na	tba	na
Wc10	Imperfect/S	wc3	wc3	wc4	na	na	na	na	na	tba	na
Wc11	Imperfect/VS	wc4	wc4	wc5	na	na	na	na	na	tba	na
Wc12	Poor/H	wc2	wc3	wc3	na	na	na	na	na	tba	na
Wc13	Poor/M	wc3	wc3	wc4	na	na	na	na	na	tba	na
Wc14	Poor/S	wc4	wc4	wc5	na	na	na	na	na	tba	na
Wc15	Poor/VS	wc5	wc5	wc5	na	na	na	na	na	tba	na
Wc16	Very poor/H	wc4	wc4	wc5	na	na	na	na	na	tba	na
Wc17	Very poor/M	wc5	wc4	wc5	na	na	na	na	na	tba	na

Lower subsoil wetness – 1.5 m (Wc)											
Attribute value		Irrigated group									
		Tree crops				Row crops			Root crops	Forestry	
		Group									
		1	2	3	4	5	6	7	8	9	10
Wc18	Very poor/S	wc5	wc5	wc5	na	na	na	na	na	tba	na
Wc19	Very poor/VS	wc5	wc5	wc5	na	na	na	na	na	tba	na

Section 2 - Soil profile limitations

Infiltration/soil profile recharge (Ir)	
Attribute levels – based on soil permeability characteristics (surface soil and subsoil)	
Highly permeable (CS, <SL) throughout the profile to >1.0 m	Code: Ir1
Highly permeable (CS, <SL) surface soil to ≥0.25 m, moderately permeable (CS-FS, >SL-CL) to >1.0 m	Code: Ir2
Moderately permeable (CS-FS, >SL-CL) throughout the profile to >1.0 m	Code: Ir3
Moderately permeable (CS-FS, >SL-CL) surface soil to ≥0.25 m, slowly permeable (LC-MC, non-sodic) to >1.0 m	Code: Ir4
Slowly permeable (LC-MC, non-sodic) at or before 0.25 m	Code: Ir5
Very slowly permeable clay (≥MC or sodic) or impermeable rock at or before 0.25 m	Code: Ir6

Note 1: Surface soil is defined as combined A1, A2, A3/B1 horizons and/ or dominant soil material in upper 0.5 m.

Note 2: Ir attribute values are described by "short hand" codes for surface texture – Sand to Sandy Loam (<SL), Sandy Clay to Clay Loam (>SL), Clay Loam (CL), Silty Loam to Silty Clay Loam (>ZL), Light Medium Clay to Heavy Clay (>LMC); sand fraction - Fine Sand (FS), Medium Sand (MS), Coarse Sand (CS)

Soil water availability (M)		
Attribute levels – based on calculated SWS to a standard depth of 1.0 m (or depth to rock)		
Very high	SWS >125 mm	Code: M1
Very high	SWS 100–125 mm	Code: M2
High	SWS 75–100 mm	Code: M3
Moderate	SWS 50–75 mm	Code: M4
Low	SWS 25-50 mm	Code: M5
Very low	SWS <25 mm	Code: M6

Soil depth (Pd)		
Attribute levels – based on standard soil depth (m) defined by Isbell (2002)		
Giant	>5.0 m	Code: Pd1
Very deep	1.5-5.0 m	Code: Pd2
Deep	1.0-<1.5 m	Code: Pd3
Moderate	0.5-<1.0 m	Code: Pd4
Shallow	0.25-<0.5 m	Code: Pd5
Very shallow	<0.25 m	Code: Pd6

Rockiness (R)	
Attribute levels – based on coarse fragment (gravel, cobble, stone, boulder and outcrop) size and abundance	
None (includes <2% fine gravel 6-20 mm, coarse gravel 20-60 mm, cobbles 60-200 mm and stone 200-600 mm)	Code: R1
6-20 mm (fine gravel)	
<2%	Code: R2
2-10%	Code: R3
10-20%	Code: R4
20-50%	Code: R5
50-90%	Code: R6
>90%	Code: R7
20-60 mm (coarse gravel)	
<2%	Code: R8
2-10%	Code: R9
10-20%	Code: R10
20-50%	Code: R11

Rockiness (R)	
Attribute levels – based on coarse fragment (gravel, cobble, stone, boulder and outcrop) size and abundance	
50-90%	Code: R12
>90%	Code: R13
60-200 mm (cobble)	
<2%	Code: R14
2-10%	Code: R15
10-20%	Code: R16
20-50%	Code: R17
50-90%	Code: R18
>90%	Code: R19
200-600 mm (stones)	
<2%	Code: R20
2-10%	Code: R21
10-20%	Code: R22
20-50%	Code: R23
50-90%	Code: R24
>90%	Code: R25
>600 mm (boulders)	
<2%	Code: R26
2-10%	Code: R27
10-20%	Code: R28
20-50%	Code: R29
50-90%	Code: R30
>90%	Code: R31
Rock outcrop	
<2%	Code: R32
2-10%	Code: R33
10-20%	Code: R34
20-50%	Code: R35
50-90%	Code: R36
>90%	Code: R37

Section 2a - Subclass decision rules for soil profile limitations

Infiltration/Soil Profile Recharge (Ir)												
Attribute value		Irrigated group										
		Tree crops				Row crops			Root crops		Forestry	
		Group										
		1	2	3	4	5	6	7	8 T	8 S	9	10
Ir1	H/>1.0 m	ir1	ir1	ir1	ir1	ir1	ir1	ir1	ir1	ir1	tba	ir1
Ir2	H/≥ 0.25 m, M/>1.0 m	ir1	ir1	ir1	ir1	ir1	ir1	ir1	ir1	ir1	tba	ir1
Ir3	M/>1.0 m	ir1	ir1	ir1	ir1	ir1	ir1	ir2	ir1	ir2	tba	ir1
Ir4	M/≥ 0.25 m, S/>1.0 m	ir1	ir1	ir1	ir1	ir1	ir1	ir3	ir2	ir3	tba	ir1
Ir5	S/<0.25 m	ir2	ir2	ir2	ir2	ir1	ir1	ir4	ir3	ir4	tba	ir2
Ir6	VS or rock/<0.25 m	ir3	ir3	ir3	ir4	ir4	ir4	ir5	ir5	ir4	tba	ir3

Note 1: Pp attribute values are described by "short hand" codes for permeability - Very Slowly (VS), Slowly (S), Moderately (M), and Highly (H).

Note 2: Group 8 is split into T-tape and pivot irrigation

Soil Water Availability (M)												
Attribute value		Irrigated group										
		Tree crops				Row crops			Root crops		Forestry	
		Group										
		1	2	3	4	5	6	7	8 T	8 S	9	10
M1	>125 mm	m1	m2	m2	m1	m2	m1	m2	m2	m1	tba	m1
M2	100–125 mm	m1	m1	m1	m1	m1	m1	m1	m1	m1	tba	m1
M3	75–100 mm	m1	m1	m1	m1	m1	m1	m1	m1	m2	tba	m1
M4	50–75 mm	m1	m2	m2	m3	m2	m2	m3	m2	m2	tba	m3
M5	25-50 mm	m2	m3	m3	m5	m3	m4	m5	m3	m3	tba	m5
M6	<25 mm	m3	m4	m4	m5	m5	m5	m5	m4	m5	tba	m5

Note 1: Group 8 is split into T-tape and pivot irrigation.

Soil Depth (Pd)											
Attribute value		Irrigated group									
		Tree crops				Row crops			Root crops	Forestry	
		Group									
		1	2	3	4	5	6	7	8	9	10
Pd1	>5.0 m	pd1	pd1	pd1	pd1	pd1	pd1	pd1	pd1	tba	pd1
Pd2	1.5-5.0 m	pd1	pd1	pd1	pd1	pd1	pd1	pd1	pd1	tba	pd1
Pd3	1.0-<1.5 m	pd1	pd1	pd1	pd1	pd1	pd1	pd1	pd1	tba	pd1
Pd4	0.5-<1.0 m	pd3	pd3	pd3	pd1	pd1	pd1	pd1	pd1	tba	pd3
Pd5	0.25-<0.5 m	pd4	pd5	pd4	pd3	pd2	pd3	pd3	pd3	tba	pd5
Pd6	<0.25 m	pd5	pd5	pd5	pd5	pd4	pd5	pd5	pd5	tba	pd5

Rockiness (R)											
Attribute value		Irrigated group									
		Tree crops				Row crops			Root crops	Forestry	
		Group									
		1	2	3	4	5	6	7	8	9	10
R1	None	r2	r2	r1	r1	r1	r1	r1	r1	tba	r2
6-20 mm (fine gravel)											
R2	<2%	r1	r1	r1	r1	r1	r1	r1	r2	tba	r1
R3	2-10%	r1	r1	r1	r1	r2	r2	r2	r3	tba	r1
R4	10-20%	r1	r2	r1	r1	r3	r3	r3	r4	tba	r1
R5	20-50%	r1	r3	r2	r3	r4	r4	r4	r5	tba	r3
R6	50-90%	r3	r5	r4	r5	r5	r5	r5	r5	tba	r5
R7	>90%	r5	r5	r5	r5	r5	r5	r5	r5	tba	r5
20-60 mm (coarse gravel)											
R8	<2%	r1	r1	r1	r1	r2	r2	r2	r3	tba	r1
R9	2-10%	r1	r1	r1	r1	r3	r3	r3	r4	tba	r1
R10	10-20%	r1	r2	r1	r3	r4	r4	r4	r5	tba	r3

Rockiness (R)											
Attribute value		Irrigated group									
		Tree crops				Row crops			Root crops	Forestry	
		Group									
		1	2	3	4	5	6	7	8	9	10
R11	20-50%	r2	r4	r2	r5	r5	r5	r5	r5	tba	r5
R12	50-90%	r4	r5	r4	r5	r5	r5	r5	r5	tba	r5
R13	>90%	r5	r5	r5	-	r5	r5	r5	r5	tba	r5
60-200 mm (cobbles)											
R14	<2%	r1	r1	r1	r2	r3	r3	r3	r4	tba	r1
R15	2-10%	r3	r3	r3	r3	r4	r4	r4	r5	tba	r2
R16	10-20%	r4	r4	r4	r4	r5	r5	r5	r5	tba	r4
R17	20-50%	r5	r5	r5	r5	r5	r5	r5	r5	tba	r5
R18	50-90%	r5	r5	r5	r5	r5	r5	r5	r5	tba	r5
R19	>90%	r5	r5	r5	r5	r5	r5	r5	r5	tba	r5
200-600 mm (stones)											
R20	<2%	r1	r1	r1	r3	r4	r4	r4	r5	tba	r3
R21	2-10%	r3	r3	r3	r5	r5	r5	r5	r5	tba	r5
R22	10-20%	r4	r4	r4	r5	r5	r5	r5	r5	tba	r5
R23	20-50%	r5	r5	r5	r5	r5	r5	r5	r5	tba	r5
R24	50-90%	r5	r5	r5	r5	r5	r5	r5	r5	tba	r5
R25	>90%	r5	r5	r5	r5	r5	r5	r5	r5	tba	r5
>600 mm (boulders)											
R26	<2%	r2	r3	r2	r5	r5	r5	r5	r5	tba	r5
R27	2-10%	r4	r5	r4	r5	r5	r5	r5	r5	tba	r5
R28	10-20%	r5	r5	r5	r5	r5	r5	r5	r5	tba	r5
R29	20-50%	r5	r5	r5	r5	r5	r5	r5	r5	tba	r5
R30	50-90%	r5	r5	r5	r5	r5	r5	r5	r5	tba	r5
R31	>90%	r5	r5	r5	r5	r5	r5	r5	r5	tba	r5
Rock outcrop											

Rockiness (R)											
Attribute value		Irrigated group									
		Tree crops				Row crops			Root crops	Forestry	
		Group									
		1	2	3	4	5	6	7	8	9	10
R32	<2%	r3	r3	r3	r5	r2	r2	r2	r2	tba	r5
R33	2-10%	r4	r4	r4	r5	r3	r3	r3	r3	tba	r5
R34	10-20%	r4	r5	r4	r5	r5	r5	r5	r5	tba	r5
R35	20-50%	r5	r5	r5	r5	r5	r5	r5	r5	tba	r5
R36	50-90%	r5	r5	r5	r5	r5	r5	r5	r5	tba	r5
R37	>90%	r5	r5	r5	r5	r5	r5	r5	r5	tba	r5

Section 3 - Soil physical limitations

Soil adhesiveness (Pa)		
Attribute levels – based on soil surface condition, particle size characteristics and soil morphology		
No restrictions	Loose, soft or firm, medium to coarse sandy surface horizons (<SL) to 0.3 m	Code: Pa1
Slightly adhesive soils	Firm to hardsetting, fine to medium sandy surface horizons (<SL) to 0.3 m	Code: Pa2
Moderately adhesive soils	Hardsetting, loamy surface horizons (SCL-CL) to 0.3 m	Code: Pa3
Strongly adhesive soils	Hardsetting silty or clayey surface horizons (ZL, ZCL, LC, LMC, MC, HC) in the upper 0.3 m (includes Dermosols, Vertosols and thin surfaced Sodosols)	Code: Pa4

Excessive permeability (Pp)		
Attribute levels – based on soil permeability characteristics		
Very slowly permeable (>LMC or sodic) or hard rock in the upper 0.5 m		Code: Pp1_VS
Slowly permeable (LC-LMC) in the upper 0.5 m		Code: Pp2_S
Moderately permeable (CS-FS, >SL-CL) surface soil (<0.5 m) over slowly permeable (LC-LMC) subsoil to 1.0 m		Code: Pp3_MS
Moderately permeable (CS-FS, >SL-CL) throughout the profile to 1.0 m		Code: Pp4_M
Highly permeable (CS-FS, <SL) surface soil (<0.5 m) over moderately permeable (CS-FS, >SL-CL) subsoil to 1.0 m		Code: Pp5_HM
Highly permeable (CS-FS, <SL) throughout the profile to 1.0 m		Code: Pp6_H

Soil surface condition (Ps)		
Attribute levels – based on surface soil condition, PSA characteristics and soil morphology		
Coarse sandy surface soils that do not set hard – loose, soft or firm, medium to coarse sandy surface horizons with sand to sandy loam surface textures; no restriction to seedling emergence and establishment		Code: Ps1
Firm to hard setting, low strength, fine sandy surface soils – firm to hard setting, massive, fine to medium sandy surface horizons with sand to sandy loam surface textures; slight restriction to seedling emergence and establishment		Code: Ps2
Hard setting, moderate strength, loamy (coarse) surface soils – hard setting, massive, loamy surface horizons with sandy loam to clay loam surface textures and a medium to coarse sand fraction; slight restriction to seedling emergence and establishment		Code: Ps3
Hard setting, high strength, loamy (fine) surface soils – hard setting, massive, loamy surface horizons with sandy loam to clay loam surface textures and a fine to medium sand fraction; moderate restriction to seedling emergence and establishment		Code: Ps4
Very hard setting, high strength, silty surface horizons – hard setting, massive, dense, silty surface horizons with silty loam, silty clay loam or silty light clay surface textures (elevated silt fraction) that are prone to surface crusting; moderate to severe restriction to seedling emergence and establishment		Code: Ps5
Coarsely structured clayey surface horizons with poor seed-soil contact – clayey surface horizons with moderate to strong surface structure and coarse peds (>10-20 mm); typically coarsely self-mulching cracking clays (e.g. coastal floodplains) or non-cracking clay soils with very coarse blocky structure; significantly limits prolonged seed contact with moist soil; severe to extreme restriction to seedling emergence and establishment		Code: Ps6

Section 3a - Subclass decision rules for soil physical limitations

Soil Adhesiveness (Pa)											
Attribute value		Irrigated group									
		Tree crops				Row crops			Root crops		Forestry
		Group									
		1	2	3	4	5	6	7	8	9	10
Pa1	L-F, <SL/MS-CS	pa1	pa1	pa1	pa1	pa1	pa1	pa1	pa1	tba	pa1
Pa2	F-HS, <SL/FS-MS	pa1	pa2	pa1	pa2	pa1	pa1	pa1	pa2	tba	pa1
Pa3	HS, SCL-CL	pa1	pa5	pa1	pa3	pa1	pa1	pa3	pa3	tba	pa2
Pa4	HS, silty/clayey	pa1	pa5	pa1	pa5	pa3	pa3	pa4	pa4	tba	pa3

Excessive permeability (Pp)												
Attribute value		Irrigated group										
		Tree crops				Row crops			Root crops		Forestry	
		Group										
		1	2	3	4	5	6	7	8 T	8 S	9	10
Pp1	VS (or rock) /0.5 m	pp2	pp4	pp3	pp5	pp5	pp4	pp5	pp5	pp5	tba	pp5
Pp2	S/0.5 m	pp2	pp3	pp3	pp3	pp3	pp2	pp4	pp4	pp4	tba	pp4
Pp3	M/0.5 m, S/1.0 m	pp1	pp1	pp1	pp1	pp1	pp1	pp2	pp2	pp3	tba	pp2
Pp4	M/1.0 m	pp1	pp1	pp1	pp1	pp1	pp1	pp1	pp1	pp2	tba	pp1
Pp5	H/0.5 m, M/1.0 m	pp1	pp1	pp1	pp1	pp1	pp1	pp1	pp1	pp1	tba	pp1
Pp6	H/1.0 m	pp1	pp2	pp1	pp2	pp2	pp1	pp2	pp1	pp2	tba	pp2

Note 1: Groups 1, 2, 3, 7, 8S & 10 rules are for spray irrigation, Groups 4, 5, 6 and 8T are for T-tape irrigation

Soil Surface Condition (Ps)													
Attribute value		Irrigated group											
		Tree crops				Row crops			Root crops		Forestry		
		Group											
		1	2	3	4	5	6	7	8 T	8 S	9	10	
Ps1	L-F/<SL/MS-CS	ps1	ps1	ps1	ps1	ps1	ps1	ps1	ps1	ps1	ps1	tba	ps1
Ps2	F-HS/<SL/FS-MS	ps1	ps1	ps1	ps1	ps1	ps1	ps1	ps1	ps1	ps1	tba	ps1
Ps3	HS/>SL/MS-CS	ps1	ps1	ps1	ps1	ps2	ps3	ps3	ps3	ps3	ps3	tba	ps1
Ps4	HS/>SL/FS-MS	ps2	ps3	ps3	ps3	ps3	ps5	ps5	ps5	ps5	ps5	tba	ps2
Ps5	HS/>ZL	ps3	ps5	ps5	ps5	ps5	ps5	ps5	ps5	ps5	ps5	tba	ps3
Ps6	coarse BL/>LC	ps3	ps5	ps5	ps5	ps5	ps5	ps5	ps5	ps5	ps5	tba	ps3

Note 1: Pa and Ps attribute values are described by “short hand” codes for the following parameters: surface condition – Loose (L), Soft (S), Firm (F) or Hard Setting (HS); surface texture – Sand to Sandy Loam (<SL), Sandy Loam to Clay Loam (>SL), Silty Loam to Silty Clay Loam (>ZL), Light Clay to Heavy Clay (>LC); sand fraction - Fine Sand (FS), Medium Sand (MS), Coarse Sand (CS)

Note 2: Pp attribute values are described by “short hand” codes for permeability - Very Slowly (VS), Slowly (S), Moderately (M), Highly (H)

Note 3: Groups 1, 2, 3, 7 & 10 rules are for spray irrigation, Groups 4, 5 and 6 are for T-tape irrigation

Section 4 - Soil nutrient limitations

Nutrient deficiency (Nd)		
Attribute levels – based on measured CEC/ECEC and soil texture in the topsoil (0-0.25 m)		
Very low CEC – <5 cmol/kg	Sand, loamy sand or sandy loam topsoil texture (<SL)	Code: Nd1
	Sandy clay loam to clay loam topsoil texture (SCL-CL)	Code: Nd2
	Light clay to light medium clay topsoil texture (LC-LMC)	Code: Nd3
	Medium clay to heavy clay topsoil texture (>MC)	Code: Nd4
Low CEC – 5-15 cmol/kg	Sand, loamy sand or sandy loam topsoil texture (<SL)	Code: Nd5
	Sandy clay loam to clay loam topsoil texture (SCL-CL)	Code: Nd6
	Light clay to light medium clay topsoil texture (LC-LMC)	Code: Nd7
	Medium clay to heavy clay topsoil texture (>MC)	Code: Nd8
Moderate/high CEC – >15 cmol/kg	Sand, loamy sand or sandy loam topsoil texture (<SL)	Code: Nd9
	Sandy clay loam to clay loam topsoil texture (SCL-CL)	Code: Nd10
	Light clay to light medium clay topsoil texture (LC-LMC)	Code: Nd11
	Medium clay to heavy clay topsoil texture (>MC)	Code: Nd12

Section 4a - Subclass decision rules for soil nutrient limitations

Nutrient Deficiency (Nd)											
Attribute value		Irrigated group									
		Tree crops				Row crops			Root crops	Forestry	
		Group									
		1	2	3	4	5	6	7	8	9	10
Very low CEC <5 cmol/kg											
Nd1	<SL	na	na	na	na	na	na	na	na	tba	na
Nd2	SCL-CL	na	na	na	na	na	na	na	na	tba	na
Nd3	LC-LMC	na	na	na	na	na	na	na	na	tba	na
Nd4	>MC	na	na	na	na	na	na	na	na	tba	na
Low CEC 5-15 cmol/kg											
Nd5	<SL	na	na	na	na	na	na	na	na	tba	na
Nd6	SCL-CL	na	na	na	na	na	na	na	na	tba	na
Nd7	LC-LMC	na	na	na	na	na	na	na	na	tba	na
Nd8	>MC	na	na	na	na	na	na	na	na	tba	na
Moderate/high CEC >15 cmol/kg											
Nd9	<SL	na	na	na	na	na	na	na	na	tba	na
Nd10	SCL-CL	na	na	na	na	na	na	na	na	tba	na
Nd11	LC-LMC	na	na	na	na	na	na	na	na	tba	na
Nd12	>MC	na	na	na	na	na	na	na	na	tba	na

Note 1: Nd attribute values are described using "short hand" codes for surface texture – Sand to Sandy Loam (<SL), Sandy Clay Loam (SCL), Clay Loam (CL), Light Clay (LC), Light Medium Clay (LMC) and Medium to Heavy Clay (>MC).

Appendix F Soil/landscape attributes limitation sub-class values and land suitability classes for potential irrigated agricultural land uses.

Land Unit 5a		Undulating low hills; very gravelly massive soils overlying hard rock; local relief 30-50 m; slopes >12%.																			
Limitation	Attribute value	Code	Irrigated group																		
			Tree crops				Row crops			*Root crops		Forestry									
			Group																		
											1	2	3	4	5	6	7	8T	8P	9	10
Landscape limitations																					
E	Water erosion	Slope >5.0%	E6	e5	e5	e5	e5	e5	e5	e5	e5	e5	tba	e5							
F	Flooding	No flooding	F1	f1	f1	f1	f1	f1	f1	f1	f1	f1	tba	f1							
W	Wetness (0.5 m)	Well drained Mod. permeable	Wa3	wa1	wa1	wa1	wa1	wa1	wa1	wa1	wa1	wa1	tba	wa1							
	Wetness (1.0 m)	Well drained Mod. permeable	Wb3	wb1	wb1	wb1	wb1	wb1	wb1	wb1	wb1	wb1	tba	wb1							
	Wetness (1.5 m)	Well drained Mod. permeable	Wc3	wc1	wc1	wc1	na	na	na	na	na	na	tba	na							
Xs	Soil complexity	Highly variable landscape	Xs4	xs4	xs5	xs4	xs5	xs5	xs5	xs5	xs5	xs5	tba	xs5							
Soil profile limitations																					
Ir	Infiltration recharge	SL-CL ⁻ to 0.45 m Rock>0.45 m	Ir2	ir1	ir1	ir1	ir1	ir1	ir1	ir1	ir1	ir1	tba	ir1							
M	Soil water availability	SWS: 2-6 mm	M6	m3	m4	m4	m5	m5	m5	m5	m4	m5	tba	m5							
Pd	Soil depth	Shallow (0.25-0.50 m)	Pd5	pd4	pd5	pd4	pd3	pd2	pd3	pd3	pd3	pd3	tba	pd5							
R	Rockiness	80%Coarse gravels <2% Rock outcrop	R12, R32	r3-4	r3-5	r3-4	r5	r2-5	r2-5	r2-5	r2-5	r2-5	tba	r5							
Soil physical limitations																					
Pa	Soil adhesiveness	SL to 0.09 m	Pa2	pa1	pa2	pa1	pa2	pa1	pa1	pa1	pa2	pa2	tba	pa1							
Pp	Excessive permeability	SL-CL ⁻ to 0.45 m No subsoil, rock	Pp4	pp1	pp1	pp1	pp1	pp1	pp1	pp1	pp1	pp1	pp1	pp1							
Ps	Soil surface condition	Firm to hard setting	Ps2	ps1	ps1	ps1	ps1	ps1	ps1	ps1	ps1	ps1	ps1	ps1							
Soil nutrient limitations																					
Nd	Nutrient deficiency	Very low CEC	Nd1	na	na	na	na	na	na	na	na	na	tba	na							
Land Suitability Class				5	5	5	5	5	5	5	5	5	tba	5							

*Note 1: Group 8T represents T-tape irrigation, Group 8P represents pivot irrigation.

Note 2: Refer to Table 7.9 of this report for potential individual crops and Table 7.8 for land suitability class descriptions assessed within the survey area.

Land Unit 6a		Undulating rises; including inclined very gravelly foot-slopes above low lying drainage areas; local relief 15-20 m; slopes 5-10%												
Limitation	Attribute value	Code	Irrigated group											
			Tree crops				Row crops			*Root crops		Forestry		
			Group											
			1	2	3	4	5	6	7	8T	8P	9	10	
Landscape limitations														
E	Water erosion	Slope >5.0%	E6	e5	e5	e5	e5	e5	e5	e5	e5	tba	e5	
F	Flooding	No flooding	F1	f1	f1	f1	f1	f1	f1	f1	f1	tba	f1	
W	Wetness (0.5 m)	Well drained Mod. permeable	Wa3	wa1	wa1	wa1	wa1	wa1	wa1	wa1	wa1	tba	wa1	
	Wetness (1.0 m)	Well drained Mod. permeable	Wb3	wb1	wb1	wb1	wb1	wb1	wb1	wb1	wb1	tba	wb1	
	Wetness (1.5 m)	Well drained Mod. permeable	Wc3	wc1	wc1	wc1	na	na	na	na	na	tba	na	
Xs	Soil complexity	Highly variable landscape	Xs4	xs4	xs5	xs4	xs5	xs5	xs5	xs5	xs5	tba	xs5	
Soil profile limitations														
Ir	Infiltration recharge	SL to 0.20 m Rock >0.20 m	Ir6	ir3	ir3	ir3	ir4	ir4	ir4	ir5	ir5	ir4	tba	ir3
M	Soil water availability	SWS: 6-9 mm	M6	m3	m4	m4	m5	m5	m5	m5	m4	m5	tba	m5
Pd	Soil depth	Very shallow (<0.25 m)	Pd6	pd5	pd5	pd5	pd5	pd4	pd5	pd5	pd5	tba	pd5	
R	Rockiness	80%Coarse gravels <2% Rock outcrop	R12, R32	r3-4	r3-5	r3-4	r5	r2-5	r2-5	r2-5	r2-5	tba	r5	
Soil physical limitations														
Pa	Soil adhesiveness	SL to 0.20 m	Pa2	pa1	pa2	pa1	pa2	pa1	pa1	pa1	pa2	tba	pa1	
Pp	Excessive permeability	SL to 0.20 m No subsoil, rock	Pp1	pp2	pp4	pp3	pp5	pp5	pp4	pp5	pp5	pp5	tba	pp5
Ps	Soil surface condition	Firm to hard setting	Ps2	ps1	ps1	ps1	ps1	ps1	ps1	ps1	ps1	ps1	tba	Ps2
Soil nutrient limitations														
Nd	Nutrient deficiency	Very low CEC	Nd1	na	na	na	na	na	na	na	na	tba	na	
Land Suitability Class				5	5	5	5	5	5	5	5	tba	5	

*Note 1: Group 8T represents T-tape irrigation, Group 8P represents pivot irrigation.

Note 2: Refer to Table 7.9 of this report for potential individual crops and Table 7.8 for land suitability class descriptions assessed within the survey area.

Land Unit 7a		Gently undulating low rises; including gently inclined gravelly pediment slopes; local relief 5-6 m; slopes 2-5%												
Limitation	Attribute value	Code	Irrigated group											
			Tree crops				Row crops			*Root crops		Forestry		
			Group											
			1	2	3	4	5	6	7	8T	8P	9	10	
Landscape limitations														
E	Water erosion	Slope 2.0-5.0%	E4-5	e3-4	e3-4	e3-4	e2-3	e5	e5	e5	e5	tba	e3-5	
F	Flooding	No flooding	F1	f1	f1	f1	f1	f1	f1	f1	f1	tba	f1	
W	Wetness (0.5 m)	Well drained Mod. permeable	Wa3	wa1	wa1	wa1	wa1	wa1	wa1	wa1	wa1	tba	wa1	
	Wetness (1.0 m)	Well drained Mod. permeable	Wb3	wb1	wb1	wb1	wb1	wb1	wb1	wb1	wb1	tba	wb1	
	Wetness (1.5 m)	Well drained Mod. permeable	Wc3	wc1	wc1	wc1	na	na	na	na	na	tba	na	
Xs	Soil complexity	Moderately variable landscape	Xs3	xs2	xs5	xs2	xs5	xs3	xs3	xs3	xs3	tba	xs5	
Soil profile limitations														
Ir	Infiltration recharge	SL-SL+ to 1.50 m	Ir1	ir1	ir1	ir1	ir1	ir1	ir1	ir1	ir1	ir1	tba	ir1
M	Soil water availability	SWS: 42-68 mm	M4-5	m1-2	m2-3	m2-3	m3-5	m2-3	m2-4	m3-5	m2-3	m2-3	tba	m3-5
Pd	Soil depth	Shallow - deep (0.5-1.5 m)	Pd 3-5	pd1-4	pd1-5	pd1-4	pd1-3	pd1-2	pd1-3	pd1-3	pd1-3	tba	pd1-5	
R	Rockiness	10-20% Fine gravels <2% Rock outcrop	R3, R32	r1-3	r2-3	r1-3	r1-5	r2-3	r2-3	r2-3	r2-4	tba	r1-5	
Soil physical limitations														
Pa	Soil adhesiveness	SL-SL+ to 1.50 m	Pa2	pa1	pa2	pa1	pa2	pa1	pa1	pa1	pa2	tba	pa1	
Pp	Excessive permeability	SL to 0.10 m SL-SL+ to 1.50 m	Pp6	pp1	pp2	pp1	pp2	pp2	pp1	pp2	pp1	pp2	tba	pp2
Ps	Soil surface condition	Firm to hard setting	Ps2	ps1	ps1	ps1	ps1	ps1	ps1	ps1	ps1	ps1	tba	ps1
Soil nutrient limitations														
Nd	Nutrient deficiency	Very low CEC	Nd1	na	na	na	na	na	na	na	na	tba	na	
Land Suitability Class				4	5	4	5	5	5	5	5	tba	5	

*Note 1: Group 8T represents T-tape irrigation, Group 8P represents pivot irrigation.

Note 2: Refer to Table 7.9 of this report for potential individual crops and Table 7.8 for land suitability class descriptions assessed within the survey area.

Land Unit 7a1		Undulating low rises; sandy colluvial wash slopes above drainage floors; local relief 5-8 m; slopes 6-10%												
Limitation	Attribute value	Code	Irrigated group											
			Tree crops				Row crops			*Root crops		Forestry		
			Group											
			1	2	3	4	5	6	7	8T	8P	9	10	
Landscape limitations														
E	Water erosion	Slope >5.0%	E6	e5	e5	e5	e5	e5	e5	e5	e5	e5	tba	e5
F	Flooding	No flooding	F1	f1	f1	f1	f1	f1	f1	f1	f1	f1	tba	f1
W	Wetness (0.5 m)	Imperfect drained Highly permeable	Wa8	wa1	wa2	wa1	wa2	wa2	wa2	wa2	wa2	wa2	tba	wa2
	Wetness (1.0 m)	Imperfect drained Highly permeable	Wb8	wb1	wb1	wb1	wb1	wb1	wb1	wb1	wb1	wb1	tba	wb1
	Wetness (1.5 m)	Imperfect drained Highly permeable	Wc8	wc1	wc1	wc2	na	na	na	na	na	na	tba	na
Xs	Soil complexity	Moderately variable landscape	Xs3	xs2	xs5	xs2	xs5	xs3	xs3	xs3	xs3	xs3	tba	xs5
Soil profile limitations														
Ir	Infiltration recharge	LS-S to 0.9 m CLS to 1.5 m	Ir2	ir1	ir1	ir1	ir1	ir1	ir1	ir1	ir1	ir1	tba	ir1
M	Soil water availability	SWS: 71-74 mm	M3	m1	m1	m1	m1	m1	m1	m1	m1	m2	tba	m1
Pd	Soil depth	Deep (1.0-1.5 m)	Pd3	pd1	pd1	pd1	pd1	pd1	pd1	pd1	pd1	pd1	tba	pd1
R	Rockiness	No gravels or rock outcrop	R1	r2	r2	r1	r1	r1	r1	r1	r1	r1	tba	r2
Soil physical limitations														
Pa	Soil adhesiveness	LS-S to 0.9 m	Pa2	pa1	pa2	pa1	pa2	pa1	pa1	pa1	pa2	pa2	tba	pa1
Pp	Excessive permeability	LS to 0.4 m S-CLS to 1.50 m	Pp5	pp1	pp1	pp1	pp1	pp1	pp1	pp1	pp1	pp1	tba	pp1
Ps	Soil surface condition	Firm to hard setting	Ps2	ps1	ps1	ps1	ps1	ps1	ps1	ps1	ps1	ps1	tba	ps1
Soil nutrient limitations														
Nd	Nutrient deficiency	Very low CEC	Nd1	na	na	na	na	na	na	na	na	na	tba	na
Land Suitability Class				5	5	5	5	5	5	5	5	5	tba	5

*Note 1: Group 8T represents T-tape irrigation, Group 8P represents pivot irrigation.

Note 2: Refer to Table 7.9 of this report for potential individual crops and Table 7.8 for land suitability class descriptions assessed within the survey area.

Land Unit 8a		Level to very gently undulating plains; deep massive red earths; local relief <2 m; slopes <1%												
Limitation	Attribute value	Code	Irrigated group											
			Tree crops				Row crops			*Root crops		Forestry		
			Group											
			1	2	3	4	5	6	7	8T	8P	9	10	
Landscape limitations														
E	Water erosion	Slope <1.0%	E1-2	e1	e1	e1	e1	e1	e1	e1	e1	e1	tba	e1
F	Flooding	No flooding	F1	f1	f1	f1	f1	f1	f1	f1	f1	f1	tba	f1
W	Wetness (0.5 m)	Well drained Mod. permeable	Wa3	wa1	wa1	wa1	wa1	wa1	wa1	wa1	wa1	wa1	tba	wa1
	Wetness (1.0 m)	Well drained Mod. permeable	Wb3	wb1	wb1	wb1	wb1	wb1	wb1	wb1	wb1	wb1	tba	wb1
	Wetness (1.5 m)	Well drained Mod. permeable	Wc3	wc1	wc1	wc1	na	na	na	na	na	na	tba	na
Xs	Soil complexity	Uniform landscape	Xs1	xs1	xs1	xs1	xs1	xs1	xs1	xs1	xs1	xs1	tba	xs1
Soil profile limitations														
Ir	Infiltration recharge	LS to 0.12 m SCL-CLS to 1.5 m	Ir2	ir1	ir1	ir1	ir1	ir1	ir1	ir1	ir1	ir1	tba	ir1
M	Soil water availability	SWS: 75-80 mm	M3	m1	m1	m1	m1	m1	m1	m1	m1	m2	tba	m1
Pd	Soil depth	Very deep (>1.5 m)	Pd2	pd1	pd1	pd1	pd1	pd1	pd1	pd1	pd1	pd1	tba	pd1
R	Rockiness	No gravels or rock outcrop	R1	r2	r2	r1	r1	r1	r1	r1	r1	r1	tba	r2
Soil physical limitations														
Pa	Soil adhesiveness	LS to 0.12 m	Pa2	pa1	pa2	pa1	pa2	pa1	pa1	pa1	pa2	pa2	tba	pa1
Pp	Excessive permeability	LS to 0.12 m SCL-CLS to 1.5 m	Pp5	pp1	pp1	pp1	pp1	pp1	pp1	pp1	pp1	pp1	tba	pp1
Ps	Soil surface condition	Firm to hard setting	Ps2	ps1	ps1	ps1	ps1	ps1	ps1	ps1	ps1	ps1	tba	ps1
Soil nutrient limitations														
Nd	Nutrient deficiency	Very low CEC	Nd1	na	na	na	na	na	na	na	na	na	tba	na
Land Suitability Class				2	2	1	2	1	1	1	2	2	tba	2

*Note 1: Group 8T represents T-tape irrigation, Group 8P represents pivot irrigation.

Note 2: Refer to Table 7.9 of this report for potential individual crops and Table 7.8 for land suitability class descriptions assessed within the survey area.

Land Unit 8b		Level to gently undulating plains; upland gravelly massive earths; local relief <2 m; slopes <1%												
Limitation	Attribute value	Code	Irrigated group											
			Tree crops				Row crops			*Root crops		Forestry		
			Group											
			1	2	3	4	5	6	7	8T	8P	9	10	
Landscape limitations														
E	Water erosion	Slope <1.0%	E1-2	e1	e1	e1	e1	e1	e1	e1	e1	e1	tba	e1
F	Flooding	No flooding	F1	f1	f1	f1	f1	f1	f1	f1	f1	f1	tba	f1
W	Wetness (0.5 m)	Well drained Mod. permeable	Wa3	wa1	wa1	wa1	wa1	wa1	wa1	wa1	wa1	wa1	tba	wa1
	Wetness (1.0 m)	Well drained Mod. permeable	Wb3	wb1	wb1	wb1	wb1	wb1	wb1	wb1	wb1	wb1	tba	wb1
	Wetness (1.5 m)	Well drained Mod. permeable	Wc3	wc1	wc1	wc1	na	na	na	na	na	na	tba	na
Xs	Soil complexity	Uniform landscape	Xs1	xs1	xs1	xs1	xs1	xs1	xs1	xs1	xs1	xs1	tba	xs1
Soil profile limitations														
Ir	Infiltration recharge	SL to 0.12 m SCL-CLS to 1.5 m	Ir2	ir1	ir1	ir1	ir1	ir1	ir1	ir1	ir1	ir1	tba	ir1
M	Soil water availability	SWS: 34-55 mm	M4-5	m1-2	m2-3	m2-3	m3-5	m2-3	m2-4	m3-5	m2-3	m2-3	tba	m3-5
Pd	Soil depth	Shallow - deep (<0.5-1.5 m)	Pd 3-5	pd1-4	pd1-5	pd1-4	pd1-3	pd1-2	pd1-3	pd1-3	pd1-3	pd1-3	tba	pd1-5
R	Rockiness	No gravels or rock outcrop	R1	r2	r2	r1	r1	r1	r1	r1	r1	r1	tba	r2
Soil physical limitations														
Pa	Soil adhesiveness	SL to 0.12 m	Pa2	pa1	pa2	pa1	pa2	pa1	pa1	pa1	pa2	pa2	tba	pa1
Pp	Excessive permeability	SL to 0.12 m SCL-CLS to 1.5 m	Pp5	pp1	pp1	pp1	pp1	pp1	pp1	pp1	pp1	pp1	tba	pp1
Ps	Soil surface condition	Firm to hard setting	Ps2	ps1	ps1	ps1	ps1	ps1	ps1	ps1	ps1	ps1	tba	ps1
Soil nutrient limitations														
Nd	Nutrient deficiency	Very low CEC	Nd1	na	na	na	na	na	na	na	na	na	tba	na
Land Suitability Class				4	5	4	5	3	4	5	3	tba	5	

*Note 1: Group 8T represents T-tape irrigation, Group 8P represents pivot irrigation.

Note 2: Refer to Table 7.9 of this report for potential individual crops and Table 7.8 for land suitability class descriptions assessed within the survey area.

Land Unit 8b1		Level to gently undulating plains; deep sandy earths including upland margins of broad drainage floors; local relief 1-2 m; slopes <1%												
Limitation	Attribute value	Code	Irrigated group											
			Tree crops				Row crops			*Root crops		Forestry		
			Group											
			1	2	3	4	5	6	7	8T	8P	9	10	
Landscape limitations														
E	Water erosion	Slope <1.0%	E1-2	e1	e1	e1	e1	e1	e1	e1	e1	e1	tba	e1
F	Flooding	No flooding	F1	f1	f1	f1	f1	f1	f1	f1	f1	f1	tba	f1
W	Wetness (0.5 m)	Well drained Mod. permeable	Wa3	wa1	wa1	wa1	wa1	wa1	wa1	wa1	wa1	wa1	tba	wa1
	Wetness (1.0 m)	Well drained Mod. permeable	Wb3	wb1	wb1	wb1	wb1	wb1	wb1	wb1	wb1	wb1	tba	wb1
	Wetness (1.5 m)	Well drained Mod. permeable	Wc3	wc1	wc1	wc1	na	na	na	na	na	na	tba	na
Xs	Soil complexity	Uniform landscape	Xs1	xs1	xs1	xs1	xs1	xs1	xs1	xs1	xs1	xs1	tba	xs1
Soil profile limitations														
Ir	Infiltration recharge	LS-S to 1.5 m	Ir1	ir1	ir1	ir1	ir1	ir1	ir1	ir1	ir1	ir1	tba	ir1
M	Soil water availability	SWS: 30-48 mm	M5	m2	m3	m3	m5	m3	m4	m5	m3	m3	tba	m5
Pd	Soil depth	Shallow - deep (0.5-1.5 m)	Pd 3-5	pd1-4	pd1-5	pd1-4	pd1-3	pd1-2	pd1-3	pd1-3	pd1-3	pd1-3	tba	pd1-5
R	Rockiness	No gravels or rock outcrop	R1	r2	r2	r1	r1	r1	r1	r1	r1	r1	tba	r2
Soil physical limitations														
Pa	Soil adhesiveness	LS-S to 1.5 m	Pa1	pa1	pa1	pa1	pa1	pa1	pa1	pa1	pa1	pa1	tba	pa1
Pp	Excessive permeability	LS to 0.15 m LS-S to 1.5 m	Pp6	pp1	pp2	pp1	pp2	pp2	pp1	pp2	pp1	pp2	tba	pp2
Ps	Soil surface condition	Coarse sandy	Ps1	ps1	ps1	ps1	ps1	ps1	ps1	ps1	ps1	ps1	tba	ps1
Soil nutrient limitations														
Nd	Nutrient deficiency	Very low CEC	Nd1	na	na	na	na	na	na	na	na	na	tba	na
Land Suitability Class				4	5	4	5	3	4	5	3	tba	5	

*Note 1: Group 8T represents T-tape irrigation, Group 8P represents pivot irrigation.

Note 2: Refer to Table 7.9 of this report for potential individual crops and Table 7.8 for land suitability class descriptions assessed within the survey area.

Land Unit 8c		Gently undulating plains; shallow gravelly earths on lower slopes; local relief 1-2 m; slopes 1-3%												
Limitation	Attribute value	Code	Irrigated group											
			Tree crops				Row crops			*Root crops		Forestry		
			Group											
			1	2	3	4	5	6	7	8T	8P	9	10	
Landscape limitations														
E	Water erosion	Slope 1.0-3.0%	E3-4	e1-3	e1-3	e1-3	e1-2	e2-5	e2-5	e2-5	e2-5	tba	e1-3	
F	Flooding	No flooding	F1	f1	f1	f1	f1	f1	f1	f1	f1	tba	f1	
W	Wetness (0.5 m)	Well drained Mod. permeable	Wa3	wa1	wa1	wa1	wa1	wa1	wa1	wa1	wa1	tba	wa1	
	Wetness (1.0 m)	Well drained Mod. permeable	Wb3	wb1	wb1	wb1	wb1	wb1	wb1	wb1	wb1	tba	wb1	
	Wetness (1.5 m)	Well drained Mod. permeable	Wc3	wc1	wc1	wc1	na	na	na	na	na	tba	na	
Xs	Soil complexity	Uniform landscape	Xs1	xs1	xs1	xs1	xs1	xs1	xs1	xs1	xs1	tba	xs1	
Soil profile limitations														
Ir	Infiltration recharge	SL to 0.5 m SCL to 1.3 m	Ir2	ir1	ir1	ir1	ir1	ir1	ir1	ir1	ir1	ir1	tba	ir1
M	Soil water availability	SWS: 26-43 mm	M5	m2	m3	m3	m5	m3	m4	m5	m3	m3	tba	m5
Pd	Soil depth	Moderate - deep (0.5-1.5 m)	Pd 3-4	pd1-3	pd1-3	pd1-3	pd1	pd1	pd1	pd1	pd1	pd1	tba	pd1-3
R	Rockiness	No gravels or rock outcrop	R1	r2	r2	r1	r1	r1	r1	r1	r1	tba	r2	
Soil physical limitations														
Pa	Soil adhesiveness	SL to 0.5 m	Pa1	pa1	pa1	pa1	pa1	pa1	pa1	pa1	pa1	tba	pa1	
Pp	Excessive permeability	SL to 0.12 m SL-SCL to 1.3 m	Pp5	pp1	pp1	pp1	pp1	pp1	pp1	pp1	pp1	pp1	pp1	pp1
Ps	Soil surface condition	Coarse sandy	Ps1	ps1	ps1	ps1	ps1	ps1	ps1	ps1	ps1	ps1	tba	ps1
Soil nutrient limitations														
Nd	Nutrient deficiency	Very low CEC	Nd1	na	na	na	na	na	na	na	na	tba	na	
Land Suitability Class				3	3	3	5	5	5	5	5	5	tba	5

*Note 1: Group 8T represents T-tape irrigation, Group 8P represents pivot irrigation.

Note 2: Refer to Table 7.9 of this report for potential individual crops and Table 7.8 for land suitability class descriptions assessed within the survey area.

Land Unit 8c1		Gently undulating plains; sandy wash soils on lowland plains; local relief 1-2 m; slopes 1-3%																			
Limitation	Attribute value	Code	Irrigated group																		
			Tree crops				Row crops			*Root crops		Forestry									
			Group																		
											1	2	3	4	5	6	7	8T	8P	9	10
Landscape limitations																					
E	Water erosion	Slope 1.0-3.0%	E3-4	e1-3	e1-3	e1-3	e1-2	e2-5	e2-5	e2-5	e2-5	tba	e1-3								
F	Flooding	No flooding	F1	f1	f1	f1	f1	f1	f1	f1	f1	tba	f1								
W	Wetness (0.5 m)	Imperfect drained Highly permeable	Wa8	wa1	wa2	wa1	wa2	wa2	wa2	wa2	wa2	tba	wa2								
	Wetness (1.0 m)	Imperfect drained Highly permeable	Wb8	wb1	wb1	wb1	wb1	wb1	wb1	wb1	wb1	tba	wb1								
	Wetness (1.5 m)	Imperfect drained Highly permeable	Wc8	wc1	wc1	wc2	na	na	na	na	na	tba	na								
Xs	Soil complexity	Moderately variable landscape	Xs2	xs1	xs2	xs1	xs3	xs2	xs2	xs2	xs2	tba	xs3								
Soil profile limitations																					
Ir	Infiltration recharge	LS- to 0.50 m S to 1.5 m	Ir2	ir1	ir1	ir1	ir1	ir1	ir1	ir1	ir1	ir1	tba	ir1							
M	Soil water availability	SWS: 31-49 mm	M5	m2	m3	m3	m5	m3	m4	m5	m3	m3	tba	m5							
Pd	Soil depth	Moderate – very deep (0.5->1.5 m)	Pd 2-4	pd1-3	pd1-3	pd1-3	pd1	pd1	pd1	pd1	pd1	tba	pd1-3								
R	Rockiness	No gravels or rock outcrop	R1	r2	r2	r1	r1	r1	r1	r1	r1	tba	r2								
Soil physical limitations																					
Pa	Soil adhesiveness	LS-SL to 0.75 m	Pa1	pa1	pa1	pa1	pa1	pa1	pa1	pa1	pa1	tba	pa1								
Pp	Excessive permeability	LS to 0.14 m SL-CLS to 1.5 m	Pp5	pp1	pp1	pp1	pp1	pp1	pp1	pp1	pp1	pp1	pp1								
Ps	Soil surface condition	Coarse sandy	Ps1	ps1	ps1	ps1	ps1	ps1	ps1	ps1	ps1	ps1	ps1								
Soil nutrient limitations																					
Nd	Nutrient deficiency	Very low CEC	Nd1	na	na	na	na	na	na	na	na	tba	na								
Land Suitability Class				3	3	3	5	5	5	5	5	5	tba	5							

*Note 1: Group 8T represents T-tape irrigation, Group 8P represents pivot irrigation.

Note 2: Refer to Table 7.9 of this report for potential individual crops and Table 7.8 for land suitability class descriptions assessed within the survey area.

Land Unit 9a		Alluvial Plains; local relief <1 m; slopes <1%												
Limitation	Attribute value	Code	Irrigated group											
			Tree crops				Row crops			*Root crops		Forestry		
			Group											
			1	2	3	4	5	6	7	8T	8P	9	10	
Landscape limitations														
E	Water erosion	Slope <1.0%	E1-2	e1	e1	e1	e1	e1	e1	e1	e1	e1	tba	e1
F	Flooding	Annual occurrence	F4	f5	f5	f5	f5	f5	f5	f5	f5	f5	tba	f5
W	Wetness (0.5 m)	Poorly drained Mod. permeable	Wa13	wa1	wa2	wa3	wa3	wa5	wa5	wa5	wa5	wa5	tba	wa3
	Wetness (1.0 m)	Poorly drained Mod. permeable	Wb13	wb2	wb3	wb3	wb2	wb1	wb1	wb1	wb1	wb2	tba	wb1
	Wetness (1.5 m)	Poorly drained Mod. permeable	Wc13	wc3	wc3	wc4	na	na	na	na	na	na	tba	na
Xs	Soil complexity	Moderately variable landscape	Xs3	xs2	xs5	xs2	xs5	xs3	xs3	xs3	xs3	xs3	tba	xs5
Soil profile limitations														
Ir	Infiltration recharge	CL to 0.12 m LC-LMC to 1.5 m	Ir5	ir2	ir2	ir2	ir2	ir1	ir1	ir4	ir3	ir4	tba	ir2
M	Soil water availability	SWS: 106 mm	M2	m1	m1	m1	m1	m1	m1	m1	m1	m1	tba	m1
Pd	Soil depth	Very deep (>1.5 m)	Pd2	pd1	pd1	pd1	pd1	pd1	pd1	pd1	pd1	pd1	tba	pd1
R	Rockiness	No gravels or rock outcrop	R1	r2	r2	r1	r1	r1	r1	r1	r1	r1	tba	r2
Soil physical limitations														
Pa	Soil adhesiveness	CL to 0.12 m LC-LMC to 1.5 m	Pa4	pa1	pa5	pa1	pa5	pa3	pa3	pa4	pa4	pa4	tba	pa3
Pp	Excessive permeability	CL to 0.12 m LC-LMC to 1.5 m	Pp2	pp2	pp3	pp3	pp3	pp3	pp2	pp4	pp4	pp4	tba	pp4
Ps	Soil surface condition	Coarsely structured	Ps6	ps3	ps5	ps5	ps5	ps5	ps5	ps5	ps5	ps5	tba	ps3
Soil nutrient limitations														
Nd	Nutrient deficiency	Low CEC	Nd2	na	na	na	na	na	na	na	na	na	tba	na
Land Suitability Class				5	5	5	5	5	5	5	5	5	tba	5

*Note 1: Group 8T represents T-tape irrigation, Group 8P represents pivot irrigation.

Note 2: Refer to Table 7.9 of this report for potential individual crops and Table 7.8 for land suitability class descriptions assessed within the survey area.

Land Unit 9a1		Alluvial Plains; sandy wash soils bordering clay plains; local relief <1 m; slopes <1%												
Limitation	Attribute value	Code	Irrigated group											
			Tree crops				Row crops			*Root crops		Forestry		
			Group											
			1	2	3	4	5	6	7	8T	8P	9	10	
Landscape limitations														
E	Water erosion	Slope <1.0%	E1-2	e1	e1	e1	e1	e1	e1	e1	e1	e1	tba	e1
F	Flooding	Annual occurrence	F4	f5	f5	f5	f5	f5	f5	f5	f5	f5	tba	f5
W	Wetness (0.5 m)	Poorly drained Mod. permeable	Wa13	wa1	wa2	wa3	wa3	wa5	wa5	wa5	wa5	wa5	tba	wa3
	Wetness (1.0 m)	Poorly drained High permeable	Wb12	wb2	wb2	wb2	wb1	wb1	wb1	wb1	wb1	wb2	tba	wb1
	Wetness (1.5 m)	Poorly drained High permeable	Wc12	wc2	wc3	wc3	na	na	na	na	na	na	tba	na
Xs	Soil complexity	Uniform landscape	Xs1	xs1	xs1	xs1	xs1	xs1	xs1	xs1	xs1	xs1	tba	xs1
Soil profile limitations														
Ir	Infiltration recharge	LS-CS to 1.0 m MC to 1.5 m	Ir4	ir1	ir1	ir1	ir1	ir1	ir1	ir3	ir2	ir3	tba	ir1
M	Soil water availability	SWS: 69-82 mm	M3-4	m1	m1-2	m1-2	m1-3	m1-2	m1-2	m1-3	m1-2	m2	tba	m1-3
Pd	Soil depth	Very deep (>1.5 m)	Pd2	pd1	pd1	pd1	pd1	pd1	pd1	pd1	pd1	pd1	tba	pd1
R	Rockiness	No gravels or rock outcrop	R1	r2	r2	r1	r1	r1	r1	r1	r1	r1	tba	r2
Soil physical limitations														
Pa	Soil adhesiveness	LS-CS to 1.0 m	Pa1	pa1	pa1	pa1	pa1	pa1	pa1	pa1	pa1	pa1	tba	pa1
Pp	Excessive permeability	LS to 0.4 m CS-MC to 1.5 m	Pp3	pp1	pp1	pp1	pp1	pp1	pp1	pp2	pp2	pp3	tba	pp2
Ps	Soil surface condition	Coarse sandy	Ps1	ps1	ps1	ps1	ps1	ps1	ps1	ps1	ps1	ps1	tba	ps1
Soil nutrient limitations														
Nd	Nutrient deficiency	Very low CEC	Nd1	na	na	na	na	na	na	na	na	na	tba	na
Land Suitability Class				5	5	5	5	5	5	5	5	5	tba	5

*Note 1: Group 8T represents T-tape irrigation, Group 8P represents pivot irrigation.

Note 2: Refer to Table 7.9 of this report for potential individual crops and Table 7.8 for land suitability class descriptions assessed within the survey area.

Land Unit 10a		Open drainage lines, including incised creeks and channels; local relief 1-2 m; slopes <1%.												
Limitation	Attribute value	Code	Irrigated group											
			Tree crops				Row crops			*Root crops		Forestry		
			Group											
			1	2	3	4	5	6	7	8T	8P	9	10	
Landscape limitations														
E	Water erosion	Slope <1.0%	E1-2	e1	e1	e1	e1	e1	e1	e1	e1	e1	tba	e1
F	Flooding	Annual occurrence	F4	f5	f5	f5	f5	f5	f5	f5	f5	f5	tba	f5
W	Wetness (0.5 m)	Very poorly drained Mod. permeable	Wa17	wa2	wa4	wa4	wa5	wa5	wa5	wa5	wa5	wa5	tba	wa4
	Wetness (1.0 m)	Very poorly drained Mod. permeable	Wb17	wb4	wb4	wb4	wb3	wb3	wb2	wb3	wb4	wb4	tba	wb3
	Wetness (1.5 m)	Very poorly drained Mod. permeable	Wc17	wc5	wc4	wc5	na	na	na	na	na	na	tba	na
Xs	Soil complexity	Highly variable landscape	Xs4	xs4	xs5	xs4	xs5	xs5	xs5	xs5	xs5	xs5	tba	xs5
Soil profile limitations														
Ir	Infiltration recharge	CL-LC to 0.3 m LMC-HC TO 1.5 m	Ir4-5	ir1-2	ir1-2	ir1-2	ir1-2	ir1	ir1	ir3-4	ir2-3	ir3-4	tba	ir1-2
M	Soil water availability	SWS: 102 mm	M2	m1	m1	m1	m1	m1	m1	m1	m1	m1	tba	m1
Pd	Soil depth	Very deep (>1.5 m)	Pd2	pd1	pd1	pd1	pd1	pd1	pd1	pd1	pd1	pd1	tba	pd1
R	Rockiness	No gravels or rock outcrop	R1	r2	r2	r1	r1	r1	r1	r1	r1	r1	tba	r2
Soil physical limitations														
Pa	Soil adhesiveness	CL-LC to 0.3 m LMC-HC to 1.5 m	Pa 3-4	pa1	pa5	pa1	pa3-5	pa1-3	pa1-3	pa3-4	pa3-4	pa3-4	tba	pa2-3
Pp	Excessive permeability	CL-LC to 0.3 m LMC-HC to 1.5 m	Pp2-3	pp1-2	pp1-3	pp1-3	pp1-3	pp1-3	pp1-2	pp2-4	pp 2-4	pp 3-4	tba	pp2-4
Ps	Soil surface condition	Hardsetting - high/coarsely structured	Ps4/6	ps2-3	ps3-5	ps3-5	ps3-5	ps3-5	ps5	ps5	ps 5	ps 5	tba	ps2-3
Soil nutrient limitations														
Nd	Nutrient deficiency	Low CEC	Nd2	na	na	na	na	na	na	na	na	na	tba	na
Land Suitability Class				5	5	5	5	5	5	5	5	5	tba	5

*Note 1: Group 8T represents T-tape irrigation, Group 8P represents pivot irrigation.

Note 2: Refer to Table 7.9 of this report for potential individual crops and Table 7.8 for land suitability class descriptions assessed within the survey area.

Land Unit 10b		<i>Low-lying spillway depressions, including minor edges of flooded depressions and perennial billabongs; local relief <1 m: slopes <1%</i>												
Limitation	Attribute value	Code	Irrigated group											
			Tree crops				Row crops			*Root crops		Forestry		
			Group											
			1	2	3	4	5	6	7	8T	8P	9	10	
Landscape limitations														
E	Water erosion	Slope <1.0%	E1-2	e1	e1	e1	e1	e1	e1	e1	e1	e1	tba	e1
F	Flooding	Annual occurrence	F4	f5	f5	f5	f5	f5	f5	f5	f5	f5	tba	f5
W	Wetness (0.5 m)	Poorly drained High permeable	Wa12	wa1	wa2	wa2	wa3	wa5	wa5	wa5	wa5	wa5	tba	wa2
	Wetness (1.0 m)	Poorly drained High permeable	Wb12	wb2	wb2	wb2	wb1	wb1	wb1	wb1	wb1	wb2	tba	wb1
	Wetness (1.5 m)	Poorly drained High permeable	Wc12	wc2	wc3	wc3	na	na	na	na	na	na	tba	na
Xs	Soil complexity	Uniform landscape	Xs1	xs1	xs1	xs1	xs1	xs1	xs1	xs1	xs1	xs1	tba	xs1
Soil profile limitations														
Ir	Infiltration recharge	LS-S to 1.10 m LS to 1.5 m	Ir1	ir1	ir1	ir1	ir1	ir1	ir1	ir1	ir1	ir1	tba	ir1
M	Soil water availability	SWS: 64 mm	M4	m1	m2	m2	m3	m2	m2	m3	m2	m2	tba	m3
Pd	Soil depth	Very deep (>1.5 m)	Pd2	pd1	pd1	pd1	pd1	pd1	pd1	pd1	pd1	pd1	tba	pd1
R	Rockiness	No gravels or rock outcrop	R1	r2	r2	r1	r1	r1	r1	r1	r1	r1	tba	r2
Soil physical limitations														
Pa	Soil adhesiveness	LS-S to 1.10 m LS to 1.5 m	Pa1	pa1	pa1	pa1	pa1	pa1	pa1	pa1	pa1	pa1	tba	pa1
Pp	Excessive permeability	LS to 0.12 m S-LS to 1.5 m	Pp6	pp1	pp2	pp1	pp2	pp2	pp1	pp2	pp1	pp2	tba	Pp6
Ps	Soil surface condition	Coarse sandy	Ps1	ps1	ps1	ps1	ps1	ps1	ps1	ps1	ps1	ps1	tba	Ps1
Soil nutrient limitations														
Nd	Nutrient deficiency	Very low CEC	Nd1	na	na	na	na	na	na	na	na	na	tba	na
Land Suitability Class				5	5	5	5	5	5	5	5	5	tba	5

*Note 1: Group 8T represents T-tape irrigation, Group 8P represents pivot irrigation.

Note 2: Refer to Table 7.9 of this report for potential individual crops and Table 7.8 for land suitability class descriptions assessed within the survey area.

Land Unit 10b1		Gently sloping broad drainage floors; local relief <1 m; slopes <1%												
Limitation	Attribute value	Code	Irrigated group											
			Tree crops				Row crops			*Root crops		Forestry		
			Group											
			1	2	3	4	5	6	7	8T	8P	9	10	
Landscape limitations														
E	Water erosion	Slope <1.0%	E1-2	e1	e1	e1	e1	e1	e1	e1	e1	e1	tba	e1
F	Flooding	Annual occurrence	F4	f5	f5	f5	f5	f5	f5	f5	f5	f5	tba	f5
W	Wetness (0.5 m)	Poorly drained High permeable	Wa12	wa1	wa2	wa2	wa3	wa5	wa5	wa5	wa5	wa5	tba	wa2
	Wetness (1.0 m)	Poorly drained High permeable	Wb12	wb2	wb2	wb2	wb1	wb1	wb1	wb1	wb1	wb2	tba	wb1
	Wetness (1.5 m)	Poorly drained High permeable	Wc12	wc2	wc3	wc3	na	na	na	na	na	na	tba	na
Xs	Soil complexity	Moderately variable landscape	Xs3	xs2	xs5	xs2	xs5	xs3	xs3	xs3	xs3	xs3	tba	xs5
Soil profile limitations														
Ir	Infiltration recharge	LS-CS to 1.25 m	Ir1	ir1	ir1	ir1	ir1	ir1	ir1	ir1	ir1	ir1	tba	ir1
M	Soil water availability	SWS: 20-32 mm	M5	m2	m3	m3	m5	m3	m4	m5	m3	m3	tba	m5
Pd	Soil depth	Deep (1.0-1.5 m)	Pd3	pd1	pd1	pd1	pd1	pd1	pd1	pd1	pd1	pd1	tba	pd1
R	Rockiness	No gravels or rock outcrop	R1	r2	r2	r1	r1	r1	r1	r1	r1	r1	tba	r2
Soil physical limitations														
Pa	Soil adhesiveness	LS-CS to 1.25 m	Pa1	pa1	pa1	pa1	pa1	pa1	pa1	pa1	pa1	pa1	tba	pa1
Pp	Excessive permeability	LS to 0.5 m CS to 1.25 m	Pp6	pp1	pp2	pp1	pp2	pp2	pp1	pp2	pp1	pp2	tba	pp2
Ps	Soil surface condition	Coarse sandy	Ps1	ps1	ps1	ps1	ps1	ps1	ps1	ps1	ps1	ps1	tba	ps1
Soil nutrient limitations														
Nd	Nutrient deficiency	Very low CEC	Nd1	na	na	na	na	na	na	na	na	na	tba	na
Land Suitability Class				5	5	5	5	5	5	5	5	5	tba	5

*Note 1: Group 8T represents T-tape irrigation, Group 8P represents pivot irrigation.

Note 2: Refer to Table 7.9 of this report for potential individual crops and Table 7.8 for land suitability class descriptions assessed within the survey area.

Land Unit 11a		Swamps, wetlands, flooded depressions and perennial billabongs; local relief <1 m; slopes <1%												
Limitation	Attribute value	Code	Irrigated group											
			Tree crops				Row crops			*Root crops		Forestry		
			Group											
			1	2	3	4	5	6	7	8T	8P	9	10	
Landscape limitations														
E	Water erosion	Slope <1.0%	E1-2	e1	e1	e1	e1	e1	e1	e1	e1	e1	tba	e1
F	Flooding	Annual occurrence	F4	f5	f5	f5	f5	f5	f5	f5	f5	f5	tba	f5
W	Wetness (0.5 m)	Very poorly drained Mod. permeable	Wa17	wa2	wa4	wa4	wa5	wa5	wa5	wa5	wa5	wa5	tba	wa4
	Wetness (1.0 m)	Very poorly drained Mod. permeable	Wb17	wb4	wb4	wb4	wb3	wb3	wb2	wb3	wb4	wb4	tba	wb3
	Wetness (1.5 m)	Very poorly drained Mod. permeable	Wc17	wc5	wc4	wc5	na	na	na	na	na	na	tba	na
Xs	Soil complexity	Uniform landscape	Xs1	xs1	xs1	xs1	xs1	xs1	xs1	xs1	xs1	xs1	tba	xs1
Soil profile limitations														
Ir	Infiltration recharge	SC-CL to 0.3 m SCL-CL to 1.5 m	Ir3	ir1	ir1	ir1	ir1	ir1	ir1	ir2	ir1	ir2	tba	ir1
M	Soil water availability	SWS: 53 mm	M4	m1	m2	m2	m3	m2	m2	m3	m2	m2	tba	m3
Pd	Soil depth	Very deep (>1.5 m)	Pd2	pd1	pd1	pd1	pd1	pd1	pd1	pd1	pd1	pd1	tba	pd1
R	Rockiness	No gravels or rock outcrop	R1	r2	r2	r1	r1	r1	r1	r1	r1	r1	tba	r2
Soil physical limitations														
Pa	Soil adhesiveness	SC-CL to 0.3 m SCL-CL to 1.5 m	Pa3	pa1	pa5	pa1	pa3	pa1	pa1	pa3	pa3	pa3	tba	pa2
Pp	Excessive permeability	SC-CL to 0.3 m SCL-CL to 1.5 m	Pp4	pp1	pp1	pp1	pp1	pp1	pp1	pp1	pp1	pp1	pp1	pp1
Ps	Soil surface condition	Hardsetting- moderate to high	Ps3-4	ps1-2	ps1-3	ps1-3	ps1-3	ps2-3	ps3-5	ps3-5	ps3-5	ps3-5	tba	ps1-3
Soil nutrient limitations														
Nd	Nutrient deficiency	Very low CEC	Nd2	na	na	na	na	na	na	na	na	na	tba	na
Land Suitability Class				5	5	5	5	5	5	5	5	5	tba	5

*Note 1: Group 8T represents T-tape irrigation, Group 8P represents pivot irrigation.

Note 2: Refer to Table 7.9 of this report for potential individual crops and Table 7.8 for land suitability class descriptions assessed within the survey area.

Appendix G Survey species list

The following species were recorded in the study area during the field survey.

Tree
<i>Acacia auriculiformis</i>
<i>Alphitonia excelsa</i>
<i>Alstonia actinophylla</i>
<i>Barringtonia acutangula</i>
<i>Brachychiton diversifolius</i>
<i>Canarium australianum</i>
<i>Corymbia bella</i>
<i>Corymbia bleeseri</i>
<i>Corymbia confertiflora</i>
<i>Corymbia foelscheana</i>
<i>Corymbia polycarpa</i>
<i>Corymbia polysciada</i>
<i>Corymbia porrecta</i>
<i>Erythrophleum chlorostachys</i>
<i>Eucalyptus alba</i>
<i>Eucalyptus miniata</i>
<i>Eucalyptus tectifera</i>
<i>Eucalyptus tetradonta</i>
<i>Ficus virens</i>
<i>Lophostemon grandiflorus</i>
<i>Lophostemon lactifluus</i>
<i>Melaleuca cajuputi</i>
<i>Melaleuca leucodendra</i>
<i>Melaleuca nervosa</i>
<i>Melaleuca viridiflora</i>
<i>Melicope elleryana</i>
<i>Miliusa traceyi</i>
<i>Terminalia carpentariae</i>
<i>Terminalia ferdinandiana</i>
<i>Terminalia grandiflora</i>
<i>Terminalia platyphylla</i>
<i>Timonius timon</i>
<i>Xanthostemon eucalyptoides</i>
<i>Xanthostemon paradoxus</i>
Small Tree
<i>Asteromyrtus symphyocarpa</i>
<i>Atalaya varifolia</i>
<i>Banksia dentata</i>
<i>Buchanania obovata</i>
<i>Clerodendrum floribundum</i>
<i>Cochlospermum fraseri</i>
<i>Croton arnhemicus</i>
<i>Denhamia obscura</i>

<i>Dolichandrone filiformis</i>
<i>Ehretia saligna</i>
<i>Exocarpos latifolius</i>
<i>Ficus aculeata</i>
<i>Ficus scobina</i>
<i>Gardenia megasperma</i>
<i>Grevillea decurrens</i>
<i>Grevillea heliosperma</i>
<i>Grevillea pteridifolia</i>
<i>Hakea arborescens</i>
<i>Persoonia falcata</i>
<i>Planchonella pohlmaniana</i>
<i>Planchonia careya</i>
<i>Pouteria arnhemica</i>
<i>Stenocarpus acacioides</i>
<i>Stephania japonica</i>
<i>Syzygium eucalyptoides</i> subsp. <i>bleeseri</i>
<i>Syzygium eucalyptoides</i> subsp. <i>eucalyptoides</i>
<i>Syzygium suborbiculare</i>
<i>Terminalia canescens</i>
<i>Wrightia saligna</i>
Palm
<i>Livistona humilis</i>
<i>Livistona inermis</i>
<i>Pandanus spiralis</i>
Shrub
<i>Acacia difficilis</i>
<i>Acacia dimidiata</i>
<i>Acacia dunnii</i>
<i>Acacia holosericea</i>
<i>Acacia lamprocarpa</i>
<i>Acacia latescens</i>
<i>Acacia leptocarpa</i>
<i>Acacia mimula</i>
<i>Acacia oncinocarpa</i>
<i>Acacia praelongata</i>
<i>Antidesma ghesaembilla</i>
<i>Brachychiton paradoxum</i>
<i>Bridelia tomentosa</i>
<i>Calytrix achaeta</i>
<i>Calytrix exstipulata</i>
<i>Distichostemon hispidulus</i>
<i>Dodonaea hispidula</i>
<i>Grewia retusifolia</i>

<i>Osbeckia australiana</i>
<i>Parinari nonda</i>
<i>Petalostigma banksii</i>
<i>Petalostigma pubescens</i>
<i>Petalostigma quadriloculare</i>
<i>Verticordia cunninghamii</i>
Tussock Grass
<i>Alloteropsis semialata</i>
<i>Andropogon gayensis</i>
<i>Aristida holathera</i>
<i>Aristida hygrometrica</i>
<i>Chrysopogon fallax</i>
<i>Chrysopogon latifolius</i>
<i>Chrysopogon oliganthus</i>
<i>Cymbopogon refractus</i>
<i>Dimeria ornithopoda</i>
<i>Ectrosia leporina</i>
<i>Eragrostis pubescens</i>
<i>Eragrostis schultzei</i>
<i>Eriachne avenacea</i>
<i>Eriachne burkittii</i>
<i>Eriachne ciliata</i>
<i>Eriachne schultzeana</i>
<i>Eriachne trisetata</i>
<i>Eriocaulon fistulosum</i>
<i>Germainia truncatiglumis</i>
<i>Heteropogon contortus</i>
<i>Heteropogon triticeus</i>
<i>Mnesithea roettboelliodes</i>
<i>Panicum mindanaense</i>
<i>Pseuderanthemum variabile</i>
<i>Pseudopogonatherum contortum</i>
<i>Pseudoraphis spinescens</i>
<i>Sacciolepis indica</i>
<i>Schizachyrium fragile</i>
<i>Setaria apiculata</i>
<i>Setaria incrassata</i>
<i>Sorghum intrans</i>
<i>Sorghum plumosum</i>
<i>Sporobolus australasicus</i>
<i>Thaumastochloa major</i>
<i>Urochloa holosericea</i>
<i>Urochloa pubigera</i>
Herbs

<i>Anisomeles malabarica</i>
<i>Bonamia brevifolia</i>
<i>Buchnera linearis</i>
<i>Cartonema parviflorum</i>
<i>Cartonema spicata</i>
<i>Chamaecrista nomame</i>
<i>Corynotheca lateriflora</i>
<i>Desmodium pyncnotrichum</i>
<i>Drosera brevicornis</i>
<i>Drosera petiolaris</i>
<i>Eriocaulon fistulosum</i>
<i>Eriocaulon tortuosum</i>
<i>Eurybiopsis macrorhiza</i>
<i>Flemingia parviflora</i>
<i>Flemingia pauciflora</i>
<i>Flemingia sp. Sericea</i>
<i>Flemingia trifoliastrum</i>
<i>Glycine hirticaulis</i>
<i>Goodenia armstrongiana</i>
<i>Goodenia holtzeana</i>
<i>Haemodorum brevicaulis</i>
<i>Haemodorum coccineum</i>
<i>Haemodorum ensifolium</i>
<i>Heliotropium indicum</i>
<i>Hibbertia caudice</i>
<i>Hibbertia cistifolia</i>
<i>Hibbertia juncea</i>
<i>Hibiscus meraukensis</i>
<i>Hyptis suaveolens</i>
<i>Indigofera saxicola</i>
<i>Ipomoea brassii</i>
<i>Jasminum molle</i>
<i>Kailarsenia suffruticosa</i>
<i>Lindernia sp. Hann River</i>
<i>Lindsaea ensifolia</i>
<i>Lobelia douglasiana</i>
<i>Lomandra tropica</i>
<i>Lycopodiella cernua</i>
<i>Mitrasacme nummularia</i>
<i>Phyllanthus eutaxioides</i>
<i>Polycarpaea violacea</i>
<i>Polygala coralliformis</i>
<i>Sauropus ditassoides</i>
<i>Sowerbaea alliacea</i>

<i>Spermacoce calliantha</i>
<i>Spermacoce leptoloba</i>
<i>Spermococce stenophylla</i>
<i>Stylidium semipartitum</i>
<i>Stylidium tenerrimum</i>
<i>Tephrosia remotiflora</i>
<i>Tephrosia reticulata</i>
<i>Thecanthes lobelia</i>
<i>Uraria lagopodioides</i>
<i>Urena lobata</i>
<i>Utricularia involvens</i>
<i>Waltheria indica</i>
<i>Xyris complanata</i>
Sedge
<i>Arthrostylis aphylla</i>
<i>Eleocharis dulcis</i>
<i>Eleocharis sphacelata</i>
<i>Fimbristylis macrantha</i>
<i>Fimbristylis nutans</i>
<i>Fimbristylis simplex</i>
<i>Fimbristylis simulans</i>
<i>Scleria levis</i>
<i>Scleria rugosa</i>
<i>Tricostularia undulata</i>
Rush
<i>Dapsilanthus spathaceus</i>
Orchid
<i>Cymbidium canaliculatum</i>
Lily
<i>Patersonia macrantha</i>
Vine
<i>Ampelocissus acetosa</i>
<i>Bonamia media</i>
<i>Cassytha filiformis</i>
<i>Dioscorea transversa</i>
<i>Flemingia trifoliatrum</i>
<i>Grevillea goodii</i>
<i>Gymnanthera oblonga</i>
<i>Jasmimum molle</i>
<i>Marsdenia viridifolia</i>
<i>Passiflora foetida</i>
<i>Smilax australis</i>
<i>Tylophora flexuosa</i>
<i>Vigna lanceolata</i>

<i>Vigna vexillate var. angustifolia</i>
Aquatic
<i>Ceratophyllum spp.</i>
<i>Hydrilla verticillata</i>
<i>Najas spp.</i>
<i>Nymphaea violacea</i>
<i>Nymphoides indica</i>

Appendix H NT Herbarium Holtz database species list

Holtz Flora List from Darwin Herbarium for Wildman River Region.

Taxon
<i>Abrus precatorius</i>
<i>Acacia auriculiformis</i>
<i>Acacia hemignosta</i>
<i>Acacia lamprocarpa</i>
<i>Acacia praelongata</i>
<i>Adenanthera pavonina</i>
<i>Adenostemma lavenia</i>
<i>Ageratum conyzoides</i>
<i>Aidia racemosa</i>
<i>Alloteropsis semialata</i>
<i>Alternanthera nodiflora</i>
<i>Alysicarpus vaginalis</i>
<i>Ammannia baccifera</i>
<i>Ammannia multiflora</i>
<i>Arenga microcarpa</i>
<i>Artocarpus glaucus</i>
<i>Asteromyrtus symphyocarpa</i>
<i>Basilicum polystachyon</i>
<i>Bergia pusilla</i>
<i>Blumea tenella</i>
<i>Bonamia brevifolia</i>
<i>Bothriochloa pertusa</i>
<i>Brachyachne ambigua</i>
<i>Buchanania arborescens</i>
<i>Buchnera gracilis</i>
<i>Burmannia coelestis</i>
<i>Burmannia juncea</i>
<i>Byblis aquatica</i>
<i>Byblis liniflora</i>
<i>Calandrinia gracilis</i>
<i>Caldesia oligococca</i>
<i>Calophyllum soulattri</i>
<i>Calopogonium mucunoides</i>
<i>Carallia brachiata</i>
<i>Cardiospermum halicacabum</i>
<i>Cartonema parviflorum</i>
<i>Cartonema sp. pedicellate</i>
<i>Cartonema trigonospermum</i>
<i>Cassytha filiformis</i>
<i>Centrolepis banksii</i>
<i>Centrolepis exserta</i>
<i>Chamaecrista rotundifolia</i>
<i>Chiloschista phyllorhiza</i>

<i>Chloris barbata</i>
<i>Chlorophytum laxum</i>
<i>Choriceras tricorne</i>
<i>Chrysopogon latifolius</i>
<i>Chrysopogon oliganthus</i>
<i>Clerodendrum costatum</i>
<i>Clitoria australis</i>
<i>Coldenia procumbens</i>
<i>Colocasia esculenta</i>
<i>Corynotheca lateriflora</i>
<i>Crepidium fontinale</i>
<i>Crotalaria medicaginea</i>
<i>Cyanotis axillaris</i>
<i>Cyanthillium cinereum</i>
<i>Cyclophyllum schultzii</i>
<i>Cymbopogon refractus</i>
<i>Cynodon radiatus</i>
<i>Cyperus aquatilis</i>
<i>Cyperus breviculmis</i>
<i>Cyperus brevifolius</i>
<i>Cyperus cristulatus</i>
<i>Cyperus exaltatus</i>
<i>Cyperus haspan</i>
<i>Cyperus iria</i>
<i>Cyperus javanicus</i>
<i>Cyperus orgadophilus</i>
<i>Cyperus pulchellus</i>
<i>Cyperus serotinus</i>
<i>Cyperus tenuispica</i>
<i>Cyperus zollingeri</i>
<i>Desmodium heterocarpon</i>
<i>Desmodium heterocarpon</i>
<i>Desmodium pullenii</i>
<i>Desmodium pycnotrichum</i>
<i>Desmodium tortuosum</i>
<i>Desmodium trichostachyum</i>
<i>Digitaria longiflora</i>
<i>Dimeria ornithopoda</i>
<i>Dioscorea transversa</i>
<i>Diospyros calycantha</i>
<i>Diplatia furcata</i>
<i>Drosera burmanni</i>
<i>Drosera indica</i>
<i>Ectrosia agrostoides</i>

<i>Ectrosia leporina</i>
<i>Eleocharis sphacelata</i>
<i>Eleusine indica</i>
<i>Emilia sonchifolia</i>
<i>Eragrostis cumingii</i>
<i>Eragrostis pubescens</i>
<i>Eragrostis schultzii</i>
<i>Eriachne agrostidea</i>
<i>Eriachne burkittii</i>
<i>Eriachne ciliata</i>
<i>Eriachne filiformis</i>
<i>Eriachne schultziiana</i>
<i>Eriachne sulcata</i>
<i>Eriachne trisetia</i>
<i>Eriocaulon cinereum</i>
<i>Eriocaulon fistulosum</i>
<i>Eriocaulon setaceum</i>
<i>Eriocaulon spectabile</i>
<i>Ficus brachypoda</i>
<i>Fimbristylis acicularis</i>
<i>Fimbristylis acuminata</i>
<i>Fimbristylis complanata</i>
<i>Fimbristylis densa</i>
<i>Fimbristylis dichotoma</i>
<i>Fimbristylis furva</i>
<i>Fimbristylis lanceolata</i>
<i>Fimbristylis pallida</i>
<i>Fimbristylis pauciflora</i>
<i>Fimbristylis punctata</i>
<i>Fimbristylis schultzii</i>
<i>Fimbristylis tetragona</i>
<i>Fimbristylis xyridis</i>
<i>Flacourtia territorialis</i>
<i>Fuirena umbellata</i>
<i>Galactia tenuiflora</i>
<i>Ganophyllum falcatum</i>
<i>Glycine hirticaulis</i>
<i>Glycine tomentella</i>
<i>Glycosmis trifoliata</i>
<i>Gomphrena celosioides</i>
<i>Goodenia armstrongiana</i>
<i>Goodenia coronopifolia</i>
<i>Goodenia holtzeana</i>
<i>Goodenia leiosperma</i>

<i>Goodenia porphyrea</i>
<i>Goodenia sepalosa</i>
<i>Haemodorum brevicaulis</i>
<i>Helicteres hirsuta</i>
<i>Helicteres sphaerothera</i>
<i>Heliotropium alcyonium</i>
<i>Heliotropium bracteatum</i>
<i>Helminthostachys zeylanica</i>
<i>Hibbertia cistifolia</i>
<i>Homalanthus novoguineensis</i>
<i>Hydrilla verticillata</i>
<i>Hygrochloa aquatica</i>
<i>Hygrophila angustifolia</i>
<i>Hymenachne amplexicaulis</i>
<i>Hypoxis nervosa</i>
<i>Ichnocarpus frutescens</i>
<i>Iphigenia indica</i>
<i>Ipomoea aquatica</i>
<i>Isachne confusa</i>
<i>Isachne minutula</i>
<i>Isoetes coromandelina</i>
<i>Isoetes cristata</i>
<i>Jacquemontia paniculata</i>
<i>Larsenaikia suffruticosa</i>
<i>Leea indica</i>
<i>Leersia hexandra</i>
<i>Limnophila australis</i>
<i>Limnophila fragrans</i>
<i>Lindernia aplectra</i>
<i>Lindernia ciliata</i>
<i>Lindernia crustacea</i>
<i>Lindernia lobelioides</i>
<i>Lindernia plantaginea</i>
<i>Lindernia scapigera</i>
<i>Lobelia dioica</i>
<i>Lobelia douglasiana</i>
<i>Lomandra tropica</i>
<i>Lophostemon lactifluus</i>
<i>Ludwigia octovalvis</i>
<i>Luffa aegyptiaca</i>
<i>Macaranga tanarius</i>
<i>Marsdenia glandulifera</i>
<i>Melaleuca viridiflora</i>
<i>Melicope elleryana</i>

<i>Merremia gemella</i>
<i>Merremia hederacea</i>
<i>Micromelum minutum</i>
<i>Miliusa brahei</i>
<i>Mitrasacme aggregata</i>
<i>Mitrasacme exserta</i>
<i>Mitrasacme nummularia</i>
<i>Monochoria australasica</i>
<i>Murdannia graminea</i>
<i>Murdannia sp. Top End</i>
<i>Myriophyllum trachycarpum</i>
<i>Myrsine pedicellata</i>
<i>Nauclea orientalis</i>
<i>Nervilia aragoana</i>
<i>Nymphoides aurantiaca</i>
<i>Nymphoides minima</i>
<i>Nymphoides quadriloba</i>
<i>Nymphoides subacuta</i>
<i>Olax imbricata</i>
<i>Oldenlandia leptocaulis</i>
<i>Oplismenus compositus</i>
<i>Ottelia alismoides</i>
<i>Panicum mindanaense</i>
<i>Parsonsia velutina</i>
<i>Persicaria attenuata</i>
<i>Phyllanthus eutaxioides</i>
<i>Phyllanthus reticulatus</i>
<i>Piper macropiper</i>
<i>Pistia stratiotes</i>
<i>Plectranthus scutellarioides</i>
<i>Pleomele angustifolia</i>
<i>Polyalthia australis</i>
<i>Polygala bifoliata</i>
<i>Polygala coralliformis</i>
<i>Polygala longifolia</i>
<i>Poranthera coerulea</i>
<i>Pseudopogonatherum irritans</i>
<i>Psilotum nudum</i>
<i>Rhynchospora heterochaeta</i>
<i>Rhynchospora longisetis</i>
<i>Rhynchospora rubra</i>
<i>Rotala mexicana</i>
<i>Rotala occultiflora</i>
<i>Sacciolepis indica</i>

<i>Sauropus ditassoides</i>
<i>Schefflera actinophylla</i>
<i>Schizachyrium pachyarthron</i>
<i>Schoenoplectus lateriflorus</i>
<i>Scleria annularis</i>
<i>Scleria caricina</i>
<i>Scleria levis</i>
<i>Scleria lithosperma</i>
<i>Scleria lithosperma</i>
<i>Scleria novae-hollandiae</i>
<i>Scleria pygmaea</i>
<i>Scleria rugosa</i>
<i>Selaginella ciliaris</i>
<i>Selaginella pygmaea</i>
<i>Senna occidentalis</i>
<i>Sesbania burbidgeae</i>
<i>Sida rhombifolia</i>
<i>Sorghum intrans</i>
<i>Sowerbaea alliacea</i>
<i>Spermacoce calliantha</i>
<i>Spermacoce leptoloba</i>
<i>Spermacoce occultiseta</i>
<i>Spermacoce stenophylla</i>
<i>Stackhousia intermedia</i>
<i>Stylidium lobuliflorum</i>
<i>Stylidium schizanthum</i>
<i>Stylidium tenerrimum</i>
<i>Stylidium turbinatum</i>
<i>Synedrella nodiflora</i>
<i>Syzygium nervosum</i>
<i>Tephrosia oblongata</i>
<i>Tephrosia remotiflora</i>
<i>Tephrosia reticulata</i>
<i>Terminalia pterocarya</i>
<i>Thaumastochloa major</i>
<i>Thaumastochloa rariflora</i>
<i>Thespesia thespesioides</i>
<i>Trachymene rotundifolia</i>
<i>Trithuria cowieana</i>
<i>Trithuria lanterna</i>
<i>Tylophora erecta</i>
<i>Typhonium cochleare</i>
<i>Urochloa distachya</i>
<i>Urochloa polyphylla</i>

<i>Utricularia aurea</i>
<i>Utricularia chrysantha</i>
<i>Utricularia leptoplectra</i>
<i>Utricularia nivea</i>
<i>Uvedalia linearis</i>
<i>Uvedalia linearis</i>
<i>Vachellia pallidifolia</i>
<i>Vallisneria nana</i>
<i>Vallisneria rubra</i>
<i>Vavaea amicorum</i>
<i>Verticordia cunninghamii</i>
<i>Waltheria indica</i>
<i>Whiteochloa capillipes</i>
<i>Xyris indica</i>
<i>Xyris pusilla</i>
<i>Zornia prostrata</i>

