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Land Resources of the Miriam Vale and Kolan Shires

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This publication is for general distribution. The information in this report is derived from 1:250 000 scale land resource mapping which is an adequate scale for regional planning purposes. In assessing individual applications for subdivision a detailed assessment of land resources is usually necessary. Explicit evaluation of economic factors such as the size of production units or crop viability have not been included in the land capability assessment as they are not considered relevant to the quality of the land resource (State Planning Policy 1/92).

This report is intended to provide information only on the subject under review. There are limitations inherent in land resource studies, such as accuracy in relation to map scale and assumptions regarding socio-economic factors for land evaluation. Readers are advised against relying solely on the information contained therein. Before acting on the information conveyed in this report, readers should be satisfied they have received adequate information and advice subject to their enquiry.

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Summary

Land resource assessment involving the description and mapping of land systems over 615 307 ha has been completed in the Kolan and Miriam Vale shires. Land systems or areas throughout which there is a recurring pattern of topography, soils and vegetation were mapped at 1:250 000. Within each land system component land units were described in terms of soils, landform attributes and vegetation. Land capability classes ranging from class III to VIII as well as the limitations which affect the use of the land are also given for each land unit. Fifty land systems were identified and 255 mapping units are shown on the land system map which accompanies this report. A land capability map showing the dominant and subdominant land classes was produced for the 255 mapping units. A land use map was produced for each shire to capture the distribution of the major land uses at 1999–2000.

This information will assist in strategic and regional planning, resource management, environmental impact assessment, development control, infrastructure planning and nature conservation for all levels of government, industry and catchment management groups. It will assist landcare groups in developing suitable management strategies to avoid or reduce degradation, which includes salinity and erosion.

This land resource information is available in electronic format (Geographical Information System, GIS), printed maps and this report. A database which includes information on each mapping unit is attached to the GIS. Information for the 364 land units is also available. These databases allow for rapid data manipulation and provide flexibility in the presentation of information such as maps, tables and specific enquiries for a wide range of uses and clients. The digital data as well as hard copies of other maps are available from the Department of Natural Resources, Mines & Energy in Bundaberg.

The area was divided into seven broad geological groups including: (1) alluvial landscapes; (2) deeply weathered basic volcanic rocks; (3) basic and intermediate intrusive and extrusive igneous rocks; (4) acid to intermediate volcanic rocks; (5) acid to intermediate intrusive rocks; (6) sedimentary rocks; and (7) metamorphic rocks.

Most land systems support a eucalypt community. Vine forest covers one land system and smaller proportions of three other land systems.

The major landform patterns of the area varies from plains in the east to hills and mountains in the west. Modal slopes vary from level (<1%) on the alluvial plains to steep slopes (32–56%) on the hills and mountains.

Soils vary considerably throughout the area due mainly to the wide range of rock types, age of the landscapes and landforms. Uniform coarse textured soils are prominent on the alluvial landscapes along the coast and the upper landscape positions of the acid igneous rocks. Non cracking clays and gradational soils are common on the basic and intermediate extrusive and intrusive igneous rocks, on some alluvial land systems and some land systems on acid to intermediate volcanic rocks. Sodic duplex soils are the dominant soils of the sedimentary rocks and metamorphic rocks while smaller proportions of these soils occur on the alluvial landscapes, the acid to intermediate igneous rocks and the acid to intermediate volcanic rocks. Cracking clays, although not extensive, occur on two of the alluvial landscapes and the basic and intermediate intrusive and extrusive igneous rocks. Shallow soils are common on the crests and upper slopes of land systems with mountains and steep hills.

Acid sulfate soils occur on the coastal wetlands along the northern coastline and the creek and river estuaries.

The two shires have 6524 residential and rural blocks that are <20 ha. National Parks and Reserves occupy 25 049 ha while State Forestry reserves occupy 75 460 ha. The sugar industry is an important industry in south east of the Kolan Shire. Substantial areas of eucalypt and paulownia plantations are established in the two shires and their area is increasing.

The land capability classification shows that most of the area is suitable for pastoral uses (Class VI and VII). Based on the proportion of land units in each land system, about 12% is regarded as class VIII or unsuitable for agricultural use of any kind; this land occurs on the coastal marine plains and some of the mountainous country. The major limiting factors influencing the use of the land in the area are low plant available water capacity, wetness and erosion due to steep slopes.

Although not extensive, land degradation to varying degrees has occurred in the areas. The major forms of degradation are pasture weed infestation, salinity and erosion.

A severe infestation of Giants Rats Tail grass is decreasing the productive value of some grazing land especially in parts of Miriam Vale shire. Smaller infestations of parthenium, cats claw creeper, rubber vine, groundsel bush and lantana occur throughout the study area.

Salinity degradation usually as seepage salting on lower slopes and in drainage depressions, is present in small areas especially east and west of Bororen. Low rainfall over the last decade has decreased the incidence of salinity due to lowering of the watertables but may increase in above average or normal seasons.

Erosion is often present in concave slopes and drainage lines especially on sodic duplex soils where excessive clearing or overgrazing has resulted in poor surface cover. The planting of trees up and down the slope in newly developed tree plantations is not recommended due to the high risk of erosion during establishment.

1. Introduction

The Miriam Vale and Kolan Shires occupy about 651 600 ha in the northern extremity of South East Queensland.

The only existing land resource information available for the area is the Coastal Burnett Land Management Manual (Glanville *et al.* 1991) and the Atlas of Australian Soils (Isbell *et al.* 1967). The information contained in these reports is of inadequate detail for developing planning and implementing strategies promoting better land use planning, integrated catchment management and sustainable land use.

Land resource assessment has been completed in all of the areas surrounding the shires. These studies include the 250 000 surveys of the Capricorn Coast lands (Forster and Barton 1995) in the north west, North Burnett area (Donnollan and Searle 1999) in the west, and the Central Burnett (Kent 2002.) in the south. The 1: 100 000 Childers soil survey of Wilson (1997) and the Bundaberg 1:50 000 soil survey of Donnollan *et al.* (1998) adjoins the area in the south east. Part of the Childers and Bundaberg surveys extend into the Kolan Shire so the area covered by these more detailed surveys has not been included in this survey. Information on these areas can be obtained from the respective surveys.

The Bruce Highway, is the major link road through the area and passes through the major centres of the areas, namely Gin Gin in the south and Miriam Vale in the north. The Rosedale Road and Tableland Road link Bundaberg in the south east of the study area with Agnes Water in the north east of the area. Other roads such as the Blackmans Gap Road, Mt Perry Road, and the Kalpowar Road provide links to the west. The main coastal railway in Queensland passes through towns of the area such as Rosedale, Lowmead, Miriam Vale and Bororen.

The location of the study area relative to adjacent surveys is shown in Figure 1.

The main objectives of the project were to:

- provide user friendly long term baseline land resource information to improve future resource management strategies and actions in the Kolan and Miriam Vale shires;
- support regional planning requirements of industry and local government;
- give community groups and landholders access to land resource information to support sustainable management strategies;
- provide a permanent central repository of resource information in GIS format for the study area.

The land resource information is available in electronic format (Geographical Information System, GIS) databases, printed maps and this report. GIS and database packages can be used to interrogate the digital data to obtain more specific land resource information than this report and the included land systems, land use and land capability maps can provide. The digital data as well as hard copies of other maps are available from the Department of Natural Resources, Mines & Energy in Bundaberg.

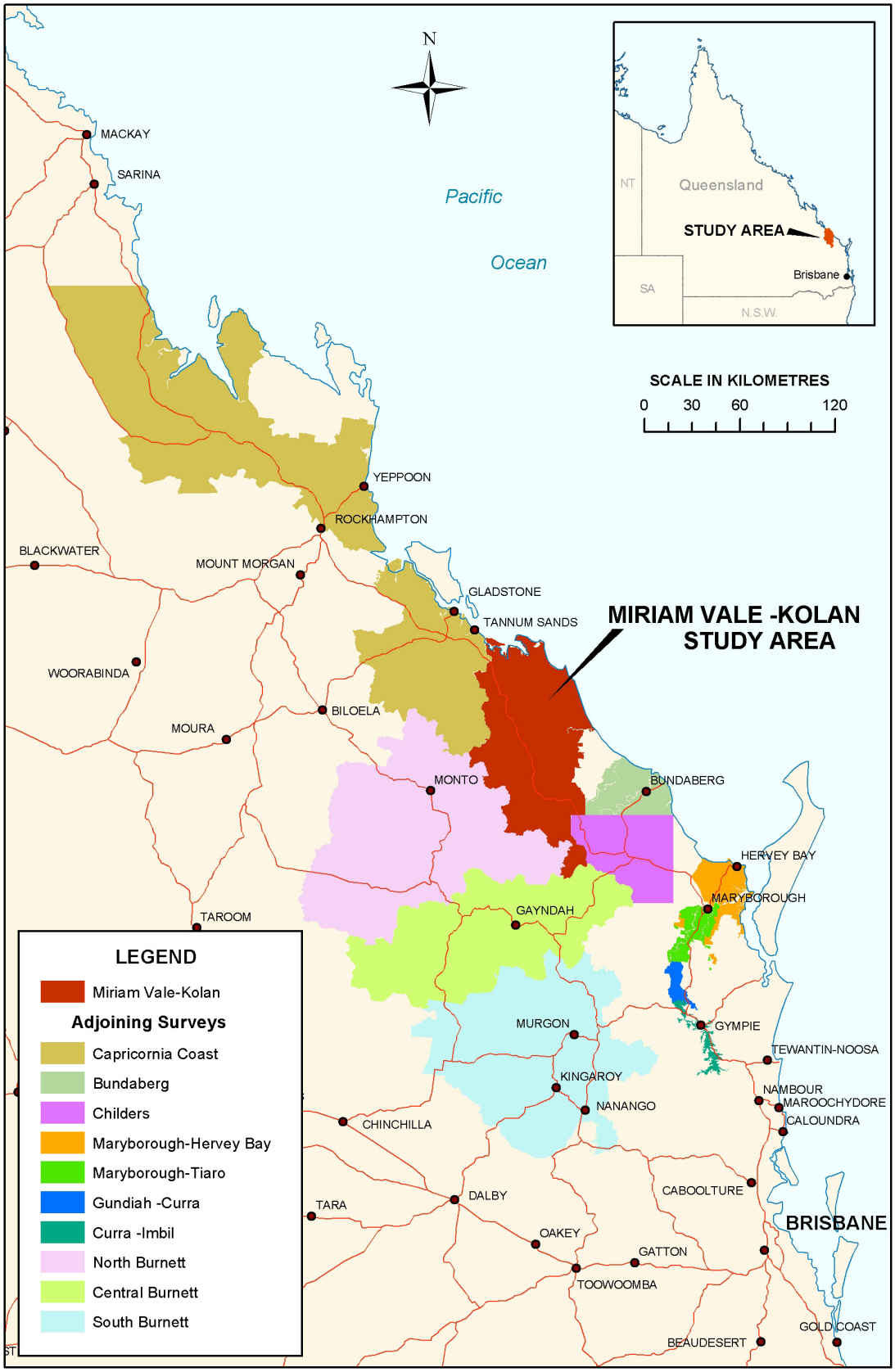

Figure 1 Location of study area[1]

[1] For detailed list of adjoining surveys, see Appendix VII

2. Survey methods

A land use study and a land system survey was undertaken to collect the land resource information for the study area.

The land use study involved the capture of a number of GIS coverages including land tenure (National Parks and Reserves, and State Forest and residential allotments) and sugarcane assignments. Satellite imagery, aerial photos and field checking was used to identify land use. Industry and government sources provided information on dairy farms, piggeries, poultry farms, aquaculture and forestry plantations. The remaining land was allocated to native and improved pastures. The Shires provided locations of gravel pits. The two accompanying land use maps, one for each shire, shows the location of current land uses for the survey area.

The land system approach was used to map and describe the land resources of the area. A land system is defined by Christian and Stewart (1953) as an area or group of areas throughout which there is a recurring pattern of topography, soils and vegetation. Each land system is composed of one or more land units.

Following a relevant literature review and reconnaissance of the area, aerial photo interpretation was undertaken on 1:80 000 scale black and white photos. Interim land systems based on differences in geology, vegetation and landform were identified from this interpretation. The use of gamma radiometrics and a Digital Elevation Model (DEM) were additional tools used in the mapping process.

The natural radioactive decay of the isotopes of the elements potassium (K), thorium (Th), and uranium (U) can be measured by airborne gamma spectrometry (AGS). A receiver in a plane collects a gamma ray spectrum which is processed to derive abundances of K, Th and U as well as a total count in the top 0.30 metre of the earths surface. In this area, plane traverses were at 400 metre spacings. The point values are interpolated to form a grid of values which can then be displayed as an image of the area covered by the plane transects. As different rocks and weathered products provide characteristic abundances of these elements, the contrasting patterns produced in the image can be used to distinguish rock types and geomorphology. The use of gamma radiometrics in this area was useful in aiding the mapping of the land systems in some areas, especially in the large Miriam Vale granodiorite geological formation. It was also particularly useful in separating the finer surfaced soils on the intermediate igneous rocks from the more extensive sandy surfaced soils developed on acid igneous rocks.

A DEM or a three dimensional representation of the area was created using 40 metre contour data. It added another useful layer of information within the study. The DEM was less useful in delineating landforms in the east of the study area where plains and rises predominate.

Detailed descriptions of soils, vegetation and site characteristics were made at over 600 sites along field traverses to confirm the land system boundaries and to define land units. Site density was low in the more inaccessible parts of the survey area. A reliability diagram of the intensity of investigations is shown with the land systems map.

The sites were located using a global positioning system accurate to 10–20 m. A coloured photograph was taken at many of these sites. Information on landscape, vegetation and soil morphology at each site was recorded on a computer database. Seventy six subsoil samples from 52 soils were analysed at selected subsoil depths for cation exchange capacity and cation contribution as well as pH and salt levels. Surface samples from a further sixty six sites were analysed for nutrients.

Land system nomenclature

Fifty land systems were identified in the area and a land system map at a scale of 1:250 000 shows the extent and location of these land systems over 255 mapping units. Each of the mapping units is named after the dominant land system in that unit. Individual land systems are briefly described in terms of landform and geology, dominant vegetation and major soils in the reference for the map. For ease of interpretation, the land systems have been subdivided into seven broad geological and geomorphological groups. Land systems within these broad groups were further subdivided using landform, vegetation and soils.

Landform pattern characterised by relief and modal slope (Table 5 in Speight 1990), was the major criteria used for subdivision by landform.

Usually the land system was named after the major geological unit on which it occurred. However, other names were selected if the names of the geological units were not appropriate or if the geological unit name was used for other land systems for other surveys.

A number after the name identified those land systems of the same geological formation but with either a different landform or suite of soils. For instance, the Miriam Vale geological formation is an intrusive rock formation consisting of granodiorite, adamellite, quartz diorite and minor pegmatite, gneiss and gabbro. The landform of the Miriam Vale land systems, ranges from gently undulating rises to undulating rise for *Miriam Vale 1* and *2*, to rolling hills to steep mountains for *Miriam Vale 7*. *Miriam Vale 1* with a suite of fine textured surface soils developed primarily from granodiorite or diorite is separated from *Miriam Vale 2* with its coarse textured soils developed from granite or adamellite. The remaining Miriam Vale land systems have either a different landform or suite of soils.

Land units

A total of 364 land units for the 50 land systems were described in terms of landform element, soils, remnant vegetation and land capability. Soils were described using the morphological terms defined by Northcote (1979) and classified using the new Australian Soil Classification (Isbell 1996). The limitation subclasses were assessed for each land unit and the land capability classes were subsequently derived for each land unit. An estimate of the percentage of area of the land system occupied by each land unit is also given in the land system description. A two-dimensional diagram is provided to identify the position of the land unit within the land system. A description of the land units of each land system is given in Appendix I.

A land capability map at 1:250 000 was derived from the land capability class of the dominant and subdominant land units in each mapping unit. However, a land system often contains more than two classes so care must be taken in using this map. A more detailed land capability assessment for a particular land system can be obtained from the land unit descriptions in Appendix I as well as from the land unit database.

3. Physical resources

Climate

The climate of the Miriam Vale and Kolan areas is subtropical, with warm to hot summers and mild winters. The mean summer maximum temperatures are about 28^{o}C with winter temperatures less than 10^{o}C lower. Average minimum temperatures range from 17 to 20^{o}C in the summer months to 4 to 14^{o}C in the winter months. Approximately 70% of the mean annual rainfall falls in the summer months, from October to March, with variability extremely high. Evaporation ranges from 3 to 6 mm/day during the summer months and from 2 to 4 mm/day during winter. Climate data has been obtained from Australian Rainman (Clewett *et al*. 1994).

Rainfall

Rainfall stations within the area are located at Rosedale, Gin Gin, Miriam Vale and Bororen. Record periods range from 102 years at Rosedale to 112 years at Bororen. Mean annual rainfall is 1171 mm at Miriam Vale, 1147 mm at Bororen, 1110 mm at Rosedale and 1063 mm at Gin Gin.

Miriam Vale is the most westerly station at longitude 151°57'compared to Gin Gin, the most easterly station at 151°97'. Miriam Vale may receive slightly higher annual rainfall due to the series of mountain ranges occurring directly to the west. The mean monthly rainfall for the five rainfall stations in the area is shown as histograms in Figure 2.

Rainfall variability is very high, for instance the highest annual rainfall at Miriam Vale is 2457 mm and the lowest 553 mm. The highest and lowest rainfall figures for Gin Gin are 1810 mm and 379 mm respectively. Standard deviations from the annual rainfall for the stations of Rosedale and Bororen are about 300 mm.

Temperature

Climate stations at Kalpowar, Bulburin Forestry, Bustard Head and the Town of 1770 were used as a data source for temperature and evaporation. Kalpowar and Bulburin Forestry stations are located just outside the survey boundary. Data was sourced from these stations as the temperature data available within the survey area was limited. The monthly, maximum and minimum temperatures are shown for these stations in Figure 3.

The maximum monthly temperatures for Kalpowar, Bustard Head and Town of 1770 stations are similar while those for Bulburin Forestry are slightly lower due to the higher elevation. Temperatures rarely exceed 35°C in the summer months from December to January.

The mean minimum temperatures for Bustard Head range from 22.5°C in January to 13.2°C in July and for the Town of 1770 from 22.8°C to 13.8°C for the same months. The mean minimum temperatures for Kalpowar range from 18.6°C in January to 3.6°C in July and for Bulburin Forestry from 17.9°C to 8.5°C for the same months. The lower minimum temperatures for Kalpowar and Bulburin Forestry may be attributed to their more westerly location and the higher elevation.

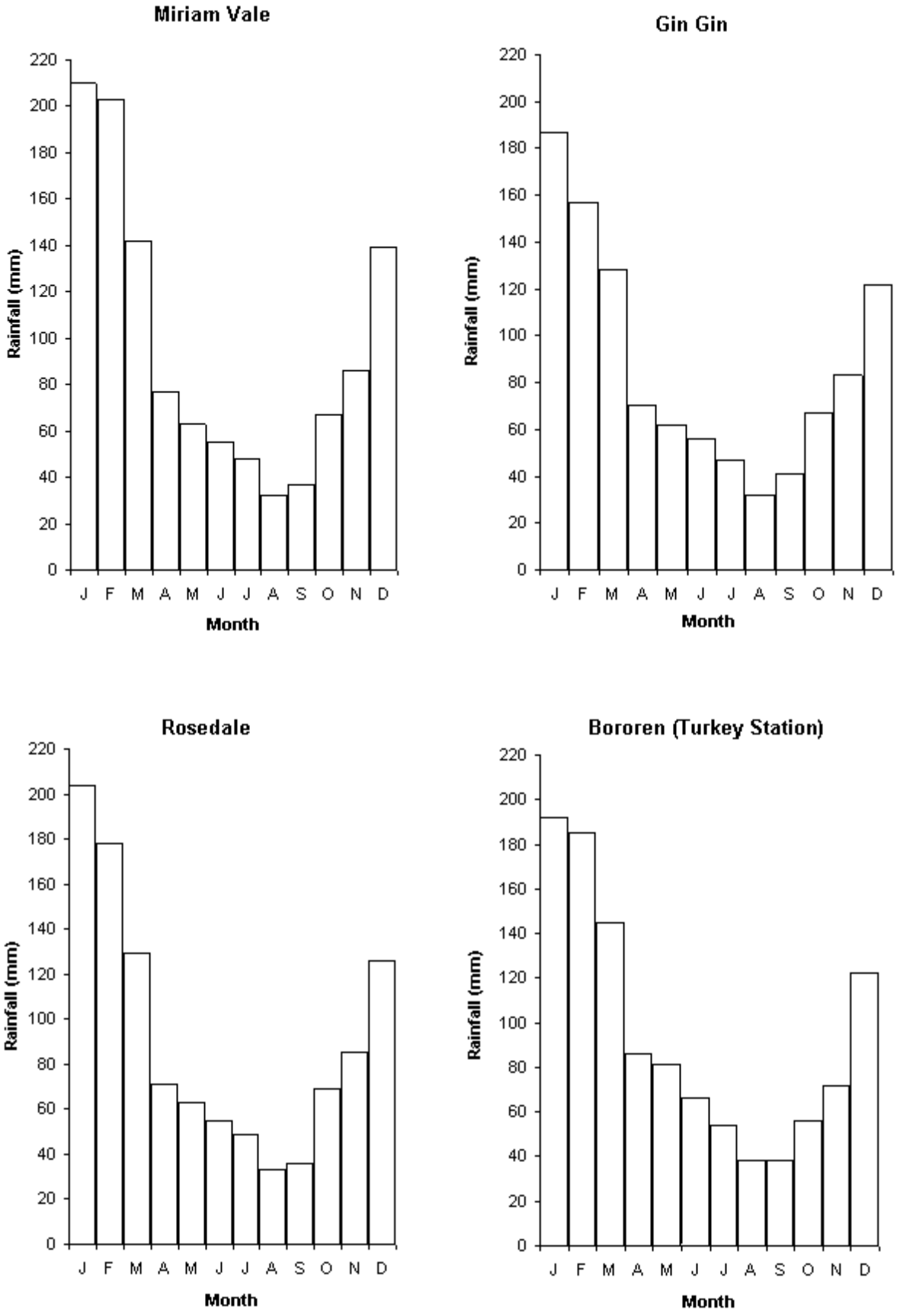

Figure 2. Mean monthly rainfall for stations in the Miriam Vale and Kolan Shires: Miriam Vale, Gin Gin, Rosedale and Bororen.

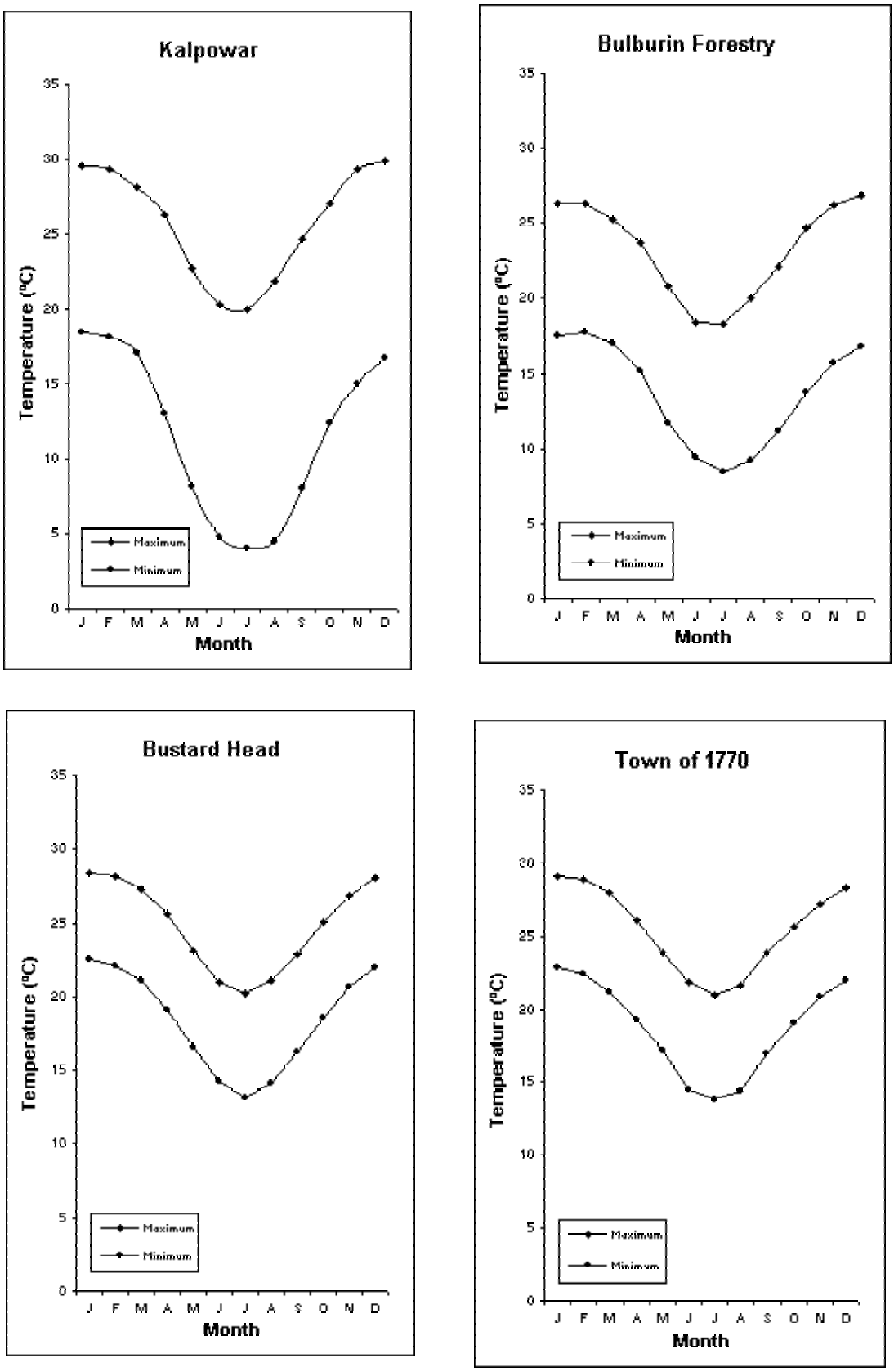

Figure 3. Mean monthly, maximum and minimum temperatures for stations in and adjacent to the Miriam Vale and Kolan Shires: Kalpowar, Bustard Head, Bulburin Forestry and Town of 1770

Evaporation

Table 1 shows the mean monthly pan evaporation in mm/day for Kalpowar, Bulburin Forestry and Bustard Head stations. Kalpowar has the highest evaporation rates with Bulburin Forestry and Bustard Head both having similar but lower rates.

Table 1. Average daily pan evaporation (mm/day) for stations Kalpowar, Bustard Head and Bulburin Forestry

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Kalpowar	6.1	5.4	4.3	4	3	2.7	2.9	3.7	4.8	5.6	6.5	6.6
Bulburin Forestry	4.2	3.6	3.1	2.8	2.5	2.1	2.6	3.2	3.9	4.3	4.8	4.8
Bustard Head	5.4	4.6	3.9	3	2.2	2.1	2	2.2	2.9	3.8	4.7	5.4

Geology

The study area is covered by the Maryborough, Monto and Bundaberg geological 1:250 000 sheets and the geology is described in the accompanying reports (Ellis 1968, Dear *et al.* 1971, Ellis and Whitaker 1976). A brief summary of the structural geology and geological history is given below. A brief description of the rock types of the geological formations of each land system are given in the description of the land systems.

Structural geology and geological history

Two major faults, the Perry and the Electra Faults trending in a north-north west alignment effectively subdivide the area into two structural blocks. Ellis and Whitaker (1976) described the Coastal Block as lying between the Perry fault which passes through Mt Perry in the west and the Electra fault which passes between Berajondo and Lowmead. The Rosedale Block is bounded in the west by the Electra fault and by the Maryborough Basin in the east. The Bullyard Fault separates the Rosedale Block and the Maryborough Basin in the southern part of the study area. In the north, an extensive area of Triassic terrestrial acid volcanics unconformably overlies the Rosedale Block.

In the Devonian and Carboniferous, a sequence of sediments including greywacke, siltstone, mudstone and shale of the Curtis Island Group (including the Wandilla and Goodnight Beds) were deposited. In the Lower Permian, the geosynclinal sediments and volcanics of the Biggenden Beds were deposited unconformably on the Curtis Island Group. In the same period a number of sedimentary and volcanic events of the Gympie Group occurred.

During the Permian to the middle Triassic, a number of batholiths including the Miriam Vale Granodiorite and the Castletower Granite was emplaced into the Curtis Island Group and Biggenden Beds.

During the Triassic, the Brooweena Formation was laid down. This was followed by terrestrial acid volcanic extrusions over a large part of the area. These volcanic extrusions include the Agnes Water Volcanics, Muncon Volcanics, Aranbanga Beds and Goyan Andesite.

During the late Triassic, a number of granitic plutons intruded the area. These intrusions include the Tawah Granite, Wonbah Granodiorite, Hogback Granite, Watalgan Granite and some unnamed granite plutons.

A depositional sequence from the early Jurrasic onwards occurred in the Maryborough Basin as a result of much uplifting and movement in the Triassic. Cretaceous deposition in the Maryborough Basin began with a sequence of terrestrial acid volcanics and sediments of the Grahams Creek

Formation followed by marine sediments of the Maryborough Formation. The Burrum Coal Measures conformably overlie the Maryborough Formation.

Strong folding movements followed the Cretaceous depositional phase and by the early Tertiary the folded Cretaceous succession had been eroded to base level. Subsidence occurred and the sediments of the Elliott Formation were deposited mainly under fluviatile conditions. Only remnants of the Elliott Formation remain in the study area.

Renewed activity in the Electra fault zone in the vicinity of Lowmead resulted in shale, mudstone and other sediments being deposited in a graben. Olivine basalt was extruded in the south during the Tertiary. In the study area, this basalt appears as small remnant areas in the Monduran and Gin Gin areas.

Coastal and estuarine fine sand and mud, coastal dune sand and fluviatile alluvium were deposited in the Holocene.

Land Systems

Geology, geomorphology and landform were the major factors used to differentiate the land systems. For ease of interpretation the land systems may be divided into seven broad groups which are as follows:

Group 1.	Alluvial landscapes;
Group 2.	Deeply weathered basic volcanic rocks;
Group 3.	Basic and intermediate, intrusive and extrusive igneous rocks;
Group 4.	Acid to intermediate volcanic rocks;
Group 5.	Acid to intermediate intrusive rocks;
Group 6.	Sedimentary rocks;
Group 7.	Metamorphic rocks.

Fifty land systems and 255 mapping units were defined for the area.

Group 1. Alluvial landscapes

The alluvial landscapes have been subdivided into (a) marine plains; (b) coastal dunes and sand plains; (c) coastal alluvial plains; and (d) alluvial plains of rivers and creeks. Plains, estuaries and tidal flats are common elements associated with the marine plain. The only land system of the marine plains is *Bustard* which occupies 15 637 ha. Much of this land system is affected by tidal influences. Acid sulfate soils in the form of deep saline clays, muds and sands are the major soils of this land system. These areas should be left in their natural state as any disturbance may have detrimental on-site and off-site environmental impacts if oxidation of these sediments occur with subsequent release of sulfuric acid.

Wreckrock and *Eurimbula* (11 836 ha) are the two land systems of the coastal dunes and sand plains. These dunes and sandplains have been formed largely from the action of wind and waves. *Eurimbula* is found on the coastal lowlands in the north, on Middle Island and Hummock Hill Island, while *Wreckrock* occupies a narrow band in the coastline from Agnes Water to Rules Beach. A number of mapping units of the *Eurimbula* land system in the Rodds Bay area is associated with the marine plains of *Bustard* and are mapped as complex systems containing land units of both land systems. The major soils on the beach ridges, swales and slopes of these land systems are uniform coarse textured soils. Eucalypt open forest and woodland are the major vegetation formation although an area of 'rainforest species' is present in the land system *Eurimbula.* National Parks and Reserves occupy the majority of these land systems although on the coastline between Deepwater Creek and Rules Beach, many lots are of freehold tenure. Tree crops mainly macadamia nuts, are grown on some of these lots.

The coastal alluvial land systems of *Cook* and *Deepwater* (9207 ha) adjoin the coastal dunes and sand plains and occupy a narrow strip from Rules Beach to Agnes Water as well as a plain west of Bustard Bay. The fine depositional material of land system *Deepwater* compares to the coarse textured material of *Cook*. Uniform coarse textured soils are the major soils of the plains and drainage lines of *Cook* while gradational soils and sodic duplex soils with clay loam to light clay surfaces are dominant in *Deepwater*.

The National Parks and Reserves and many of the small subdivided blocks within these land systems are largely undisturbed while other areas are used for beef cattle grazing. Tea tree is common on many of the land units with bloodwoods and stringybarks as emergents. Banksias are common in *Cook*.

Plains, fans and levees are common elements of the level to gently undulating plains of the river and creek alluvial land systems, *Baffle* and *Boondilla* which occupy 19 854 ha. Mapping units of land system *Baffle* occur on the alluvia associated with the rivers and creeks and of adequate size to map at 1:250 000 scale. Smaller alluvial deposits unable to be mapped at the 1:250 000 scale are included in the description of the major land system in which they occur. *Boondilla* land system occurs west of Bororen and Miriam Vale and is associated with the many short streams originating from the mountains to the west and terminating in the swamps and drainage lines some 2–5 kilometres to the east. A wide range of soils occurs on these systems. Sodic duplex soils occur on the older alluvia plains while cracking clays occupy the lower plains and drainage lines. Gradational soils and non sodic duplex soils as well as coarse textured uniform soils are common soils on the levees, fans and scrolls. Most of the mapping units of these land systems have been extensively to completely cleared. Remnant vegetation includes Queensland blue gum, Moreton Bay ash, bloodwoods and gum-topped box. Grazing of beef cattle is a major enterprise of these land systems. Dairying on irrigated pastures is also undertaken. Eucalypt plantations have recently been established on some areas of these land systems.

Group 2. Deeply weathered basic volcanic rocks

This group has only one land system *Monduran 1*, which occupies 214 ha. It consists of gently undulating rises on a plateau. The major soils are deep, red and minor brown and yellow, gradational soils and non cracking clays formed from deeply weathered Tertiary Basalt. Eucalypt open forest is the major vegetation formation but the area is extensively to completely cleared. The major enterprise carried out on this land system is horticultural tree cropping with minor paulownia plantation and beef cattle grazing.

Group 3. Basic and intermediate intrusive and extrusive igneous rocks

Nine land systems occupying 35 374 ha have been identified in this group based on six different geological formations.

Monduran 2 and *Hindmarsh* land systems are formed on Tertiary basalt. The landform of *Monduran 2* is gently undulating to undulating rises on a plateau while *Hindmarsh* has higher relief consisting of undulating low hills to rolling low hills. *Hindmarsh* land systems are located east of Kalpowar on the boundary between the North Burnett Study and this study. The largest areas of *Monduran 2* are located near Lake Monduran and near Gin Gin. Smaller isolated plateaus of *Monduran 2* have been mapped in the south east of the study area near Gin Gin.

Muncon 1 and *2* are located on a range of volcanic rocks within the Muncon Volcanics Formation in the western part of the survey area. *Muncon 1* on undulating rises to rolling low hills has much lower relief than the hills and mountains of *Muncon 2*.

Land system *Wateranga* on the Wateranga Gabbro Formation adjoins the North Burnett Study area in the south west. The single mapping unit of *Moonta* has developed on the Moonta Diorite Formation in the south central portion just west of Moolboolaman. *Blackman* is located near the western boundary on the Blackmans Gap Road and consists of undulating low hills to rolling hills. The rolling hills of the *Goyan* land system is formed on Goyan Andesite in the south of the study area.

The *Serpent* land system of 127 ha has developed on the ultra basic rock Serpentinite near the western boundary east of Kalpowar. The relief of this mapping unit varies from undulating low hills to rolling hills.

The vegetation formation of these land systems varies from eucalypt open forest to woodland with areas of rainforest on land system *Monduran 2*. Most of the land systems within this subdivision have been extensively cleared and used for beef cattle grazing. *Muncon 2* and *Serpent,* which are in State Forestry Reserves as well as the rolling hills of *Goyan,* have had limited clearing.

Non cracking clays and gradational soils with a fine textured surface are common soils of this group. Cracking clays are also common especially on those land systems with lower relief. Other soils in this subdivision include non sodic and sodic duplex soils as well as shallow uniform medium textured soils on the steeper landforms of *Muncon 2.*

Group 4. Acid to intermediate volcanic rocks

Three different geological formations are associated with this broad geological grouping which comprises five land systems and occupies 81 925 ha.

Three land systems of the Agnes Water Volcanic Formation have been separated either on land form or soils and occur in the north east of the survey area near and west of Agnes Water. The smaller areas of the *Eddington* land system on the volcanics of the undivided Gympie Group and land system *Aranbanga* (formed on the Aranbanga Volcanic Group) are located in the southern part of the survey area.

Non cracking clays have developed on the acid and intermediate volcanic rocks of *Agnes Water 1* whose landform varies from gently undulating rises to undulating low hills. Solodic soils are also present in this land system and are also found on the major part of land system *Agnes Water 2* which has a similar landform. The soils of the higher crests and steep slopes of the hills and mountains of *Agnes Water 3* are usually shallow uniform coarse to medium textured soils over rock with abundant surface rock and rock outcrop. Sodic duplex soils and gradational soils are also present on this land system.

The red and brown gradational and non sodic duplex soils occupy a greater area than the sodic duplex soils in land system *Eddington*. Shallow, coarse to medium textured soils over rock and non sodic and sodic duplex soils are common soils on the crests and slopes of land system *Aranbanga.* Deeper sodic duplex soils and non cracking clays occur on the lower slopes and drainage lines.

Much of the eucalypt open forest to woodland has been extensively cleared on the major part of *Agnes Water 1* and to a lesser extent on *Agnes Water 2*. Beef cattle grazing is the major enterprise carried out on these land systems. The open to closed eucalypt forest and areas of minor rainforest largely remain undisturbed especially in the National Parks and Forestry Reserves of land system *Agnes Water 3*. Rural subdivision has occurred on this land system and grazing of beef cattle is undertaken on the lower relief of this land system.

The undulating low hills to rolling hills of land system *Eddington* support a eucalypt woodland to open woodland which has largely been extensively cleared. The rolling low hills of land system *Aranbanga* have had limited to extensive clearing of vegetation. Beef cattle grazing is the major enterprise carried out on these land systems.

Group 5. Acid to intermediate intrusive rocks

Sixteen land systems on eight different geological formations make up this group. Landforms and soil sequences were other factors used to differentiate the land systems in this group which occupy 259 123 ha. Generally these systems extend in a wide band through the central portion of the study area.

Seven land systems have been identified on the large Miriam Vale Granodiorite Formation. The landform varies from gently undulating rises to undulating rises of land system *Miriam Vale 1* to rolling hills to steep mountains of *Miriam Vale 7.*

The gently undulating to undulating rises of *Miriam Vale 1* have similar soils to the undulating low hills to rolling low hills in *Miriam Vale 4.* The major soils are gradational soils, non sodic duplex soils and non cracking and cracking clays with minor sodic duplex soils formed from granodiorite and diorite. Even though the landform of *Miriam Vale 2* is similar to *Miriam Vale 1,* the granite parent material of this land system has developed coarse textured soils. *Miriam Vale 3* with gently undulating rises to undulating low hills is dominated by sodic duplex soils usually with fine or coarse textured surfaces. The soils on the undulating low hills to rolling hills of *Miriam Vale 5* vary from sodic duplex soils and gradational soils to uniform coarse textured soils. The two land systems with the highest relief within the Miriam Vale Granodiorite Formation, *Miriam Vale 6* and *7,* have similar coarse textured soils. These coarse textured horizons lie directly over decomposing granite or have clay subsoils.

The landform of land systems *Tawah, Matchbox 2, Watalgan 2, Hogback* and *Castletower,* varies from undulating low hills to rolling hills to steep mountains. Uniform coarse textured soils over rock and non sodic and sodic duplex soils with coarse textured surface horizons have developed on the granitic rocks of these land systems.

For *Watalgan 1, Perry* and *Wonbah* land systems, sodic duplex soils usually with coarse textured surface horizons are the dominant soils of the land systems with shallower uniform coarse textured soils over rock as the subdominant soil. *Matchbox 1* has a range of soils including gradational soils, sodic duplex soils and non sodic duplex soils.

The major vegetation of these land systems are eucalypt open forest to woodland with some small areas of semi evergreen vine forest on land system *Castletower*.

The extent of clearing largely depends on relief and the suite of soils within the land system. Generally the land systems with landform varying from rises to low hills including *Miriam Vale 1, 2, 3, 4* and *5, Watalgan 1, Tawah, Perry* and *Wonbah,* are extensively to completely cleared. The land systems with more productive soils have been cleared more extensively. For instance, *Miriam Vale 2* has less clearing than *Miriam Vale 1* due to the better soils on *Miriam Vale 1*.

Generally, land systems *Miriam Vale 6* and *7, Matchbox 2, Watalgan 2, Hogback* and *Castletower* have had limited to no clearing due to their relief and poorer suite of soils; they have limited grazing potential.

Beef cattle grazing is the major enterprise carried out in this group of land systems especially on the rises to low hills. Recently eucalypt plantations have been established on cleared lands especially on *Miriam Vale 1* and *4,* and this trend is expected to continue. *Matchbox 1, Wonbah* and smaller areas of *Miriam Vale 4* and *6* have been extensively used for rural subdivision.

Photo 1. Soils with high levels of exchangeable sodium and magnesium result in impermeable poorly drained soils.

Photo 2. Soil erosion has occurred on the lower slopes and drainage lines, especially on sodic duplex soils.

Photo 3. The cleared undulating low hills to rolling low hills of land system *Miriam Vale 4* are valuable grazing lands.

Photo 4. Deep, red, coarse textured uniform soils occur on land system *Wreckrock.*

Group 6. Sedimentary rocks

Seven land systems occupying 107 005 ha have been identified on the range of sedimentary rocks. Different landform, vegetation and soil sequences were other criteria used to separate the land systems. These land systems are distributed throughout the area.

The *Lowmead, Brooweena, Rosedale 1* and *Elliott* land systems have low relief varying from gently undulating rises to undulating low hills. The remaining three land systems *Rosedale 2, Bania 1* and *2* have higher relief varying from undulating low hills to steep hills.

The most common soils of the land systems in this group are sodic duplex soils and sodic gradational soils. Other soils include shallow, stony, medium textured soils over rock especially on the crests and upper slopes of the land systems with higher relief. Some soils, especially on the *Lowmead* and *Brooweena* land systems, are strongly acid in the subsoils usually with high magnesium and aluminium levels. Most soils have fine textured surface horizons indicating development on the finer sedimentary rocks such as siltstone, mudstone and shale.

Land system *Bania 1* on the Wandilla Formation have a different suite of soils to the other land systems in the group, dominated by gradational and non cracking clays.

The vegetation of this group is usually a eucalypt open forest to woodland, except for land system *Bania 1*, which consists of 'softwood scrub' forest.

Extensive clearing to complete clearing has been undertaken on *Rosedale 1*, and portions of *Lowmead, Brooweena, Rosedale* 2 and *Elliott.* Most of the other land systems have had limited to no disturbances especially on the land systems with higher relief.

A large proportion of many of these land systems including *Brooweena, Rosedale 1* and *2, Lowmead* and some of *Elliott* have been subdivided into small rural blocks. Beef cattle grazing is the major enterprise carried out in the rural lands although state forest reserves cover some of these land systems.

Group 7. Metamorphic rocks

Five land systems occupying 75 410 ha have been identified on the metamorphic rocks of the Goodnight Formation and the Curtis Island Group. The two *Goodnight* land systems occur in the south east portion of the survey while *Curtis* adjoins the North Burnett survey in the south west. *Electra 2* occurs throughout the central area while *Electra 1* occupies a single mapping unit in the north west. The dominant soils in this group are sodic duplex soils and shallow, stony, uniform, medium textured soils over rock. Some gradational soils, non sodic duplex soils and non cracking clays are found on land systems *Goodnight 1, Curtis* and *Electra 1.*

Landform varies from rolling low hills to steep hills except for *Electra 1* which ranges from gently undulating rises to undulating low hills. Vegetation on *Goodnight 2, Electra 1* and *2* and *Curtis* is a eucalypt open forest to woodland while *Goodnight 1* supports a vine forest with hoop pine emergents. The vegetation of a large proportion of *Goodnight 1* is undisturbed as it is protected under National Parks and Reserves. Some pine plantations have been established on this land system. Small freehold areas under vine forest have been completely cleared and are used for beef cattle grazing or rural subdivision. Extensive clearing has occurred on *Electra 1* while the higher and steeper areas of *Electra 2* and *Goodnight 2* have had limited clearing. The remaining areas as well as *Curtis* and *Electra 1* are used for beef cattle grazing. Large areas of *Goodnight 2* and areas closer to the major settlements of *Electra 2* have been subdivided into small rural blocks.

Vegetation

The vegetation of the area has been mapped (at a scale of 1:100 000) by the Queensland Herbarium: Thompson (1997) mapped the vegetation of the Miriam Vale and Calliope, Bean (1997) the Rosedale, Monto and Bundaberg sheets while Sparshott (1997) mapped the Childers and Perry sheets. Most of the study area is dominated by eucalypt open forest to woodland. However, vine forest with rainforest species are common on some or part of some land systems. Tea tree open forest is common on lower lying land units of some of the land systems. The common names and the botanical names for the major species recorded in the area are listed in Appendix II.

Vine forest

Vine forest is the major vegetation formation in land systems *Goodnight 1* and *Bania 1*. About 40% of land system *Muncon 2* consists of vine forest with rainforest vegetation as the major species. Rainforest species are common in part of the land system *Eurimbula.* Smaller discrete areas are found on land systems *Castletower, Agnes Water 3* and *Hindmarsh.*

Tea tree communities

Tea tree closed forest to woodland are common on land systems *Deepwater* and *Cook.* Banksia species are often associated with yellow stringy bark and bloodwoods often occurring as emergents. Land units in low lying drainage lines of land systems *Elliott, Brooweena, Electra 1, Agnes Water 2* and *3, Miriam Vale 2* and *Matchbox 1* have tea tree as their major component or as an understorey.

Eucalypt communities

Narrow-leaved ironbark open forest

Pure stands are not common and are usually associated with spotted gum, bloodwoods, silver-leaved ironbark and Moreton Bay ash. This community occurs throughout the area and is usually associated with crests and upper to midslopes on gently undulating rises to mountains. This community is less common on land systems of alluvial origin.

Spotted gum open forest to woodland

This community is usually associated with narrow-leaved ironbark and occurs on similar landscapes to those of narrow-leaved ironbark although often confined to the poorer soils of the crests and ridges.

Bloodwood open forest to woodland

The more common bloodwood species occurring in the study area include pink bloodwood, brown bloodwood, long-fruited bloodwood and gum-topped bloodwood. This community occurs on most of the land systems dominated by eucalypt species including the alluvial land systems.

Silver-leaved ironbark open forest to woodland

Silver-leaved ironbark, although not common throughout the area, grows on some of the land systems formed on basic and intermediate intrusive and extrusive igneous rocks especially *Moonta, Muncon 1, Wateranga, Hindmarsh* and *Monduran 2.* It is also present on some of the land units of *Miriam Vale 1* and *Eddington.*

Gum-topped box open forest to woodland

Gum-topped box usually occurs on sodic duplex soils on the lower slopes and drainage lines of land systems developed on sedimentary rocks. This community is also common on some of the land units of *Agnes Water 1, 2* and *3, Miriam Vale 3, Deepwater, Baffle, Boondilla* and *Goodnight 2*. Gum-topped box also occurs on some of the crests and ridges of the land systems *Goodnight 2, Electra 2, Rosedale 2* and *Bania 2.*

Queensland blue gum woodland

Queensland blue gum is present on most of the land systems dominated by eucalypt species, especially on the lower slopes and drainage lines. Land systems *Bustard, Cook* and *Eurimbula* are the only land systems without areas of Queensland blue gum. Swamp mahogany and Moreton Bay ash are common associated species.

Landform and Drainage

Landform

Generally the landform of the area can be divided into the coastal lowlands near the coast and the dissected hilly to mountainous country in the central and western part of the study area. The coastal lowlands extend along the coast from Baffle Creek northwards to about Red Rocks, south of Agnes Water and again in the north around Bustard and Rodds Bay. Rises and low hills lie between the extremely low relief in the east and the high to very high relief in the west and central parts.

In the central part of the area, the Munro Range, the Edinburgh Mountains, the Westwood Range and the Gwynne Range lie parallel to the coast in a north-northwest trend following the major geological structural features. Individual peaks such as Arthurs Seat (501 m), Dromedary Mt (475 m), North Gwynne (395 m) are some of the higher peaks within these ranges.

The Grevillea Range, part of the Dawes Range and Watalgan Range are prominent high features in the central area south of Baffle Creek.

Many Peaks Range, Bobbys Range, Dawes Range and the Burnett Range are prominent features on the western boundary of the study area. Mt Molangul (769 m), Mt Stanley (742 m) and Mt Fort William (715 m) just to the west of the study area are some of the highest peaks in these ranges.

In this report landform for the area has been described in the terms used by McDonald *et al.* (1990). In these terms the relief of the area ranges from extremely low along the coast to very high on the western edge of the study area. The landform pattern of the area ranges from plains near the coast, grading through to rises, hills and to mountains in the central and western parts. Modal slope varies from level (<1%) on the alluvial plains to steep (32-52%) slopes in the hills and mountains. The landform patterns of the area are described below.

Plains

Level to gently undulating plains occur on the alluvial, marine plains, coastal dunes and sand plains land systems. Slopes of 0–3% commonly occur on these land systems, however one of the land units in land system *Wreckrock* between Agnes Water and Wreckrock has slopes of 10–25%. Some areas of land system *Boondilla* just west of Bororen have extremely low slopes and sometimes impeded drainage resulting in a number of lagoons, high watertables and salinity outbreaks.

Beach ridges, swales, plains and drainage lines are common landform elements on the coastal dunes and sand plains and the coastal alluvial plains. Common elements associated with land systems *Boondilla* and *Baffle* include plains, levees, fans and scrolls.

The total area of these land systems dominated by plains is 40 629 ha, including 15 637 ha of marine plains of *Bustard* land system.

Rises

Rises with relative relief varying from 9–30 m include gently undulating rises (slopes from 1–3%), undulating rises (3–10%) and rolling rises (10–32%).

Gently undulating rises are the major landform pattern of *Monduran 1* and *2, Agnes Water 1* and *2, Miriam Vale 1, 2* and *3, Lowmead, Brooweena* and *Electra 1* land systems. Undulating rises, rolling rises and undulating low hills are minor landform patterns associated with these land systems. These mapping units total 77 681 ha.

Undulating rises of mapping units *Wateranga, Muncon 1, Watalgan 1* and *Elliott* occur on 16 524 ha.

Low hills

Low hills with relative relief varying from 30–90 m include undulating low hills which are gently inclined 3–10% and rolling low hills with slopes which range from 10–32%.

Undulating low hills occupy 187 066 ha and include *Hindmarsh, Serpent, Eddington, Miriam Vale 4, 5* and *6, Matchbox 2, Perry* and *Electra 2.* Rolling low hills occupy 67 010 ha and include mapping units of *Blackman, Aranbanga, Wonbah, Rosedale 2, Goodnight 1* and *2,* and *Curtis.*

Rolling hills to steep hills are minor landform patterns associated with these mapping units.

Hills

Undulating hills (slope 3–10%), rolling hills (slope 10–32%) and steep hills (slope >32%) describe areas with relative relief between 90 and 300 m.

Undulating hills of mapping units *Agnes Water 2* and *Watalgan 2* occupy 61 052 ha, while rolling hills of *Goyan, Hogback, Miriam Vale 7, Castletower, Bania 1* and *2* occupy 76 428 ha. Steep hills and steep mountains are minor landform patterns associated with these mapping units.

Mountains

The rolling (slopes 10–32%) and steep (slopes >32%) mountains of mapping units *Muncon 2* occupy about 21 456 ha. Mountains have relative relief of >300 m.

Drainage

The Baffle Creek and Kolan River Systems are the major drainage systems of the area. Drainage, especially in the hilly and mountainous country is largely geologically controlled by major fault lines. Jointing in the Agnes Water Volcanics, the Muncon Volcanics, Miriam Vale Granodiorite and Watalgan Granite results in a rectilinear drainage pattern.

The major rivers and creeks of the Miriam Vale and Kolan Shires are shown in Figure 1.

Fred Haigh Dam near the centre of the study area (capacity 586 000 ML) is the major water storage for the Bundaberg Irrigation Area.

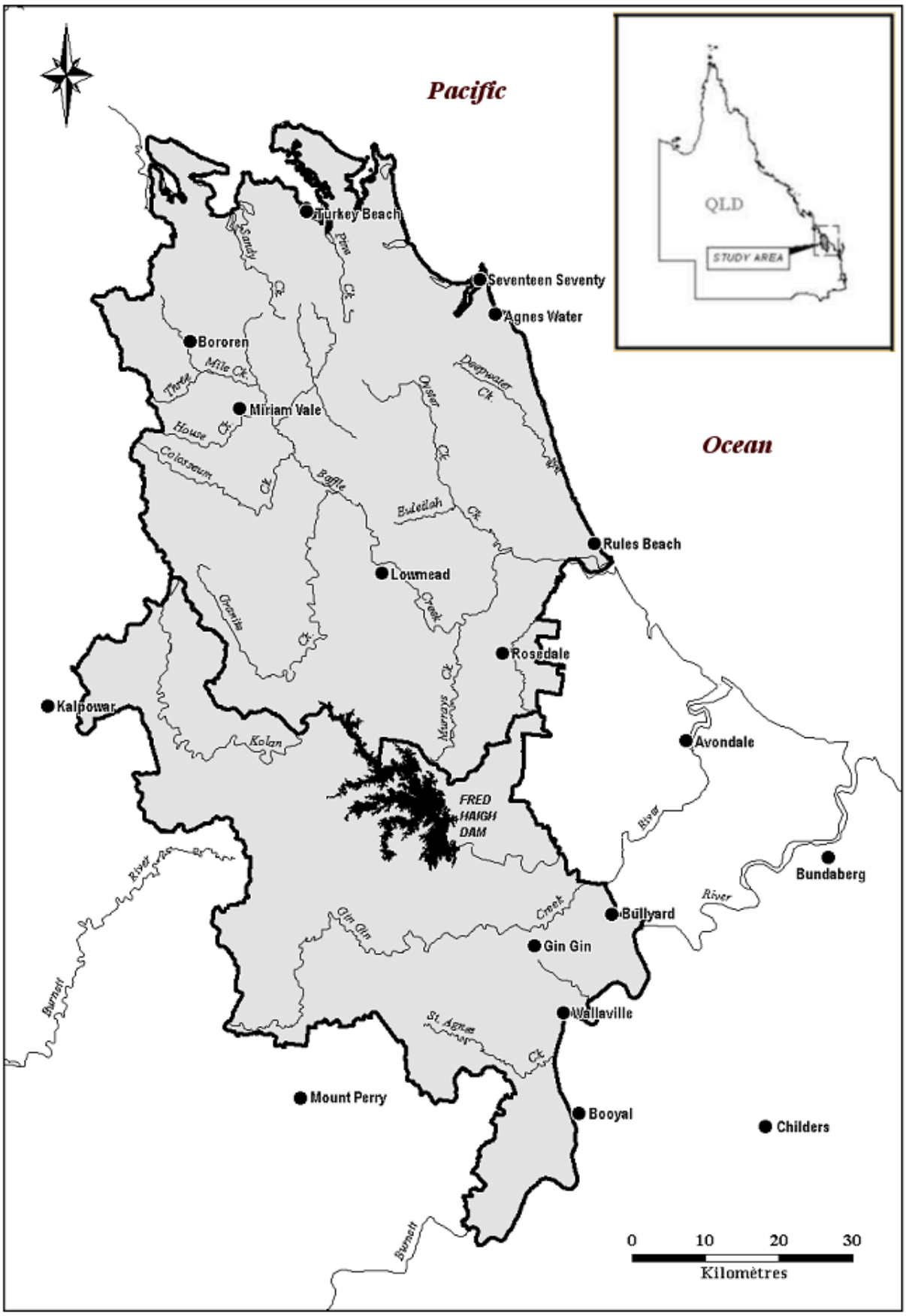

Figure 4. Major rivers and creeks of the Miriam Vale and Kolan study area**.**

Soils

The Australian Soil Classification System (ASC) (Isbell 1996) was used to classify the soils of the area. A brief description of the Soil Orders of the Australian Soil Classification is given in Table 2. Other terms using more common soil terminology have been included in the text and these terms are linked to ASC for ease of interpretation.

Table 2. A brief description of the soil orders of the Australian Soil Classification

Soil Order	Brief description
Chromosols	Soils with strong texture contrast between A and B horizons. B horizons are not strongly acid and are not sodic in the upper B horizon but may be sodic at depth.
Dermosols	Soils with structured B horizons and lacking strong texture contrast between A and B horizons.
Ferrosols	Soils with B2 horizons which are high in free iron oxide and which lack strong texture contrast between the A and B horizons.
Hydrosols	Soils in which the greater part of the profile is saturated for at least 2-3 months in most years.
Kandosols	Soils which lack strong texture contrast, have massive or only weakly structured B horizons, and are not calcareous throughout.
Kurosols	Soils with a strong texture contrast between the A horizons and the strongly acid B horizons.
Podosols	Soils with B horizons dominated by the accumulation of compounds of organic matter, aluminium and/or iron.
Rudosols	Soils with negligible pedologic organisation.
Sodosols	Soils with strong texture contrast between the A horizons and B horizons which are not strongly acid but are sodic in the upper 0.2 m.
Tenosols	Soils with weak pedologic organisation apart from the A horizons.
Vertosols	Soils with clay content >35% with shrink-swell properties that exhibit strong cracking when dry and at depth have slickensides and/or lenticular structure.

Note: The descriptions in this table are provided to assist any readers less familiar with the Australian Soil Classification system used in this report. [see also Appendix VI for a description of the relationships between the classification systems of Isbell (1996) and Northcote (1979) in the study area].

In the description of the land systems, the soils have been described in terms of depth to parent material, general profile morphology and soil classification. A more detailed description of the soils is given in the land unit descriptions, including the depth of soil, the condition of the surface, thickness and texture of the A horizons, texture of the B horizons and soil reaction trend. Classification to the suborder level of Isbell (1996) is also given. These detailed soil descriptions are given in Appendix I.

The major and minor soils of the land system subdivisions as well as some comments on their distribution are shown in Table 3. The most diverse range of soils occur in the sedimentary rock division of group 6.

Table 3. Major and minor soils of the seven subdivisions of the land systems

Land system subdivision	Major soils	Minor soils	Comments
Alluvial landscapes (group 1)	Uniform coarse textured soil (Tenosols and Podosols). Non cracking clays and structured gradational soils (Dermosols). Sodic duplex soils (Sodosols and Kurosols). Acid sulfate soils (Hydrosols). Cracking clays (Vertosols).	Massive gradational soils (Kandosols). Seasonally or permanently wet soils (Hydrosols).	Tenosols and Podosols are common soils on the Coastal dunes and sand plains and land system *Cook* of the Coastal Alluvial Plains. A wide range of soils occurs on land system *Baffle*. Fine textured surface Dermosols and Sodosols are common soils on land system *Deepwater*. Acid sulfate soils occur in land system *Bustard*.
Deeply weathered basic volcanic rocks (group 2).	Non cracking clays (Ferrosols).		
Basic and intermediate intrusive and extrusive igneous rocks (group 3).	Non cracking clays and structured gradational soils with fine textured surfaces (Dermosols and Ferrosols). Cracking clays (Vertosols). Non sodic and sodic duplex soils (Chromosols).	Sodic duplex soils (Sodosols).	
Acid to intermediate volcanic rocks (group 4).	Structured gradational soils and non cracking clays (Dermosols). Sodic duplex soils (Sodosols and Kurosols). Uniform coarse to medium textured soils over rock (Tenosols).	Non sodic duplex soils (Chromosols). Massive gradational soils (Kandosols).	The shallow Tenosols are usually found on the upper slopes and crests on land systems of higher relief.
Acid to intermediate igneous rocks (group 5).	Sodic duplex soils (Sodosols and Chromosols). Uniform coarse textured soils over rock (Tenosols). Structured gradational soils (Dermosols).	Cracking clays (Vertosols). Non sodic duplex soils (Chromosols).	The coarse textured soils (Tenosols) are usually found on land systems with higher relief except for land system *Miriam Vale 2.*
Sedimentary rocks (group 6)	Sodic duplex soils (Sodosols and Kurosols). Non cracking clays and structured gradational soils (Dermosols). Uniform medium textured soils over rock (Tenosols).	Non sodic duplex soils (Chromosols). Seasonally wet gradational and duplex soils (Hydrosols).	The shallow Tenosols are usually stony and are found on crests and upper slopes.
Metamorphic rocks (group 7)	Sodic duplex soils (Sodosols and Chromosols). Uniform medium textured soils over rock.	Gradational soils and non cracking clays.	

Morphology and location

Vertosols

Vertosols, due to their high clay content (>35%) and shrink swell properties, have high plant available water capacity (PAWC) for crop growth. The Black Vertosols are usually imperfectly drained while the Red Vertosols are better drained and the Grey Vertosols are poorer drained. Vertosols have a narrow moisture content range for optimum tillage and can have physical problems if tilled outside of this range. Self mulching surfaces usually found on the Vertosols in the land systems of *Monduran 2, Muncon 1, Hindmarsh and Miriam Vale 1* and *4* offer fewer problems with germination and emergence compared to the hardsetting surfaces associated with cracking clays of other land systems.

Black Vertosols are the most common Vertosols of the area with minor Brown, Grey and Red Vertosols. Vertosols frequently have normal or linear gilgai on slopes and are often associated with non cracking clays (Dermosols).

Vertosols are more common on the land systems developed on basic to intermediate igneous rocks (group 3) especially on the lower landscape positions and to a lesser extent the mid slopes. Land systems *Wateranga, Muncon 1*, *Hindmarsh, Monduran 2* and *Moonta* have from 10–35% of their mid to lower slopes occupied by Vertosols. Black and Brown Vertosols intimately associated with Dermosols have also developed on some crests and upper slopes of *Monduran 2, Hindmarsh, Wateranga* and *Muncon 1*.

Black and minor Grey Vertosols have developed on some of the lower slopes and drainage lines of land systems *Miriam Vale 1* and *4* in group 5. About 10% of the area of land system *Baffle* is occupied by Black and Grey Vertosols while Black Vertosols have developed on some of the plains of land system *Boondilla.* Watertables are often close to the surface in these soils and some salinity patches have developed.

Vertosols are not common on land systems within the sedimentary rock subdivision with only about 5% of the area of *Rosedale 1* occupied by cracking clays.

Dermosols

Most Dermosols of the study area have hardsetting, clay loam to light clay surface horizons 0.2 to 0.4m thick. Most soils are moderately deep to deep but some shallow soils may be found on the crests, upper and mid slopes of many of the land systems. These soils are usually imperfectly drained to moderately well drained with the Red Dermosols the better drained of the group.

Brown and Black and minor Red Dermosols occupy large areas of all of the land systems developed on basic to intermediate igneous rocks (group 3). These soils are often associated with Vertosols or Chromosols.

Brown and Red Dermosols are common soils on the crests, upper and mid slopes of land systems *Eddington, Aranbanga* and *Agnes Water 1* on acid to intermediate volcanic rocks (group 4). These soils are common (>50% of area) on land systems *Miriam Vale 1* and *4* in group 5 usually associated with Chromosols. Of the land systems on sedimentary rocks (group 6), *Bania 1, Bania 2, Rosedale 1, Elliott* and *Rosedale 2* usually have greater than 25% of their crests and mid slopes occupied by Brown and Red Dermosols. Red and Brown Dermosols associated with Kandosols occupy most of *Bania 1*.

About 40% of the area of land system *Goodnight 1* (group 7) is occupied by Red and Brown Dermosols. Land system *Curtis* has less than 25% of Dermosols while Red and Brown Dermosols occupy about 25% of land system *Baffle* (Group 1).

Grey and less commonly Brown or Yellow Dermosols are found in the lower slopes and drainage lines of many land systems including *Rosedale 1* and *2, Elliott* and *Lowmead* are sedimentary rocks (group 6), *Miriam Vale 3, 4* and *6, Wonbah,* and *Matchbox 1* and *2* (group 5), *Agnes Water 1* and *3* (group 4) and *Electra 1* (group 7).

Grey Dermosols are common soils (>70%) on land system *Deepwater.* These imperfectly drained soils usually have clay loam to light clay dilatent surfaces and high exchangeable magnesium and sodium in the light clay to medium clay subsoils. Poorly drained Hydrosols are associated.

Chromosols

The Chromosols in the study area usually become sodic at depth. Chromosols in the study area are relatively minor soils and are usually associated with Sodosols and Dermosols on crests and upper slopes. Red and Brown Chromosols are the most common.

Red and Brown Chromosols, closely associated with Dermosols are common soils on *Goyan, Muncon 1* and *2* (group 3) and *Aranbanga, Eddington* and *Agnes Water 1* (group 4).

Red and Brown Chromosols associated with Dermosols are common on the crests and upper slopes of *Miriam Vale 1* and *4* (group 5). Most of the Chromosols in land system *Wonbah* are sodic at depth and closely associated with Sodosols.

Elliott and *Rosedale 2* (group 5) and *Electra 1* (group 7) have up to 20–35% of their area occupied by Chromosols often associated with Sodosols and Dermosols.

About 70% of the land system *Goodnight 2* (group 7) is occupied by Chromosols with sodic subsoils, and Sodosols.

Ferrosols

In the study area, Ferrosols are common on the deeply weathered land system of *Monduran 1,* and land system *Serpent.* Ferrosols also occupy some of the land units of *Hindmarsh* and *Monduran 2*.

Kandosols

Kandosols are not common in the study area, except in land system *Bania 1* where Kandosols and associated Dermosols occupy most of the land system. Small areas of Kandosols, often associated with Dermosols or Tenosols, are present on the crests, upper and mid slopes of land systems *Matchbox 1* and *2, Miriam Vale 6* and *7, Watalgan 2* as well as *Agnes Water 3.* Kandosols also occur on some of the levees, fans, scrolls and back plains of *Boondilla* and *Baffle.*

Sodosols

Sodosols usually have a number of adverse physical and chemical properties such as high exchangeable sodium percentage (ESP), strongly alkaline pH and high salinity levels which influence subsoil permeability, plant available water capacity (PAWC), crop establishment and nutrient availability. The sodic horizons are usually readily dispersible and prone to erosion. However some sodic soils in this study area have strongly acid pH (pH less than 5.5). The higher aluminium availability tends to counterbalance the degree of dispersion (Isbell 1996).

Chromosols, Dermosols and Kurosols are often associated with Sodosols in this study area.

Sodosols in *Deepwater, Baffle* and *Boondilla* (group 1) occupy up to 50% of the land systems. Less than 10% of the area of land systems *Goyan, Moonta* and *Muncon 1* (group 1) are occupied by Sodosols.

Miriam Vale 3, 5 and *6, Matchbox 1, Perry, Tawah, Watalgan 1* and *Wonbah* land system (group 5) have more than 50% of areas dominated by Sodosols. The area of Sodosols in other land systems in this group is much less and usually associated with Chromosols.

The area of Sodosols in land systems *Agnes Water 1, 2* and *3* and *Eddington* (group 4) ranges from 25–45%.

Sodosols are present in at least some of the land units in the land systems of the sedimentary rocks (group 6). *Rosedale 1* and *2*, and *Brooweena* have more than 50% of their area occupied by Sodosols, usually associated with Kurosols and Tenosols. Of the other land systems in group 6, *Elliott* and *Bania 2* have about 25% occupied by Sodosols.

Land systems *Goodnight 1* and *2* and *Electra 1* and *2* (group 7) are dominated (>60%) by Sodosols.

Kurosols

Analytical results on a number of selected profiles indicate that these soil are strongly sodic and high in magnesium and aluminium. Even through these soils are relatively less dispersive than Sodosols

due to high available aluminium, the low Ca/Mg ratio (often less than 0.1) indicates that these soils are dispersive with low subsoil permeability rates. Kurosols in this study area have similar properties to the Sodosols and occur in association with Sodosols.

Matchbox 1, *Miriam Vale 2* and *6* (group 5) and *Agnes Water 2* (group 4) and *Electra 2* (group 7) have limited areas occupied by Kurosols. Land systems *Brooweena* and *Lowmead* (group 6) have a high proportion (>50%) of their areas occupied by Kurosols while *Rosedale 1* also has a significant area of Kurosols.

Hydrosols

In this study area, soils on lower slopes and in drainage depressions or soils with hard pans or strongly sodic clay layers at depth are often poorly drained due to impeded drainage. Tidal areas are also wet.

Land system *Bustard* within the coastal wetlands is dominated by Hydrosols due to tidal inundation. These soils usually contain sulfidic materials (usually pyrite FeS_2) or sulfuric materials (such as sulfuric acid) at various depths and quantities. These potential or actual acid sulfate soils should not be disturbed and always be correctly managed to prevent the release of sulfuric acid and other contaminants into the environment.

Other Hydrosols are present in some of the lower slopes and drainage lines of land system *Cook* and *Deepwater* (group 2), *Elliott* and *Brooweena* (group 6) and *Matchbox 1* and *2*, and *Miriam Vale 2* and *6* (group 5).

Podosols

In this report, these soils have usually been described as deep uniform coarse textured soils dominated by the accumulation of iron compounds at depth.

Podosols are common in the land systems of *Eurimbula* and *Cook* (group 2). These soils are found in broad flats, drainage lines and plains. Drainage within these soils ranges from freely drained to long term saturation in the subsoil.

Tenosols and Rudosols

Leptic Rudosols in this study area have a massive or weakly structured surface horizon over hard or partially weathered rock. The Leptic Tenosols have a structured surface horizon over rock while the Bleached-Leptic has a bleached subsurface horizon. The Orthic Tenosols have a weakly developed subsoil horizon or a subsoil horizon with 15% clay or less while the Bleached-Orthic Tenosols are similar but contain a conspicuously bleached subsurface horizon.

Tenosols are common on *Wreckrock* (100%) and *Cook* (35%) of the alluvial landscapes with minor areas of the land systems *Baffle* and *Boondilla* occupied by Tenosols. All these soils are deep coarse textured soils usually with thick bleached subsurface horizons.

Tenosols occupy 50–65% of the area of *Watalgan 2*, *Miriam Vale 2*, *Matchbox 2*, *Tawah* and *Miriam Vale 7* (group 5). These soils are coarse textured soils usually with a bleached subsurface horizons over decomposing granite, and predominantly occur higher in the landscape. *Perry*, *Watalgan 1*, *Wonbah*, *Miriam Vale 5* and *6* of the same group have Tenosols as the dominant soil on 10–30% of their areas, predominantly on the crests and upper slopes.

Tenosols occupy 10–45% of the area of *Rosedale 2*, *Brooweena* and *Bania 2* (group 6). These shallow, medium textured, gravelly soils over rock usually occur on the crests and upper slopes.

Tenosols occupy a large proportion of *Agnes Water 3* (group 4) especially on the higher crests and slopes. *Aranbanga* in the same group has about 25% of its area occupied by medium textured Tenosols.

The land systems *Curtis, Goodnight 2* and *Electra 2* (group 7) have 30–70% of their area occupied by Tenosols.

Rudosols are not common in the study area but are present in land systems *Bania 2* and *Curtis*.

Chemical and physical attributes

Chemical analyses were completed on 142 soil samples. Surface samples from 67 sites over 29 different land systems were analysed for fertility attributes. A further 76 subsoil samples from 58 sites that represent 52 soils over 21 land systems were analysed at selected subsoil depths primarily to determine the cation exchange capacity and individual cation contributions, total soluble salt levels and pH.

The samples were analysed by the Analytical Services, Natural Resource Services, Indooroopilly according to the methods described by Bruce and Rayment (1982).

For comparison purposes, the analysed soil samples were grouped into the same seven broad groups under which the land systems were subdivided. However, no samples were analysed from Group 2: deeply weathered basic volcanic rocks.

Soil pH represents the degree of acidity (pH <7) and alkalinity in a soil. Salinity is a measure of the concentration of soluble salts present in a soil as is expressed as electrical conductivity (EC dS/m) and chloride (%).

Cations (positively charged ions) are held on negatively charged surfaces of soil minerals and organic matter. The movement of cations is known as cation exchange and the capacity of a soil to exchange cations is the cation exchange capacity (CEC). The major cations are calcium (Ca), magnesium (Mg), sodium (Na), potassium (K), aluminium (Al) and acid (H). Measurements are in milliequivalants/100 gms. The CEC and the number and proportion of cations can indicate the general fertility and physical attributes. For example soils with a high proportion of calcium display a stable friable structure while soils with high levels of sodium and or magnesium tend to disperse. A calcium: magnesium (Ca/Mg) ratio <0.5 is often associated with dispersive soils (Emerson 1977).

Sodicity can be measured as Exchangeable Sodium Percentage (ESP) which equals Exch. Na/CEC expressed as a percentage. Soils are non sodic if ESP is <6%, sodic between 6 and 15% and strongly sodic >15%. However, the affects of sodicity are influenced by texture, clay type, CEC, relative abundance of other cations, pH, salt level and organic matter. Loch and Smith (1988) suggest that magnesium reinforces the dispersive effects of ESP and the ratio Mg/CEC expressed as a percentage is also a guide to soil physical condition. When Exchangeable Aluminium/CEC is greater than 5% toxic effects on plant growth may occur.

A summary of the chemical results of the fertility attributes are shown in Appendix III. The results from the selected subsoil samples and useful ratios are shown in Appendix IV.

Group 1. Alluvial landscapes

Bulk surface samples

Ten bulk surface samples from five land systems were analysed for nutrients. Most of the samples had low fertility corresponding to the sandy nature of the soils analysed.

Most of the samples had a pH between pH 5 and pH 6.4 (very strongly acid to slightly acid) although site 488 from land system *Cook* had a pH of 4.5 and the cracking clay from *Boondilla,* pH 8.9. Baker and Rayment (1983) state that most crops and pastures prefer a pH of 6.0–7.5 and if the soil pH is below 5.5, growing conditions for all but acid tolerant plants become more difficult usually due to excessive accumulations of aluminium, manganese and iron.

All samples had low levels of salt in the surface except for the cracking clay of *Boondilla* land system. Small areas of salt accumulations were observed near the sample site due to the high watertables that exist in this area.

Most bulk soil samples (0–0.1 m) had a low CEC except for the cracking clay on *Boondilla*. The low values are related to the sandier textures and /or low organic matter which ranged from fine sandy clay loam to fine sand for these sites. An exception was the Dermosol sampled in *Deepwater* which had a texture of clay loam but with a CEC of 2.5 which corresponds to the low CEC also found in the subsoil. This low CEC for this texture suggests that the main clay mineral type is kaolinite. Sanchez (1976) suggest that effective CEC of <4 mq/100g is necessary to retain most cations against leaching.

Organic carbon percentage ranged from 1.3% (low) to 3.5 % (high). Two surface samples from land system *Cook* had the highest OC but had extremely low Mn levels.

Most of the soils were very low in phosphorus, sulfur, copper and zinc although the Sodosol (site 12) from land system *Baffle* had medium to high levels of copper and zinc.

Subsoils

Seven profiles were analysed from land systems *Baffle, Boondilla* and *Deepwater*. The soils included a Sodosol on the plains and a Kandosol on the levee of the *Baffle* land system, Dermosols on the plains of *Deepwater,* and Vertosols and Sodosols from land system *Boondilla*.

The pH of the subsoils of the sampled sites were neutral to alkaline except for site 100 from *Deepwater* which was medium to strongly acid (pH 5.1–6.0) throughout. The pH of the Vertosols and the Sodosols from *Boondilla* land system was strongly alkaline (8.5–9.0) especially at depth.

EC and chloride values ranged from very low (EC <0.15 dS/m) in the well drained Kandosol on the creek levee (*Baffle)* to medium (EC 0.45–0.9 dS/m) in the sites from *Deepwater*. In *Boondilla*, salts in the Vertosol were lower than the Sodosols. CEC varied (6–15 meq/100g) in the profiles from *Deepwate*r and on the levee on the *Baffle* land system. The CEC of the subsoils on land system *Boondilla* ranged from 17 to 45 meq/100g.

Most (77–99%) of the cation exchange of the subsoils of *Deepwater* is occupied by Mg and Na. The ratio between calcium and magnesium (Ca/Mg) is very low (<0.02) except for profile 122 which had a value of 0.48. The high sodicity (ESP 33–63) and low Ca/Mg ratios indicate that the subsoils are readily dispersible (Emerson 1977).

Calcium levels are high on those soils of *Boondilla* and *Baffle* especially the cracking clays. Magnesium is generally the major cation, with high sodium in the Sodosol on the *Baffle* land system and increasing at depth on site 538. The Ca/Mg ratios are below 0.5 (except for site 536 at depth) and together with sodic subsoils would be expected to be dispersible. The soil on the levee of *Baffle* is non sodic and has a much higher Ca/Mg ratio which indicates a stable soil.

Group 2. Deeply weathered basic volcanic rocks

There are no analysed bulks surface samples or subsoils for this group.

Group 3. Basic and intermediate intrusive and extrusive igneous rocks

Bulk surface samples

Six Dermosols and one Vertosol were sampled in this group. The Dermosols had a clay loam to light clay surface texture while the cracking clay had a medium clay surface.

The pH ranged from 5.5 to 6.8. Salts were low in all samples.

The CEC of the Dermosols ranged from 9 to 20 meq/100g while the CEC of the Vertosol was 31 meg/100g. Ca dominated the cation exchange except for the cracking clay in which Mg dominated.

The organic carbon levels ranged from medium to high (1.4 to 4.4%) with the highest on land system *Monduran 2*. Most samples had low (10–20 mg/kg) phosphorus levels although *Monduran 2* had high levels (94 mg/kg). Most had medium levels of copper, manganese and zinc although site 175 on *Goyan* land system had low levels of copper. All sites had low levels of sulfate.

Subsoils

Three sites (two Brown Dermosols, one Black Vertosol) were sampled on the *Moonta* land system and one site (Brown Dermosol) at depth 0.3–0.45 m in the *Goyan* land system.

The pH of the upper B horizon were slightly acid to neutral while the pH of the Vertosol increased to 8.2 at depth. Salts were very low to low in the upper profiles but became high at depth in the Vertosol.

The CEC of the Dermosols sampled varied from 14–24 meq/100g while the CEC of the two subsoil depths for the Vertosol was 37–42 meq/100g. The Dermosols had a Ca/Mg ratio of greater than 1. The ratio of 0.5 for the Vertosol at depth in association with sodicity (ESP 12.4) indicates dispersible properties.

The other soils were generally non sodic (<6% ESP). Exchangeable potassium levels were generally low.

Group 4. Acid to intermediate volcanic rocks

Bulk surface samples

Seven bulk surface samples from *Agnes Water 1, Agnes Water 3* and *Eddington* systems were analysed for nutrients.

Sites 243 and 267 of *Agnes Water 3* and site 440 of *Eddington* had pH 5.3–5.7, while site 1009 on the lower slopes in *Agnes Water 1* had a pH 8.1. These acidic and alkaline pH values respectively may have nutrient deficiency or toxicity problems for crops and pastures.

Salts in the surface were very low to low (<0.15–0.45 dS/m).

CEC was 2–31meg/100g. The higher cations (CEC 8–31 meq/100g) on *Agnes Water 1* and *Eddington* on the more intermediate volcanic rocks were generally due to the higher clay content and organic matter. Calcium and magnesium are the major cations. The low values (CEC 2–4 meq/100g) of the soils on the *Agnes Water 3* land system are related to the coarse textures, lower organic matter and the clay mineralogy associated with the more acid rocks. Ca, K and Mg are deficient for favourable plant growth on *Agnes Water 3* using ratings from Sanchez (1976) and Baker and Eldershaw (1993).

Organic carbon is high (2.6–4.7%) on the sites from *Eddington* and the site on the lower slopes of *Agnes Water 1*. Other sites on *Agnes Water 1* and *Agnes Water 3* are low. All sites have very low levels of nitrate (N).

The sites on *Agnes Water 3* have very low to low levels of phosphorus, sulfate, copper and zinc with medium levels of manganese. Low levels of phosphorus and sulfate, and medium levels of copper and zinc, occur in the sampled soils of *Agnes Water 1*. The *Eddington* land system has medium to high levels of phosphorus, low levels of sulfate, medium levels of copper with medium to high levels of zinc.

Subsoils

Ten subsoils sampled from six sites were analysed from land systems *Agnes Water 1, 2* and *3*. The pH varied from pH 5.6 to 8.7. Generally those samples with a high pH had the highest CEC. Salts were very low to low (<0.22 dS/m) in all samples except for site 1007 which became medium (0.59 dS/m) at depth.

Generally, samples from sites 118 and 243 in *Agnes Water 3* and 1010 of *Agnes Water 1* had lower CEC (<12 meq/100g) than the other sites (>20 meq/100g). Those sites in *Agnes Water 3* with lower CEC had low to very low Ca levels (0–1.7 meq/100g) on the cation exchange with magnesium and sodium occupying 84–95% of the cation exchange sites. Aluminium occupies 5.6% of the exchange on site 118. The extremely low Ca/Mg ratios of 0.01 or less; and sodic to strongly sodic (ESP 9–36) subsoils, make these soils vulnerable to dispersion.

Those soils from *Agnes Water 1* and *2*, although variable, generally had similar levels of Ca and Mg although site 1010 had a high Mg level (20 meq/100g) in comparison with calcium at depth (0.7 meq/100g). ESP ranged from 4.5 to 10.7.

Group 5. Acid to intermediate intrusive rocks

Bulk surface samples

Twenty one sites were sampled at 0–0.1 m for nutrient analyses. Generally nutrients were low to very low. The pH of the samples were 5.5–6.9, a suitable range for most plants. Salts were very low in all samples.

Generally, CEC corresponds to texture and organic matter content. CEC was low (<10 meq/100g) for all samples except for those soils from *Miriam Vale 4* and 124 of *Watalgan 1* which had finer textures and higher organic matter. Calcium was the dominant cation in most samples except for sites 152 and 107 in land system *Matchbox 1* where magnesium was dominant on the cation exchange.

Organic carbon ranged from 1.1 to 3.6% with the higher levels (>3%) occurring on those soils of *Miriam Vale 4* and *Watalgan 1*.

Nitrate levels were very low to low (<10.3 mg/kg). Phosphorus levels were low (4–8 mg/kg) except for those soils of land system *Miriam Vale 4*, site 124 of *Watalgan 1* and site 202 of *Wonbah* which had low to medium levels (12–38 mg/100 gm).

Sulfate levels were very low to low (2.5–9.4 mg/kg). Copper and zinc values were low to medium with those samples from *Miriam Vale 4* and *Watalgan 1* usually with the higher values.

Subsoils

Thirty two samples representing 22 sites were analysed in this group. The soils analysed included Sodosols, Kurosols, Hydrosols, Vertosols, Dermosols and Chromosols from land systems *Matchbox 1, Wonbah, Watalgan 2* and *Miriam Vale 1, 2, 3* and *4*.

The pH of the samples ranged from 4.6 to 8.6. Generally the soils developed on granites had lower pH values than those developed on diorite or granodiorite. Salts varied from very low (<0.15 dS/m) to high (0.9–2.0 dS/m). The higher salt loads were usually associated at depth with the Vertosols and Sodosols. The soils formed on the more acid rocks usually had lower levels than those from the intermediate rocks.

High CEC (16–54 meq/100g) occurred on the soils of land system *Miriam Vale 1* and *4*, primarily on intermediate rocks. Magnesium was usually the dominant cation with calcium subdominant, although at site 87 and 1002 (both Dermosols) calcium was the dominant cation. Site 1001 became sodic at a depth of 1.2–1.3 m while the other sites in *Miriam Vale 1* and *4* were non sodic at the depth analysed.

CEC of the samples of the Sodosols sampled from land system *Miriam Vale 3* were 12–28 meq/100g. Magnesium was the dominant cation. All samples were sodic (ESP 6–15) or strongly sodic (ESP >15).

The CEC of the clay subsoils of those soils formed from acid rocks *(Miriam Vale 2, Matchbox 1, Watalgan 2)* were 1.1–16.8 meq/100g. With the exception of site 42 which was sampled on a lower slope in *Watalgan 2*, Ca/Mg ratios ranged from 0 to 0.25 indicating the high magnesium to calcium

ratio on the cation exchange. These soils are also sodic and prone to dispersion although the low pH of these soils and the presence of aluminium may counteract this effect. The high aluminium saturation (Exch Al/CEC x 100) which ranges from 4 to 41% may cause aluminium toxicity for some crops. In addition, the low pH can have a marked effect on nutrient availability, including aluminium. Often these soils have very deep A horizons and the chemical properties of the subsoils may have little affect on plant growth. However, crop growth may be affected on those soils such as 156 on land system *Matchbox 1*, 202 on *Wonbah* and 42 on *Watalgan* where high Al levels and very strongly acid pH occur at depths <0.5m

Group 6. Sedimentary rocks

Bulk surface samples

Fifteen samples from five different land systems were analysed for nutrients. The soils are generally infertile with low levels for most nutrients.

The pH of these samples ranged from 5.3 to 6.8 with most above 5.5 which is considered suitable for most crops. Soluble salt levels were very low.

Samples from *Elliott, Brooweena* and *Lowmead* had very low CECs (<4 meq/100g) while other samples ranged from 4 to 13 meq/100g. Calcium was the dominant cation in most samples except for those samples on land system *Elliott* where magnesium was usually dominant.

Organic carbon was medium to high (1.7–4.6%) except for samples in land system *Elliott* (OC 1.1–1.3%). Nitrate N was low while phosphorus levels were generally very low (3–9 meq/100g) The results from samples from *Rosedale 1* and *2* were variable and were 1–23 meq/100g.

Copper and zinc levels were low in samples from land system *Elliott* and some samples in *Brooweena* and *Lowmead*. The other samples usually had medium levels. Sulfate levels were generally low although two sites, one each from land system *Lowmead* and *Brooweena,* had medium levels.

Subsoils

Fifteen subsoil samples from eleven different sites were analysed for salt levels and cation exchange capacity.

The subsoils from land systems *Lowmead, Brooweena,* site 147 from *Rosedale 1* and sites 541 and 566 of *Rosedale 2* were strongly to very strongly acidic (pH 4.2–5.4). The pH of the other soils ranged from 6.1 to 8.2 except for site 503 on a lower slope of *Rosedale 1* which was very strongly alkaline (pH >9.0).

The cation exchange capacity of these samples was 8–28meq/100g usually with the more acid soils having lower values. Most of the soils had very low levels (<2 meq/100g) of calcium on the cation exchange. Magnesium was the dominant cation on most soils usually occupying over 40% of the exchange sites. Ca/Mg ratios were all extremely low (<0.14), except for site 545 a Red Chromosol on *Rosedale 1*. Most soils were sodic (6–15 ESP) to strongly sodic (>15 ESP) with many soils having greater than 25% exchangeable sodium, indicating a tendency to disperse.

The strongly acid to very strongly acid subsoils in land systems *Lowmead* and *Brooweena* had high exchangeable aluminium percentages (>18%), much higher than the level (<5%) suggested as having no effect on plant growth (Baker and Eldershaw 1993).

Group 7. Metamorphic rocks

Bulk surface samples

Only six representative soils from land systems *Electra 1, Goodnight 1* and *2* were sampled for nutrient analysis. Results show that these soils are infertile.

The pH of these samples were slightly to strongly acid (pH 5.2–6.5) with very low salt concentrations.

CEC ranged from 5 to 10 meq/100g. Calcium was dominant on the exchange with magnesium also contributing a high proportion.

Organic carbon ranged from 2.1 to 3.2%, a medium to high level. Phosphorus and copper levels ranged from low to medium while sulfate was in the low range. Zinc levels were in the medium range while nitrate N was low to very low.

Subsoils

Two subsoils in land system *Electra 1* were sampled for analyses.

The upper B horizons of these sites were neutral (pH 6.8–7.1) and had very low to moderate salt levels.

CEC was 12–22 meq/100g with magnesium the dominant cation, especially for site 62 which had a Ca/Mg ratio of 0.04. Soil were sodic to strongly sodic (ESP 10–38).

4. Land capability

Introduction

The land capability classification of Rosser *et al.* (1974) was used to assess the land units of each land system for agricultural, pastoral and non agricultural uses. Agricultural use implies cultivation and rainfed cereal cropping while pastoral use implies grazing of stock on improved or native pasture. Land Resources Branch Staff (1990) recommends this classification system for studies where evaluation for a wide range of agricultural land uses is required at a small scale (1:250 000 or smaller). The limiting factors of Rosser *et al.* (1974) were replaced by limitations and given the code similar to those described in Land Resources Branch Staff (1990).

The system uses eight classes with limitations and hazards to agricultural and pastoral use becoming progressively greater from Class 1 to Class VIII. The land capability class descriptions are shown in Table 4.

Thirteen limitations were regarded as important for the broad agricultural uses being assessed for the study. Diagnostic attributes were selected to measure or estimate each of the relevant limitations. For each limitation, critical values of the diagnostic attributes were established in order to rank the effects of the limitations in terms of increasing degree of severity. These limitation subclasses ranged from the least severe to the most severe on a scale ranging from one to eight. The capability was determined on a 1 to 8 scale usually by the most severe limitation subclass. The limitations, the diagnostic attributes and the limitation subclasses are described in Table 5. A more detailed description follows in the text.

Limitations

The limitations and subclasses were assessed for each land unit of the land systems and the land class was subsequently determined. Most land units had two classes (rarely three) due to the wide range of soil and land attributes present. The limitation subclasses and land capability classes for the land units are given in the description of the land systems in Appendix I. These data are also recorded on a computer database which is available at NRM&E, Bundaberg.

The major limitations affecting land capability in the area are water availability (m) and erosion (e).

Water availability (m)

Crop production is highly dependent on the amount of water available to plants. Water availability refers to the limitation placed on crop yield by restriction of soil water supply. Under dryland conditions climatic and soil factors are the major determinants of the amount of water available to the crop. Climatic factors include the amount, distribution and intensity of rainfall as well as temperature, radiation and evaporation. The storage capacity of a soil is influenced by texture, structure, surface condition, soil depth, horizonation and other impediments to water entry or to plant root development.

Shields and Williams (1991) developed subclasses for plant available water capacity (PAWC) for their study in the Kilcummin area and these criteria were used in this study. The PAWC was estimated for the soils in each land unit primarily from the knowledge of the PAWC of similar soils from previous research and studies throughout Queensland.

Table 4. A description of the eight land capability classes used in classifying land in the Miriam Vale–Kolan shires

Land Class	Description
Class I	Land suitable for all agricultural and pastoral uses. Land is suited to a wide range of crops and is highly productive. Land presents no limitations to use of machinery or choice of implements. Wind and water erosion hazard are low even under intensive cultivation.
Class II	Land suitable for all agricultural uses but with slight restrictions to use for cultivation in one or more of the following categories: Land with some limitation to the choice of crops and/or slight restrictions to productivity. Land with some impediment to the use of cultivation machinery which limits the choice of implements or restricts the conditions for successful operation. Land which under cultivation requires simple conservation practices to reduce soil loss to an acceptable level. These include agronomic practices such as contour working, strip cropping, stubble mulching.
Class III	Land suitable for all agricultural uses but with moderate restrictions to use for cultivation in one or more of the following categories: Land with moderate limitations to the choice of crops and/or moderate restrictions to productivity. Land with moderate impediment to the use of cultivation machinery which limits the choice of implements or restricts the conditions for successful operation. Land which under cultivation requires intensive conservation practices to reduce soil loss to an acceptable level. These include contour banking systems and intensive residue management involving specialised machinery.
Class IV	Land primarily suited to pastoral use but which may be safely used for occasional cultivation with careful management. Land on which the choice of crops is severely restricted and/or condition is such that productivity under cropping is severely limited. Land with severe impediment to the use of cultivation machinery which limits the choice of implements or severely restricts the conditions for successful operation. Land which cannot be used safely for permanent cultivation. If cropped, a pasture phase must be the major component in the cropping program to limit soil loss to an acceptable level.
Class V	Land which in all other characteristics would be arable but has limitations which, unless removed, make cultivation impractical and/or uneconomical.
Class VI	Land which is not suitable for cultivation but is well suited to pastoral use and on which pasture improvement involving the use of machinery is practicable.
Class VII	Land which is not suitable for cultivation but on which pastoral use is possible only with careful management. Pasture improvement involving the use of machinery is not practicable.
Class VIII	Land which has such severe limitations that it is unsuited for either cultivation or grazing.

Effective soil depth (pd)

All crops require an adequate depth of soil to provide physical support to a plant. The effective soil depth is often the depth to hard rock but impeding layers such as hard pans, impermeable subsoils, high salinity zones and acid subsoils affect the proliferation of root growth. Effective soil depth <0.25 m was regarded as too shallow for arable land and had a limitation of pd6. Soil depths between 0.25 and 0.5 m had a pd4 limitation while those from 0.5 to 1 m had a pd3 limitation.

Surface condition (ps)

The establishment of a uniform stand of desired density is important for successful crop and improved pasture production. Germination, seedling emergence, crop establishment and the spread of introduced pastures may be affected by adverse physical conditions of the soil surface. The adverse climatic conditions especially during the summer crop planting period necessitates that adequate seed soil contact is available to prevent desiccation prior to germination and establishment. Self mulching surfaces, especially those with a fine self mulch, present fewer problems with germination and emergence than those that set hard. The cracking clays within the land systems of *Monduran 2*,

Muncon 1, Hindmarsh, Miriam Vale 1 and *4* and *Boondilla* usually have self mulching surfaces and will present few problems with germination and emergence.

Table 5. A brief description of the diagnostic attributes used to determine the limitation subclasses

Limitation subclasses	Diagnostic attributes
m2	>130 mm Plant available water capacity (PAWC)
m3	100–130 mm PAWC
m4	75–100 mm PAWC
m6	<75 mm PAWC
pd3	0.5–1 m effective soil depth
pd4	0.25–0.5 m effective soil depth
pd6	<0.25 m effective soil depth
ps2	Surface conditions which provide minor limitation to germination, seedling emergence and crop establishment
ps3	Moderate limitation
ps4	Severe limitation
nd2	Moderate nutrient status in the virgin state, especially phosphorus
nd3	Low nutrient status, especially phosphorous
pm2	Clay soils with a narrow appropriate soil moisture range for successful cultivation, ie. light clay surfaces
pm3	Clay soils with a minimal soil moisture range for successful cultivation, ie. medium to heavy clay surfaces
sa2	Moderate to high salinity levels (>0.45 dS/m) between 0.6 and 0.9 m or below
sa3	Moderate to high salinity level <0.6 m
sa4	Discharge areas which may become salinised
sa6	Areas affected by secondary salinisation
ts4	Short steep slopes or gullies that prevent machinery use
ts6	Slopes 15–20%
ts7	Slopes 20–45%
ts8	Slopes >45%
r2	Few surface gravel or rock outcrop
r3	Common surface rocks or rock outcrop (10–20%)
r4	Moderate or many surface rocks or rock outcrop (20–50%)
r5	Abundant surface rock or rock outcrop (>50%)
tm2	Vertical interval of gilgai between 0.1 and 0.3 m
tm3	Vertical interval of gilgai >0.3 m
w4	Low lying areas seasonally wet
w5	Seep areas usually permanently wet
e2	Suitable for cultivation with simple erosion control practices, ie. slopes <2% for Sodosols, 2–5% other soils
e3	Suitable for cultivation with intensive erosion control methods, ie. slopes 2–5% for Sodosols, 5–10% other soils
e4	Marginal soils for cultivation even with intensive control methods, ie. slopes 10–12% on soils other than Sodosols
e6	Continuous pasture required to reduce erosion losses but cultivation acceptable to establish pasture, ie. slopes 5–10% for Sodosols, 12–20% for other soils
e7	Continuous pasture required to reduce erosion losses with high management input, ie. slopes 10–20% for Sodosols, 20–45% for other soils
e8	Grazing not recommended, ie. slopes >20% for Sodosols and >45% for other soils
f2	Flooding occurs but only minimal to moderate damage to crops
f3	Flooding may cause severe damage to crops
x6	Areas normally suitable for cultivation but due to inaccessibility, small areas or other restrictions cause the area to be downgraded

The surfaces of most other soils have hardsetting properties and would present problems with germination and establishment especially those with loam to clay loam surfaces. Secondary spread of

introduced grass species can also be restricted by the hardsetting surface of soils with sandy loam to clay loam textures (Cavaye *et al.* 1989).

Narrow moisture range (pm)

Cracking clays have a specific moisture content, usually present for a limited time, during which tillage can successfully be carried out (Ahmad 1984). The most opportune time to till these soils is approximately at the lower plastic limit (Utomo and Dexter 1981). If wetter the soil will smear and if drier, clods will be produced.

Timing of cultivation is an important consideration in cropping areas especially for planting operations for summer crops. The high evaporation rates narrow the time period considerably for the most opportune time for broad acre planting. Subjective assessment of this limitation has been made based largely on the clay content of the surface of these cracking clays with the heavier clays (medium to heavy clays) being assessed as having a narrower opportune time for cultivation than those with lighter clay surfaces.

Salinity (sa)

The presence of soluble salts in the soil solution can affect crop growth by reducing the water available to the crop (osmotic effect) and by increasing the concentration of certain ions that have a toxic effect on plant metabolism (specific effect) (FAO 1985). Salinity may be an inherent attribute of the soil and may also occur as the consequence of agricultural practices or clearing of native vegetation (Shields and Williams 1991).

Soils with moderate to high salinity levels (EC >0.45 dS/m) below 0.6 m are expected to provide a minor limitation to production while those soils with high levels above 0.6 m are expected to cause moderate limitation to productivity.

Discharge areas, often with resultant salinity outbreaks have been observed in the area west of Bororen especially on the cracking clays and sodic duplex soils mainly due to the presence of high watertables. Other salinity outbreaks have also occurred in the *Miriam Vale 3, Agnes Water 1, Agnes Water 2, Matchbox 1* and *Electra 1* land systems. The land units within these systems that have the potential to be or presently are affected by salinity have been assessed as having an sa4 or sa6 limitation.

Topography limitation (ts)

The topography limitation has a direct affect on the ease of machinery operations and for the land use efficiency in general. It covers the slope limit for the safe use of machinery. The slope limit for the safe and efficient use of machinery is 15%. Gullied land has been given a subclass of ts4.

Rockiness limitation (r)

The term rockiness refers to rock outcrop and coarse fragments (McDonald *et al.* 1990). Coarse fragments or outcrop on the surface or in the cultivated zone may interfere with cultural and harvesting operations and may damage machinery. This limitation does not consider the effects of rockiness on properties such as soil water storage capacity or infiltration and erodibility. The limitation is based on the percentage of coarse fragments of various sizes on the surface or in the plough layer.

Few surface gravel or rock outcrop was regarded as offering a slight restriction to farming operations and given a subclass of r2. Areas with abundant rock or outcrop >50% prevent machinery use and have a subclass of r5. Subclass r4 is allocated to those lands with 20–50% rock outcrop or surface

stone which would provide a severe restriction to the use of machinery. Land with 10 to 20% surface rock or surface stone would present a moderate impediment to the use of machinery.

Microrelief (tm)

Microrelief refers to relief up to a few metres above the plane of the land surface (McDonald *et al.* 1990). The limitation considers the effect of microrelief on the cultivation and trafficability of machinery.

Normal or linear gilgai with vertical interval of 0.3 m or less is common on the Vertosols of many of the land systems. This microrelief is considered to cause only a slight restriction to the use of machinery.

Land with normal gilgai of vertical interval greater than 0.3 m is regarded as having a greater impediment to the use of machinery and successful operation and establishment of crops and is allocated a tm3 subclass.

Wetness (w)

The wetness limitation considers the affects of excess water on crop production and on effective machinery operation. In this study, wetness refers to areas which have excess water on the soil surface or within the profile as a result of rainfall or run-on from surface water and from poor soil drainage. This excess water remains on the surface or in close proximity due to poor soil permeability caused by restrictions within the soil profile such as sodic clay layers or hard pans.

Two subclasses have been defined in this area. Seep areas that are permanently wet prevent cultivation being carried out and severely limit crop production from these areas. These areas have been given a w5 subclass. Other areas which are wet seasonally have been given a subclass of w4 due to fewer restrictions on the use of that land. Land units, usually lower in the landscape which are permanently or seasonally wet commonly occur in land systems *Agnes Water 1, Boondilla, Cook, Deepwater, Electra 1, Elliott, Matchbox 1* and *2, Miriam Vale 2* and *Miriam Vale 6.*

Water erosion (e)

Erosion causes soil deterioration and reduces productivity by removing plant nutrients and organic matter. As erosion increases, cultivation becomes more difficult, depth of soil decreases and if erosion continues unabated, productivity may be reduced to zero.

Climatic factors (amount, distribution and intensity of rainfall), landform (gradient and shape of slope), edaphic factors (infiltration rate and soil erosivity), vegetative cover and management practices are major factors influencing water erosion. Slopes, soils and management practices for the climatic conditions of the area were the criteria used for subclass determination. Sodic duplex soils (Sodosols) are more erosive than other soils so effective erosion control cannot be achieved on similar slopes for other soils.

Increased management inputs are required as slope increases with marginal arable land (class IV) assessed as having slopes of 10–12% on all soils except Sodosols with intensive erosion control methods. Land with a subclass e6 will need to have continuous pasture as the major enterprise to reduce erosion losses although cultivation is acceptable for pasture establishment with 5–10% slopes for Sodosols and with slopes of 12–20% for other soils.

Grazing is not recommended on slopes >20% for Sodosols and >45% for other soils and land with those attributes has a subclass of e8.

Flooding (f)

Crop damage due to flooding is a result of both moving water or submersion by standing water. Submersion can cause damage by depriving the plant of oxygen while flowing water can flatten the crop, expose roots, cover the crop with silt or cause stream bank erosion and damage infrastructure.

The flooding limitation is only applicable to land adjacent to rivers and major creeks. Subjective assessment based on an estimate of damage to crops has been used as the criteria for subclass determination.

Land complexity (x)

This limitation refers to areas that may be suitable for a particular enterprise but due to inaccessibility may not be able to be used for that purpose. In this study area only one limitation subclass is used (x6) to downgrade areas normally suitable for cultivation but become unsuitable due to a range of restrictions.

Land capability classes

A range of land capability classes may be assigned for each mapping unit depending on the land classes evaluated for the land units. The dominant land capability class and subdominant land capability class (where applicable) for the mapping units are recorded on the computer database and are also represented on the land capability map which accompanies this report. Other land capability classes may be present but the dominant and subdominant land capability class range usually represents greater than 70% of the mapping unit.

Areas of the dominant and subdominant land capability class combinations and the number of mapping units are shown in Table 6. The dominant and subdominant land capability classes for the mapping units are shown in Appendix V.

Table 6. Dominant and subdominant land capability classes of the Kolan–Miriam Vale shires

Dominant land class	Subdominant land class	Number of mapping units	Area (ha)
II	III	1	214
III	IV	9	3 397
III	VI	5	1 029
IV	VI	14	8 763
IV	VII	1	737
VI	III	5	3 806
VI	IV	11	22 717
VI		106	166 505
VI	VII	46	253 110
VI	VIII	20	79 867
VII	VI	2	1 285
VII	VIII	20	58 249
VIII		15	15 637

Only 214 ha of one mapping unit (*Monduran 1*) is suitable for all agricultural uses. Other mapping units including those of land systems *Baffle, Monduran 2* and *Wateranga* have the majority of their lands suitable for all agricultural uses. Fifteen mapping units including those of land systems *Baffle, Miriam Vale 1, Muncon 1* and *Hindmarsh* have Class IV (severe restrictions to permanent cultivation) as their major class with minor areas of Classes VI and VII.

The majority of land in the area is more suitable for pastoral use [total of 585 539 ha] with a dominant Class of VI or VII.

Areas of Class VIII (unsuitable for cultivation or grazing) are present in land systems *Agnes Water 3, Muncon 2, Miriam Vale 7, Castletower, Watalgan 2, Hogback* and *Curtis* due mainly to steep slopes.

Land system *Bustard* of the Coastal Wetlands has acid sulfate soils amongst the deep saline clays, muds and sands and has been classified as Class VIII.

Land Uses

Current land uses

Current land uses were identified and mapped in the Kolan and Miriam Vale Shires for 1999–2000. Two maps showing land uses for each shire are included in this report. The information obtained has been derived from industry bodies and government sources with some field observations mainly to identify areas of horticultural activity. The land uses identified and the area of the various land uses and/or the number of lots are shown in Table 7.

Table 7. Area (ha) and numbers of lots (where appropriate) of the current land uses (1999–2000) of the Miriam Vale and Kolan Shires

Miriam Vale		
Land use	**Hectares (Approx.)**	**Total Number of Lots**
Residential (<0.5 ha)	156	1438
Rural (0.5–2 ha)	1619	1105
Rural (2–10 ha)	1643	412
Rural (10–20 ha)	17925	1119
Rural (20–40 ha)	9571	400
National Parks and Reserves	19281	33
Horticulture •	733	39
Forestry - State Forest[#]	43673	66
Dairies		10*
Aquaculture		3
Native and Improved Pasture	245122	
Paulownia	870	
Plantations – Eucalypt[+]	8261	
Plantations – Pine	588	
Total for Miriam vale	**349442**	

Kolan		
Land use	**Hectares (Approx.)**	**Total Number of Lots**
Residential (<0.5)	97	613
Rural (0.5–2 ha)	308	255
Rural (2–10 ha)	3606	661
Rural (10–20 ha)	11199	951
Rural (20–40 ha)	9060	347
National Parks and Reserves	5768	25
Horticulture	762	40
Forestry - State Forest #	31787	
Aquaculture		6
Native and Improved Pasture	172114	
Sugarcane	6919	
Dairies		3
Paulownia	41	
Plantations – Eucalypt +_	116	
Plantations - Pine	3003	
Total for Kolan	244780	

• Includes tree crops as well as small crops
Includes grazing leases on forestry land
* Number of dairy farms
+ Includes trial sites as well as production sites

A number of interesting statistics emerge from the study and the major ones are discussed below.

The majority of land over the two shires is used for the grazing of beef cattle on native and improved pastures (417 236 ha). Large areas (75 460 ha) are State Forest lands although much of this area is leased for grazing. The area occupied by National Parks and Reserves is 25 049 ha.

The number of residential and rural blocks is much greater in the Miriam Vale Shire (4474 ha) than in the Kolan Shire (2827 ha). Sugarcane production is only carried out in the Kolan Shire.

The area of plantation timber especially eucalypt is expanding very rapidly especially in the Miriam Vale Shire (8261 ha). More plantations have been planted since these statistics were collected. The eucalypts in this area are being grown mainly for paper production. Fast growing trees such as *Eucalyptus dunni* and *E. grandis* are expected to be harvested in 8–10 years. Smaller areas are being grown for hardwood timber production. One company is evaluating trees for this area with a number of trial sites and these are included in the total areas.

A number of paulownia plantations have also been established especially in the Lowmead–Tablelands Road area. The area of paulownia is also expected to increase in the future. Although most of the pine plantations are state government controlled, one private company has planted over 750 ha.

Most plantation timber plantings have been made on cleared land previously used for cattle grazing. This rapid increase will lead to a decrease in cattle production from the areas.

Production

Production figures for the major enterprises and livestock numbers for the ten year period 1987–1997 are shown in Table 8. (Source: Bureau of Statistics Agricultural).

The gross value of crops is much higher in the Kolan Shire than the Miriam Vale Shire. Production from sugarcane in the Kolan Shire would be responsible for most of this difference as over 6000 ha of sugarcane are currently grown.

The gross value of livestock disposal in the Miriam Vale Shire is higher than that for the Kolan Shire and fluctuates considerably depending on the season. The beef cattle numbers however have been increasing in the Kolan Shire and numbers are now similar to numbers in Miriam Vale. With the expansion of plantation eucalypts in the Miriam Vale Shire on areas usually running cattle, a decline of cattle numbers in this shire will occur. The number of dairy cattle in the Miriam Vale Shire, although decreasing from the number between 1987–1991, is much higher than that for the Kolan Shire. The production from the major small crops in both shires fluctuates considerably mainly due to prices and seasonal conditions.

Mango production, although fluctuating widely, increased considerably over the 10 year period. Orange production has also increased and would be expected to further increase with the increased plantings over the last few years especially near Monduran.

Macadamia production in the Miriam Vale Shire is now an important industry and more plantings in the area will further boost the supply from this crop. Mango production is also increasing in the Miriam Vale Shire.

Table 8. Production for the major enterprises and livestock numbers for the Kolan and Miriam Vale Shires (1987–1997)

Kolan (S)

Series	1987/88	1988/89	1989/90	1990/91	1991/92	1992/93	1993/94	1994/95	1995/96	1996/97
Gross value of crops ($)	12 036 147	12 242 509	15 855 440	13 057 474	10 287 325	11 954 652	16 145 291	17 420 445	14 863 397	15 181 596
Gross value of livestock disposals ($)	5 172 372	4 937 040	5 021 421	6 432 805	5 129 786	5 173 936	5 922 320	5 595 737	4 612 193	4 529 094
Total gross value of production ($)	17 529 444	17 571 814	21 256 620	19 886 013	15 820 985	17 682 615	22 577 330	23 508 557	20 173 148	20 406 130
Sugarcane cut for crushing - Area (Ha)	4 851	4 614	4 825	5 014	4 773	4 586	4 693	4 885	4 909	5 099
Sugarcane cut for crushing - Production (Tonne)	362 384	351 446	370 632	336 399	282 770	338 937	346 597	389 436	373 308	402508
Capsicum, chillies, peppers - Production (Kg)	6 768	42 170	98 808	141 268	55 772	137 446	114,692	115 747	600	21 300
Cucumbers - Production (Kg)	81 677	322 336	340 650	45 270	9 060	79 510	34,176	42 557	41 300	52 100
Marrows and squashes - Production (Kg)	34 376	19 105	3 450	11 515	5 460	49 425	37,335	16 079	85 395	123 000
Zucchini - Production (Kg)	54 434	149 690	172 800	81 850	60 990	89 640	151,760	175 011	57 215	36 510
Tomatoes - Production (Tonne)	1 728	1 774	1 254	1 191	759	673	1,214	365	244	117
Oranges - Production (Kg)	0	19 000	2 850	1 000	1 000	1 000	1,500	5 607	31 870	8 725
Mangoes - Production (Kg)	156 126	38 520	162 150	107 600	342 652	340 520	232,469	525 656	502 929	395 620
Dairy cattle (Number)	458	425	416	415	387	453	434	488	491	665
Beef cattle (Number)	44 500	43 596	46 229	49 341	48 541	51 357	54 868	53 689	51 266	55 733

Miriam Vale (S)

Series	1987/88	1988/89	1989/90)	1990/91	1991/92	1992/93	1993/94	1994/95	1995/96	1996/97
Gross value of crops ($)	2 655 890	3 103 091	3 192 931	3 449 213	3 142 220	3 931 601	4 822 531	5 043 660	6 073 402	5 592 787
Gross value of livestock disposals ($)	6 392 957	6 283 099	7 575 470	8 315 204	7 520 600	6 839 856	9 162 428	8 587 845	6 203 563	5 881 894
Total gross value of production ($)	10 415 563	10 880 971	12 446 121	13 332 663	12 252 418	12 490 355	15 378 567	15 512 027	14 237 432	13 670 483
Cucumbers - Production (Kg)	13 000	13 810	1 100	41 605	32 381	6 206	12 828	12 580	13 650	1 420
Marrows and squashes - Production (Kg)	12 000	16 030	9 000	15 565	11 850	73 675	125 500	30 839	11 907	43 760
Zucchini - Production (Kg)	82 810	57 650	61 050	65 000	114 900	137 760	481 496	73 364	35 690	6 995
Melons: Water - Production (Tonne)	110	254	877	424	283	130	341	561	493	176
Tomatoes - Production (Tonne)	14	30	469	558	548	348	79	68	447	8
Nuts: Macadamia - Production (Kg)	600 000	600 000	500 000	700 000	600 000	635 000	800 000	798 062	800 444	801 190
Mangoes - Production (Kg)	0	0	2 050	990	3 600	0	1 060	19 400	26 955	19 510
Dairy cattle (Number)	2 586	2 388	2 408	2 264	2 048	2 099	1 445	1 843	1 720	1 974
Beef cattle (Number)	51 555	52 368	57 566	56 165	57 006	58 288	62 703	59 654	58 972	56 506

Photo 5. Citrus production has increased in the Kolan Shire as younger orchards come into production

Photo 6. Beef cattle production on native and improved pastures is an important industry of the area

Photo 7. Irrigated pastures are an important source of fodder for the dairy industry

Photo 8. Over 8000 ha of eucalypt plantations have been established in the area recently

6. Land degradation

Land degradation has occurred to various degrees in the study area. The major forms of degradation are soil erosion, tree and scrub regrowth, salinity, pasture degradation and weed infestations. Correct management of acid sulfate soils and poorly drained areas are also important issues.

Erosion

Degradation by erosion has occurred on grazing lands and on some of the small areas that are being intensively farmed.

Gully erosion in drainage lines is a problem over much of the grazing lands especially in areas largely occupied by Sodosols. Overclearing on slopes with resultant greater runoff and the complete clearing of concave slopes and drainage lines has been the main cause of this degradation. Overgrazing has also influenced this degradation.

Severe gully erosion has occurred in parts of mapping units 51, 81, 17, 168, 194, 181, 244, 224, 151, 120.

Erosion has occurred in areas being prepared for tree planting and pasture production when unprotected bare soil is subjected to storm rains.

Tree plantations are being established in the area with most rows established on the contour. However some operators are establishing rows up and down the slope with subsequent rills and gully development on the deep furrows formed for the planting especially on steep slopes which are common on many of these plantations. This form of rill and gully development will continue to cause serious degradation for the duration of the plantation unless control measures are implemented. However suitable control measures are difficult to implement in these situations and planting on the contour is the best option.

Salinity

A number of salinity outbreaks have been observed in the area. Salinity area identification and control has been undertaken in some areas (R Scarborough *pers. comm.*). Due to a decade of dry years additional salinity outbreaks have not occurred.

Watertable salting and seepage salting are the main salinity types in the area. Watertable salting occurs when the watertable exists close to the surface. Capillary action draws water from the watertable upwards through the soil. Water evaporates or is used by vegetation and the salts which were dissolved in the water accumulate at the surface or in the root zone when the water is removed (Department of Natural Resources 1997). Seepage salting, a form of watertable salting, occurs when the permanent or seasonal watertable is at the soil surface in lower slope positions.

Salinity is present in areas west and east of Bororen, and in the Fingerboard area. Mapping units include 53 in land system *Boondilla*, 51 in land system *Electra 1*, 38 in land system *Agnes Water 2*, 18 in land system *Miriam Vale 3*, 84 in land system *Agnes Water 1*, 77 in *Agnes Water 2* and 89 in *Matchbox 1*.

To manage salt affected areas, DNR (1997) suggests four management strategies: (a) manage the existing situation; (b) reduce recharge; (c) intercept water in the transmission area; and (d) increase water use in the discharge area.

Tree and scrub regrowth

Eucalypt, wattle, paperbark and scrub regrowth have occurred throughout the area following clearing of the natural vegetation where regrowth control measures have not been implemented. Regrowth of eucalypt species is often aided by heavy stocking rates which eliminates competition between the grass species and the seedling trees and scrubs. Fire, especially a slow one with adequate fuel, will keep eucalypt seedlings up to 1 m tall under control by destroying the top growth and is the cheapest form of control (Daniel *et al.* 2000). Usually a good fire after pulling a stand of native trees will reduce the incidence of woody plant regrowth.

Wattle regrowth is common on many of the shallower, often stony soils on hill crests and ridge lines and steeper sloping areas. Often these areas should not have been cleared originally. The protection offered to erosion by this regrowth is often more beneficial than that of the poorer native pasture production from these soils.

Paperbark is common on many of the low lying areas and drainage lines of a number of land systems. When cleared, excessive regrowth usually occurs if appropriate control methods are not undertaken. Generally, clearing should be avoided in wet areas as trees extract water and decreases degradation by wetness and salinity.

Pasture degradation

Pasture degradation has occurred throughout the area and is related to a number of factors such as excessive grazing, indiscriminate use of fire, weed infestation and poor seasons. The low nutrient status of these soils as shown in the discussion of the chemical properties previously, is also a factor in poor pasture growth. Many graziers have introduced a legume into their pasture lands and this not only increases productivity but also offers protection against degradation.

Giants Rats Tail (GRT) grass is a serious weed of the study area. GRT grass is aggressive, has low palatability when mature and is difficult to control. It has adapted to a wide range of soils. Heavy GRT infestations have occurred in the Fingerboard, Lowmead, Rules Beach, Rosedale and Miriam Vale areas. A map showing the distribution of this weed is available from the Miriam Vale Shire Council. GRT grass is a declared plant under Queensland legislation and landholders are required to control this weed. A number of pamphlets and notes which outline the ecology of the plant and its control have been released by the Department of Natural Resources, Mines & Energy and the Department of Primary Industries. Other weed species in the area include cats claw creeper, parthenium weed, rubber vine, groundsel bush and lantana. These smaller infestations need to be controlled to prevent a wider spread.

Waterlogging

Waterlogging is associated with the lower slopes and drainage depressions of a number of land systems. It also occurs on the plains of some of the alluvial land systems. Most of these poorly drained areas have deep sandy surface horizons over a pan or sodic clay layer which prevents drainage. These low lying areas usually have a dense stand of paperbarks and or banksia species.

The land systems with areas affected by waterlogging include *Cook* of the alluvial landscapes, *Matchbox 1* and *2, Miriam Vale 2* and *6*, and *Watalgan 1* and *2* of the acid to intermediate intrusive rock subdivision and *Elliott* of the sedimentary rock group.

Acid sulfate soils

Acid sulfate soils are associated with the land system *Bustard* of the Coastal Wetlands and occur along the coast, and river and creek estuaries usually below the 5 m contour.

Acid sulfate soils contain iron sulfides, mainly iron pyrite (FeS_2), in their waterlogged sediments. These sulfides, harmless if they remain under water, react with air to form sulfuric acid if exposed by drainage or are disturbed. This acid acidifies the soil, groundwater and eventually drainage waters and streams. Acid water and associated contaminants can be lethal to aquatic life, particularly fish and bottom dwelling animals, and cause damage to estuarine ecosystems. Acid waters can also corrode concrete and steel structures. Plant growth may be severely restricted on acid sulfate soils due to the extremely acid soil conditions, the toxic effects of aluminium and unavailability of nutrients such as phosphorus.

Management options are available to manage acid sulfate soil areas but the best management practice is to avoid disturbing these areas.

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APPENDIX I

Land Unit Descriptions

Introduction

Three hundred and sixty four land units are described in terms of landform attributes, soils, remnant vegetation and land capability for the 50 land systems.

The geological formations are those of Ellis (1968), Dear *et al.* (1971) and Ellis and Whitaker (1976). The scientific names for the vegetation species are shown in Appendix II.

Many terms used in the descriptions are from Northcote (1979), McDonald *et al.* (1990), and Isbell (1996). The primary profile form division and subdivisions, i.e. cracking clays, non cracking clays, gradational soils and duplex soils are those of Northcote (1979). The final classification, i.e. Red Chromosols, Black Vertosols, etc. is the Australian Soil Classification of Isbell (1996). The soil colours are those of the colour classes of the same author.

Some of the important criteria used in the descriptions are shown below:

Soil depth:	Very shallow:	<0.25 m
	Shallow:	0.25–<0.5 m
	Moderately deep:	0.5–<1.0 m
	Deep:	1.0–<1.5 m
	Very deep	>1.5m
A1 horizon thickness:	Thin:	<0.1 m
	Medium:	0.1–<0.3 m
	Thick:	0.3–0.6 m
	Very thick:	>0.6 m

Soil reaction trend

Acid trend: surface soil has pH value lower than 7.0 and the deep subsoil has a pH value <6.5.
Neutral trend: surface pH has pH value between 5.0 and 8.0 and deep subsoil has pH value between 6.5 and 8.0
Alkaline trend: surface soil has pH value >5.0 and the deep subsoil has pH value >8.0

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Ellis, P.L. (1968). *Geology of the Maryborough 1:250 000 sheet area,* Queensland Department of Mines. Report No 26, Geological Survey of Queensland.

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Land System Page Reference

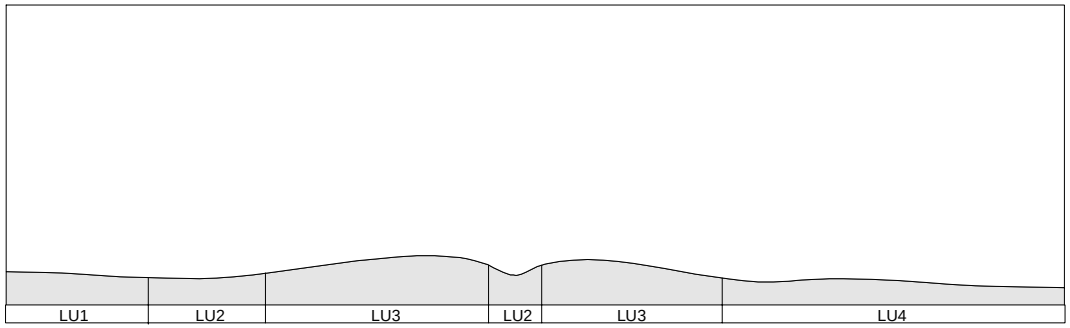
LAND SYSTEM – BUSTARD (Bt)

General Description: Tidal flats and plains of the coastal wetlands. Major soils are deep saline clays, muds and sands (Intertidal, Supratidal, Extratidal or Redoxic Hydrosols and Orthic and Bleached-Orthic Tenosols).

Geology: Coastal and estuarine fine sand and mud.

Landform: Tidal flats and plains.

Vegetation: Closed forest to saline grass land with no effective disturbance. Swamp paperbark, coastal she-oak and cabbage palms, or mangroves and salt marshes.



Land Unit	Area %	Landform Attributes	Soils	Remnant Vegetation	Land Class
LU1	5	Plains adjacent to coastal dunes and sand plains.	Deep, uniform coarse textured soils with loose surfaces; sand to sandy loam medium to thick A horizons with loose surfaces; sandy to sand loam B horizons; acid to neutral soil reaction trend. Orthic Tenosols.	Open forest Swamp paperbark, coastal she-oak and cabbage palm.	VIII
LU2	5	Low lying plains and drainage lines subject to tidal inundation.	Deep, usually mottled, grey, gradational soils and non cracking clays with firm to crusting surfaces; clay loam to light clay, medium A horizons; light clay B horizons often with jarosite or pyrite; often with sand to sandy clay D horizons; neutral to alkaline soil reaction trend. Intertidal, Supertidal and Extratidal Hydrysols.	Mangroves and coastal she-oak with marine couch.	VIII
LU3	5	Slightly elevated rises.	Deep, uniform coarse textured soils with loose to firm surfaces; sand, medium to thick A horizons; sand B horizons usually with D horizons ranging from sand to light clay which may contain pyrite; acid to neutral soil reaction trend. Orthic and Bleached-Orthic Tenosols/Oxyaquic Hydrosols.	Open forest. Coastal she-oak, Moreton Bay ash and soap tree.	VIII
LU4	85	Intertidal flats. Frequently to infrequently inundated by saline tidal waters.	Deep, uniform coarse textured soils, clays and muds. Intertidal Hydrosols/	Closed forest. Mangroves or isolated saline grasses	VIII

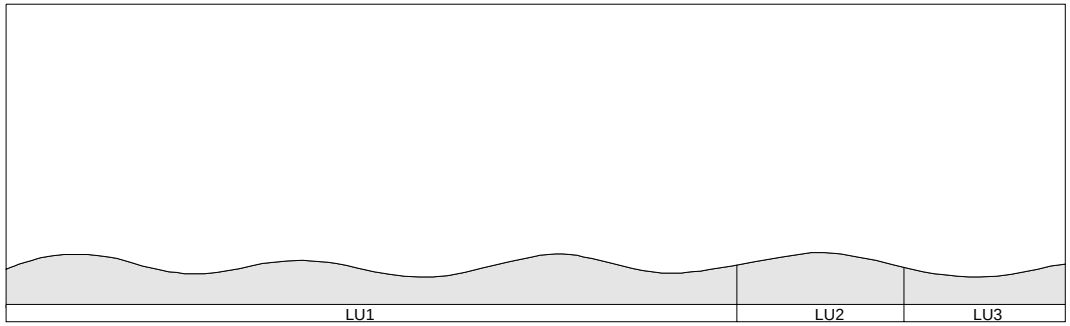
LAND SYSTEM – EURIMBULA (Em)

General Description: Level to gently undulating beach ridge plains. Major soils are deep to very deep, black to brown, uniform coarse textured soils, dominated by the accumulation of iron compounds (Semiaquic and Aeric Podosols).

Geology: Quaternary Coastal Dune Sand.

Landform: Beach ridge plains with associated ridges and swales.

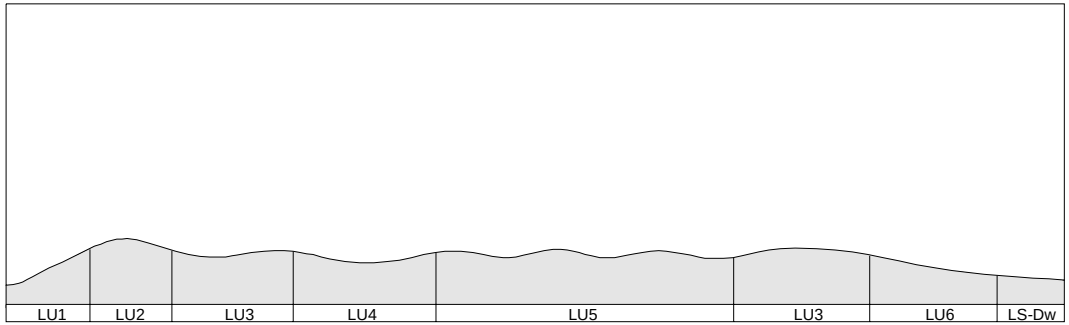
Vegetation: Open to closed forest, with no effective disturbance. Queensland blue gum, Moreton Bay ash, bloodwoods and cabbage palm with areas of 'Rainforest' species and hoop pine emergents.



Land Unit	Area %	Landform Attributes	Soils	Remnant Vegetation	Land Class
LU1	60	Low sloping beach ridges and swales, 0–3%.	Deep to very deep, uniform coarse textured soil, with firm to loose surfaces; fine loamy sand to loamy sand, medium A horizons; fine sand B horizons, dominated by iron compounds, occasionally with illminite throughout upper B horizons, over buried horizons of fine sand dominated by iron compounds often with bleached A2 horizons; neutral to alkaline soil reaction trend. Semiaquic Podosols.	Open forest. Queensland blue gum, Moreton Bay ash, cabbage palm and minor *Melaleuca* species, yellow stringybark and pink bloodwood with *Banksia* species dominating the lower stratum, with hoop pine emergents.	VI m6, ps4, nd3
LU2	25	Low beach ridges, 0–3%.	Deep to very deep, uniform coarse textured soils with loose surfaces; loamy sand, medium A horizons; fine sand B horizons, dominated by iron compounds; neutral soil reaction trend. Aeric Podosols.	Closed forest. 'Rainforest' species, including Burdekin plum, bumpy ash, she pine, hard bolly gum, scaly ebony and native cherry with hoop pine emergents.	VI m6, ps4, nd3
LU3	15	Swales, 0–2%.	Deep to very deep, uniform coarse textured soils with loose surfaces; fine sand to loamy sand, medium to thick A horizons often with bleached A2 horizons; fine sandy B horizons, dominated by iron compounds, over buried horizons of fine sand dominated by iron compounds usually with A2 horizons, occasionally bleached; neutral soil reaction trend. Semiaquic Podosols.	Closed forest. 'Rainforest' species and cabbage palm.wth hoop pine emergents.	VI m6, ps4, nd3

LAND SYSTEM – WRECKROCK (Wr)

General Description: Level to rolling beach ridge plains. Major soils are deep, uniform, coarse textured soils (Orthic, Bleached Orthic and Bleached Leptic Tenosols).
Geology: Quaternary Coastal Dune Sand.
Landform: Beach ridge plains with associated beach ridges, swales and slopes.
Vegetation: Open forest to woodland with no disturbance to completely cleared. Pink and brown bloodwoods, Moreton Bay ash and Queensland blue gum with wattles, coast and wallum banksia and cabbage palms dominating the understorey.



Land Unit	Area %	Landform Attributes	Soils	Remnant Vegetation	Land Class
LU1	10	Slopes, 10–25%.	Deep, red, uniform, coarse textured soils with loose surfaces; fine sand to sand, thick A horizons; sand to sandy loam B horizons; acid to neutral soil reaction trend. Orthic Tenosols.	Closed forest. Coast banksia, bloodwoods, Moreton Bay ash and wattles.	VI m6, ps4, nd3, e6
LU2	5	Higher beach ridges, 0–2% (when present).	Deep, coarse textured soils with loose surfaces; fine sand to loamy sand, very thick A horizons with conspicuously bleached A2 horizons; acid soil reaction trend. Bleached Leptic Tenosols.	Open forest to woodland. Pink bloodwood, Moreton Bay ash, and minor long-fruited bloodwood, with wattles, wallum banksia and coast banksia dominating the lower stratum.	VI m6, ps4, nd3, e2
LU3	15	High beach ridges, 0–3%.	Deep, red, coarse textured soils with loose surfaces; sand to fine sand, thick A horizons with occasional bleached A2 horizons; sand to sandy loam B horizons; acid to neutral soil reaction trend. Orthic and Bleached Orthic Tenosols.	Open forest to woodland. Pink and brown bloodwood and Moreton Bay ash with coast banksia, wattles and cabbage palms dominating the lower stratum.	VI m6, ps4, nd3, e2
LU4	45	Swales, 1–2%.	Deep, coarse textured soils with loose surfaces; sand, very thick A horizons with conspicuously bleached A2 horizons; acid soil reaction trend. Bleached Leptic Tenosols.	Woodland. Brown bloodwood, with wattles and *Melaleuca* species and bracken fern dominating the lower stratum.	VI m6, ps4, nd3, e2

(cont.)

WRECKROCK (continued)

Land Unit	Area %	Landform Attributes	Soils	Remnant Vegetation	Land Class
LU5	20	Beach ridges, 1–4%.	Deep to very deep, brown and yellow, coarse textured soils with loose surfaces; sand to fine sand thick to very thick A horizons occasionally with bleached A2 horizons; sand B horizons; neutral soil reaction trend. Orthic and Bleached Orthic Tenosols.	Open forest to woodland. Queensland blue gum and Moreton Bay ash, with coast banksia, wattles and minor cabbage palms dominating the lower stratum.	VI m6, ps4, nd3, e2
LU6	5	Slopes, 5–10%.	Deep, coarse textured soils with loose surfaces; sand to sandy loam, very thick A horizons with a conspicuously bleached A2 horizon; acid soil reaction trend. Bleached Leptic Tenosols.	Open forest. Brown bloodwood with wattles, cabbage palms and bracken fern dominating the lower stratum.	VI m6, ps4, nd3, e2

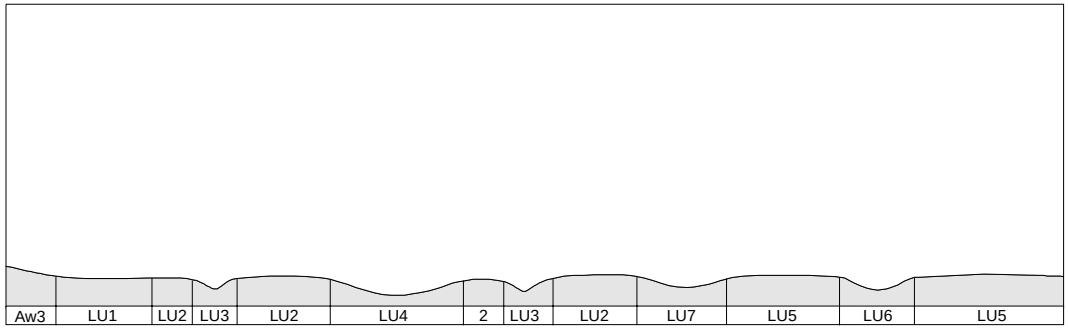
LAND SYSTEM – DEEPWATER (Dw)

General Description: Level plains to gently undulating plains on recent alluvia. Major soils are deep to very deep, grey, gradational soils and non cracking clays (Grey Dermosols and Redoxic Hydrosols) and deep to very deep, grey and brown, sodic duplex soils (Grey and Brown Sodosols).

Geology: Quaternary alluvia.

Landform: Level plains to gently undulating plains with associated drainage lines.

Vegetation: Closed to open forest with limited clearing. Swamp paperbark and broad-leaved tea tree forest, with yellow stringybark, swamp mahogany and brown bloodwood as emergents and Queensland blue gum, gum-topped box, brown bloodwood and Moreton Bay ash with an understorey of grass trees and *Casuarina* species.



Land Unit	Area %	Landform Attributes	Soils	Remnant Vegetation	Land Class
LU1	5	Footslopes, 1–2%.	Deep, often mottled, grey, gradational and sodic duplex soils with hardsetting surfaces; clay loam to light clay, thick to very thick dilatent A horizons with bleached A2 horizons, often with light clay structureless B1 horizons; light to medium heavy clay B2 horizons; neutral to alkaline soil reaction trend. Grey Sodosols and Dermosols.	Closed forest. Broad-leaved tea tree and swamp paperbark occasionally with yellow stringybark as emergent and grass trees in the lower stratum.	VI m6, pd3, ps4, nd3, w4, e2
LU2	40	Level plains, 0–1%.	Deep, frequently mottled, grey, gradational soils with hardsetting surfaces; clay loam, medium A horizons; light to light medium clay B horizons; acid soil reaction trend. Grey Dermosols.	Closed forest to woodland. Broad-leaved tea tree often with smooth-barked apple with brown bloodwood as emergent and grass trees dominating the lower stratum.	VI m6, pd4, ps4, nd3, w4, e2
LU3	5	Narrow drainage lines, 1–2%.	Deep, frequently mottled, grey, non cracking clays; light clay, medium A horizons; sandy light to medium clay B horizons; acid soil reaction trend. Redoxic Hydrosols.	Closed forest. Swamp paperbark, sedges dominating the lowest stratum.	VI m6, pd3, ps4, nd3, w4, e2
LU4	5	Broad drainage lines and closed depressions, 0–0.5%.	Deep to very deep, usually mottled, grey, non cracking clays with hardsetting surfaces; light clay, thick A horizons; light medium to medium clay B horizons; acid soil reaction trend. Grey Dermosols.	Woodland to open woodland. Broad-leaved tea tree with sparse swamp turpentine and sedges and matrush in the lowest stratum.	VI m6, pd3, ps4, nd3, w4–5

(cont.)

DEEPWATER (continued)

Land Unit	Area %	Landform Attributes	Soils	Remnant Vegetation	Land Class
LU5	25	Level plains, 0–1%.	Deep to very deep, mottled, grey and brown, sodic duplex soils with hardsetting surfaces; fine sandy clay loam to clay loam, medium to thick A horizons with bleached A2 horizons; light medium clay B horizons; neutral to alkaline soil reaction trend. Grey and Brown Sodosols.	Open forest. Gum-topped box, Queensland blue gum, swamp mahogany, bloodwoods, yellow stringybark and *Melaleuca* species.	VI m6, pd4, ps4, nd3, e2
LU6	5	Drainage lines, 0–3%.	Deep, often mottled, grey, gradational soils with hardsetting surfaces; clay loam, thick A horizons; light to medium clay B horizons; alkaline soil reaction trend. Grey Dermosols.	Open forest. Queensland blue gum, gum-topped box and Moreton Bay ash.	VI m6, pd4, ps4, nd3, w4, e2
LU7	15	Low lying plains and drainage lines, 0–1%.	Deep, often mottled, grey, gradational soils and non cracking clays with hardsetting surfaces; clay loam to light clay, thick A horizons; light clay B horizons; acid soil reaction trend. Grey Dermosols.	Open forest. Swamp paperbark and Queensland blue gum with swamp paperbark also dominating the lower stratum.	VI m6, pd4, ps4, nd3, w4

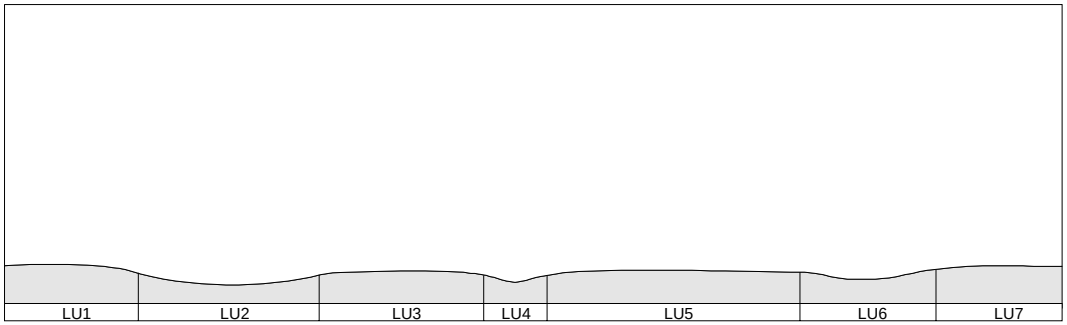
LAND SYSTEM – COOK (Ck)

General Description: Level to gently undulating plains of recent alluvia. Major soils are deep to very deep, brown and grey, uniform, coarse textured, seasonally wet soils (Semi Aquic, Aquic and Aeric Podosols, Bleached Leptic and Orthic Tenosols and Redoxic and Oxyaquic Hydrosols).

Geology: Quaternary Alluvia.

Landform: Level to gently undulating plains with associated drainage depressions.

Vegetation: Open forest to woodland. No effective disturbance, with some areas completely cleared. Broad-leaved tea tree, wallum banksia, paper-barked tea tree and swamp paperbark with an understorey of grass trees, *Casuarina* and *Grevillea* species and pink bloodwood and yellow stringybark often occurring as emergents.



Land Unit	Area %	Landform Attributes	Soils	Remnant Vegetation	Land Class
LU1	25	Plains, 0–1%.	Deep to very deep, uniform, coarse textured soils with loose surfaces; sandy, very thick A horizons with bleached A2 horizons; (when present) coarse sand to sand B horizons; acid soil reaction trend. Bleached Leptic Tenosols.	Open forest. Wallum banksia with pink bloodwood as emergent.	VI m6, ps4, nd3
LU2	15	Broad drainage lines, 0–1%.	Deep, mottled, uniform, coarse textured soils and grey and brown, gradational, seasonally or permanently wet soils with loose to firm surfaces; sand to sandy loam, very thick A horizons with bleached A2 horizons; sandy loam to sandy light medium clay B horizons often with organic matter and aluminium compounds; acid to neutral soil reaction trend. Aquic Podosols and Redoxic Hydrosols.	Open forest to woodland. Broad-leaved tea tree, paper-barked tea tree, wallum banksia and grass trees and heath may be present in lower stratum.	VI m6, ps4, nd3, w4
LU3	25	Broad flats and plains, 0–1%.	Deep to very deep, brown and grey, uniform, coarse textured soils with loose surfaces; coarse sand to loamy sand, very thick A horizons usually with bleached A2 horizons; coarse sand to loamy sand B horizons, usually with iron and organic compounds, over buried soils with bleached A2 horizons and B horizons with iron and organic compounds; acid to neutral, occasionally alkaline, soil reaction trend. Aeric and Aquic Podosols.	Open forest to woodland. Paper-barked tea tree, wallum banksia, coast banksia and *Casuarina* species with yellow stringybark, bloodwoods and swamp mahogany as emergents.	VI m6, ps4, nd3, w4
LU4	5	Narrow drainage lines, 1–2%.	Shallow, uniform, fine textured, seasonally or permanently wet soils with firm surfaces; silty clay to sandy light clay, medium to thick A horizons, overlying buried soils of sands to sandy clay loam; acid soil reaction trend. Oxyaquic Hydrosols.	Open forest. Broad-leaved tea tree with pink bloodwood as emergent while coast banksia, grass trees and bracken fern may be present in the lower stratum.	VI m6, ps4, nd3, w5, e2

COOK (continued)

Land Unit	Area %	Landform Attributes	Soils	Remnant Vegetation	Land Class
LU5	10	Plains, 0–3%.	Moderately deep to deep, uniform, coarse textured, seasonally or permanently wet soils; fine sand to fine sandy loam, very thick A horizons with bleached A2 horizons usually overlying a hard pan; acid soil reaction trend. Semi Aquic Podosols.	Woodland to open woodland. Swamp paperbark, wallum banksia and *Casuarina* species with pink bloodwood, swamp mahogany and yellow stringybark present as emergents.	VI m6, ps4, nd3, w5, e2
LU6	10	Drainage lines, 1–2%	Deep to very deep, uniform, coarse textured, seasonally wet soils; fine sand to sandy loam, thick A horizons with bleached A2 horizons; sand to fine sand B horizons, overlying buried soils, with bleached A2 horizons; acid soil reaction trend. Aquic Podosols.	Open forest. Wallum banksia.	VI m6, ps4, nd3, w5
LU7	10	Plains, 0–2%.	Moderately deep to deep, uniform, coarse textured soils with loose surfaces; coarse sand to sand, thick A horizons; sand to loamy sand B horizons, overlying buried soils with sand A horizons and medium clay B horizons; acid to neutral soil reaction trend. Orthic Tenosols and Redoxic Hydrosols.	Open forest. Broad-leaved tea tree, wattles, *Casuarina* and *Grevillea* species with bloodwoods as emergents.	VI m6, ps4, nd3, w5

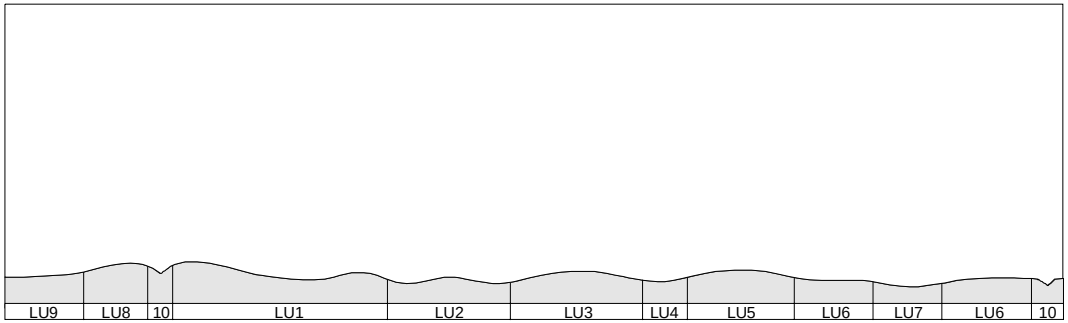
LAND SYSTEM – BAFFLE (Bf)

General Description: Level to gently undulating plains of recent and older alluvia of rivers and major creeks. Major soils are deep to very deep, grey, brown and yellow, sodic and non sodic duplex soils (Grey, Brown and Yellow Sodosols and Chromosols), deep to very deep, uniform coarse and medium textured soils (Bleached-Orthic and LepticTenosols) and black, brown and red gradational soils (Black, Brown and Red Kandosols and Dermosols) and black and grey, cracking clays (Black and Grey Vertosols).

Geology: Quaternary Alluvia.

Landform: Level to gently undulating plains with associated levees, scrolls, swales, fans and drainage depressions.

Vegetation: Open forest to woodland, extensively to completely cleared. Queensland blue gum, gum-topped box, narrow-leaved ironbark and swamp mahogany with minor Moreton Bay ash and bloodwoods.



Land Unit	Area %	Landform Attributes	Soils	Remnant Vegetation	Land Class
LU1	13	Levees, scrolls and swales, fans and backplains, 0.5–3%.	Deep to very deep, occasionally mottled, brown, gradational soils and non sodic duplex soils with hardsetting surfaces; loam fine sandy to fine sandy clay loam, medium to thick A horizons; fine sandy clay loam to fine sandy light medium clay B horizons; buried soils or D horizons may occur; neutral soil reaction trend. Brown Dermosols, Kandosols and Chromosols.	Open forest. Queensland blue gum and Moreton Bay ash with minor swamp mahogany and bloodwoods.	III–IV m3–4, ps3, e2, f2
LU2	5	Scrolls and swales, 0–2%.	Deep, mottled, brown and yellow, gradational and non sodic duplex soils with hardsetting surfaces; loam fine sandy to fine sandy clay loam, thick to very thick A horizons with bleached A2 horizons; fine sandy clay loam to fine sandy light medium clay B horizons; neutral soil reaction trend. Brown and Yellow Dermosols and Chromosols.	Woodland. Queensland blue gum with narrow-leaved ironbark occasionally present.	III–IV m3–4, ps3, f2
LU3	5	Fans and higher plains, 0.5–1%.	Deep to very deep, red and brown, gradational soils with hardsetting surfaces; clay loam to light clay, medium to thick A horizons; light medium clay B horizons, often overlying D horizons; few to many medium pebbles throughout profile; neutral soil reaction trend. Red and Brown Dermosols.	Closed to open forest. Queensland blue gum and swamp mahogany.	II–III m2–3, ps3

(cont.)

BAFFLE (continued)

Land Unit	Area %	Landform Attributes	Soils	Remnant Vegetation	Land Class
LU4	5	Swales and drainage depressions, 0–1%.	Deep to very deep, mottled, black, brown and grey, non cracking clays and sodic duplex soils with hardsetting surfaces; sandy clay loam to light clay, medium to thick A horizons with bleached A2 horizons; light medium to medium clay B horizons often overlying buried soils; hard pan may be present; acid to neutral, occasionally alkaline, soil reaction trend. Black and Brown Dermosols and Brown and Grey Kurosols and Sodosols.	Open forest to woodland. Queensland blue gum and gum-topped box with bloodwoods, swamp mahogany and *Melaleuca* species.	IV or VI m4-6, pd3-4, ps3, w4, f2
LU5	5	Fans and scrolls, 1–3%.	Deep to very deep, brown and grey, gradational soils and sodic duplex soils with hardsetting surfaces; loam to fine sandy clay loam, medium A horizons with bleached A2 horizons; fine sandy light to medium clay B horizons; few fine gravel at depth; neutral soil reaction trend. Brown and Grey Dermosols and Sodosols.	Open forest to woodland. Gum-topped box, Queensland blue gum, bloodwoods and minor narrow-leaved ironbark.	IV or VI m4–6, pd3–4, ps3, e2–3
LU6	40	Plains, 1–3%.	Deep to very deep, often mottled, grey, black and brown, sodic duplex soils with hardsetting surfaces; sandy clay loam to clay loam, medium to thick A horizons with bleached A2 horizons; light medium to medium clay B horizons; neutral to alkaline soil reaction trend. Black, Brown and Grey Sodosols.	Open forest. Gum-topped box, Queensland blue gum and minor narrow-leaved ironbark and bloodwoods.	VI m6, pd3–4, ps3, sa2, (tm2), e2–3
LU7	10	Plains and drainage lines, 0–1%. Gilgai present.	Deep to very deep, black and grey, cracking clays with self mulching surfaces; light clay to light medium clay A horizons usually with bleached A2 horizons; medium to medium heavy clay B horizons; alkaline soil reaction trend. Black and Grey Vertosols.	Open forest. Queensland blue gum.	III–IV m2, ps2, pm2–3, sa2, tm2, (w4)
LU8	5	Levees, fans and scrolls, 0.5–2%.	Deep to very deep, black and brown, uniform, coarse to medium textured soils with hardetting surfaces; sand to sandy loam, thick A horizons; sand to loam B horizons; acid to neutral soil reaction trend. Black and Brown Kandosols and Leptic Tenosols.	Open forest. Moreton Bay ash, bloodwoods and Queensland blue gum often with understorey of *Banksia* species and wattles. Rainforest species may also be present.	VI m6, ps2, nd3, f2
LU9	10	Scrolls, fans and backplains, 1–3%.	Moderately deep to deep, uniform, coarse textured soils, over buried soils and grey, non sodic duplex soils with hardsetting surfaces; coarse sand to sandy loam, thick to very thick A horizons with bleached A2 horizons; sand to coarse sandy light clay B horizons or buried clay D horizons; acid to neutral soil reaction trend. Bleached Orthic Tenosols and Grey Chromosols	Open forest. Bloodwoods, swamp mahogany and Queensland blue gum.	VI m6, ps2, nd3, f2
LU10	2	Stream channels and banks.	Unconsolidated sands and gravels. Alluvial soils.	Open forest to woodland. Queensland blue gum, Moreton Bay ash, *Casuarina* and *Melaleuca* species.	VIII

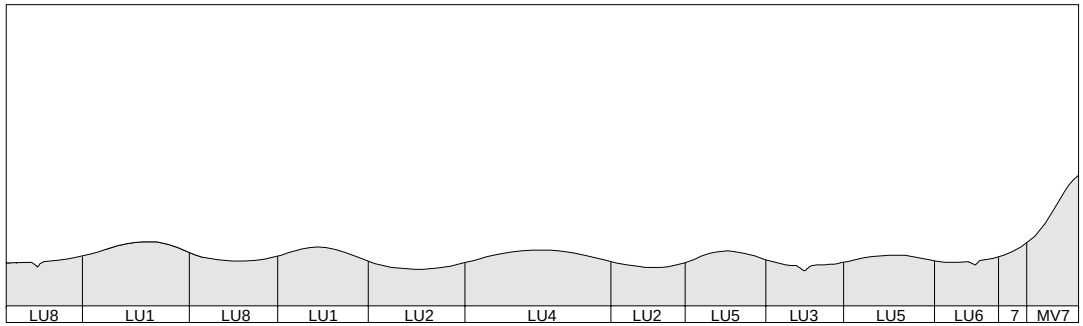
LAND SYSTEM – BOONDILLA (Bd)

General Description: Alluvial plains and pediments and minor gently undulating rises on acid and intermediate intrusive rocks. Major soils are moderately deep to deep, black, brown and grey, sodic duplex soils (Black, Brown and Grey Sodosols, Kurosols and Chromosols), deep to very deep, black, cracking clays and black and grey non cracking clays and gradational soils (Black Vertosols and Black and Grey Dermosols), deep, yellow, coarse textured gradational soils, (Yellow Kandosols) and coarse textured uniform soils (Leptic Rudosols and Bleached Leptic and Bleached Orthic Tenosols).

Geology: Quarternary Alluvial and minor Miriam Vale Granodiorite – Granodiorite, adamellite, and quartz diorite and minor pegmatite.

Landform: Alluvial plains, pediments and minor gently undulating rises.

Vegetation: Open forest to woodland, extensively to completely cleared. Queensland blue gum, swamp mahogany, bloodwoods, narrow-leaved ironbark and minor smooth-barked apple, Moreton Bay ash and gum-topped box with *Melaleuca* species and cockatoo apple often dominating the lower stratum.



Land Unit	Area %	Landform Attributes	Soils	Remnant Vegetation	Land Class
LU1	5	Levees and alluvial fans, 2–4%.	Deep, yellow, coarse textured gradational soils with hardsetting surfaces; coarse sand to sandy loam, very thick A horizons; coarse sandy loam to coarse sandy clay loam B horizons, with fine gravel common throughout; neutral soil reaction trend. Yellow Kandosols.	Open forest. Queensland blue gum, bloodwoods and swamp mahogany with cockatoo apple dominating the lower stratum.	VI m6, ps3, nd3
LU2	25	Plains and drainage depressions, 0–2%. Gilgai may be present.	Deep to very deep, occasionally mottled, black, cracking clays with self mulching to hardsetting surfaces; light medium clay A horizons; light medium to medium clay B horizons; few to common fine pebbles at depth; few to many carbonate nodules in B horizon; neutral to alkaline soil reaction trend. Black Vertosols.	Woodland. Queensland blue gum. Small areas dominated by *Melaleuca* species may be present.	IV or VI m2, ps2, pm3, (sa 4 or 6), w4, f2–3, tm2
LU3	5	Plains and drainage lines, 1–4%.	Deep to very deep, coarse textured uniform soils with hardsetting surfaces; loamy sand to sandy clay loam, medium to thick A horizons often with bleached A2 horizons; (when present) coarse sand to sand B horizons; sand to coarse sand D horizons or buried soils may be present; neutral soil reaction trend. Bleached Leptic and Bleached Orthic Tenosols and Leptic Rudosols.	Woodland, extensively cleared. Queensland blue gum and swamp mahogany, bloodwoods and narrow-leaved ironbark.	VI m6, ps3, nd3, f2

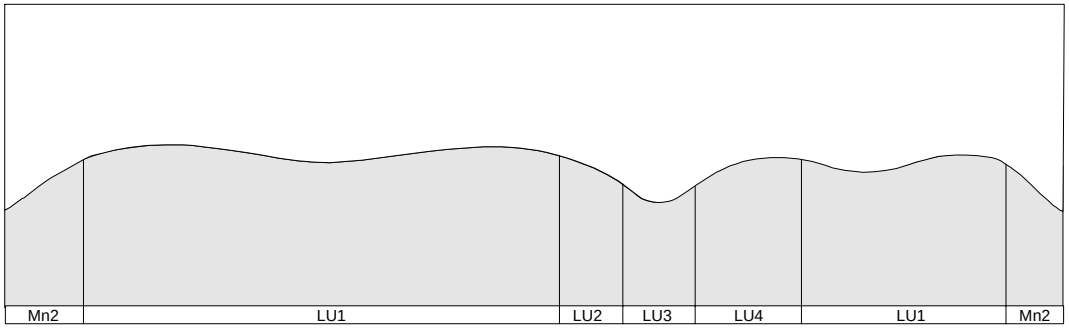
(cont.)

BOONDILLA (continued)

Land Unit	Area %	Landform Attributes	Soils	Remnant Vegetation	Land Class
LU4	30	Plains, 0.5–2%.	Deep to very deep, black and grey, sodic duplex soils with hardsetting surfaces; sandy loam to sandy clay loam, medium A horizons usually with bleached A2 horizons; sandy light medium to medium clay B horizons; coarse sandy light to medium clay D horizons may be present; neutral to alkaline soil reaction trend. Black and Grey Sodosols.	Open forest to woodland. Queensland blue gum, narrow-leaved ironbark, gum-topped box, swamp mahogany, bloodwoods and smooth-barked apple.	VI m6, pd4, ps3, nd3, e2, f2
LU5	15	Crests and mid slopes of ridges, 3–6%.	Moderately deep, brown, sodic duplex soils with hardsetting surfaces; fine sandy loam to clay loam, medium A horizons usually with bleached A2 horizons; light medium to medium clay B horizons; neutral to alkaline soil reaction trend. Brown Sodosols.	Open forest. Queensland blue gum, narrow-leaved ironbark and Moreton Bay ash.	VI m6, pd4, ps3, nd3, e3–4
LU6	5	Footslopes and associated drainage lines, 2–6%.	Deep, mottled, grey, non cracking clays and gradational and sodic duplex soils with hardsetting surfaces; clay loam to light clay, medium A horizons with bleached A2 horizons; sandy light medium to medium heavy clay B horizons, with few to common fine gravel; alkaline soil reaction trend. Grey Dermosols and Sodosols.	Closed forest. Queensland blue gum and minor gum-topped box.	VI m4 or 6, pd3, ps3, e2–3, x6
LU7	10	Footslopes and associated drainage lines, 3–10%. Surface pebbles and stone may be present.	Moderately deep to deep, often mottled, grey and brown, sodic duplex soils; sandy loam, thick to very thick A horizons with bleached A2 horizons; light medium to medium clay B horizons, with few to many fine gravel; acid to neutral soil reaction trend. Grey and Brown Kurosols and Chromosols.	Open woodland. Queensland blue gum, *Melaleuca* species and swamp mahogany. River she oak common in drainage lines.	VI m6, pd3, ps2, nd3, (r2–3), e3–6
LU8	5	Plains, 0.5–1%.	Deep, black and grey, gradational soils with hardsetting surfaces; clay loam, medium A horizons; light to light medium clay B horizons; sandy D horizons may be present; neutral soil reaction trend. Black and Grey Dermosols.	Open forest. Queensland blue gum and swamp mahogany with *Melaleuca* species and cockatoo apple dominating the lower stratum.	IV–VI. m6, pd3, ps2, e2

LAND SYSTEM – MONDURAN 1 (Mn1)

General Description: Gently undulating rises on a plateau. Major soils are deep, red, yellow and brown, non cracking clays (Red, Yellow and Brown Ferrosols) and grey non cracking clays (Redoxic Hydrosols).
Geology: Deeply weathered Tertiary Basalt – Olivine Basalt.
Landform: Undulating rises on a plateau.
Vegetation: Open forest with extensive to complete clearing. Queensland blue gum, Moreton Bay ash, bloodwoods, narrow-leaved ironbark and rough-barked apple.



Land Unit	Area %	Landform Attributes	Soils	Remnant Vegetation	Land Class
LU1	80	Gently undulating rises, 3–8% slope.	Deep, red, non cracking clays with hardsetting surfaces; light clay, medium A horizons; light to light medium clay B horizons; few medium gravel at depth; acid to neutral soil reaction trend. Red Ferrosols.	Open forest. Queensland blue gum, Moreton Bay ash, narrow-leaved ironbark and bloodwoods.	II–III m2, ps2, e2–3
LU2	5	Convex mid to upper slopes, 5–10%.	Deep, yellow, non cracking clays with hardsetting surfaces; light clay, medium A horizons; light to medium clay B horizon; few medium gravel at depth; acid to neutral soil reaction trend. Yellow Ferrosols.	Open forest. Bloodwoods, Queensland blue gum and narrow-leaved ironbark.	II–III m2, ps2, e2–3
LU3	5	Lower slopes and drainage lines, 1–4%.	Deep, mottled grey, non cracking clays with hardsetting surfaces; light clay, medium A horizons; light medium to medium clay B horizons; neutral to alkaline soil reaction trend. Redoxic Hydrosols.	Open forest. Rough-barked apple, swamp mahogany and Queensland blue gum.	IV m2, ps2, w4, e2
LU4	10	Convex upper slopes and crests, 3–8%.	Moderately deep to deep, occasionally mottled, brown, non cracking clays with hardsetting surfaces; light clay, medium A horizons; light medium to medium clay B horizons, usually with few to common medium to coarse basalt gravel; neutral soil reaction trend. Brown Ferrosols.	Open forest. Silver-leaved ironbark, Queensland blue gum, Moreton Bay ash and narrow-leaved ironbark.	II–III m2–3, ps2, e2–3

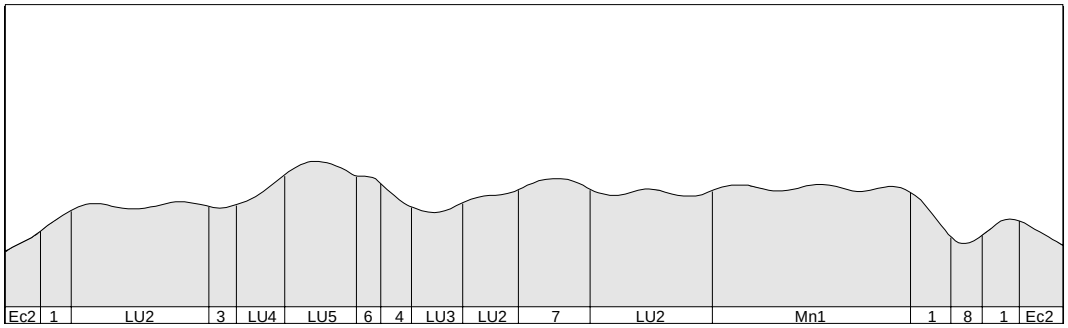
LAND SYSTEM – MONDURAN 2 (Mn2)

General Description: Undulating rises on a plateau and associated bounding slopes on basic volcanic rocks. Major soils are shallow to moderately deep, black and brown, cracking and non cracking clays (Black and Brown Vertosols and Dermosols).

Geology: Tertiary and Gin Gin Basalt – Olivine basalt.

Landform: Undulating rises on a plateau.

Vegetation: Open forest, with extensive to complete clearing. Queensland blue gum, Moreton Bay ash, narrow-leaved ironbark, silver-leaved ironbark and bloodwoods with occasional rough-barked apple and swamp mahogany.



NOTE: Mn1 also found within this system.

Land Unit	Area %	Landform Attributes	Soils	Remnant Vegetation	Land Class
LU1	5	Mid to upper slopes, 15–20% and bounding slopes 20–40%. Few to abundant surface cobble. Common to abundant rock outcrop.	Shallow to moderately deep, brown, non cracking clays with hardsetting to self mulching surfaces; light clay, medium A horizons; light clay B horizons usually with few to common medium gravel; neutral soil reaction trend. Brown Dermosols.	Open forest. Moreton Bay ash, Queensland blue gum, narrow-leaved ironbark and silver-leaved ironbark.	VII m3, pm2, r3–5, ts6–7, e6–7
LU2	55	Gently undulating to undulating rises on a plateau, 1–5%. Few to common surface coarse gravel to cobbles. Rock outcrop may be present.	Shallow to moderately deep, black and brown, cracking and non cracking clays with self mulching surfaces; light to light medium clay, A horizons; light to medium clay B horizons with medium gravel common at depth; neutral soil reaction trend. Black and Brown Vertosols and Dermosols.	Open forest. Queensland blue gum, narrow-leaved ironbark, Moreton Bay ash and silver-leaved ironbark.	III–IV m3-4, pm2–3, r2–3, e2
LU3	10	Lower slopes and drainage lines, 1–3%.	Moderately deep to deep, black, cracking clays with self mulching surfaces; light to light medium clay A horizons; light medium to medium heavy clay B horizons; alkaline soil reaction trend. Black Vertosols	Open forest. Queensland blue gum.	II–III m2–3, pm2, e2
LU4	10	Mid to lower concave slopes, 8–12%. Few to many large surface gravel and cobbles. Rock outcrop may be present.	Shallow to moderately deep, black and brown, non cracking clays with self mulching to hard setting surfaces; light to light medium clay A horizons; light to medium clay B horizons with few to many small to medium gravel; neutral soil reaction trend. Black and Brown Dermosols.	Open forest. Queensland blue gum.	III–IV m3–4, pm2, r2–3, e3–4

(cont.)

MONDURAN 2 (continued)

Land Unit	Area %	Landform Attributes	Soils	Remnant Vegetation	Land Class
LU5	5	Higher crests, 2–4% slope. Abundant gravel on the surface. Rock outcrop common.	Shallow to moderately deep, brown, non cracking clays and gradational soils with hardsetting surfaces; clay loam to light clay, medium A horizons; light to light medium clay B horizons with few to abundant medium gravel; neutral soil reaction trend. Brown Dermosols.	Open forest. Moreton Bay ash and narrow-leaved ironbark.	IV or V m3–4, ps2, pm2, r4–5, e2
LU6	5	Mid convex slopes, 2–4%. Abundant rock outcrop.	Very shallow to shallow, brown, non cracking clays and gradational soils with hardsetting surfaces; clay loam to light clay, thin A horizons; light to light medium clay B horizons with common to many fine to medium gravel; neutral soil reaction trend. Brown Dermosols.	Open forest. Narrow-leaved ironbark and Moreton Bay ash.	V–VI m4 or 6, ps2, pm2, r5, e2
LU7	5	Slightly elevated rises on the plateau, 2–5% slope.	Moderately deep to deep, red, non cracking clays with hardsetting surfaces; light clay, medium A horizons; light clay B horizons with medium gravel abundant at depth; neutral soil reaction trend. Red Ferrosols.	Isolated trees. Rough-barked apple.	II–III m2-3, ps2, e2
LU8	5	Lower slopes and drainage lines, 3–5%. Few cobble on the surface and common rock outcrop.	Deep to very deep, black and brown, cracking clays with self mulching surfaces; light medium clay A horizons; medium to medium heavy clay B horizons; alkaline soil reaction trend. Black and Brown Vertosols.	Open forest. Queensland blue gum, silver-leaved ironbark and bloodwoods, with wattles dominating the understorey.	III–IV m2, pm2-3, r3–4, e2

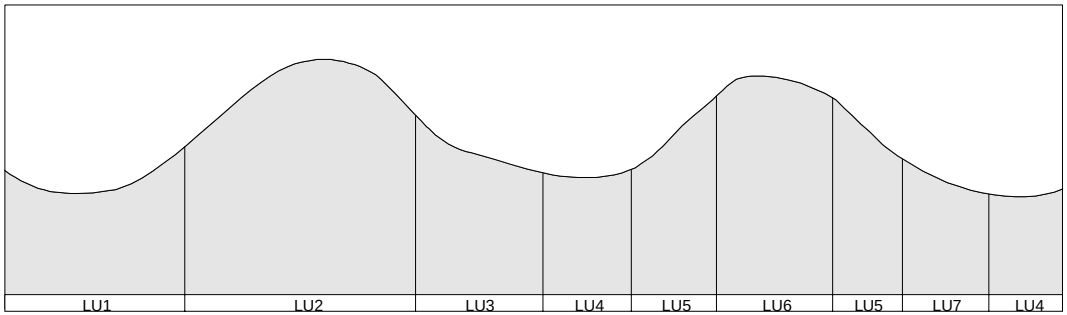
LAND SYSTEM - WATERANGA (Wg)

General Description: Undulating rises to undulating low hills on basic intrusive rocks. Major soils are shallow to deep, brown and black, non cracking and cracking clays (Dermosols and Vertosols).

Geology: Wateranga Gabbro and unnamed gabbro formation – Layered olivine gabbro, norite, anorthosite, minor granite, diorite.

Landform: Undulating rises to undulating low hills.

Vegetation: Woodland, extensively to completely cleared. Silver-leaved ironbark, narrow-leaved ironbark, bloodwoods, Queensland blue gum and Moreton Bay ash.



Land Unit	Area %	Landform Attributes	Soils	Remnant Vegetation	Land Class
LU1	15	Lower and mid slopes, 5–10%. Minor rock outcrop.	Shallow to deep, brown, non cracking clays with hardsetting surfaces; light clay, thin to medium A horizons; light medium clay B horizons with occasional rock fragments; alkaline soil reaction trend. Brown Dermosols.	Woodland. Narrow-leaved ironbark and Moreton Bay ash.	III–IV m3–4, pd3, ps3, r2–3, e3
LU2	15	Crests, upper and mid slopes, 5–10%.	Shallow, brown, non cracking clays with hardsetting surfaces; fine sandy light clay to light clay, medium A horizons; fine sandy light clay to medium clay B horizons; neutral to alkaline soil reaction trend. Black and Brown Dermosols.	Woodland. Narrow-leaved ironbark and bloodwoods.	IV m4, pd3, ps3, e3
LU3	20	Mid slopes, 5–10%.	Moderately deep, black and brown, non cracking clays with hardsetting surfaces; fine sandy light clay to light clay, thin to medium, A horizons; fine sandy light clay to medium clay B horizons; neutral to alkaline soil reaction trend. Black and Brown Dermosols.	Woodland. Silver-leaved ironbark, bloodwoods and narrow-leaved ironbark.	III m3, ps3, e3
LU4	10	Broad drainage depressions, 1–4%.	Deep, black, cracking clays with self mulching surfaces; light to medium clay A horizons; medium clay B horizons; alkaline soil reaction trend. Black Vertosols.	Open woodland. Queensland blue gum and silver-leaved ironbark.	II–III m2, pm2–3, e2

(cont.)

WATERANGA (continued)

Land Unit	Area %	Landform Attributes	Soils	Remnant Vegetation	Land Class
LU5	15	Mid slopes, 5–10%. Rock outcrop common.	Shallow, black, cracking clays with hardsetting to self mulching surfaces; light to medium clay A horizons; medium clay B horizons; neutral to alkaline soil reaction trend. Black Vertosols.	Woodland. Narrow-leaved ironbark, Queensland blue gum, gum topped bloodwood, silver-leaved ironbark and Moreton Bay ash.	III–IV m3–4, pd3, pm2–3, r3–4, e3
LU6	15	Crests and upper slopes, 3–5%. Rock outcrop may be present.	Shallow to moderately deep, black, non cracking and cracking clays with hardsetting to self mulching surfaces; light to light medium clay A horizons; light medium clay B horizons; neutral to alkaline soil reaction trend. Black Dermosols and Vertosols.	Open forest. Gum topped bloodwood, silver-leaved ironbark and narrow-leaved ironbark.	III–IV m3–4, pd3–4, pm2–3, r2–4, e2-3
LU7	10	Mid to lower slopes, 3–6%. Linear gilgai may be present.	Deep, black and brown, cracking clays with self mulching surfaces; medium clay A horizons; medium clay B horizons; alkaline soil reaction trend. Black and Brown Vertosols.	Woodland to open woodland. Queensland blue gum, gum topped bloodwood and silver-leaved ironbark.	III m2–3, pm3, tm2, e2–3

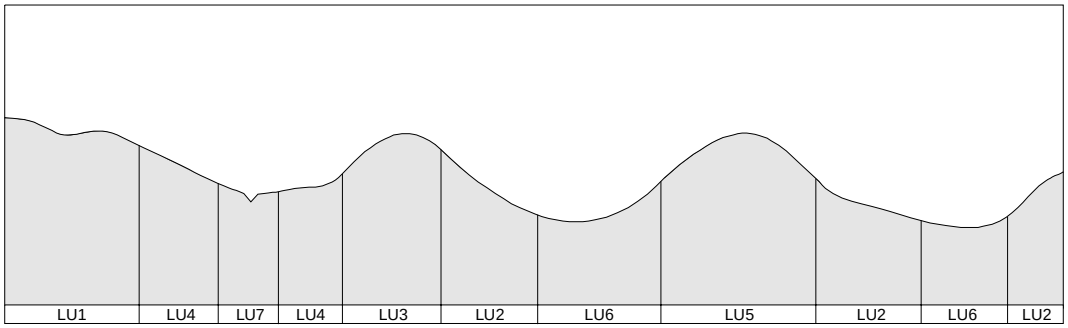
LAND SYSTEM - MUNCON 1 (Mc1)

General Description: Undulating rises to rolling low hills on intermediate and basic volcanic rocks. Major soils are shallow to moderately deep, brown and red, gradational soils and non sodic and sodic duplex soils (Brown and Red Dermosols and Chromosols), and red, brown and black non cracking and cracking clays (Red, Brown and Black Dermosols and Vertosols).

Geology: Muncon Volcanics – Intermediate and basic lava, tuff, agglomerate, siltstone, lithic arenite, conglomerate and mudstone.

Landform: Undulating rises to rolling low hills.

Vegetation: Open forest to woodland with limited to extensive clearing. Narrow-leaved ironbark, Moreton Bay ash, bloodwoods, silver-leaved ironbark, spotted gum and Queensland blue gum.



Land Unit	Area %	Landform Attributes	Soils	Remnant Vegetation	Land Class
LU1	10	Crests and upper slopes, 7–20%. Rock outcrop common in some areas.	Shallow, brown and red, sodic duplex soils and gradational soils with hardsetting surfaces; clay loam, medium A horizons; light clay to medium clay B horizons, usually with medium gravel; neutral to alkaline soil reaction trend. Brown and Red Chromosols and Dermosols.	Open forest. Spotted gum, narrow-leaved ironbark and Moreton Bay ash.	VI m4 or 6, pd3–4, ts4 or 6, (r3–5), e6
LU2	10	Ridge crests and slopes, 5–15%. Rock outcrop and surface stone may be present.	Shallow to moderately deep, red, brown and black, non cracking and cracking clays with hardsetting to self mulching surfaces; light clay, medium A horizons; light to medium clay B horizons, usually with medium gravel; neutral alkaline soil reaction trend. Red, Brown and Black Dermosols and Vertosols.	Woodland. Silver-leaved ironbark, bloodwoods, occasionally with narrow-leaved ironbark and Queensland blue gum.	III-IV m3–4, pd3–4, pm2, r2–4, e3–4
LU3	15	Crests and ridges, 5–10% slope. Rock outcrop common in some areas.	Shallow to moderately deep, brown and red, non sodic duplex and gradational soils with hardsetting surfaces; clay loam, medium A horizons; light to light medium clay B horizons, often with medium to coarse gravel; alkaline soil reaction trend. Brown and Red Chromosols and Dermosols.	Open forest to woodland. Silver-leaved ironbark and narrow-leaved ironbark.	IV m4, pd3–4, ps3,(r2–4), e3

(cont.)

MUNCON 1 (continued)

Land Unit	Area %	Landform Attributes	Soils	Remnant Vegetation	Land Class
LU4	15	Upper and mid slopes, 5–15%. Surface rock may be present.	Shallow to moderately deep, brown, red and yellow, sodic and non sodic duplex soils with hardsetting surfaces; clay loam, medium A horizons occasionally with bleached A2 horizons; medium clay B horizons; usually with rock fragment; neutral to alkaline soil reaction trend. Brown, Red and Yellow Chromosols.	Open forest to woodland. Narrow-leaved ironbark, silver-leaved ironbark and Queensland blue gum.	IV m3–4, pd3–4, ps3, r2–3, e3–4
LU5	15	Crests, ridges and upper slopes, 20–40% slopes. Rock outcrop and surface stone common to abundant.	Shallow, red and brown, non sodic duplex and gradational soils with hardsetting surfaces; clay loam, medium A horizons; light to light medium clay B horizons, usually with rock fragments; neutral to alkaline soil reaction trend. Brown and Red Chromosols and Dermosols.	Open forest. Narrow-leaved ironbark, spotted gum. Grass trees may be present in some areas.	VII m6, pd3–4, ps3, ts7, r3–5, e7
LU6	20	Mid and lower slopes, 3–15%. Linear gilgai usually present. Surface stone may be present.	Moderately deep to deep, red, black and brown, cracking and non cracking clays with self mulching to hardsetting surfaces; light clay A horizons; light to medium clay B horizons occasionally with few to many medium to coarse gravel; neutral to alkaline soil reaction trend. Red, Black and Brown Vertosols and Dermosols.	Woodland. Silver-leaved ironbark, Queensland blue gum, Moreton Bay ash and swamp mahogany. Queensland blue gum usually dominant on lower slopes.	III-IV m2–3, pm2, r2–3, tm2, e3–4
LU7	5	Alluvial flats and drainage lines 1–3%.	Deep grey and brown sodic duplex soils with hardsetting surfaces; clay loam medium to thick A horizons with bleached A2 horizons, light medium to medium clay B horizons, usually with few to common fine to medium gravel; neutral to alkaline soil reaction trend. Grey and Brown Sodosols.	Woodland. Gum-topped box, Queensland blue gum and swamp mahogany. River she oak common in channels.	VI m6, pd3–4, ps3, e3, f2–3

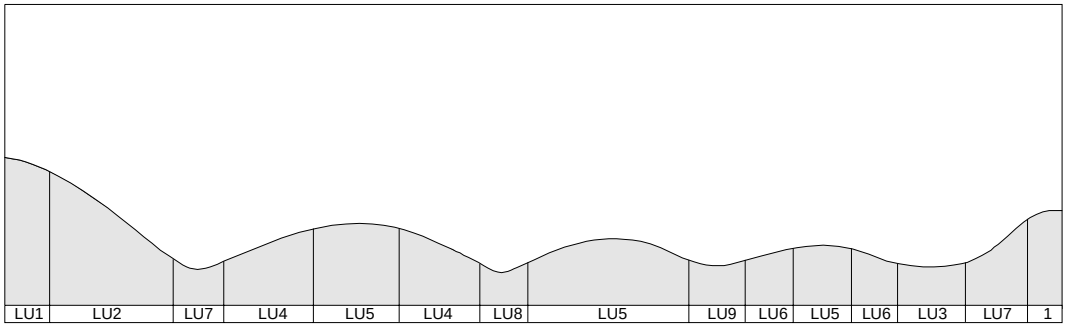
LAND SYSTEM – MOONTA (Mo)

General Description: Undulating rises to rolling low hills on intermediate igneous rocks. Major soils are deep, brown and black, cracking and non cracking clays (Brown and Black Vertosols and Dermosols) and minor grey and brown sodic duplex soils (Grey and Brown Sodosols).

Geology: Moonta Diorite – Diorite and granodiorite.

Landform: Undulating rises to rolling low hills.

Vegetation: Woodland to open woodland, extensively cleared. Silver-leaved ironbark, bloodwoods, Queensland blue gum, Moreton Bay ash and narrow-leaved ironbark.



Land Unit	Area %	Landform Attributes	Soils	Remnant Vegetation	Land Class
LU1	10	Higher crests and upper slopes, 4–10%. Common to many large gravel to cobble on surface. Rock outcrop present.	Very shallow to shallow, uniform, fine textured soils over rock and brown, non cracking clays with hardsetting surfaces; light clay, medium A horizons; (when present) light clay B horizon with common to many medium gravel; neutral to alkaline soil reaction trend.	Open woodland. Narrow-leaved ironbark, silver-leaved ironbark and gum-topped bloodwood.	VI m6, pd4 or 6, ps2, r4–5, e3
LU2	10	Upper to mid slopes, 10–20%. Few to many medium, coarse, surface gravel.	Moderately deep to deep, brown, non cracking clays with hardsetting surfaces; light clay, medium A horizons; light medium to medium clay B horizons with few fine to medium gravel; alkaline soil reaction trend. Brown Dermosols.	Open woodland. Silver-leaved ironbark and Moreton Bay ash, with wattles species dominating the lower stratum.	VI m2–3, ps2, ts4 or 6, r2–3, e6
LU3	10	Concave lower slopes and drainage lines, 0–2%. Linear gilgai may be present.	Deep to very deep, black cracking clays with hardsetting to self mulching surfaces; light medium to medium clay A horizons; medium to medium heavy clay B horizons, usually with few fine gravel; alkaline soil reaction trend. Black Vertosols.	Open woodland. Queensland blue gum and silver-leaved ironbark.	III m2, pm3, sa2, (tm2), e2 .
LU4	25	Slopes, 4–7%. Few to common surface coarse gravel and cobble may be present.	Moderately deep to deep, brown, gradational soils and non cracking clays with hardsetting surfaces; clay loam to light clay, medium A horizons; light medium to medium clay B horizons usually with few to many small to medium gravel; alkaline soil reaction trend. Brown Dermosols.	Open woodland. Silver-leaved ironbark, gum-topped bloodwood and Moreton Bay ash.	III m3, ps2, pm2, (r2–3), e2–3

(cont.)

MOONTA (continued)

Land Unit	Area %	Landform Attributes	Soils	Remnant Vegetation	Land Class
LU5	25	Lower crests and upper slopes, 2–8%. Few to many coarse surface gravel and cobble. Rock outcrop usually present.	Shallow, brown and red, gradational soils and non cracking clays with hardsetting surfaces; clay loam to light clay, medium A horizons; light to light medium clay B horizons, often with few to common fine to medium gravel; acid to neutral soil reaction trend. Brown and Red Dermosols.	Woodland. Silver-leaved ironbark and gum-topped box.	IV m4, ps2, pm2, r2–3, e2–3
LU6	5	Mid slopes, 5–12%. Few surface coarse gravel may be present.	Deep, brown and yellow, sodic, duplex soils with hardsetting surfaces; sandy clay loam to clay loam, medium to thick A horizons, with bleached A2 horizons; light medium to medium clay B horizons with few to abundant medium gravel; neutral to alkaline soil reaction trend. Brown and Yellow Sodosols and Chromosols.	Woodland. Silver-leaved ironbark, gum-topped bloodwood and Moreton Bay ash.	VI m6, pd3-4, ps3, (r2–3), e3 or 6
LU7	5	Lower slopes and minor drainage lines, 2–5%.	Moderately deep to deep, black and brown, non cracking clays with hardsetting surfaces; light clay, medium A horizons; light medium to medium clay B horizons usually with few medium to coarse gravel; alkaline soil reaction trend. Black and Brown Dermosols.	Woodland. Queensland blue gum and Moreton Bay ash.	III m2–3, pm2, sa2, e3
LU8	5	Lower slopes and drainage lines, 2–4%.	Deep, usually mottled, grey and brown, sodic duplex soils with hardsetting surfaces; sandy clay loam to clay loam, medium A horizons with bleached A2 horizons; medium clay B horizons; alkaline soil reaction trend. Grey and Brown Sodosols.	Woodland. Silver-leaved ironbark, Moreton Bay ash and Queensland blue gum.	VI m6, pd4, ps3, sa4, e3
LU9	5	Lower concave slopes and drainage lines, 2–6%.	Deep, brown and grey, sodic duplex soils with hardsetting surfaces; sandy clay loam to clay loam, medium A horizons with bleached A2 horizons; medium clay B horizons; neutral to alkaline soil reaction trend. Brown and Grey Sodosols.	Woodland. Queensland blue gum, bloodwoods and Moreton Bay ash.	VI m6, pd4, ps3, sa2, e3

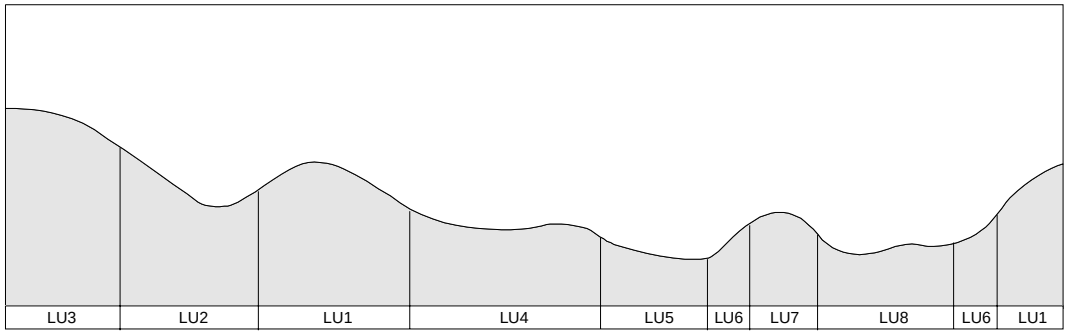
LAND SYSTEM - HINDMARSH (Hm)

General Description: Undulating low hills to rolling low hills on deeply weathered and fresh basalt. Major soils are deep, red and brown, gradational soils and non cracking clays and shallow to moderately deep, brown and black, non cracking and cracking clays (Red and Brown Ferrosols and Black and Brown Dermosols and Vertosols).

Geology: Tertiary basalt.

Landform: Undulating low hills to rolling low hills on a plateau.

Vegetation: Woodland with minor rainforest with limited clearing with some areas completely cleared with an established hoop pine plantation. Silver-leaved ironbark, spotted gum, narrow-leaved ironbark, bloodwoods, Queensland blue gum, crows ash and rainforest species.



Land Unit	Area%	Landform Attributes	Soils	Remnant Vegetation	Land Class
LU1	20	Crests and upper slopes, 3–8%.	Deep, red, gradational soils and non cracking clays with loose to firm surfaces; clay loam to light clay, medium A horizons; light to medium clay B horizons; acid to neutral soil reaction trend. Red Ferrosols.	Forest. Pink bloodwood, with some Queensland blue gum and *Casuarina* species.	III m3, ps3, e2–3
LU2	10	Upper, mid and lower slopes, 8–30%. Few to abundant, medium pebbles and stone may be present on surface.	Moderately deep to deep, often mottled, brown, gradational and non sodic duplex soils with hardsetting surfaces; clay loam, medium A horizons; light to medium clay B horizons; acid soil reaction trend. Brown Ferrosols and Chromosols.	Unknown. Hoop pine plantation.	VI–VII m3–4, ps3, ts6–7, r3–4, e4 or 6
LU3	15	Crests and upper slopes, 3–10%.	Moderately deep to deep, red, gradational soils and non cracking clays with hardsetting surfaces; clay loam to light clay, medium to thick A horizons; medium clay B horizons; acid soil reaction trend. Red Ferrosols.	Closed forest. Crows ash, hoop pine and other rainforest species.	III–IV m3–4, ps3, e2–3
LU4	15	Ridges, upper and mid slopes, 5–10%. Rock outcrop and surface stone usually present.	Shallow to moderately deep, brown and black, gradational soils and non cracking clays with loose to hardsetting surfaces; clay loam to light clay, medium A horizons; medium clay B horizons; acid to neutral soil reaction trend. Black and Brown Dermosols.	Woodland. Spotted gum, narrow-leaved ironbark and Queensland blue gum.	IV or VI m3–4 or 6, pd3–4, ps3, r3–4, e3–4

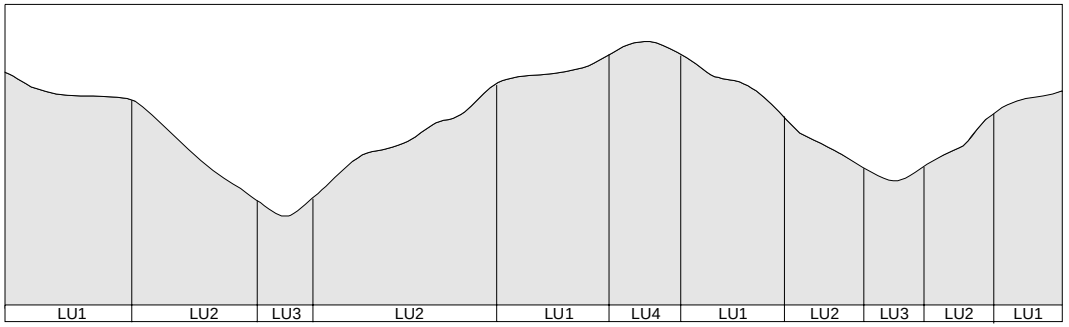
(cont.)

HINDMARSH (continued)

Land Unit	Area%	Landform Attributes	Soils	Remnant Vegetation	Land Class
LU5	10	Mid to lower slopes, 5–8%.	Shallow to moderately deep, black and brown, cracking and non cracking clays with self mulching to hardsetting surfaces; light clay, medium A horizons; medium clay B horizons; acid to neutral soil reaction trend. Black and Brown Vertosols and Dermosols.	Woodland. Queensland blue gum and spotted gum.	III–IV m3–4, pd3–4, pm3, e2–3
LU6	5	Steep upper slopes, 12–30%. Rock outcrop and surface stone common.	Shallow, brown and black, gradational soils and non cracking and cracking clays with self mulching to hardsetting surfaces; clay loam to light clay medium A horizons; light clay B horizons; acid to neutral soil reaction trend. Brown and Black Dermosols and Vertosols.	Woodland. Silver-leaved ironbark, narrow-leaved ironbark, bloodwoods and wattles.	VI–VII m4, pd3–4, ps3, ts6–7, r4–5, e6
LU7	5	Crests, 3–5%. Rock outcrop and surface stone common.	Very shallow to shallow, black and brown, gradational soils and non cracking clays with hardsetting surfaces; clay loam to light clay A horizons; light clay B horizons; acid to neutral soil reaction trend. Black and Brown Dermosols.	Woodland. Narrow-leaved ironbark, spotted gum and silver-leaved ironbark.	IV or V m4 or 6, pd4 or 6, ps3, r3–5, e4
LU8	20	Ridges, mid and upper slopes, 3–8%. Surface stone often present.	Shallow to moderately deep, black, cracking and non cracking clays with hardsetting to self mulching surfaces; light clay, medium A horizons; medium clay B horizons; neutral soil reaction trend. Black Vertosols and Dermosols.	Woodland. Silver-leaved ironbark, narrow-leaved ironbark and bloodwoods.	III–IV m3–4, pd3–4, pm2–3, r2–3, e2–3

LAND SYSTEM – SERPENT (Sp)

General Description: Undulating low hills to rolling hills on serpentinite. Major soils are deep, brown and red, non cracking clays (Brown and Red Ferrosols).
Geology: Serpentinite.
Landform: Undulating low hills to rolling hills.
Vegetation: Open forest with no effective disturbance to limited clearing. Spotted gum, narrow-leaved ironbark, bloodwoods, gum-topped box, broad-leaved ironbark, swamp mahogany and Queensland blue gum.



Land Unit	Area %	Landform Attributes	Soils	Remnant Vegetation	Land Class
LU1	30	Crests and upper slopes, 10–20%. Few to common, medium to coarse, surface gravel.	Moderately deep to deep, red and brown, non cracking clays with hardsetting surfaces; light clay, medium A horizons; light to medium clay B horizons; usually with few to abundant fine to coarse gravel; alkaline soil reaction trend. Red and Brown Ferrosols.	Open forest. Spotted gum, narrow-leaved ironbark and bloodwoods with an understorey of *Casuarina* species and grass trees.	VI m2–3, ps2, ts6, r2–3, e6
LU2	40	Midslopes, 10–30%.	Moderately deep to deep, red and brown, non cracking clay with hardsetting surfaces; light clay medium A horizons occasionally with bleached A2 horizons; light medium to medium clay B horizon; medium gravel common at depth; alkaline soil reaction trend. Red and Brown Ferrosols.	Open forest. Gum-topped box, spotted gum and bloodwoods often with an understorey of 'softwood scrub' species.	VI m2–3, ps2, (ts6), e6
LU3	15	Concave lower slopes, 4–10%.	Moderately deep to deep, brown, non cracking clays with hardsetting surfaces; light clay, medium A horizons; medium clay B horizons; buried soil horizons may be present; often few to common medium gravel at depth; alkaline soil reaction trend. Brown Ferrosols.	Closed forest. Queensland blue gum, swamp mahogany, broad-leaved ironbark and bloodwoods often with an understorey of wattles.	III–IV m2–3, ps2, e3–4
LU4	15	Higher crests and upper slopes 5–15%. Common to abundant, medium surface gravel and stone.	Very shallow to moderately deep, red and brown, non cracking clays with hardsetting surfaces; light clay, medium A horizons; medium clay B horizons; abundant medium gravel throughout profile; alkaline soil reaction trend. Red and Brown Ferrosols.	Open forest. Narrow-leaved ironbark, spotted gum with *Casuarina* species and with grass trees dominating the lower stratum.	VI m3–4, ps2, r3–5, e3–6

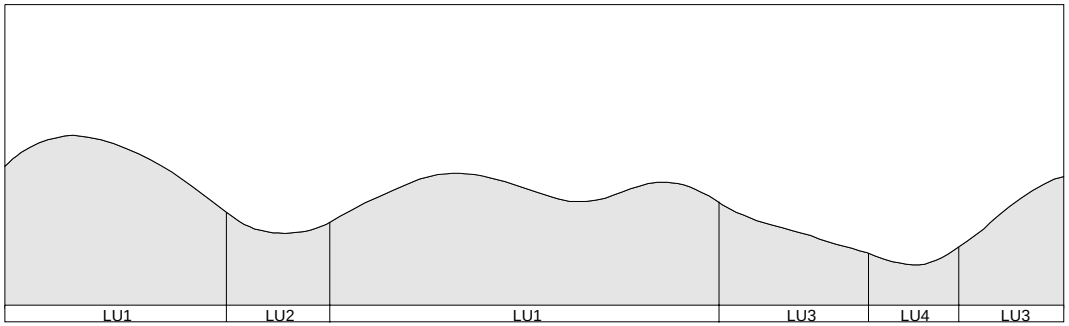
LAND SYSTEM – BLACKMAN (Bm)

General Description: Rolling low hills to rolling hills on sedimentary rocks. Major soils are shallow to deep, black and brown, gradational and non cracking clays (Black and Brown Dermosols).

Geology: Diorite.

Landform: Rolling low hills to rolling hills.

Vegetation: Open forest to woodland, extensively cleared. Narrow-leaved ironbark, bloodwoods, Queensland blue gum and minor Moreton Bay ash with areas of 'softwood scrub' species.



Land Unit	Area %	Landform Attributes	Soils	Remnant Vegetation	Land Class
LU1	45	Crests and upper slopes, 5–20%. Common to abundant large pebbles on surface, with areas of rock outcrop.	Shallow to moderately deep, brown, gradational soils and non cracking clays with hardsetting surfaces; clay loam to light clay, thick A horizons; light to light medium clay B horizons with few to many fine to coarse gravel; neutral soil reaction trend. Brown Dermosols.	Open forest. Bloodwoods, narrow-leaved ironbark and Moreton Bay ash with areas of 'softwood scrub' species.	IV or VI m4, pd3–4, ps2, pm2, r3–5, ts6, e3–4 or 6
LU2	10	Higher concave mid and lower slopes, 5–15%.	Deep, brown, gradational soils and non cracking clays with hardsetting surfaces; clay loam to light clay, medium to thick A horizons; light medium to medium clay B horizons, with few to common small gravel; alkaline soil reaction trend. Brown Dermosols.	Woodland. Queensland blue gum and narrow-leaved ironbark.	IV or VI m3, ps2, pm2, e3–4 or 6
LU3	35	Mid slopes, 10–20%. Usually common to abundant large pebbles and stone on surface. Rock outcrop may occur.	Shallow to moderately deep, black and brown, gradational soils and non cracking clays with hardsetting surfaces; clay loam to light clay, medium A horizons; light medium to medium clay B horizons with few to common medium gravel; neutral to alkaline soil reaction trend. Black and Brown Dermosols.	Open forest. Gum-topped bloodwood, Queensland blue gum and narrow-leaved ironbark.	VI m4, pd3–4, ps2, pm2, r3–5, (ts6), e6
LU4	10	Lower slopes and drainage lines, 3–8%.	Deep, black and brown, gradational soils and non cracking clays with hardsetting surfaces; clay loam to light clay, medium A horizons; light to medium clay B horizons; neutral to alkaline soil reaction trend. Black and Brown Dermosols.	Woodland. Queensland blue gum and 'softwood scrub' species with *Melaleuca* species dominant in drainage lines.	VI m3, ps2, pm2, e3

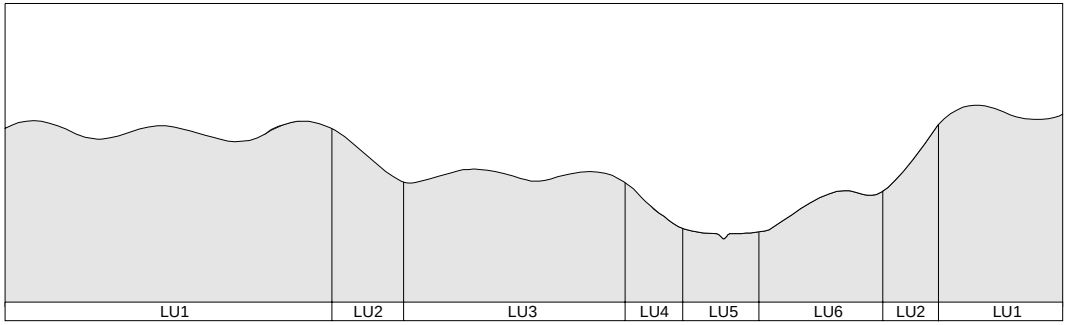
LAND SYSTEM – GOYAN (Ga)

General Description: Rolling hills on basic and intermediate extrusive rocks. Major soils are shallow, brown and red, gradational and non sodic duplex soils (Brown and Red Dermosols and Chromosols) and moderately deep, brown, black and yellow, gradational and non cracking clays and sodic and non sodic duplex soils, (Brown, Black and Yellow Dermosols and Sodosols).

Geology: Goyan Andesite – Plagioclase, biotite, hornblende, pyroxene and minor quartz.

Landform: Rolling hills.

Vegetation: Open forest with limited clearing. Narrow-leaved ironbark, silver-leaved ironbark, spotted gum, bloodwoods, yellow stringybark and Queensland blue gum.



Land Unit	Area %	Landform Attributes	Soils	Remnant Vegetation	Land Class
LU1	20	Higher crests and upper slopes, 8–15%. Common to many cobbles on surface and common to abundant rock outcrop.	Shallow, brown and red, gradational and non sodic with hardsetting surfaces; clay loam, medium A horizons occasionally with bleached A2 horizons; light to medium clay B horizons; common to abundant fine to coarse gravel; neutral soil reaction trend. Brown and Red Dermosols and Chromosols.	Open forest. Narrow-leaved ironbark, spotted gum and bloodwoods.	VI m4, pd3–4, ps2, r3–4, e3–4, x6.
LU2	30	High mid to upper slopes, 12–20%. Cobble and rock outcrop common on surface.	Shallow to moderately deep, brown, non sodic duplex soils and non cracking clays with hardsetting surfaces; clay loam to light clays, medium A horizons often with bleached A2 horizons; light medium to medium clay B horizons; few to abundant fine gravel to cobbles; neutral soil reaction trend. Brown Chromosols and Dermosols.	Open forest. Narrow-leaved ironbark, occasionally with yellow stringybark and bloodwoods.	VI m3–4, (pd3), ps2, r3–4, e3
LU3	15	Lower crests and ridges. Surface gravel and cobble and rock outcrop may be present.	Moderately deep, black and brown, non cracking clays and gradational soils with hardsetting surfaces; clay loam to light clay, medium A horizons; light medium to medium clay B horizons with few to many small to medium gravel; neutral soil reaction trend. Black and Brown Dermosols.	Open forest. Silver-leaved ironbark and Queensland blue gum with wattle understorey.	VI m3–4, (r3–4), e3–6, x6
LU4	15	Concave mid slopes, 5–10%.	Moderately deep, brown, sodic and non sodic duplex soils with hardsetting surfaces; sandy clay loam to clay loam, medium to thick A horizons often with bleached A2 horizons; medium to medium heavy clay B horizons, often with few to many fine to coarse gravel throughout profile; neutral soil reaction trend. Brown Sodosols and Chromosols.	Open forest. Queensland blue gum, occasionally with bloodwoods and silver-leaved ironbark.	VI m4, pd3, ps2, e3 or 6, x6

(cont.)

GOYAN (continued)

Land Unit	Area %	Landform Attributes	Soils	Remnant Vegetation	Land Class
LU5	10	Concave lower slopes 2–4%. and drainage depressions. Surface cobble and stone may be present.	Moderately deep to deep, mottled, brown and black, gradational soils and non cracking clays with harsetting surfaces; clay loam to light clay, medium to thick A horizons; light medium to medium clay B horizons; neutral soil reaction trend. Brown and Black Dermosols.	Open forest. Queensland blue gum and swamp mahogany.	VI m3, ps2, ts4, e2
LU6	10	Convex low to mid slopes, 8–15%. Few medium gravel on surface and rock outcrop present.	Shallow to moderately deep, brown and yellow, non sodic and sodic duplex soils with hardsetting surfaces; clay loam, medium to thick A horizons with bleached A2 horizons; medium to medium heavy clay B horizons; few to common, fine to medium gravel; neutral soil reaction trend. Brown and Yellow Chromosols.	Open forest. Narrow-leaved ironbark, occasionally with bloodwoods and yellow stringybark.	VI m3–4, (pd3), ps2, r3–4, e3 or 6

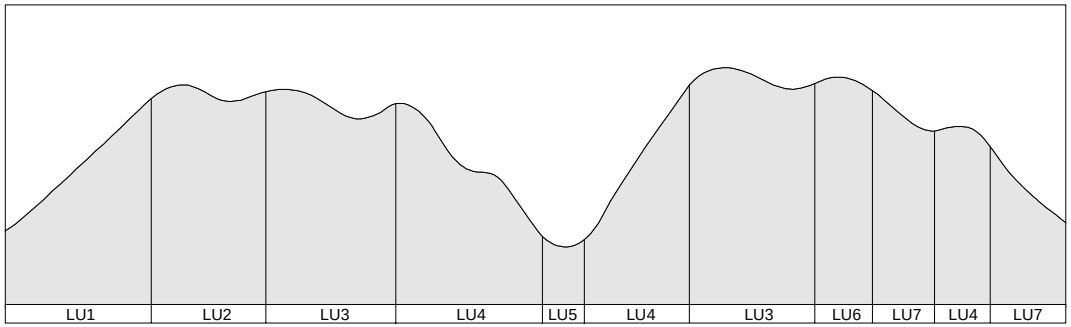
LAND SYSTEM – MUNCON 2 (Mc2)

General Description: Rolling mountains to very steep mountains on basic to intermediate, intrusive and extrusive igneous rocks. Major soils are shallow to deep, brown and red non cracking clays and gradational soils (Brown and Red Dermosols), shallow to moderately deep, brown and yellow, non sodic duplex soils (Brown and Yellow Chromosols and Kurosols), and shallow, uniform, medium to fine textured soils over rock (Bleached Leptic and Chernic Leptic Tenosols).

Geology: Muncon Volcanics – Intermediate and basic lava, tuff, agglomerate, siltstone, lithic arenite, conglomerate and mudstone.

Landform: Rolling mountains to very steep mountains.

Vegetation: Open to closed forest. 'Rainforest' species or yellow stringybark, bloodwoods, narrow-leaved ironbark, Queensland blue gum, gum-topped box and swamp mahogany, often with forest she oak and zamia palm dominating the understorey.



Land Unit	Area %	Landform Attributes	Soils	Remnant Vegetation	Land Class
LU1	30	Slopes, 40–80%. Many to abundant surface cobble and boulders and rock outcrop.	Shallow to moderately deep, uniform, medium to fine textured soils over rock and brown, non sodic duplex soils with hardsetting surfaces; loam to clay loam, medium A horizons usually with bleached A2 horizons over rock; (when present) light to medium clay B horizons with many to abundant gravel and cobble throughout profile; acid to neutral soil reaction trend. Bleached Leptic Tenosols and Brown Chromosols.	Open forest. Yellow stringybark, bloodwoods, narrow-leaved ironbark, Queensland blue gum and forest she oak with an understorey of zamia palms and ferns.	VIII m6, pd3–4, ps3, ts7–8, r5, e7–8
LU2	15	Undulating summit crests, 3–10%. Few to many large pebbles to stone usually present on surface. Igneous rock outcrop often present.	Shallow to moderately deep, occasionally mottled, brown, gradational soils and sodic and non sodic duplex soils, with hardsetting surfaces; loam to clay loam, medium A horizons with bleached A2 horizons; light to medium clay B horizons, often with few to many medium gravel and ferromagniferous nodules; acid to neutral soil reaction trend. Brown Chromosols, Kurosols and Dermosols.	Open forest. Spotted gum, narrow-leaved ironbark, yellow stringybark, bloodwoods and Queensland blue gum with forest she oak and zamia palm often present in understorey. Occasionally pure stands of gum-topped box with forest she oak.	VI m4 or 6, pd3–4, ps3, r3–5, e2-3, x6.
LU3	5	Undulating summit crests, 3–10%. Surface pebbles and cobble may be present.	Shallow to moderately deep, brown and red, non cracking clays and gradational soils with firm to hardsetting surfaces; clay loam to light clay, medium to thick A horizons; light to light medium clay B horizons, often with medium gravel to cobble; acid to neutral soil reaction trend. Brown and Red Dermosols.	Closed forest. 'Rainforest' species.	VI m3–4, pd3, (r2–3), e2–3, x6

(cont.)

MUNCON 2 (continued)

Land Unit	Area %	Landform Attributes	Soils	Remnant Vegetation	Land Class
LU4	30	Slopes, 40–80%. Usually common to abundant surface cobble and stone. Rock outcrop may be present.	Shallow to deep, red and brown, non cracking clays and gradational soils with firm to hardsetting surfaces; clay loam to light clay, medium to thick A horizons; light clay to light medium clay B horizons, usually with few to abundant medium gravel to stone throughout; acid soil reaction trend. Red and Brown Dermosols.	Closed forest. 'Rainforest' species.	VII m6, pd3–4, ps2, ts7–8, r5, e7–8
LU5	5	Lower slopes and drainage lines, 5–10%.	Moderately deep to deep, often mottled, brown and grey, non cracking clays and gradational soils with hardsetting surfaces; clay loam to light clay, medium to thick A horizons; light clay to light medium clay B horizons; D horizons of sandy clay loam to sandy light clay may occur; often medium to coarse gravel in profile; acid to neutral soil reaction trend. Brown and Grey Dermosols.	Closed forest or open forest. 'Rainforest' species or yellow stringybark, Queensland blue gum, bloodwoods and swamp mahogany.	VIII m3, ps2, e6, x6
LU6	5	Undulating summit crests, 3–10%. Many to abundant cobbles and boulders.	Shallow to moderately deep, brown, gradational soils and uniform, medium to fine textured soils over rock; clay loam to light clay, medium to thick A horizons over rock; (when present) light clay B horizons; medium gravel to stone usually present; acid soil reaction trend. Brown Dermosols and Chernic Leptic Tenosols.	Open forest. Yellow stringybark and bloodwoods.	VI m6, pd3–4, ps2, r4–5, e2–3, x6
LU7	20	Steep slopes, 40–80%. Surface stone and boulders common. Rock outcrop often present.	Shallow to moderately deep, brown and yellow, non sodic duplex soils with firm to hardsetting surfaces; sandy clay loam to clay loam sandy, thick A horizons with bleached A2 horizons; medium clay B horizons usually with many to abundant medium gravel to stone; acid to neutral soil reaction trend. Brown and Yellow Chromosols and Kurosols.	Open forest. Yellow stringybark, narrow-leaved ironbark, bloodwoods and forest she oak.	VIII m6, pd3, ps2, ts7–8, r5, e7–8

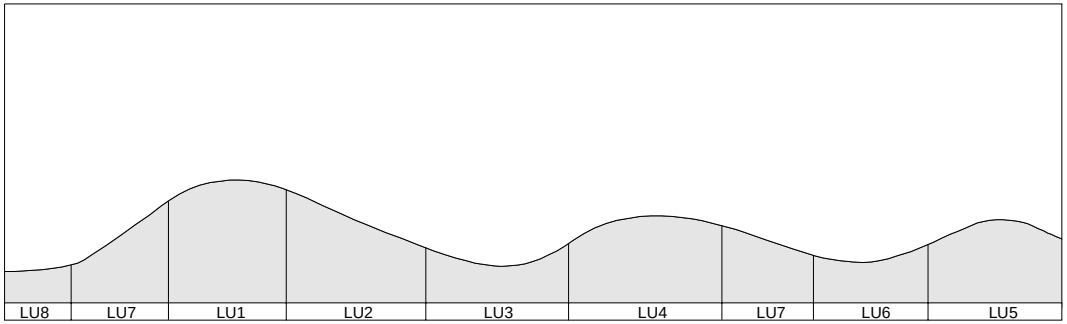
LAND SYSTEM – AGNES WATER 1 (Aw1)

General Description: Gently undulating rises to low hills on acid and intermediate volcanic rocks. Major soils are moderately deep to deep, brown and red, non cracking clays and brown, grey and yellow, sodic duplex soils (Brown and Red Dermosols and Brown, Grey and Yellow Sodosols).

Geology: Agnes Water Volcanics – Ignimbrite, acid to intermediate flows, acid tuff, breccia, minor sandstone and conglomerate.

Landform: Gently undulating rises to undulating low hills.

Vegetation: Woodland, extensively cleared. Narrow-leaved ironbark, Queensland blue gum, Moreton Bay ash and bloodwoods with minor spotted gum, gum-topped box and *Melaleuca* species.



Land Unit	Area %	Landform Attributes	Soils	Remnant Vegetation	Land Class
LU1	10	Crests and upper slopes higher in the landscape, 3–6%. Moderate to abundant rock outcrop and surface stone.	Shallow, brown and red, gradational soils and non sodic duplex soils; sandy clay loam to clay loam, medium A horizons; light to medium clay B horizons, with common to many gravel throughout; neutral to alkaline soil reaction trend. Brown and Red Dermosols and Chromosols.	Woodland. Spotted gum and narrow-leaved ironbark.	VI m6, pd4, ps2, r4, e2–3
LU2	15	Mid slopes, 5–10%. Surface stone may be present.	Deep, black to brown, gradational soils and non cracking clays; clay loam to light clay, medium to thick A horizons occasionally with bleached A2 horizons; light medium to medium clay B horizons; few to many iron and manganese nodules throughout; neutral to alkaline soil reaction trend. Black and Brown Dermosols.	Woodland to isolated trees. Queensland blue gum and bloodwoods.	III m3, ps2, pm2, (r2), e2–3
LU3	15	Lower slopes and drainage lines, 1–3%.	Moderately deep to deep, brown and grey, non cracking clays (occasionally cracking clays); light clay to light medium clay, medium to thick A horizons; medium clay B horizons with many gravel at depth; many iron and manganese nodules present often with carbonate at depth; neutral to alkaline soil reaction trend. Brown and Grey Dermosols (occasionally Vertosols).	Woodland. Queensland blue gum and narrow-leaved ironbark.	IV m3, ps2, pm2, w4, e2–3
LU4	15	Crests (1–3%) and upper slopes (4–10%). Surface gravel and cobble may be present.	Moderately deep to deep, brown and red, non cracking clays and sodic duplex soils with hardsetting surfaces; clay loam to light clay, medium A horizons occasionally with bleached A2 horizons; medium clay B horizons, with few to abundant gravel throughout; neutral to alkaline soil reaction trend. Brown and Red Dermosols and Brown Chromosols.	Woodland. Narrow-leaved ironbark, Moreton Bay ash, Queensland blue gum and bloodwoods with wattles dominating the lower stratum.	IV m4 or 6, ps2, (r2), e2–3

(cont.)

AGNES WATER 1 (continued)

Land Unit	Area %	Landform Attributes	Soils	Remnant Vegetation	Land Class
LU5	15	Crests, ridges and upper slopes, 2–5%.	Shallow to moderately deep, occasionally mottled, brown and grey, sodic duplex soils; loam to clay loam, medium to thick A horizons with bleached A2 horizons; light to medium clay B horizons; with many iron and manganese nodules throughout; neutral to alkaline soil reaction trend. Brown and Grey Sodosols.	Open forest to open woodland. Narrow-leaved ironbark, Moreton Bay ash and bloodwoods with minor gum-topped box.	VI m6, pd3–4, ps3, e3.
LU6	10	Concave lower slopes, 2 – 6%.	Moderately deep to deep, mottled, brown and grey, sodic duplex soils; loam to clay loam, medium to thick A horizons with bleached A2 horizons; light medium to medium clay B horizons; with few to many iron and manganese nodules; neutral to alkaline soil reaction trend. Brown and Grey Sodosols and Chromosols.	Woodland. Queensland blue gum, bloodwoods, swamp mahogany and minor narrow-leaved ironbark and *Melaleuca* species.	VI m4 or 6, pd3-4, ps3, sa2–4, e3–4.
LU7	10	Mid slopes, 10–15%.	Moderately deep, brown and yellow, sodic duplex soils; fine sandy clay loam to sandy clay loam, medium A horizons with bleached A2 horizons; light medium to medium clay B horizons; neutral to alkaline soil reaction trend. Brown and Yellow Sodosols.	Woodland. Narrow-leaved ironbark, bloodwoods and spotted gum.	VI–VII m6, pd4, ps3, e6–7.
LU8	10	Lower slopes and flats, 2–4%.	Moderately deep to deep, black and grey, sodic duplex soils; loam to clay loam, medium A horizons with bleached A2 horizons; light medium to medium clay B horizons; with few to many iron and manganese nodules; alkaline soil reaction trend. Black and Grey Sodosols.	Woodland. Gum-topped box and Queensland blue gum.	VI m6, pd4, ps3, sa3–4, e3, f2.

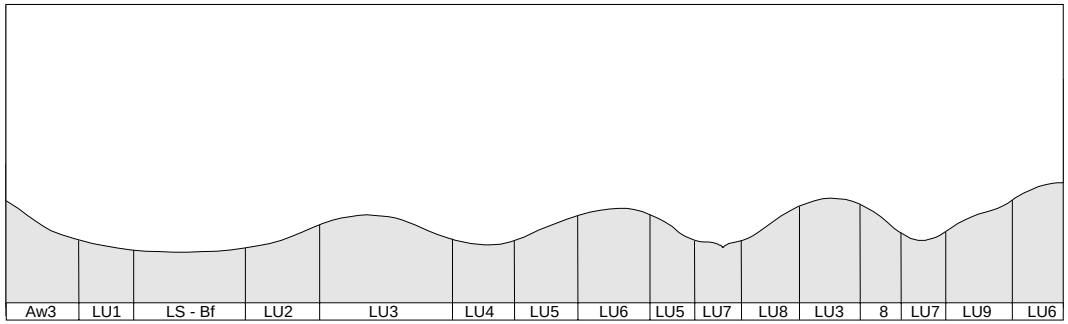
LAND SYSTEM – AGNES WATER 2 (Aw2)

General Description: Gently undulating rises to rolling low hills on acid to intermediate volcanic rocks. Major soils are moderately deep to deep, grey, brown, and yellow, sodic duplex soils (Grey, Brown and Yellow Sodosols, Kurosols and Chromosols), and brown and yellow, gradational soils (Brown and Yellow Dermosols).

Geology: Agnes Water Volcanics – Ignimbrite, acid to intermediate flows, acid tuff, breccia, minor sandstone and conglomerate.

Landform: Gently undulating rises to rolling low hills.

Vegetation: Open forest with limited to extensive clearing. White mahogany, bloodwoods, gum topped box, Queensland blue gum and minor swamp mahogany, pink bloodwood and narrow-leaved ironbark, with broad-leaved tea tree, wattles, and *Banksia* species dominating the lower stratum.



Land Unit	Area %	Landform Attributes	Soils	Remnant Vegetation	Land Class
LU1	10	Footslopes, 1–2%.	Moderately deep, mottled, grey, sodic duplex soils with hardsetting surfaces; sandy loam to fine sandy loam, thick A horizons with bleached A2 horizons; light to light medium clay B horizons; many fine gravel at depth; acid to neutral soil reaction trend. Grey Sodosols.	Open forest. Yellow stringybark with *Melaleuca* species, *Banksia* species and grass trees dominating the lower stratum.	VI m6, pd4, ps4, nd3, e2
LU2	15	Mid to lower slopes, 5–10%.	Deep, grey, sodic duplex soils with hardsetting surfaces; coarse sandy loam, very thick A horizons with bleached A2 horizons; sandy light clay to medium clay B horizons; with few to many fine gravel; acid soil reaction trend. Grey Kurosols.	Open forest. Yellow stringybark and bloodwoods, with swamp paperbark, *Banksia* and *Casuarina* species dominating the lower stratum.	VI m6, pd3, ps4, nd3, e6
LU3	10	Crests, 1–5%. Surface gravel and rock outcrop common.	Shallow to moderately deep, brown and grey, sodic duplex sodic soils with hardsetting surfaces; sandy loam to sandy clay loam, medium to thick A horizons with bleached A2 horizons; light medium to medium clay B horizons with few to many fine gravel; neutral to acid soil reaction trend. Brown and Grey Sodosols and Kurosols.	Open forest. Bloodwoods, narrow-leaved ironbark, smooth-barked apple, Queensland blue gum, yellow stringybark and minor swamp mahogany with wattles and *Banksia* species dominating the lower stratum.	VI m6, pd4, ps4, nd3, r3, e3

(cont.)

AGNES WATER 2 (continued)

Land Unit	Area %	Landform Attributes	Soils	Remnant Vegetation	Land Class
LU4	10	Concave lower slopes and flats, 0.5–3%.	Deep to very deep, mottled, brown and grey, sodic duplex and gradational soils with hardsetting surfaces; loam to clay loam, medium A horizons with bleached A2 horizons; light to light medium clay B horizons with fine gravel; alkaline soil reaction trend. Grey Kandosols and Sodosols.	Open forest to woodland. Queensland blue gum and pink bloodwood with minor swamp mahogany and yellow stringybark with broad-leaved paperbark dominating the lower stratum.	VII m6, pd4, ps4, nd3, (sa4), (w4), e2
LU5	5	Mid slopes, 4–8%.	Moderately deep, yellow, sodic duplex soils with hardsetting surfaces; coarse sandy clay loam to fine sandy clay loam, thick A horizons with bleached A2 horizons; light to light medium clay B horizons; acid to neutral soil reaction trend. Yellow Chromosols and Sodosols.	Open forest. Yellow stringybark and pink bloodwood with black she oak and broad-leaved paperbark dominating the lower stratum.	VI m6, pd3, ps4, nd3, e3 or 6.
LU6	10	Hillcrests, 2–4 %. Many fine gravel on surface.	Moderately deep, mottled, yellow, sodic duplex soils with hardsetting surfaces; clay loam, medium A horizons with bleached A2 horizons; medium clay B horizons with few to abundant fine gravel; neutral soil reaction trend. Yellow Sodosols.	Open forest. Bloodwoods, narrow-leaved ironbark and yellow stringybark.	VI m6, pd4, ps3, nd3, r2, e3
LU7	15	Lower concave slopes, 0.5–4%.	Deep, grey, usually mottled, sodic duplex and gradational soils with hardsetting surfaces; fine sandy clay loam to clay loam, medium A horizons with conspicuously bleached A2 horizons; light to medium heavy clay B horizons; with few to common fine gravel; alkaline soil reaction trend. Grey Kandosols, Sodosols and Chromosols	Open forest to woodland. Gum-topped box, Queensland blue gum and minor pink bloodwood and swamp mahogany with broad-leaved paperbark dominating the lower stratum.	VII m6, pd4, ps4. nd3, (sa4), (w4), e2–3
LU8	10	High mid slopes, 10–25%.	Deep, grey, sodic duplex soils with hardsetting surfaces; fine sandy clay loam, medium A horizons with bleached A2 horizons horizons; light medium clay B horizons; with few fine gravel at depth; neutral soil reaction trend. Grey Sodosols.	Open forests. Spotted gum and narrow-leaved ironbark with *Casuarina* species and red ash dominating the understorey.	VIII m6, pd4, ps4, nd3, ts6–7, e7–8
LU9	10	High mid slopes, 5–15%.	Moderately deep, mottled, brown, gradational soils with hardsetting surfaces; clay loam, medium A horizons with conspicuously bleached A2 horizons; light to light medium clay B horizons; with few to abundant fine gravel; neutral soil reaction trend. Brown Dermosols.	Open forest. Queensland blue gum, swamp mahogany and Moreton Bay ash.	VII m6, pd4, ps4, nd3, e6–7

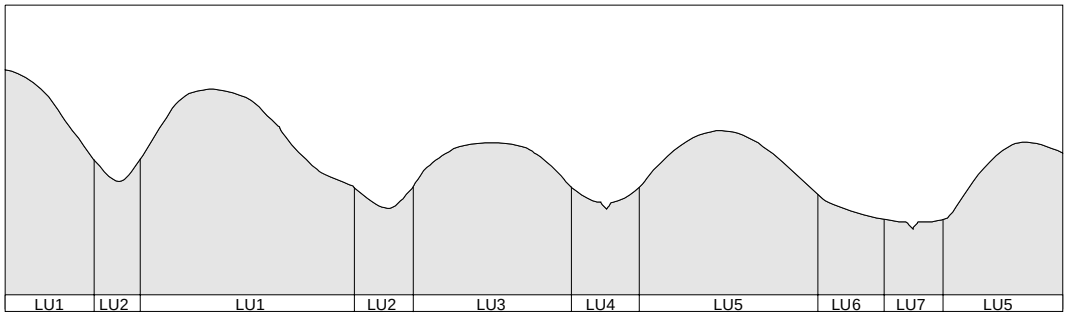
LAND SYSTEM - ARANBANGA (Ab)

General Description: Rolling low hills on acid volcanic rocks. Major soils are shallow, stony, uniform, medium and coarse textured soils (Bleached Leptic and Leptic Tenosols), red and brown, non sodic duplex soils (Red and Brown Chromosols) and black, grey, brown and yellow non cracking clays and sodic duplex soils (Black, Grey, Brown and Yellow Dermosols and Sodosols).

Geology: Undivided formation of the Aranbanga Volcanic Group – Andesitic to rhyolitic flows and pyroclastics, minor polymictic conglomerate, volcanic breccia.

Landform: Rolling low hills.

Vegetation: Open forest to woodland, with limited extensive clearing. Narrow-leaved ironbark, spotted gum, bloodwoods, Queensland blue gum and Moreton Bay ash.



Land Unit	Area %	Landform Attributes	Soils	Remnant Vegetation	Land Class
LU1	20	Crests, upper and mid slopes, 12–30%, some slopes up to 40%. Rock outcrop and surface stone may be present.	Shallow, stony, uniform, coarse to medium textured soils over rock and brown, non sodic duplex soils with hardsetting surfaces; sandy loam to sandy clay loam, medium to thick A horizons with bleached A2 horizons; (when present) sandy loam to light clay B horizons with few to abundant fine to medium gravel; acid to neutral soil reaction trend. Bleached-Leptic Tenosols and Brown Chromosols.	Open forest. Narrow-leaved ironbark, spotted gum, bloodwoods with red ash often present.	VII m6, pd4, nd3, ts6–7, r2–5, e6–7
LU2	<5	Lower concave slopes, 8–15%. Rock outcrop and surface stone may be present.	Shallow to moderately deep, uniform, medium textured soils over rock, and often mottled, grey and yellow, sodic and non sodic duplex soils with hardsetting surfaces; sandy clay loam to clay loam, medium to thick A horizons with bleached A2 horizons; (when present) light to light medium clay B horizons; few to common stone and cobble throughout profile; acid to neutral soil reaction trend. Bleached-Leptic Tenosols and Yellow and Grey Chromosols and Sodosols.	Woodland. Silver-leaved ironbark and narrow-leaved ironbark and minor Queensland blue gum.	VI–VII m6, pd3–4, ps3, ts4, r2–5, e4 or 6
LU3	30	Crests and slopes, 10–20%. Rock outcrop and surface stone may be present in some areas.	Shallow to moderately deep, red and brown, non sodic duplex soils and uniform, medium textured soils over rock with hardsetting surfaces; sandy loam to clay loam, medium to thick A horizons; (when present) light to medium clay B horizons; common to many medium gravel often present throughout profile; acid to neutral soil reaction trend. Red and Brown Chromosols and Leptic Tenosols.	Open forest to woodland. Silver-leaved ironbark, narrow-leaved ironbark and bloodwoods.	VI–VII m6, pd3–4, ps3, nd3, ts6, r2–5, e6

(cont.)

ARANBANGA (continued)

Land Unit	Area %	Landform Attributes	Soils	Remnant Vegetation	Land Class
LU4	<5	Lower slopes and major drainage lines, 3–12% slope.	Moderately deep to deep, often mottled, brown and grey, sodic duplex soils with hardsetting surfaces; sandy clay loam to clay loam, medium to thick A horizons with bleached A2 horizons; medium clay B horizons, often with medium to large gravel or cobble; alkaline soil reaction trend. Brown and Grey Sodosols.	Open forest to woodland. Queensland blue gum, Moreton Bay ash, narrow-leaved ironbark with wattles often present.	VI m6, pd3, ps3, e3-4
LU5	25	Crests and upper slopes, 15–25%. Rock outcrop and surface stone common in some areas.	Shallow, black, grey and brown, non cracking clays and sodic duplex soils with hardsetting surfaces; clay loam to light clay, medium A horizons often with bleached A2 horizons; medium clay B horizons; cobble often throughout profile; alkaline soil reaction trend. Black, Grey and Brown Dermosols and Sodosols.	Woodland. Narrow-leaved ironbark.	VI–VII m4–6, pd3–4, ps3, ts6–7, r2–5, e6
LU6	20	Mid slopes, 12–20%. Rock outcrop and surface stone common in some areas.	Shallow, black, grey and brown, non cracking clays and sodic duplex soils with hardsetting surfaces; clay loam to light clay, medium A horizons often with bleached A2 horizons; medium clay B horizons with common to many medium gravel; neutral to alkaline soil reaction trend. Black, Grey and Brown Dermosols and Chromosols.	Woodland. Narrow-leaved ironbark and silver-leaved ironbark.	VI–VII m4–6, pd3–4, ps3, ts6, r2–5, e6
LU7	<5	Lower slopes and drainage lines, 2–5% slope.	Deep, black and grey, sodic duplex soils and non cracking clays with hardsetting surfaces; clay loam to light clay, medium A horizons often with bleached A2 horizons; medium clay B horizons; alkaline soil reaction trend. Black and Grey Dermosols and Sodosols.	Woodland. Queensland blue gum and Moreton Bay ash.	IV or VI m4 or 6, ps3, sa2–3, e4

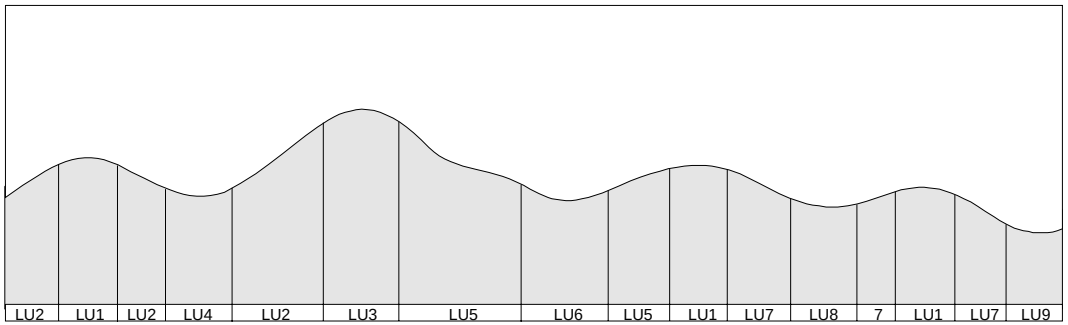
LAND SYSTEM – EDDINGTON (Ed)

General Description: Undulating low hills to rolling low hills on volcanic rocks. Major soils are shallow to moderately deep, brown and red, non cracking clays and gradational soils (Brown and Red Dermosols) and moderately deep, brown, sodic duplex soils, (Brown Sodosols).

Geology: Undivided volcanic group – Basaltic to andesitic flows and pyroclastics.

Landform: Undulating low hills to rolling low hills.

Vegetation: Woodland to open woodland with extensive to complete clearing. Narrow-leaved ironbark, Moreton Bay ash, silver-leaved ironbark, spotted gum, Queensland blue gum and swamp mahogany.



Land Unit	Area %	Landform Attributes	Soils	Remnant Vegetation	Land Class
LU1	15	Crests, 1–3%. Common to many coarse surface gravel with areas of rock outcrop.	Very shallow to shallow, brown and red, gradational and non sodic duplex soils with hardsetting surfaces; clay loam medium A horizons; light clay to light medium clay B horizons; with many to abundant medium to coarse gravel; neutral soil reaction trend. Brown and Red Dermosols and Chromosols.	Woodland. Narrow-leaved ironbark, Moreton Bay ash, bloodwoods and silver-leaved ironbark.	VI m6, pd3–4, ps2, r3–4, e2
LU2	15	Concave mid slopes, 10–20%, with some slopes up to 40%. Rock outcrop and medium to coarse surface gravel may be present.	Shallow to moderately deep, often mottled, brown, gradational soils and non cracking clays with hardsetting surfaces; clay loam to light clay, medium A horizons, light to light medium clay B horizons with few to many medium gravel; neutral soil reaction trend. Brown Dermosols.	Woodland. Narrow-leaved ironbark and Queensland blue gum.	VI–VII m3–4, ps2, ts6–7, r3–4, e6–7
LU3	15	Higher crests and ridges (1–4%) and upper slopes (10–20%). Common to abundant cobbles on surface and rock outcrop.	Very shallow to shallow, brown and red, non sodic duplex soils and gradational soils with hardsetting surfaces; sandy clay loam to clay loam, medium A horizons; light to medium clay B horizons, with common to many small gravel; neutral soil reaction trend. Brown and Red Chromosols and Dermosols.	Woodland. Narrow-leaved ironbark, Moreton Bay ash and spotted gum with wattles dominating the lower stratum.	VI m6, pd3–4, ps2, (ts6), r4–5, e2–3 or 6
LU4	5	Lower slopes and narrow drainage lines, 1 – 4%. Rock outcrop may be present.	Moderately deep to deep, red and brown, non cracking clays and gradational soils with hardsetting surfaces; clay loam to light clay, medium A horizons; medium to medium heavy clay B horizons with few to many medium to coarse gravel; soil reaction trend. Red and Brown Dermosols.	Woodland. Narrow-leaved ironbark, Queensland blue gum and minor wattles in the lower stratum.	III–IV m3, ps2, (r3–4), e2

(cont.)

EDDINGTON (continued)

Land Unit	Area %	Landform Attributes	Soils	Remnant Vegetation	Land Class
LU5	15	Convex mid slopes, 5–15%. Rock outcrop may be present.	Shallow, red, non cracking clays with hardsetting surfaces; light clay, thin to medium A horizons; light medium to medium clay B horizons with few to common medium to coarse gravel; neutral soil reaction trend. Red Dermosols.	Woodland. Narrow-leaved ironbark, silver-leaved ironbark, Moreton Bay ash and bloodwoods.	IV m4, pd3–4, ps2, e3–4
LU6	10	Concave lower slopes and drainage lines, 1–6%. Minor rock outcrop may be present.	Moderately deep to deep, red and brown, non cracking clays, with hardsetting surfaces; light clay, medium A horizons; light medium to medium heavy clay B horizons with common to many fine to coarse gravel; neutral soil reaction trend. Red and Brown Dermosols.	Woodland. Narrow-leaved ironbark, bloodwoods, Moreton Bay ash and Queensland blue gum.	III–IV m3–4, ps2, (r3), e3–4
LU7	15	Convex mid slopes, 4–10%.	Moderately deep, brown, sodic duplex soils with hardseting surfaces; clay loam, medium to thick A horizons with bleached A2 horizons; light medium to medium clay B horizons, often with fine to medium gravel; neutral soil reaction trend. Brown Sodosols.	Woodland. Narrow-leaved ironbark and Moreton Bay ash.	VI m6, pd3–4, ps3, e6
LU8	5	Lower slopes, 2–4%.	Moderately deep, brown and grey, sodic duplex soils, with hardsetting surfaces; clay loam, medium A horizons, with bleached A2 horizons; light medium to medium clay B horizons usually with few to common fine to medium gravel; neutral to alkaline soil reaction trend. Brown and Grey Sodosols.	Woodland. Queensland blue gum, swamp mahogany and narrow-leaved ironbark.	VI m6, pd4, ps3, e3
LU9	5	Concave low slopes and flats, 1–3%.	Moderately deep, often seasonally wet, brown and grey, non cracking clays with hardsetting surfaces; light clay, thick to very thick A horizons often with bleached A2 horizons; light to light medium clay B horizons; neutral soil reaction trend. Oxyaquic Hydrosols and Brown Dermosols. .	Open woodland. Narrow-leaved ironbark and Queensland blue gum.	IV m3, ps2, w4, e3

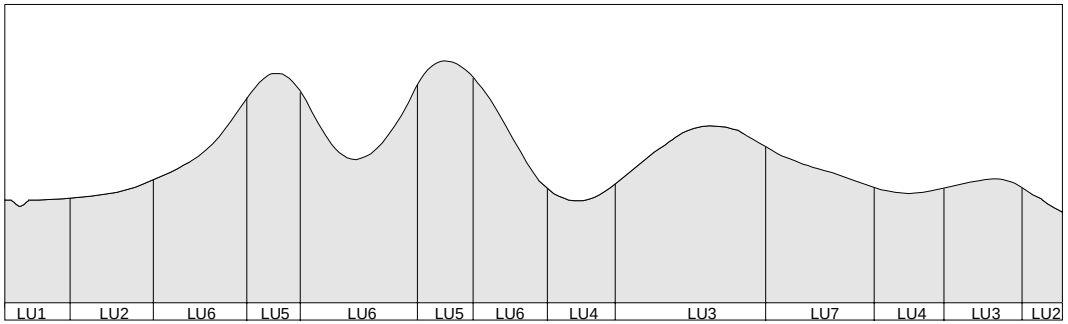
LAND SYSTEM – AGNES WATER 3 (Aw3)

General Description: Rolling hills to steep mountains and associated pediments on acid and intermediate volcanic rocks. Major soils are very shallow to shallow moderately deep, brown and yellow, uniform to gradational soils with hardsetting surfaces, usually with gravel throughout and moderately deep to deep, mottled, brown and grey, gradational soils and sodic and non sodic duplex soils, with hardsetting surfaces (Brown and Yellow Dermosols and Kandosols and Bleached Leptic Tenosols and Brown and Grey Sodosols and Chromosols).

Geology: Agnes Water Volcanics – Ignimbrite, acid to intermediate flows, acid tuff, breccia, minor sandstone and conglomerate.

Landform: Rolling hills to steep mountains.

Vegetation: Closed to open forest with no disturbance to limited clearing. Narrow-leaved ironbark, bloodwoods, gum-topped box, yellow stringybark and Queensland blue gum with minor Moreton Bay ash and spotted gum, with wattles, *Casuarina* and *Grevillea* species dominating the understorey.



Land Unit	Area %	Landform Attributes	Soils	Remnant Vegetation	Land Class
LU1	5	Flats and drainage lines, 0–2%.	Moderately deep to deep, mottled, brown and grey, brown and grey sodic duplex soils with hardsetting surfaces; loam to clay loam, medium A horizons with bleached A2 horizons; light medium to medium clay B horizons, often with fine gravel throughout; alkaline soil reaction trend. Brown and Grey Sodosols.	Open forest. Queensland blue gum, brown bloodwood and swamp mahogany, with broad-leaved paperbark and *Casuarina* species dominating the understorey.	VI m6, pd4, ps3, nd3, sa2–4, e2
LU2	10	Concave lower slopes, 3–10%.	Moderately deep to deep, often mottled, brown, grey and yellow, gradational soils and sodic duplex soils with hardsetting surfaces; fine sandy loam to clay loam, medium to thick A horizons often with bleached A2 horizons; light to medium clay B horizons; few to many fine to medium gravel at depth; acid to alkaline soil reaction trend. Brown, Grey and Yellow Dermosols and Sodosols.	Open forest to Woodland. Bloodwoods, Queensland blue gum, gum-topped box, yellow stringybark, swamp mahogany and Moreton Bay ash with *Casuarina*, *Grevillea* and *Melaleuca* species in understorey, occasionally with broad-leaved paperbark dominant.	VI m6, pd3–4, ps3, nd3, e6
LU3	20	Convex mid to upper slopes, 5–15%. Surface gravel and cobbles common. Rock outcrop may be present.	Shallow to moderately deep, often mottled, uniform, coarse to medium textured soils over rock and grey and yellow sodic duplex soils with hardsetting surfaces; sandy loam to clay loam, medium to thick A horizons with bleached A2 horizons; (when present) light to medium clay B horizons; few to abundant gravel throughout profile; acid to neutral soil reaction trend. Bleached Leptic Tenosols and Grey and Yellow Sodosols.	Closed forest. Bloodwoods, yellow stringybark, narrow-leaved ironbark, spotted gum and gum-topped box with *Casuarina*, *Grevillea* and *Melaleuca* species and grass trees in the understorey.	VI m6, pd4, ps3, nd3, r3–4, e6

(cont)

AGNES WATER 3 (continued)

Land Unit	Area %	Landform Attributes	Soils	Remnant Vegetation	Land Class
LU4	5	Lower concave slopes, 4–10%. Surface gravel common.	Shallow to moderately deep, yellow, uniform, medium textured soils with hardsetting surfaces; clay loam, medium to thick A horizons,with bleached A2 horizons; clay loam B horizons, with many medium gravel throughout; acid soil reaction trend. Yellow Kandosols.	Closed forest. Queensland blue gum, gum-topped box and rainforest species often present, with wattles dominating the lower stratum.	VII m4 or 6, pd3, ps3, nd3, ts4, r4, e3, f3
LU5	25	Hillcrests and upper slopes higher in the landscape, 20–40%. Abundant surface cobble and rock outcrop.	Very shallow to shallow, uniform, medium textured soils over rock and brown and red, gradational soils with hardsetting surfaces; sandy clay loam to clay loam, medium A horizons usually with bleached A2 horizons; (when present) clay loam to light clay B horizons with many to abundant coarse gravel and stones throughout; acid to neutral soil reaction trend. Bleached Leptic Tenosols and Red and Brown Dermosols and Kandosols.	Closed forest. Narrow-leaved ironbark, bloodwoods and spotted gum with wattles dominating the understorey.	VIII m6, pd4, ps3, nd3, ts7, r5, e7
LU6	25	Mid to lower slopes, 25–60%. Abundant cobble on surface and rock outcrop.	Very shallow, medium textured soils over rock and shallow to moderately deep, brown, gradational soils with hardsetting surfaces; clay loam, medium A horizons; (when present) light clay B horizons; many to abundant coarse gravel and stones throughout profile; acid to neutral soil reaction trend. Bleached Leptic Tenosols and Brown Kandosols and Dermosols.	Closed forest. Narrow-leaved ironbark and spotted gum with wattles dominating the lower stratum and areas of rainforest species.	VIII m6, pd3–4, ps3, nd3, ts7–8, r5, e7–8
LU7	10	Concave mid slopes, 15–30%. Few surface cobbles and moderate rock outcrop.	Moderately deep, brown, gradational soils and non cracking clays with hardsetting surfaces; clay loam to light clay, thick A horizons with bleached A2 horizons; light clay B horizons; common to abundant cobbles throughout profile; neutral soil reaction trend. Brown Dermosols.	Open forest. Bloodwoods, yellow stringybark and gum-topped box with brush box and *Casuarina* species dominating the understorey.	VII m4, pd3, nd3, ts6–7, r2–4, e6–7.

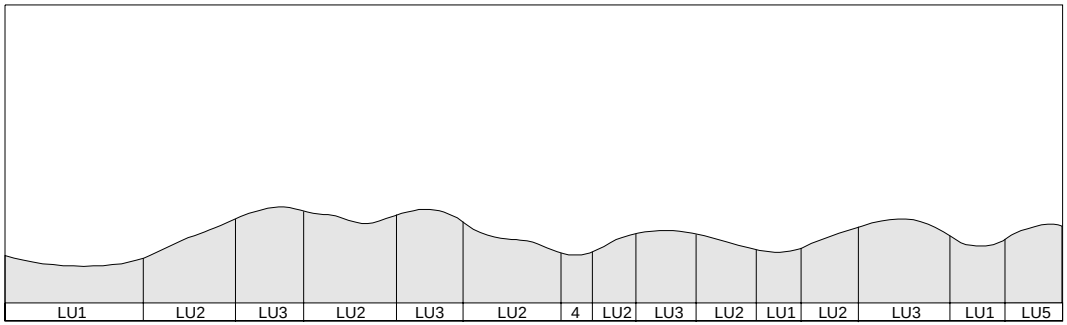
LAND SYSTEM – MIRIAM VALE 1 (Mv1)

General Description: Gently undulating rises to undulating rises on intermediate intrusive rocks. Major soils are shallow to moderately deep, brown and red, gradational and non sodic duplex soils (Brown and Red Dermosols and Chromosols), moderately deep to deep, brown, grey and yellow, sodic duplex soils, (Brown,Yellow and Grey Sodosols and Chromosols) and deep black and grey cracking clays (Black and Grey Vertosols).

Geology: Miriam Vale Granodiorite – Granodiorite and quartz diorite and minor pegmatite, gneiss and gabbro.

Landform: Gently undulating rises to undulating rises.

Vegetation: Open forest to woodland, extensively to completely cleared. Queensland blue gum, narrow-leaved ironbark, Moreton Bay ash, bloodwoods and silver-leaved ironbark.



Land Unit	Area %	Landform Attributes	Soils	Remnant Vegetation	Land Class
LU1	20	Lower slopes, plains and drainage lines, 0–2%. Gilgai may be present.	Deep, black and grey cracking clays (occasionally non cracking clays) with self mulching to hard setting surfaces; light to medium clay A horizons; light medium to heavy clay B horizons; alkaline soil reaction trend. Black and Grey Vertosols and occasionally Black and Grey Dermosols.	Woodland. Queensland blue gum, Moreton Bay ash and narrow-leaved ironbark.	III–IV m2, ps3, pm2–3, (tm2)(w4), e2, f2–3
LU2	35	Mid slopes, 5–10%	Moderately deep to deep, brown, gradational soils and non sodic and sodic duplex soils with hardsetting surfaces; sandy clay loam to clay loam, medium A horizons often with bleached A2 horizons; light medium clay B horizons; alkaline soil reaction trend. Brown Dermosols, Chromosols and Sodosols.	Open forest. Narrow-leaved ironbark, Moreton Bay ash and bloodwoods.	III, IV or VI m3–4, pd3, ps3, e3–6
LU3	25	Hillcrests and upper slopes, 4–10%. Few medium gravel may be present on surface.	Shallow to moderately deep, brown and red, non cracking clays, gradational soils and non sodic duplex soils with hardsetting surfaces; clay loam to light clay, thin to medium A horizons; light medium to medium clay B horizons; neutral to alkaline soil reaction trend. Brown and Red Chromosols and Dermosols.	Woodland. Narrow-leaved ironbark, bloodwoods and occasional Queensland blue gum and silver-leaved ironbark.	III–IV m3–4, pd3–4, ps3, (r2), e2–3
LU4	10	Concave lower slopes and narrow drainage lines, 1–3%.	Moderately deep to deep, often mottled, grey to yellow, sodic duplex soils with hardsetting surfaces; sandy clay loam to clay loam, medium A horizons with bleached A2 horizons; light medium to medium heavy clay B horizon; acid to alkaline soil reaction trend. Grey and Yellow Sodosols and Kurosols.	Open forest. Queensland blue gum, Moreton Bay ash and narrow-leaved ironbark.	VI m6, pd3–4, ps3, sa2, e2, f2–3

(cont.)

MIRIAM VALE 1 (continued)

Land Unit	Area %	Landform Attributes	Soils	Remnant Vegetation	Land Class
LU5	10	Crests and ridges (2–4%) and mid to upper slopes (3–7%).	Moderately deep to deep, brown and grey, sodic duplex soils with hardsetting surfaces; sandy clay loam to clay loam, medium A horizons often with bleached A2 horizons; medium clay B horizons with few to common small gravel throughout; neutral to alkaline soil reaction trend. Brown Sodosols and Chromosols.	Open forest. Narrow-leaved ironbark and bloodwoods with minor Moreton Bay ash, Queensland blue gum and silver-leaved ironbark.	VI m6, pd3–4, ps3, e3 or 6

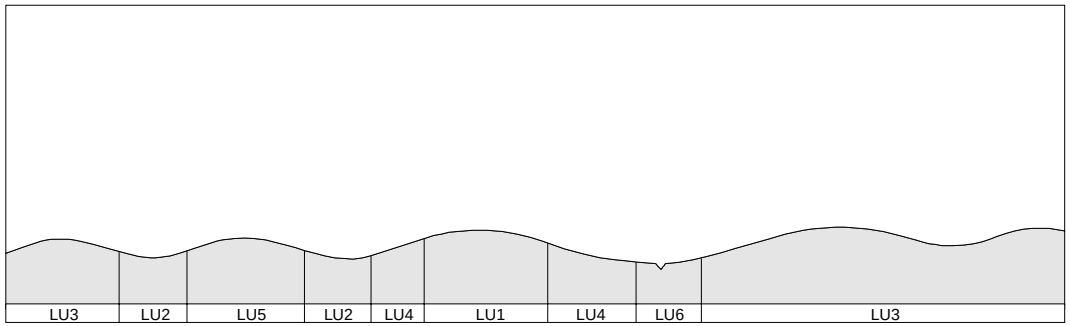
LAND SYSTEM – MIRIAM VALE 2 (Mv2)

General Description: Gently undulating rises to undulating rises on acid intrusive rocks. Major soils are moderately deep to deep, uniform coarse textured soils (Bleached Orthic Tenosols) and deep, grey and yellow, sodic and non sodic duplex soils (Grey and Yellow Chromosols, Sodosols and Kurosols).

Geology: Miriam Vale Granodiorite – Granodiorite, adamellite and quartz diorite and minor pegmatite, gneiss and gabbro.

Landform: Gently undulating rises.

Vegetation: Open forest to woodland, with limited to extensive clearing. Bloodwoods, Moreton Bay ash, Queensland blue gum, yellow stringybark, narrow-leaved ironbark, swamp mahogany with an understorey of wattles, *Melaleuca* and *Banksia* species.



Land Unit	Area %	Landform Attributes	Soils	Remnant Vegetation	Land Class
LU1	20	Upper slopes and crests, 2–5%.	Deep, mottled, grey and brown sodic and non sodic duplex soils with firm surfaces; coarse sand to coarse sandy loam, very thick A horizons with bleached A2 horizons; light to medium clay B horizons, often with few small to medium quartz grave; acid soil reaction trend. Grey and Brown Kurosols and Chromosols.	Woodland. Bloodwoods, Queensland blue gum, rough-barked and smooth-barked apple with wattles and *Banksia* species usually dominating the understorey.	VI m6, ps2, nd3, e2
LU2	10	Lower concave slopes, 1–4%.	Deep, uniform coarse textured soils with soft to firm surfaces; sand to sandy loam, thick A horizons usually with bleached A2 horizons; coarse sand to sandy loam B horizons; acid to neutral soil reaction trend. Bleached Orthic Tenosols	Closed to open forest. Queensland blue gum, yellow stringybark and bloodwoods, with *Melaleuca* species and wattles dominating the understorey.	VI m6, ps2, nd3, w4, e2
LU3	30	Crests, upper and mid slopes, 2–5%.	Moderately deep to deep, coarse textured uniform soils with soft to firm surfaces; coarse sand to loamy sand, thick to very thick A horizons with bleached A2 horizons; sand to coarse sandy loam B horizons, with abundant gravel throughout; acid soil reaction trend. Bleached Orthic Tenosols.	Open forest. Bloodwoods, Moreton Bay ash, narrow-leaved ironbark and Queensland blue gum with wattles dominating the lower stratum.	VI m6, ps2, nd3, e2

(cont.)

MIRIAM VALE 2 (continued)

Land Unit	Area %	Landform Attributes	Soils	Remnant Vegetation	Land Class
LU4	15	Mid to lower slopes, 3–7%.	Moderately deep to deep, mottled, coarse to medium textured gradational soils and sodic duplex soils with firm to hardsetting surfaces; coarse sand to sandy clay loam, thick to very thick A horizons with bleached A2 horizons; sandy light to medium clay B horizons; acid to neutral soil reaction trend. Grey Sodosols, Chromosols and Kurosols.	Closed to open forest. Bloodwoods, smooth barked apple, yellow stringybark, Queensland blue gum, swamp mahogany and narrow-leaved ironbark.	VI m6, ps2, nd3, (w4), e2–3
LU5	15	Crests, 3–6%. Rock outcrop and surface stone may be present.	Shallow to moderately deep, coarse textured uniform soils with firm surfaces; coarse sand, very thick A horizons with bleached A2 horizons, overlying rock or pan; neutral soil reaction trend. Bleached Leptic Tenosols.	Open forest. Spotted gum, narrow-leaved ironbark and bloodwoods.	VI m6, pd3–4, ps2, nd3, sa4, w4
LU6	10	Major drainage lines, 0–1%.	Deep, mottled, grey and yellow, sodic duplex and gradational soils, with hardsetting surfaces; sandy loam to sandy clay loam, medium to thick A horizons with conspicuously bleached A2 horizons; light to medium clay B horizons; often manganese in lower horizons,acid to alkaline soil reaction trend. Grey and Yellow Sodosols and Redoxic Hydrosols.	Shrubby woodland. Queensland blue gum and swamp mahogany with dense understorey of *Melaleuca* species.	VI m6, pd3–4, ps2, nd3, (r2-3), e2–3

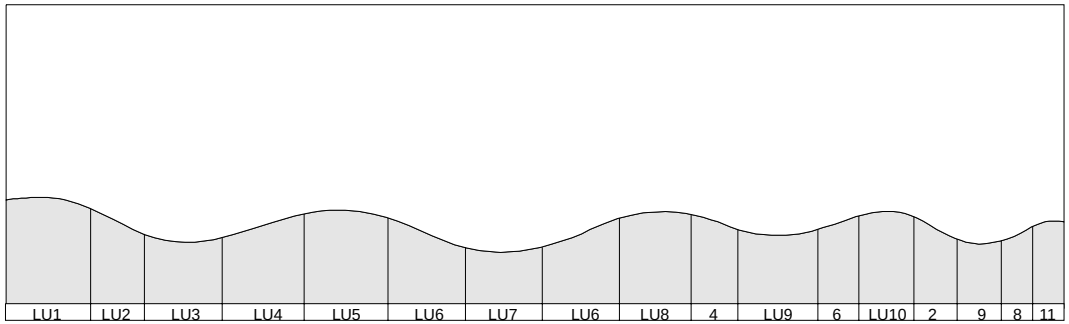
LAND SYSTEM – MATCHBOX 1 (Mb1)

General Description: Gently undulating rises to undulating rises on acid intrusive rocks. Major soils are moderately deep to deep, brown, grey and yellow, gradational soils and sodic duplex soils (Brown, Grey and Yellow Kandosols, Dermosols, Sodosols, Chromosols, Hydrosols and Redoxic Hydrosols) and very shallow to shallow, uniform, coarse textured soils (Bleached Leptic Tenosols) and grey gradational soils (Grey Kandosols).

Geology: Undifferentiated Granite – Granite, adamellite, granodiorite, diorite.

Landform: Gently undulating rises to undulating rises.

Vegetation: Open forest to woodland with limited to extensively cleared. Bloodwoods, narrow-leaved ironbark, yellow stringybark, Queensland blue gum, spotted gum, swamp mahogany and Moreton Bay ash with wattles, she oaks, *Grevillea* species and *Melaleuca* species dominating the lower stratum with *Melaleuca* species dominating the drainage lines.



Land Unit	Area %	Landform Attributes	Soils	Remnant Vegetation	Land Class
LU1	5	Hillcrests and ridges, 3–6%. Rock outcrop may be present.	Moderately deep to deep, brown, sodic duplex soils with hardsetting surfaces; sandy clay loam to clay loam, medium to thick A horizons; light medium to medium clay B horizons, with few to many fine gravel; neutral to alkaline soil reaction trend. Brown Sodosols and Chromosols.	Woodland. Narrow-leaved ironbark and bloodwoods.	VI m6, pd3–4, ps3, nd3, (r4), e3 or 6
LU2	10	Convex mid slopes, 5–10%.	Moderately deep, mottled, grey and yellow, sodic duplex soils with hardsetting surfaces; loamy sand to sandy loam, medium to thick A horizons with bleached A2 horizons; light medium to medium clay B horizons; few to abundant fine to medium gravel throughout solum; acid to neutral soil reaction trend. Grey and Yellow Sodosols and Kurosols.	Woodland. Brown bloodwood, spotted gum and yellow stringybark with broad-leaved banksia, *Grevillea* and *Casuarina* species and wattles dominating the lower stratum.	VI m6, pd3–4, ps3, nd3, e3 or 6
LU3	10	Low slopes and drainage lines, 0–3%.	Deep to very deep, often seasonal wet, mottled, sodic duplex soils; sandy clay loam to clay loam, medium A horizons with bleached A2 horizons; light medium to medium clay B horizons, with few to many medium gravel throughout; alkaline soil reaction trend. Grey Sodosols and Redoxic Hydrosols.	Eucalypt open woodland. Queensland blue gum often with *Melaleuca* species in understorey.	VI–VII m6, pd4, ps3, nd3, sa4 or 6, w4, e3

(cont.)

MATCHBOX 1 (continued)

Land Unit	Area %	Landform Attributes	Soils	Remnant Vegetation	Land Class
LU4	10	Long mid slopes, 1–3%.	Moderately deep to deep, mottled, grey, gradational soils and sodic duplex soils with hardsetting surfaces; fine sandy clay loam to clay loam, thick A horizons occasionally with bleached A2 horizons; fine sandy light clay to medium clay B horizons; neutral soil reaction trend. Grey Kandosols and Sodosols.	Open woodland. Queensland blue gum.	VI m6, pd3, ps3, nd3, e2
LU5	10	Crests, 1–3%.	Moderately deep to deep, grey and yellow, coarse textured, massive, gradational soils with loose surfaces; sand to sandy loam, thick to very thick A horizons usually with bleached A2 horizons; coarse sandy clay loam to sandy light clay B horizons; acid to neutral soil reaction trend. Grey and Yellow Kandosols.	Open forest to woodland. Wattles, *Casuarina*, *Melaleuca* and *Grevillea* species often with bloodwoods and swamp mahogany as emergents.	VI m6, (pd3), ps3, nd3, e2
LU6	10	Mid slopes, 3–8%.	Shallow to moderately deep, occasionally mottled, grey sodic duplex soils with hardsetting surfaces; fine sandy loam to loam, fine sandy, thick A horizons with bleached A2 horizons; medium clay B horizons with few to many fine gravel; acid to neutral soil reaction trend. Grey Sodosols.	Open forest. Brown bloodwood and yellow stringybark with wattles and *Casuarina* species dominating the understorey.	VI m6, pd3, ps3, nd3, e3
LU7	10	Lower concave slopes, 1–4%.	Moderately deep to deep, mottled, brown and grey, gradational and sodic duplex soils with hardsetting surfaces; sandy loam to clay loam, thick A horizons with bleached A2 horizons; light clay to medium clay B horizons, with few to common small to medium gravel throughout; few to common iron nodules at depth; acid to neutral soil reaction trend. Brown and Grey Dermosols and Sodosols.	Open forest. Brown bloodwood, yellow stringybark, swamp mahogany and minor Queensland blue gum and broad-leaved white mahogany with *Melaleuca* species dominating the understorey.	VI m6, pd3, ps3, nd3, e3
LU8	10	Crests, 1–3%.	Deep, mottled, grey, sodic duplex soils with hardsetting surfaces; loam to clay loam, thick to very thick A horizons with bleached A2 horizons; light clay to medium clay B horizons; acid soil reaction trend. Grey Kurosols and Sodosols.	Open forest. Yellow stringybark and bloodwoods.	VI m6, pd3, ps3, nd3, e3
LU9	10	Lower slopes and drainage lines, 0–1%.	Moderately deep to deep seasonally or permanently wet, mottled, grey, gradational and duplex soils, loam to clay loam, thick to very thick A horizons with bleached A2 horizons; light clay to medium clay B horizons; hard pan may be present at depth; neutral to alkaline soil reaction trend. Redoxic Hydrosols.	Closed to open forest. Broad-leaved paperbark and swamp paperbark. Bloodwoods may be present as emergents.	VI m6, ps3, nd3, sa4 or 6, w4, e2
LU10	10	Upper slopes and crests, 3–7%. Few to common fine gravel on surface.	Very shallow to shallow, uniform, coarse textured soils over rock and grey gradational soils with hardsetting surfaces; loamy sand to sandy loam, thick A horizons with bleached A2 horizons usually with common to abundant iron nodules; (when present) sandy loam to sandy clay loam B horizons, with few to common fine gravel; neutral to acid soil reaction trend. Bleached Leptic Tenosols and Grey Kandosols.	Open forest. Bloodwoods, narrow-leaved ironbark and spotted gum often with wattles and *Melaleuca* species in understorey.	VI m6, pd3–4, ps3, nd3, e3 or 6
LU11	5	Lower hillcrests, 2–4%.	Shallow to moderately deep, mottled, brown, sodic duplex soils with hardsetting surfaces; sandy loam to sandy clay loam, thick to very thick A horizons; light medium to medium clay B horizons; usually few to abundant fine to coarse gravel throughout profile; acid soil reaction trend. Brown Sodosols and Kurosols.	Woodland. Narrow-leaved ironbark, brown bloodwood and Moreton Bay ash with wattles dominating the understorey.	VI m6, (pd3), ps3, nd3, e3

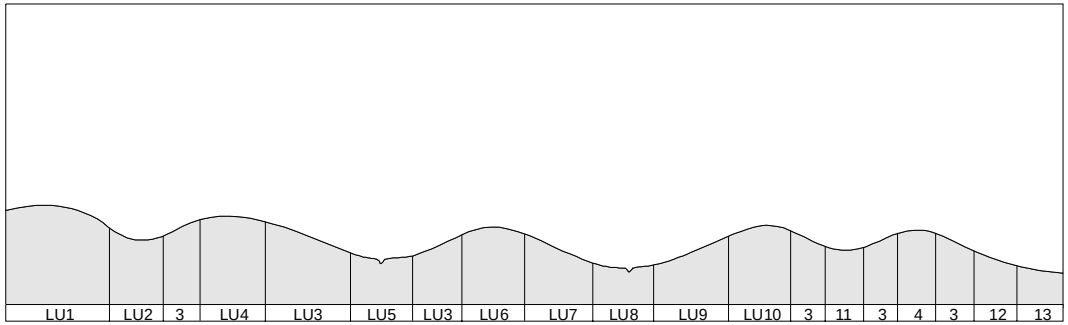
LAND SYSTEM – MIRIAM VALE 3 (Mv3)

General Description: Gently undulating rises to undulating low hills on intrusive igneous rocks. Major soils are moderately deep to deep, brown, grey and yellow, sodic duplex soils (Brown, Grey and Yellow Sodosols and Chromosols), and grey, gradational soils and non cracking clays (Grey Dermosols).

Geology: Miriam Vale Granodiorite – Granodiorite, adamellite, and quartz diorite and minor pegmatite, gneiss and gabbro.

Landform: Gently undulating rises to undulating low hills.

Vegetation: Open forest with limited to complete clearing. Narrow-leaved ironbark, bloodwoods, Moreton Bay ash, Queensland blue gum, gum-topped box, spotted gum and swamp mahogany.



Land Unit	Area %	Landform Attributes	Soils	Remnant Vegetation	Land Class
LU1	10	Crests, upper and mid slopes, 1–6%.	Moderately deep, uniform coarse textured soils and grey sodic duplex soils with firm to hardsetting surfaces; sand to sandy loam, medium to very thick A horizons often with bleached A2 horizons; sandy loam to medium clay B horizons, with few to many fine gravel throughout; neutral soil reaction trend. Bleached Leptic and Orthic Tenosols and Grey Sodosols.	Open forest. Narrow-leaved ironbark, gum-topped bloodwood, Moreton Bay ash and minor spotted gum.	VI m6, pd3, ps3, nd3, e3
LU2	5	Lower concave slopes, 2–5%.	Moderately deep, mottled, grey, sodic duplex soils with hardsetting surfaces; coarse sandy loam to coarse sandy clay loam, very thick A horizons with bleached A2 horizons; sandy light to light medium clay B horizons; common fine gravel at depth; neutral to acid soil reaction trend. Grey Sodosols.	Open forest. Queensland blue gum and swamp mahogany with broad-leaved paperbark dominating the lower stratum.	VI m6, pd3, ps3, nd3, e3
LU3	10	Mid slopes, 2–6%.	Moderately deep to deep, brown and yellow, grey, sodic duplex soils with hardsetting surfaces; sandy loam to clay loam sandy, medium to thick A horizons with bleached A2 horizons; light to medium clay B horizons, with few to abundant fine gravel throughout; neutral to alkaline soil reaction trend. Brown, Yellow and Grey Sodosols and Chromosols.	Open forest. Narrow-leaved ironbark, Queensland blue gum and gum-topped bloodwood with minor Moreton Bay ash and other bloodwoods.	VI m6, pd3–4, ps3, nd3, e3

(cont.)

MIRIAM VALE 3 (continued)

Land Unit	Area %	Landform Attributes	Soils	Remnant Vegetation	Land Class
LU4	10	Crests and upper slopes, 1–6%. Rock outcrop often present.	Moderately deep, brown, grey and yellow, sodic duplex soils with hardsetting surfaces; sandy loam to sandy clay loam, medium A horizons with bleached A2 horizons; light medium to medium clay B horizons, with few to many fine gravel throughout profile; alkaline soil reaction trend. Brown, Yellow and Grey Sodosols and Chromosols.	Open forest. Narrow-leaved ironbark, Moreton Bay ash and bloodwoods and minor Queensland blue gum with wattles dominating the lower stratum.	VI m6, pd4, ps3, nd3, (r3), e3
LU5	5	Lower slopes and drainage lines, 0.5–2%.	Deep to very deep, brown, sodic duplex soils with hardsetting surfaces; fine sandy clay loam to clay loam, medium A horizons with bleached A2 horizons; medium clay B horizons, often overlying D horizons; few to common fine gravel at depth; alkaline soil reaction trend. Brown Sodosols.	Open forest. Gum-topped box, Moreton Bay ash and narrow-leaved ironbark.	VI m6, pd4, ps3, nd3, sa4 or 6, e2
LU6	5	Crests and upper slopes, 5–10%. Common large gravel on surface. Rock outcrop may be present.	Shallow to moderately deep, red and brown, sodic duplex soils with hardsetting surfaces; sandy loam to sandy clay loam, thick A horizons; light to light medium clay B horizons; neutral soil reaction trend. Red and Brown Chromosols and Sodosols.	Open forest. Bloodwoods, narrow-leaved ironbark, swamp mahogany and spotted gum.	VI m6, pd3, ps3, nd3, r3–4, e3 or 6
LU7	10	Concave mid slopes, 2–4%.	Moderately deep to deep, grey and brown, sodic duplex soils with hardsetting surfaces; sandy clay loam to clay loam, thick A horizons with bleached A2 horizons; sandy light medium to medium clay B horizons; with few to many fine gravel; alkaline soil reaction trend. Grey and Brown Sodosols.	Woodland. Moreton Bay ash, Queensland blue gum and bloodwoods.	VI m6, pd3, ps3, nd3, e3
LU8	10	Lower slopes and drainage lines, slopes 0–3%.	Moderately deep to deep, grey, brown and black, sodic duplex soils with hardsetting surfaces; sandy clay loam to clay loam, medium A horizons with bleached A2 horizons; sandy light to light medium clay B horizons; with few to many fine gravel; alkaline soil reaction trend. Grey, Brown and Black Sodosols.	Woodland. Queensland blue gum and Moreton Bay ash with minor narrow-leaved ironbark.	VI m6, pd4, ps3, nd3, sa4 or 6, e2
LU9	10	Convex mid slopes, 4–7%.	Moderately deep, brown and grey, sodic duplex soils, with hardsetting surfaces; sandy loam to sandy clay loam, medium A horizons, with bleached A2 horizons; light medium to medium clay B horizons, common fine gravel; neutral soil reaction trend. Brown and Grey Sodosols.	Open forest. Gum-topped box and Queensland blue gum.	VI m6, pd4, ps3, nd3, e3 or 6
LU10	5	Upper slopes and hillcrests, 2–4%.	Moderately deep, brown, sodic duplex soils with hardsetting surfaces; sandy loam to sandy clay loam, medium A horizons with bleached A2 horizons; medium clay B horizons; with few to many, fine to coarse gravel throughout; neutral to alkaline soil reaction trend. Brown Sodosols and Chromosols.	Closed to open forest. Gum-topped box, Queensland blue gum and minor Moreton Bay ash and narrow-leaved ironbark.	VI m6, pd4, ps3, nd3, e3
LU11	5	Lower concave slopes, higher in the landscape, 0–2%.	Moderately deep to deep, grey, gradational soils with hardsetting surfaces; light clay, medium A horizons with bleached A2 horizons; light medium to medium clay B horizons; abundant fine gravel at depth; alkaline soil reaction trend. Grey Dermosols.	Open forest. Narrow-leaved ironbark, Moreton Bay ash and Queensland blue gum with wattles dominating the lower stratum.	IV–VI m4 or 6, pd3, ps2, nd2, e2

(cont.)

MIRIAM VALE 3 (continued)

Land Unit	Area %	Landform Attributes	Soils	Remnant Vegetation	Land Class
LU12	5	Mid to lower slopes, 3–5%.	Moderately deep to deep, grey, gradational and sodic duplex soils with hardsetting surfaces; sandy clay loam to clay loam, medium A horizons with bleached A2 horizons; light to light medium clay B horizons; with few to common, fine to medium gravel; alkaline soil reaction trend. Grey Dermosols and Sodosols.	Open forest. Queensland blue gum, narrow-leaved ironbark and bloodwoods.	VI m6, pd3, ps3, nd3, e3
LU13	5	Lower slopes and drainage lines, 0–2%. Gilgai may be present.	Deep, usually mottled, grey, cracking and non cracking clays with self mulching to hardsetting surfaces; light clay to light medium clay A horizons occasionally with bleached A2 horizons; light medium to medium clay B horizons; with few to many fine gravel throughout; alkaline soil reaction trend. Grey Vertosols and Dermosols.	Woodland. Queensland blue gum.	VI m3, ps2, pm2–3, (TM2) sa4 or 6, e2

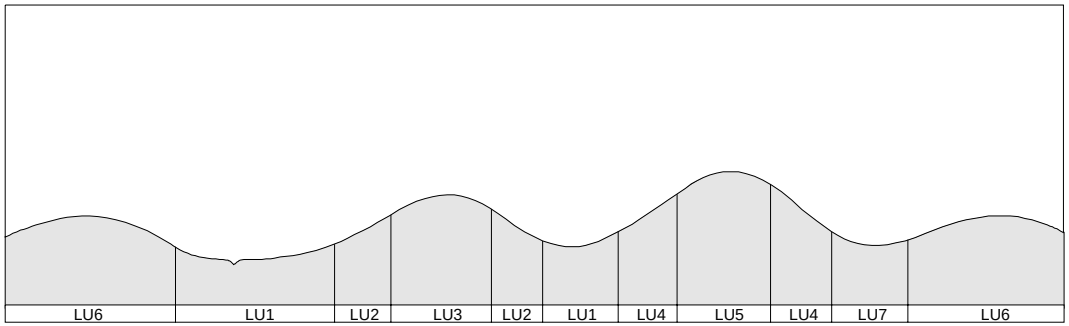
LAND SYSTEM – WATALGAN 1 (Wt1)

General Description: Undulating rises to undulating low hills on granite. Major soils are moderately deep to deep, brown and yellow, sodic duplex soils (Brown and Yellow Sodosols and Chromosols), and shallow, uniform coarse textured soils overlying rock (Bleached Leptic Tenosols) and deep to very deep, black to brown, gradational soils and non cracking clays (Black and Brown Dermosols) and

Geology: Watalgan Granite – Granite, granodiorite and minor quartz diorite.

Landform: Undulating rises to undulating low hills.

Vegetation: Open forest, limited to extensive clearing. Narrow-leaved ironbark, Moreton Bay ash, bloodwoods, yellow stringybark, Queensland blue gum, swamp mahogany and spotted gum with wattles dominating the lower stratum.



Land Unit	Area %	Landform Attributes	Soils	Remnant Vegetation	Land Class
LU1	10	Lower slopes and major drainage lines, 0–3%.	Deep to very deep, occasionally mottled, black and brown, gradational soils and non cracking clays with hardsetting surfaces; fine sandy clay loam to light clay, medium to thick A horizons; light to medium clay B horizons usually with carbonate nodules at depth; neutral to alkaline soil reaction trend. Black and Brown Dermosols.	Open forest. Queensland blue gum, swamp mahogany and yellow stringybark with minor narrow-leaved ironbark and river she oak.	III m3, ps2, sa2, e2, f2
LU2	15	Mid slopes, 3–10%.	Moderately deep, occasionally mottled, brown and yellow, sodic duplex soils with hardsetting surfaces; sandy clay loam to clay loam sandy, medium A horizons with bleached A2 horizons; light medium to medium clay B horizons with few to common fine to medium gravel; neutral to alkaline soil reaction trend. Brown and Yellow Sodosols.	Open forest. Narrow-leaved ironbark, bloodwoods and Queensland blue gum.	VI m6, pd4, ps3, nd3, e3–6
LU3	15	Upper slopes and hillcrests, 2–7%. Rock outcrop may be present.	Shallow to moderately deep, usually mottled, brown, sodic duplex soils with hardsetting surfaces; sandy clay loam to clay loam sandy, medium A horizons with bleached A2 horizons; light to medium clay B horizons, with few to many medium gravel; neutral to alkaline soil reaction trend. Brown Sodosols.	Open forest. Narrow-leaved ironbark, bloodwoods, Moreton Bay ash and Queensland blue gum.	VI m6, pd4, ps3, nd3, (r5), e3 or 6

(cont.)

WATALGAN 1 (continued)

Land Unit	Area %	Landform Attributes	Soils	Remnant Vegetation	Land Class
LU4	20	Mid slopes, 5–12%.	Moderately deep, occasionally mottled, brown and yellow, sodic duplex soils with hardsetting sufaces; coarse sandy loam to sandy loam, thick A horizons with bleached A2 horizons; sandy light to medium clay B horizons; few to very abundant, fine quartz throughout profile; neutral to acid soil reaction trend. Yellow and Brown Sodosols and Chromosols.	Open forest. Narrow-leaved ironbark and bloodwoods with minor Moreton Bay ash, yellow stringybark, swamp mahogany, Queensland blue gum and spotted gum.	VI m6, pd3, ps3, nd3, e6
LU5	15	Higher crests, 3–6%.	Shallow, uniform coarse textured soils with hardsetting surfaces; sandy loam to sandy clay loam, thick A horizons with bleached A2 horizons; few to abundant fine quartz throughout; neutral soil reaction trend. Bleached Leptic Tenosols.	Open forest. Narrow-leaved ironbark and yellow stringybark and minor long-fruited bloodwood, spotted gum and Queensland blue gum with wattles dominating the lower stratum.	VI m6, pd3, ps3, nd3, e2–3
LU6	15	Crests and upper slopes, 3–8%.	Moderately deep to deep, occasionally mottled, brown, sodic and non sodic duplex soils with hardsetting surfaces; coarse loam sand to sandy loam, thick A horizons often with bleached A2 horizons; sandy light to light medium clay B horizons with few to many fine to medium quartz; acid to neutral soil reaction trend. Brown Sodosols and Chromosols.	Open forest. Narrow-leaved ironbark, spotted gum, Queensland blue gum and bloodwoods with minor swamp mahogany with wattles and *Casuarina* species dominating the understorey.	VI m6, pd3, ps3, nd3, e3–6
LU7	10	Lower concave slopes, 3–5%.	Moderately deep to deep, brown and grey, sodic duplex soils with hardsetting surfaces; coarse loamy sand to sandy loam, thick A horizons with bleached A2 horizons; sandy light to light medium clay B horizons with few to many fine to medium gravel; neutral to alkaline soil reaction trend. Brown and Grey Sodosols.	Open forest. Queensland blue gum, Moreton Bay ash, bloodwoods and swamp mahogany with wattles dominating the lower stratum.	VI m6, pd3, ps3, nd3, e3

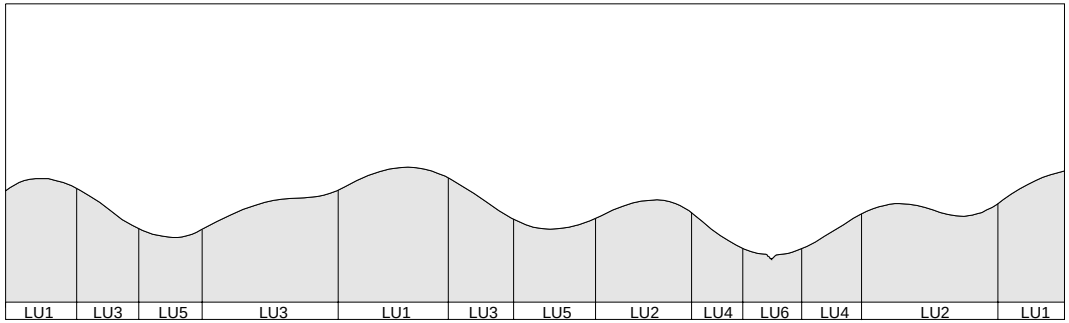
LAND SYSTEM – TAWAH (Tw)

General Description: Undulating low hills on acid to intermediate intrusive rocks. Major soils are shallow to deep, brown and grey, sodic duplex soils (Brown and Grey Sodosols) and shallow to deep, uniform, coarse textured soils (Orthic and Bleached Leptic Tenosols).

Geology: Tawah Granite – Muscovite-biotite granite, hornblende tonalite, pyroxene-hornblende diorite.

Landform: Undulating low hills.

Vegetation: Open forest, limited to extensively cleared. Narrow-leaved ironbark, bloodwoods, spotted gum, yellow stringybark, Queensland blue gum and swamp mahogany.



Land Unit	Area %	Landform Attributes	Soils	Remnant Vegetation	Land Class
LU1	20	Crests and upper slopes, 3–6%. Surface gravel and rock outcrop may be present.	Shallow to moderately deep, uniform coarse textured soils with loose to firm surfaces; coarse sand to sandy loam, medium to very thick A horizons with bleached A2 horizons, overlying rock; few to common fine to medium gravel may be present; neutral soil reaction trend. Bleached Leptic Tenosols.	Open forest. Narrow-leaved ironbark, spotted gum, bloodwoods and yellow stringybark.	VI m6, pd4, ps3, nd3, (r2–4), e2–3
LU2	20	Crests and upper slopes, 2–5%.	Shallow to moderately deep, brown, sodic duplex soils with hardsetting surfaces; loamy sand to sandy loam, medium A horizons with bleached A2 horizons; light medium to medium clay B horizons; few to many fine to medium gravel throughout profile; neutral soil reaction trend. Brown Sodosols.	Open forest. Narrow-leaved ironbark, spotted gum, bloodwoods and yellow stringybark.	VI m6, pd4, ps3, nd3, e3
LU3	20	Mid slopes, 5–15%.	Moderately deep, uniform coarse textured soils, with firm surfaces; coarse sand to loamy sand, medium to very thick A horizons occasionally with bleached A2 horizons, often overlying rock; (when present) coarse sand B horizons; few to many fine gravel throughout profile; neutral soil reaction trend. Orthic and Bleached Leptic Tenosols	Open forest. Narrow-leaved ironbark, Queensland blue gum, bloodwoods and occasional swamp mahogany.	VI m6, pd3, ps3, nd3, e4–6

(cont.)

TAWAH (continued)

Land Unit	Area %	Landform Attributes	Soils	Remnant Vegetation	Land Class
LU4	20	Mid slopes, 5–10%.	Moderately deep, occasionally mottled, brown and yellow, sodic duplex soils with hardsetting surfaces; loamy sand to sandy loam, thick A horizons with bleached A2 horizons; sandy light to medium clay B horizons; few to many fine gravel throughout profile; neutral to alkaline soil reaction trend. Brown Sodosols.	Open forest. Narrow-leaved ironbark, Queensland blue gum and Moreton Bay ash.	VI m6, pd3, ps3, nd3, e3–6
LU5	10	Lower slopes (2–7%.) and drainage lines	Moderately deep to deep, uniform coarse textured soils with firm surfaces; loamy sand to sandy loam, medium to very thick A horizons with bleached A2 horizons, usually overlying rock; (when present) coarse sand to clayey sand B horizons with few to common fine gravel; neutral soil reaction trend. Orthic and Bleached Leptic Tenosols.	Open forest. Queensland blue gum, narrow-leaved ironbark and minor spotted gum and swamp mahogany.	VI m6, pd3, ps3, nd3, e2–3
LU6	10	Lower slopes (2–6%.) and drainage lines	Moderately deep to deep, brown and grey, sodic duplex soils; loamy sand to sandy loam, medium to thick A horizons with bleached A2 horizons; sandy light medium to medium clay B horizons with few to many fine gravel; neutral to alkaline soil reaction trend. Brown and Grey Sodosols.	Open forest. Queensland blue gum, narrow-leaved ironbark and occasionally swamp mahogany with wattles dominating the understorey.	VI m6, pd3–4, ps3, nd3, e3

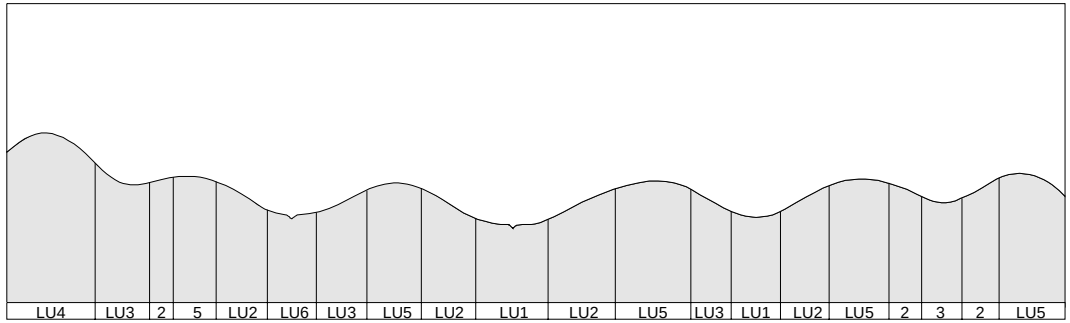
LAND SYSTEM – MIRIAM VALE 4 (Mv4)

General Description: Undulating low hills to rolling low hills on intermediate intrusive rocks. Major soils are shallow to moderately deep, brown and red, gradational soils and non sodic duplex soils, (Red and Brown Dermosols and Chromosols) and moderately deep to deep, brown, red, grey and black sodic duplex soils (Brown, Red, Grey and Black Sodosols) and black and grey, cracking and non cracking clays (Black and Grey Vertosols and Dermosols).

Geology: Miriam Vale Granodiorite – Granodiorite, adamellite, and quartz diorite and minor pegmatite, gneiss and gabbro.

Landform: Undulating low hills to rolling low hills.

Vegetation: Open forest to woodland, extensively to completely cleared. Narrow-leaved ironbark, bloodwoods, Morton Bay ash, Queensland blue gum, spotted gum, yellow stringybark and silver-leaved ironbark.



Land Unit	Area %	Landform Attributes	Soils	Remnant Vegetation	Land Class
LU1	15	Concave low slopes and drainage lines, 3–10%. Gilgai may be present.	Deep, occasionally mottled, black, cracking and non cracking clays with self mulching to hardsetting surfaces; light to light medium clay A horizons; medium to medium heavy clay B horizons, often with few fine gravel at depth; neutral to alkaline soil reaction trend. Black Vertosols and Dermosols.	Open woodland. Queensland blue gum with occasional narrow-leaved ironbark and Moreton Bay ash.	III–IV m2, (ps3), pm2–3, sa2, (tm2), e3–4, f2
LU2	20	Convex mid to low slopes, 3–15%.	Moderately deep to deep, occasionally mottled, brown and red, gradational and non sodic soils (occasionally sodic duplex soils) with hardsetting surfaces; sandy clay loam to light clay, medium to thick A horizons; light medium to medium clay B horizons; few to common fine gravel at depth; neutral to alkaline soil reaction trend. Brown and Red Dermosols and Chromosols and occasionally Brown Sodosols.	Open forest to woodland. Bloodwoods, narrow-leaved ironbark, Queensland blue gum and spotted gum with minor Moreton Bay ash and yellow stringybark.	III–IV or VI m3–4, pd3, ps3, e3–4 or 6
LU3	20	Concave mid to low slopes, 3–10%.	Moderately deep, brown, sodic (occasionally non sodic) duplex soils with hardsetting surfaces; sandy loam to clay loam, medium A horizons with bleached A2 horizons; light medium to medium clay B horizons; few to many small gravel at depth; neutral to alkaline soil reaction trend. Brown Sodosols and occasionally Chromosols.	Open forest to woodland. Narrow-leaved ironbark, bloodwoods and minor Queensland blue gum.	IV or VI m4or6, pd3, ps3, sa2(sa4), e3 or e6

(cont.)

MIRIAM VALE 4 (continued)

Land Unit	Area %	Landform Attributes	Soils	Remnant Vegetation	Land Class
LU4	15	Higher crests (3–6%) and upper slopes (10–20%). Surface stone and rock outcrop may be present.	Moderately deep to deep, red, gradational and non sodic duplex soils with hardsetting surfaces; clay loam, medium to thick A horizons; light clay to medium clay B horizons; few to common fine gravel at depth; neutral soil reaction trend. Red Dermosols and Chromosols.	Open forest. Narrow-leaved ironbark and bloodwoods.	VI m2–3, ps3, (r3–4), e3–6, x6
LU5	20	Crests (2–4%) and upper slopes (8–15%). Few small to medium gravel on surface.	Shallow to moderately deep, brown and red, gradational soils and non sodic duplex soils with hardsetting surfaces; sandy clay loam to light clay, medium A horizons; light to medium clay B horizons often with few to common fine gravel throughout; neutral to alkaline soil reaction trend. Brown and Red Dermosols and Chromosols.	Open forest. Narrow-leaved ironbark, bloodwood and minor spotted gum and occasional Queensland blue gum, silver-leaved ironbark and Moreton Bay ash.	IV or VI m3–4, ps3, r2, e3–4 or 6
LU6	10	Concave lower slopes and alluvial plains, associated with major drainage lines, 2–6%.	Moderately deep to deep, often mottled, black, brown and grey, sodic duplex soils with hardsetting surfaces; loam to clay loam, medium A horizons with bleached A2 horizons; light medium to medium clay B horizons, often with few fine to medium gravel at depth; neutral to alkaline soil reaction trend. Black, Brown and Grey Sodosols.	Open forest. Queensland blue gum and narrow-leaved ironbark.	VI m6, pd3-4, ps3, e3–4

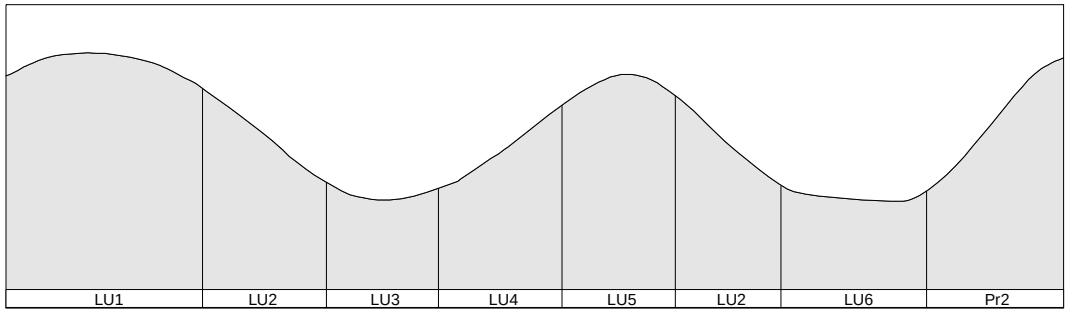
LAND SYSTEM - PERRY (Pr)

General Description: Undulating low hills to rolling low hills on acid intrusive rocks. Major soils are moderately deep to deep, grey, yellow and brown, sodic duplex soils (Sodosols and Chromosols).

Geology: Tenningering Granodiorite – Biotite granodiorite, muscovite-biotite granodiorite.

Landform: Undulating low hills to rolling low hills.

Vegetation: Open forest to woodland, extensively to completely cleared. Narrow-leaved ironbark, spotted gum, Moreton Bay ash, Queensland blue gum, rough barked apple, bloodwoods and swamp mahogany.



Land Unit	Area %	Landform Attributes	Soils	Remnant Vegetation	Land Class
LU1	30	Crests and upper slopes, 8–25%. Rock outcrop usually present.	Shallow to moderately deep, yellow and grey, sodic duplex soils with hardsetting surfaces; coarse sand to sandy loam, medium to thick A horizons usually with bleached A2 horizons; light clay to sandy light clay B horizons, with granitic fragments throughout; acid to neutral soil reaction trend. Yellow and Grey Sodosols and Chromosols.	Open forest to woodland. Narrow-leaved ironbark, gum topped bloodwood, spotted gum and swamp mahogany.	VI–VII m6, pd3–4, nd3, (ts6–7), r3–4, e6
LU2	35	Mid and lower slopes, 10–20%. Rock outcrop usually present.	Moderately deep to deep, mottled, grey and yellow, sodic duplex soils with hardsetting surfaces; loamy sand to sandy loam, thick A horizons usually with bleached A2 horizons; sandy, light to light medium clay B horizons, usually with granitic fragments throughout; acid to neutral reaction trend. Yellow and Grey Sodosols and Chromosols.	Open forest to woodland. Narrow-leaved ironbark, spotted gum, Queensland blue gum, Moreton Bay ash, rough barked apple, swamp mahogany and wattles.	VI m6, pd2, nd3, ts6, r4, e6
LU3	10	Lower slopes and broad drainage depressions, 2–6%. Seeps may develop.	Moderately deep to deep, yellow, grey and brown, sodic duplex soils with hardsetting surfaces; sand to sandy loam, thick A horizons with bleached A2 horizons; light to light medium clay B horizons, usually with granitic fragments; acid to neutral soil reaction trend. Yellow, Grey and Brown Sodosols and Chromosols.	Woodland. Queensland blue gum, rough barked apple and narrow-leaved ironbark.	VI m6, pd3, nd3, e6, (w5)

(cont.)

PERRY (continued)

Land Unit	Area %	Landform Attributes	Soils	Remnant Vegetation	Land Class
LU4	10	Mid slopes, 10–20%.	Moderately deep, uniform, coarse textured soils with hardsetting surfaces; coarse sand to sandy loam, thick A horizons with bleached A2 horizons; sandy loam B horizons; granitic fragments throughout profile; acid soil reaction trend. Bleached Orthic Tenosols.	Woodland. Moreton Bay ash, spotted gum and Queensland blue gum.	VI m6, nd3, ts6, e6
LU5	10	Crests and upper slopes, 2–10%. Surface stone often present.	Moderately deep, yellow, uniform, coarse textured and non sodic duplex soils with hardsetting surfaces; coarse sand to sandy loam, very thick A horizons with bleached A2 horizons over decomposing granodiorite; (when present) sandy clay loam to sandy light clay B horizons; granitic fragments common throughout profile; acid soil reaction trend. Bleached-Leptic Tenosols and Yellow Chromosols.	Woodland. Spotted gum, Moreton Bay ash and brown bloodwood.	VI m6, nd3, (r3–4), e3
LU6	5	Broad drainage depressions 0–2%. Seeps may develop.	Deep, black and grey, sodic duplex soils with hardsetting surfaces; sandy clay loam to clay loam, medium A horizons usually with bleached A2 horizons; light to medium clay B horizons; alkaline soil reaction trend. Black and Grey Sodosols.	Open woodland. Queensland blue gum, Moreton Bay ash, narrow-leaved ironbark and rough barked apple.	VI m6, nd3, ps3, (w5), e3

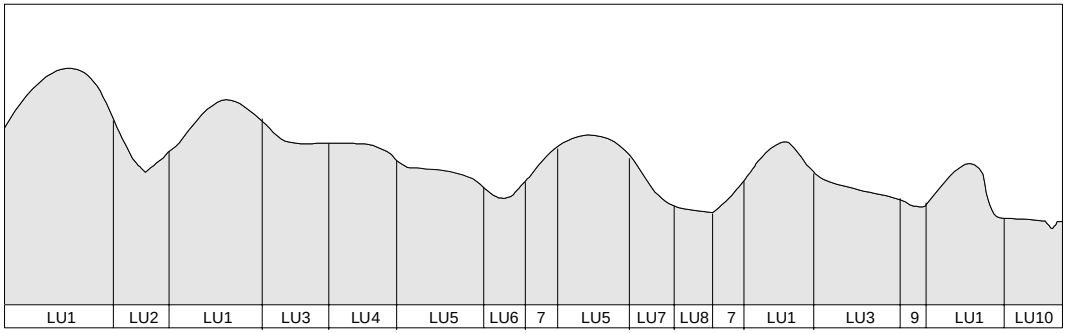
LAND SYSTEM – WONBAH (Wb)

General Description: Rolling low hills on acid to intermediate intrusive rocks. Major soils are shallow to moderately deep, red and brown, non sodic duplex soils (Red and Brown Chromosols), moderately deep to deep, brown, yellow and grey, sodic duplex soils (Brown, Yellow and Grey Sodosols and Chromosols) and shallow to moderately deep, uniform, coarse textured soils (Bleached Leptic Tenosols and Leptic Rudosols).

Geology: Wonbah Granodiorite – Hornblende-biotite granodiorite to quartz diorite.

Landform: Rolling low hills.

Vegetation: Open forest to woodland, usually extensively to completely cleared. Narrow-leaved ironbark, spotted gum, gum-topped bloodwood, Moreton Bay ash, Queensland blue gum with wattles dominating the lower stratum.



Land Unit	Area %	Landform Attributes	Soils	Remnant Vegetation	Land Class
LU1	20	Crests, upper and mid slopes, 10–40%. Rock outcrop common to abundant.	Shallow, red and brown, gradational and non sodic duplex soils with hardsetting surfaces; sandy loam to clay loam sandy, medium to thick A horizons often with bleached A2 horizons; light clay B horizons; small to medium gravel usually throughout profile; acid to neutral soil reaction trend. Red and Brown Dermosols and Chromosols.	Open forest to woodland. Narrow-leaved ironbark, spotted gum and wattles.	VI–VII m6, pd3–4, ps3, nd3, r3–5, ts4–7, e6–7
LU2	5	Lower concave slopes, 15–20%.	Moderately deep, often mottled, brown and yellow, sodic duplex soils with hardsetting surfaces; sandy clay loam, thick A horizons with bleached A2 horizons; sandy light to light medium B horizons; small to medium gravel throughout profile; acid to neutral soil reaction trend. Brown and Yellow Chromosols and Sodosols.	Woodland. Spotted gum and narrow-leaved ironbark.	VI m6, pd3, ps3, nd3, ts6, e6
LU3	15	Upper slopes, 10–15%. Rock outcrop and surface gravel common.	Shallow to moderately deep, brown and red, non sodic duplex soils with hardsetting surfaces; sandy clay loam to clay loam, medium A horizons; light to medium clay B horizons; neutral soil reaction trend. Brown and Red Chromosols.	Open forest to woodland. Spotted gum, narrow-leaved ironbark and Moreton Bay ash with wattles often present in the lower stratum.	VI–VII m4 or 6, pd3–4, ps3, nd3, r4–5, e4
LU4	5	Crests and upper slopes, 5–15%. Often many small gravel on surface.	Shallow to moderately deep, uniform, coarse textured soils with hardsetting surfaces over rock; loamy sand to sandy loam, medium to thick A horizons often with common to many small gravel throughout; acid to neutral soil reaction trend. Leptic Tenosols.	Open forest to woodland. Spotted gum and narrow-leaved ironbark.	VI m6, pd3–4, nd3, r2–3, e6

(cont.)

\WONBAH (continued)

Land Unit	Area %	Landform Attributes	Soils	Remnant Vegetation	Land Class
LU5	20	Crests and upper slopes, 3–15%.	Shallow to moderately deep, occasionally mottled, brown and yellow, often sodic, duplex soils with hardsetting surfaces; loamy sand to sandy clay loam, medium A horizons often with bleached A2 horizons; light to light medium clay B horizons, with common to many small gravel; neutral soil reaction trend. Brown and Yellow Chromosols and Sodosols.	Open forest to woodland. Narrow-leaved ironbark, gum-topped bloodwood and Moreton Bay ash.	VI m4 or 6, pd3–4, ps3, nd3, e3–4
LU6	5	Lower concave slopes, 8–12%.	Moderately deep, uniform, coarse textured soils and brown, sodic duplex soils with hardsetting surfaces; sand to sandy clay loam, thick A horizons with bleached A2 horizons; coarse sand to sandy light clay B horizons; medium gravel throughout profile; neutral soil reaction trend. Bleached Leptic Tenosols and Brown Chromosols and Sodosols.	Woodland. Queensland blue gum, Moreton Bay ash and smooth-barked apple.	VI m6, nd3, e3–4
LU7	15	Mid slopes, 10–20%.	Moderately deep to deep, brown, often sodic, duplex soils with hardsetting surfaces; sandy loam to clay loam sandy, medium to thick A horizons with bleached A2 horizons; sandy light medium to medium clay B horizons, with common small to medium gravel throughout; neutral to alkaline soil reaction trend. Brown Chromosols and Sodosols.	Open forest to woodland. Gum-topped bloodwood, narrow-leaved ironbark and minor Moreton Bay ash and Queensland blue gum with wattles dominating the lower stratum.	VI m4 or 6, ps3, nd3, ts6, e6
LU8	5	Lower slopes and drainage depressions, 1–6%. Seep and scalded areas may be present.	Moderately deep to very deep, grey and brown, often sodic, duplex and gradational soils with hardsetting surfaces; sandy clay loam to light clay, medium to thick A horizons with bleached A2 horizons; light medium to medium clay B horizons; mottles common throughout B horizon; neutral to alkaline soil reaction trend. Grey and Brown Chromosols, Sodosols and Dermosols.	Woodland. Gum-topped bloodwood, narrow-leaved ironbark and Queensland blue gum.	VI m4 or 6, pd3–4, ps3, nd3, (sa6), (w5)
LU9	5	Lower slopes and drainage lines, 2–6%.	Deep, grey and brown, non cracking clays with hardsetting surfaces; light to light medium clay, thin to medium A horizons; medium clay B horizons; neutral to alkaline soil reaction trend. Grey and Brown Dermosols.	Woodland. Queensland blue gum and Moreton Bay ash.	IV m3, ps3, nd3, e4
LU10	5	Lower slopes and major drainage lines, 1–5%.	Deep, grey, often mottled, sodic duplex soils with hardsetting surfaces; sand to sandy clay loam, thick A horizons with bleached A2 horizons; sandy light to light medium clay B horizons; sandy D horizons may be present; neutral soil reaction trend. Grey Chromosols and Sodosols.	Open forest. Queensland blue gum, smooth-barked apple and Moreton Bay ash.	VI m6, pd3–4, nd3, e4

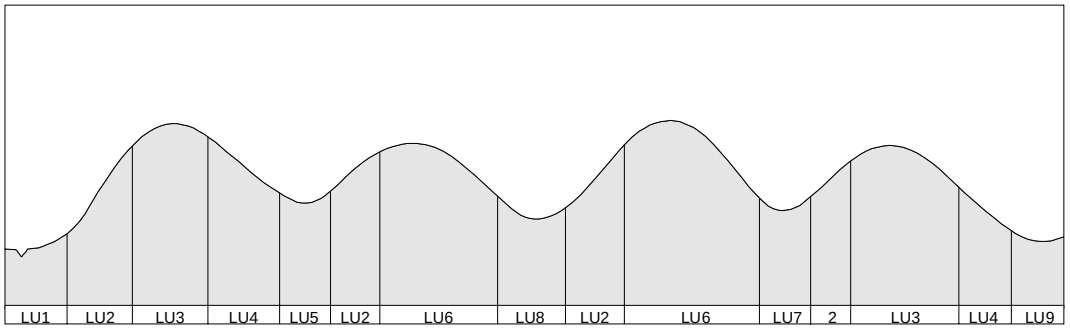
LAND SYSTEM – MIRIAM VALE 5 (Mv5)

General Description: Undulating low hills to rolling hills on intermediate to acid intrusive rocks. Major soils are moderately deep to deep brown, red, grey and yellow, sodic duplex soils (Brown, Red, Grey and Yellow Sodosols and Chromosols), and red and brown gradational soils (Red and Brown Dermosols)and shallow to moderately deep, uniform, coarse textured soils (Bleached Leptic Tenosols)

Geology: Miriam Vale Granodiorite – Granodiorite, adamellite, and quartz diorite and minor pegmatite, gneiss and gabbro.

Landform: Undulating low hills to rolling hills.

Vegetation: Open forest, limited to extensively cleared. Narrow leaved ironbark, bloodwoods, Moreton Bay ash, Queensland blue gum, spotted gum, swamp mahogany and smooth barked apple.



Land Unit	Area %	Landform Attributes	Soils	Remnant Vegetation	Land Class
LU1	5	Lower slopes (0–2%) and alluvial plains of major drainage lines.	Deep, red non structured red and brown gradational soils with hardsetting surfaces; sandy clay loam to clay loam sandy; medium to thick A horizons; sandy light clay B horizons; neutral soil reaction trend. Red and Brown Kandosols.	Open forest. Swamp mahogany, Queensland blue gum and rough barked apple.	IV m4, ps2, nd2, f2–3
LU2	15	Midslopes, 6–15%. Some slopes as steep as 25%. Rock outcrop and surface stone may be present.	Moderately deep, often mottled, brown and yellow sodic duplex soils with hardsetting surfaces; sandy loam to sandy clay loam; medium to thick A horizons with bleached A2 horizons; light medium to medium clay B horizons; often with few to many fine to medium gravel in profile; acid to neutral soil reaction trend. Brown and Yellow Sodosols.	Open forest. Narrow-leaved ironbark, spotted gum, bloodwoods, smooth barked apple. In some areas Queensland blue gum, swamp mahogany and *Casuarina* species may be present. .	VI–VII m6, pd3, ps2, nd3, r2–4, e4 or 6–7
LU3	25	Crest and upper slopes, 5–10%. Some upper slopes as steep as 20%. Rock outcrop and surface stone present especially on higher crests.	Shallow to moderately deep occasionally mottled, red and brown sodic duplex soils with hardsetting surfaces; sandy loam to sandy clay loam; medium to thick A horizons usually with bleached A2 horizons; light medium to medium clay B horizons; acid to neutral soil reaction trend. Red and Brown Sodosols and Chromosols.	Open forest Narrow-leaved ironbark, bloodwoods, Moreton Bay ash, spotted gum and smooth barked apple and minor Queensland blue gum. Spotted gum or smooth barked apple often dominant on higher crests.	VI m6, pd4, ps2, nd3, r2–4, (ts6), e4 or 6
LU4	15	Concave midslopes 5–10%.	Moderately deep to deep, brown and red (occasionally black) gradational soils and sodic duplex soils with hardsetting surfaces; sandy clay loam to clay loam; medium to thick A horizons; light clay to medium clay B horizons; often with few to common fine gravel at depth; neutral to alkaline soil reaction trend. Brown and Red (occasionally Black) Dermosols.	Open forest. Bloodwoods, Queensland blue gum, Moreton Bay ash, swamp mahogany with minor spotted gum	VI m4 or 6, pd3, ps3, nd3, e3–4 or 6

(cont.)

MIRIAM VALE 5 (continued)

Land Unit	Area %	Landform Attributes	Soils	Remnant Vegetation	Land Class
LU5	5	Lower concave slopes and drainage lines 3–5%.	Deep, brown and black, gradational soils with hardsetting surfaces; clay loam, medium to thick A horizons; light to light medium clay B horizons (sandy to sandy light clay D horizons may be present); neutral to alkaline soil reaction trend. Brown and Black Dermosols.	Open forest. Queensland blue gum, swamp mahogany, Moreton Bay ash.	VI m3–4, ps3, nd3, sa4, e3
LU6	15	Crests, upper and mid slopes 5–15%, some as steep as 25%. Rock outcrop may be present especially on higher crests.	Shallow to moderately deep, uniform coarse textured soils with firm to hardsetting surfaces; sand to sandy loam medium to thick A horizons with bleached A2 horizons; sandy loam B horizons; acid to neutral soil reaction trend. Bleached Leptic Tenosols.	. Open forest Narrow-leaved ironbark, bloodwoods and spotted gum.	VI m6, pd3–4, ps3, nd3, (ts6), r2–4, e3–4 or 6
LU7	5	Lower slopes and drainage lines 3–8%.	Moderately deep to deep, uniform coarse textured soils with firm to hardsetting surfaces; sand to sandy loam thick to very thick A horzions with bleached A2 horizons; (if present) sand to sandy loam B horizons; acid to neutral soil reaction trend. Bleached Leptic Tenosols.	Open forest Bloodwoods, smooth barked apple, Queensland blue gum with minor *Casuarina* and *Banksia* species.	VI m6, ps3, nd3, (w4), e3
LU8	10	Lower concave slopes and drainage lines 2–5%.	Moderately deep to deep, usually mottled, grey and yellow sodic duplex soils with hardsetting surfaces; sandy loam to sandy clay loam, medium to thick A horizons with bleached A2 horizons; light to medium clay B horizons; acid to alkaline soil reaction trend. Grey and Yellow Sodosols.	Open forest Queensland blue gum, Moreton Bay ash, swamp mahogany and bloodwoods.	VI m6, pd3-4, ps3, nd3, e3
LU9	5	Lower slopes and drainage lines 2–5% slope. Gilgai may be present.	Deep, black and grey, cracking clays with hardsetting to self mulching surfaces; light clay to light medium clay A horizons; medium to medium heavy clay D horizons; alkaline soil reaction trend. Black and Grey Vertosols.	Woodland. Queensland blue gum and swamp mahogany.	VI m2–3, pm2–3, sa3, (tm2), e3, x6

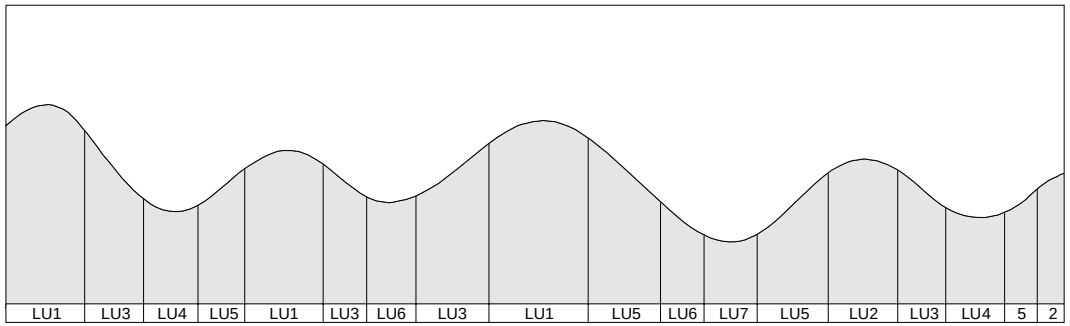
LAND SYSTEM – MIRIAM VALE 6 (Mv6)

General Description: Undulating low hills to rolling hills on acid intrusive rocks. Major soils are shallow to moderately deep, uniform coarse textured soils (Bleached Leptic, Orthic and Bleached Orthic Tenosols) and brown, yellow and grey gradational soils (Brown, Yellow and Grey Kandosols) and moderately deep to deep, brown, grey and yellow sodic duplex soils (Brown, Grey and Yellow Sodosols).

Geology: Miriam Vale Granodiorite – Granodiorite, adamellite, and quartz diorite and minor pegmatite, gneiss and gabbro.

Landform: Undulating low hills to rolling hills.

Vegetation: Open forest and woodland, no disturbance to completely cleared. Narrow-leaved ironbark, spotted gum, bloodwoods, yellow stringybark, Moreton Bay ash and Queensland blue gum with minor swamp mahogany, and wattles dominating the lower stratum.



Land Unit	Area %	Landform Attributes	Soils	Remnant Vegetation	Land Class
LU1	20	Crests (3–8%) and upper slopes (10–30%). Many to common gravel and pebbles and rock outcrop.	Shallow to moderately deep, uniform coarse textured soils over weathered granite and red and brown gradational soils with hard setting to firm surfaces; coarse sand to sandy clay loam, medium to very thick A horizons occasionally with bleached A2 horizons; (if present) loamy sand to sandy clay loam B horizons with many fine to medium granitic fragments; acid to neutral soil reaction trend. Orthic and Bleached Orthic and Bleached Leptic Tenosols and Red and Brown Kandosols.	Open forest. Spotted gum, narrow-leaved ironbark, broad-leaved ironbark, bloodwoods, yellow stringybark with swamp mahogany occasionally present	VI–VII m6, pd3, ps3, nd3, r3–4, e3 or e6–7
LU2	20	Crests (3–8%) and upper slopes (10–20%). Rock outcrop may be present.	Shallow to moderately deep, usually mottled, red, yellow and brown sodic duplex soils with hardsetting surfaces; sandy loam to sandy clay loam, thick A horizons occasionally with bleached A2 horizons; sandy light to medium clay B horizons with many small to medium gravel; acid to alkaline soil reaction trend. Yellow and Brown Chromosols and Sodosols.	Open forest. Narrow-leaved ironbark, spotted gum, yellow stringybark, Moreton Bay ash and bloodwoods often with wattle understorey.	VI m6, pd3, ps3, nd3, (r2–5), e3 or 6
LU3	10	Mid slopes, 5–15%. Rock outcrop and surface stone occasionally present.	Shallow to moderately deep, uniform, coarse textured soils and brown gradational soils with firm to hardsetting surfaces; coarse loamy sand to sandy loam, thick A horizons occasionally with bleached A2 horizons; sandy loam to sandy clay loam B horizons with many fine to medium granitic fragments; acid to neutral soil reaction trend. Orthic and Bleached Orthic Tenosols and Brown Kandosols.	Open forest. Narrow-leaved ironbark, spotted gum, bloodwoods, Moreton Bay ash and Queensland blue gum. Swamp mahogany may be present.	VI m6, pd3, ps3, nd3, (r3–4), e6

(cont.)

MIRIAM VALE 6 (continued)

Land Unit	Area %	Landform Attributes	Soils	Remnant Vegetation	Land Class
LU4	10	Lower concave slopes, 2–10%.	Moderately deep to deep mottled, yellow and grey gradational soils and uniform coarse textured soils with loose to firm surfaces; coarse sand to sandy loam, thick to very thick A horizons often with bleached A2 horizons; coarse sandy loam to clay loam coarse sandy B horizons (occasionally silica hard pans present); acid to neutral soil reaction trend. Yellow and Grey Kandosols and Dermosols, Bleached Orthic Tenosols and Redoxic Hydrosols.	Open forest. Queensland blue gum, Moreton Bay ash, swamp mahogany and bloodwoods, often with *Melaleuca* species dominating the understorey.	VI m6, pd3, ps3, nd3, (w4), e3–4
LU5	20	Mid slopes, 5–15%.	Moderately deep to deep, mottled, brown and yellow, sodic duplex soils and gradational soils with hardsetting surfaces; sand to sandy clay loam, medium to thick A horizons often with bleached A2 horizons; sandy light to medium clay B horizons; fine granitic fragments usually throughout profile; neutral to acid soil reaction trend. Brown and Yellow Sodosols and Kurosols and Brown Dermosols.	Woodland. Narrow-leaved ironbark and spotted gum with bloodwoods, yellow stringybark, Queensland blue gum, Moreton Bay ash and swamp mahogany. Queensland blue gum and Moreton Bay ash often only species on short concave slopes.	VI m6, pd3, ps3, nd3, e6
LU6	10	Lower slopes and narrow drainage lines, 3–10%.	Moderately deep to deep, mottled, grey and brown, sodic duplex soils with firm to hardsetting surfaces; sandy loam to sandy clay loam, medium to thick A horizons with bleached A2 horizons; light to medium clay B horizons usually with fine to medium granitic fragments; acid to alkaline soil reaction trend. Grey and Brown Sodosols and Redoxic Hydrosols.	Woodland. Queensland blue gum, Moreton Bay ash and swamp mahogany with minor bloodwoods, narrow-leaved ironbark wattles and *Melaleuca* species.	VI m6, pd3–4, ps3, nd3, (w4), e6
LU7	10	Major drainage lines, 0–2%.	Deep to very deep, black and grey, gradational soils and sodic and non sodic duplex soils with hardsetting surfaces; sandy loam to clay loam, medium to thick A horizons; clay loam to light medium clay B horizons; sand to clay loam D horizons may be present; acid to neutral soil reaction trend. Black and Grey Dermosols and Grey Sodosols and Chromosols.	Open forest. Queensland blue gum, Moreton Bay ash and swamp mahogany. River she-oak and cabbage palms common in channels.	VI m6, pd3–4, ps3, nd3, e3, f2

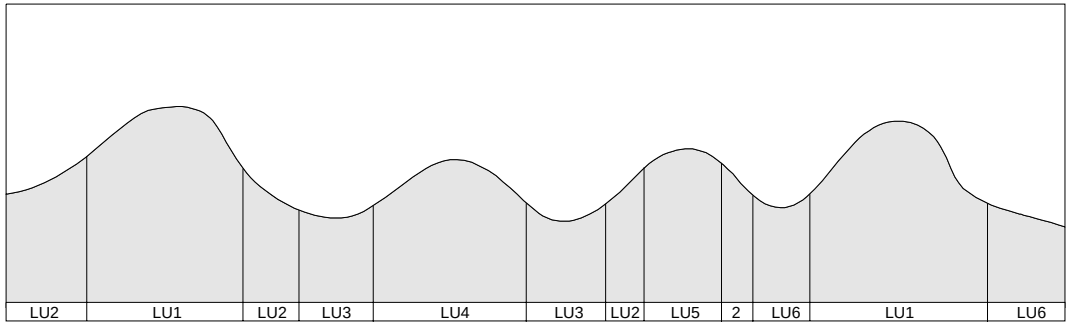
LAND SYSTEM – MATCHBOX 2 (Mb2)

General Description: Undulating low hills to steep hills on acid intrusive rocks. Major soils are shallow to moderately deep, uniform coarse textured soils (Bleached Orthic Tenosols) and moderately deep to deep, yellow, grey and red gradational soils and sodic duplex soils (Yellow, Grey and Red Kandosols, Dermosols and Chromosols).

Geology: Undifferentiated granites – granite, adamellite, granodiorite, diorite.

Landform: Undulating low hills to steep hills.

Vegetation: Open forest with no disturbance to limited clearing. Bloodwoods, yellow stringybark and narrow leaved ironbark with an understorey of *Casuarina grevillea* and *Banksia* species, wattles and cockatoo apple.



Land Unit	Area %	Landform Attributes	Soils	Remnant Vegetation	Land Class
LU1	20	Crests and upper slopes 5–20%. Common to abundant surface cobble to boulders and rock outcrop.	Shallow to moderately deep uniform, coarse textured soils with loose to firm surfaces; coarse sand to sandy loam A horizons usually with bleached A2 horizons; coarse sand to coarse sandy loam B horizon; acid to neutral soil reaction trend. Bleached-Orthic Tenosols.	Open Forest. Bloodwoods, yellow stringybark, narrow-leaved ironbark, often with *Casuarina* and *Grevillea* species.	VI m6, pd3, ps3, nd3, (ts6), r4–5, e3 or 6
LU2	30	Mid slopes, 5–40%. Common to abundant surface cobble and stone and rock outcrop especially on steeper slopes.	Shallow to moderately deep uniform coarse textured soils and brown and yellow gradational soils with loose to firm surfaces, coarse sand to sandy loam A horizon usually with bleached A2 horizons; coarse sand to coarse sandy loam B horizons; acid to neutral soil reaction trend. Bleached-Orthic Tenosols and Brown and Yellow Kandosols.	Open Forest. Bloodwoods, yellow stringybark, narrow-leaved ironbark often with scrubby understorey of *Casuarina*, *Grevillea* and *Banksia* species.	VI–VII m6, pd3, ps3, nd3, (ts6–7), r4–5, e3 or 6–7
LU3	10	Lower slopes and drainage lines 3–6% slopes.	Deep, mottled grey sodic duplex soils with loose to firm surfaces; loamy sand to sandy loam; thick to very thick A horizons; coarse sandy light to light medium clay B horizons; aid soil reaction trend. Grey Chromosols and Redoxic Hydrosols.	Open to closed forest. *Melaleuca* species, red bottlebrush and *Banksia* species with Queensland blue gum, swamp mahogany and gum-topped bloodwood as emergents.	VI m6, pd3, ps3, nd3, w4, e3

(cont.)

MATCHBOX 2 (continued)

Land Unit	Area %	Landform Attributes	Soils	Remnant Vegetation	Land Class
LU4	15	Crests and upper and mid slopes, 4–15%.	Moderately deep to deep, red and brown, gradational soils with loose to firm surfaces; sandy loam to sandy clay loam A horizons; sandy clay loam to sandy light clay B horizons; acid to neutral soil reaction trend. Red and Brown Kandosols and Dermosols.	Open forest. Bloodwoods, yellow stringy bark and narrow-leaved ironbark with understorey of cockatoo apple.	VI m6, ps3., nd3, e3–4
LU5	15	Crests and upper slopes 2–5%.	Moderately deep to deep, yellow, brown and grey gradational soils and non sodic duplex soils with loose to firm surfaces; coarse sand to coarse sandy loam, thick to very thick A horizons usually with bleached A2 horizons; sandy clay loam to sandy light medium clay B horizons; usually with few to many fine to medium gravel; acid soil reaction trend. Yellow, Brown and Grey Kandosols, Dermosols, and Chromosols.	Open forest. Bloodwoods, yellow stringybark, narrow-leaved ironbark with an understorey, black she oak, wattles, *Banksia* species and cockatoo apple.	VI m6, pd3, ps3, nd3, e3
LU6	10	Lower slopes and drainage lines 2–5%.	Deep, mottled, grey, sodic duplex soils with loose to firm surfaces; loamy sand to sandy loam thick to very thick A horizons with bleached A2 horizons; sandy light clay to light medium clay B horizons; acid soil reaction trend. Redoxic Hydrosols.	Open forest. Yellow stringybark and bloodwoods with understorey of *Casuarina* and *Banksia* species.	VI m6, ps3, nd3, e3

LAND SYSTEM – WATALGAN 2 (Wt2)

General Description: Undulating hills to rolling hills on acid intrusive rocks. Major soils are very shallow to moderately deep, uniform, coarse textured soils (Bleached Orthic, Orthic and Bleached Leptic Tenosols), shallow to deep, red, yellow and brown, gradational soils and non sodic duplex soils (Red, Yellow and Brown Kandosols, Dermosols and Sodosols) and brown and grey, gradational soils and sodic duplex soils (Browm and Grey Dermosols and Sodosols).

Geology: Watalgan Granite – Granite, granodiorite and minor quartz diorite.

Landform: Undulating hills to rolling hills.

Vegetation: Closed to open forest with no effective disturbance to limited clearing. Bloodwoods, spotted gum and narrow-leaved ironbark and minor Queensland blue gum, swamp mahogany and Moreton Bay ash with wattles dominating the lower stratum.

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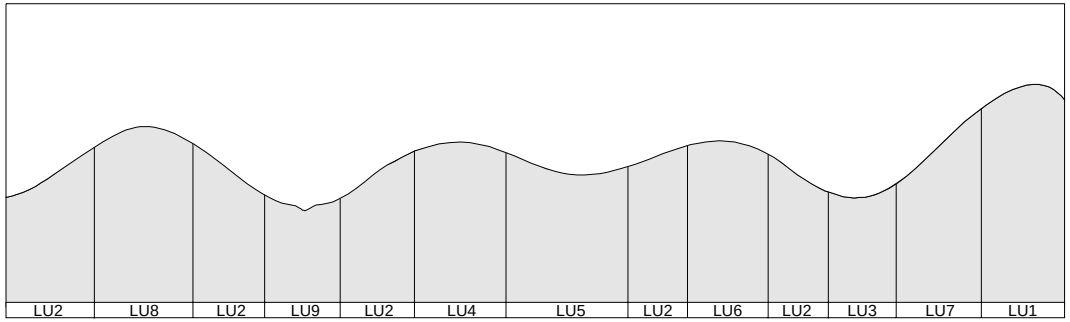


Land Unit	Area %	Landform Attributes	Soils	Remnant Vegetation	Land Class
LU1	20	Crests and upper slopes, 5–15%. Many to abundant gravel and stone on surface. Rock outcrop common.	Very shallow to shallow, uniform coarse textured soils with hardsetting surfaces, over weathering granite; sand to loamy sand, medium A horizons often with bleached A2 horizons; (when present) coarse sand to sandy loam B horizons; acid to neutral soil reaction trend. Bleached-Leptic and Bleached-Orthic and Orthic Tenosols.	Open forest. Brown bloodwood and narrow-leaved ironbark with wattles dominating the lower stratum.	VI m6, pd3, ps3, nd3, r4–5, e3–4 or 6
LU2	10	Mid slopes, 8–15%.	Moderately deep to deep, occasionally mottled, brown and grey, gradational soils and sodic duplex soils with hardsetting surfaces; coarse sand to coarse sandy loam, thick A horizons with bleached A2 horizons; coarse sandy clay loam to sandy light clay B horizons with few to common fine gravel; neutral soil reaction trend. Brown and Grey Dermosols and Sodosols.	Open forest. Brown bloodwood, spotted gum, swamp mahogany and Queensland blue gum with *Casuarina* species and wattles dominating the understorey.	VI m6, pd3, ps3, nd3, e3, 4 or 6
LU3	5	Low slopes and drainage lines, 2–4%.	Moderately deep to deep uniform soils coarse textured with hardsetting surfaces; sand to sandy loam, very thick A horizons with bleached A2 horizons; sandy loam B horizons; neutral soil reaction trend. Bleached Orthic Tenosols.	Closed forest. Bloodwoods, swamp paperbark and wattles with minor Queensland blue gum and swamp mahogany.	VI m6, ps3, nd3, ts4, e2, f2

(cont.)

WATALGAN 2 (continued)

Land Unit	Area %	Landform Attributes	Soils	Remnant Vegetation	Land Class
LU4	5	Lower crests and upper slopes, 3–10%.	Shallow, red and brown, non sodic duplex soils with hardsetting surfaces; sandy loam to sandy clay loam, thick A horizons often with bleached A2 horizons; sandy light clay B horizons wth many medium gravel at depth; neutral soil reaction trend. Red and Brown Chromosols.	Open forest. Spotted gum, narrow-leaved ironbark, bloodwoods and yellow stringybark with wattles and cockatoo apple in the understorey.	IV or VI m4 or 6, ps3, nd3, e2–3
LU5	5	Concave mid slopes, 8–15%.	Deep, red and brown, gradational soils and non sodic duplex soils with hardsetting surfaces; sandy loam to sandy clay loam, medium to thick A horizons; sandy light clay to sandy light medium clay B horizons with few to many fine to medium gravel; neutral soil reaction trend. Red and Brown Dermosols and Chromosols.	Closed forest. Bloodwoods, Moreton Bay ash and spotted gum with wattles in the understorey.	III–IV m3-4, ps3, nd3, e3–4
LU6	5	Upper slopes and crests, 5–12%.	Shallow to moderately deep, uniform coarse textured soils with hardsetting surfaces, over weathered granite; sand to loamy sand, thick A horizons with bleached A2 horizons; acid soil reaction trend. Bleached Leptic Tenosols.	Open forest. Bloodwoods, spotted gum and narrow-leaved ironbark with wattles in the understorey.	VI m6, pd3, ps3, nd3, e3–4
LU7	20	Mid and upper slopes, 20–40%. Few to many surface pebble and stone. Rock outcrop common.	Shallow to moderately deep, uniform, coarse textured soils with hardsetting surfaces over weathered granite; sand to sandy loam, thick A horizons usually with bleached A2 horizons; (when present) sand to sandy loam B horizons; acid to neutral soil reaction trend. Bleached-Leptic , Bleached-Orthic and Orthic Tenosols.	Open forest. Narrow-leaved ironbark, bloodwoods and yellow stringybark.	VII m6, pd3–4, ps3, nd3, ts6–7, e6–7
LU8	15	Crests and upper slopes, 5–12%.	Moderately deep, yellow and brown, gradational and non sodic duplex soils with loose to firm surfaces; sandy loam to sandy clay loam, thick A horizons with bleached A2 horizons; sandy light to light medium clay B horizons; acid to neutral soil reaction trend. Yellow and Brown Kandosols and Dermosols.	Open forest. Brown bloodwood, spotted gum and narrow-leaved ironbark with wattles and *Casuarina* species in the understorey.	VI m6, pd3, ps3, nd3, e3–4
LU9	5	Lower slopes and drainage lines, 3–5%.	Deep, grey and brown, sodic duplex soils with hardsetting surfaces; sandy loam to sandy clay loam, medium to thick A horizons with bleached A2 horizons; sandy light medium to medium clay B horizons; neutral soil reaction trend. Grey and Brown Sodosols.	Open forest. Queensland blue gum, swamp mahogany and swamp paperbark.	VI m6, pd3–4, ps3, nd3, w4, e2–3

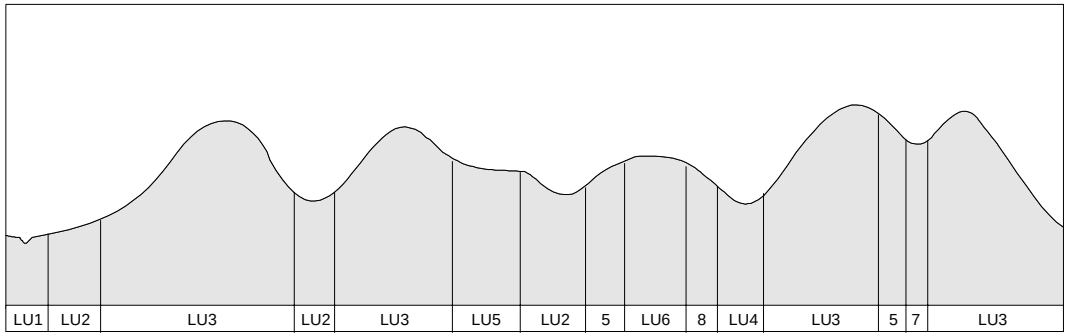
LAND SYSTEM – HOGBACK (Hb)

General Description: Rolling hills to steep hills on acid intrusive rocks. Major soils are shallow to deep, uniform, coarse textured soils over rock (Bleached Leptic Tenosols, Bleached Orthic and Orthic Tenosols), brown, red and yellow gradational soils (Brown, Red and Yellow Kandosols and Dermosols) and brown, yellow and grey sodic and non sodic duplex soils (Brown, Yellow and Grey Sodosols and Chromosols).

Geology: Hogback Granite – Biotite granite, hornblende-biotite granite.

Landform: Rolling hills to steep hills.

Vegetation: Open forest to woodland with limited to extensive clearing. Narrow-leaved ironbark, spotted gum, red bloodwood, Queensland blue gum, Moreton Bay ash, swamp mahogany and yellow stringybark with an understorey of wattles, *Casuarina* and *Grevillea* species.



Land Unit	Area %	Landform Attributes	Soils	Remnant Vegetation	Land Class
LU1	5	Major drainage depressions, 1–3%. Surface rock present in places.	Shallow to deep, alluvial soils with hardsetting surfaces; sand to sandy clay loam, medium A horizons; sand to sandy light clay D horizons; acid to neutral soil reaction trend. Leptic Rudosols.	Open forest. Queensland blue gum, Moreton Bay ash, narrow-leaved ironbark with river she-oaks and *Melaleuca* species fringing major creeks.	VI m6, nd3, (r3–4), e6, f3
LU2	10	Lower slopes and drainage depressions, 2–12%.	Moderately deep to deep, uniform, coarse textured soils and brown, yellow and grey, gradational soils with loose to hardsetting surfaces; sand to sandy clay loam, thick A horizons, usually with bleached A2 horizons; sandy loam to sandy clay loam to light clay B horizons, acid to neutral soil reaction trend. Bleached Orthic Tenosols and Brown, Yellow and Grey Kandosols and Dermosols.	Open forest. Bloodwoods, spotted gum, Queensland blue gum, swamp mahogany, narrow-leaved ironbark with an understorey *Casuarina* species and grass trees.	VI m6, nd3, e3–4
LU3	35	Crests and slopes, 30–50%. Rock outcrop common to abundant.	Shallow to moderately deep, uniform, coarse textured soils, and brown, yellow and red, gradational soils with loose to firm surfaces; coarse sand to sandy loam, thick to very thick A horizons; sandy loam to sandy clay loam B horizons; acid to neutral soil reaction trend. Orthic Tenosols and Brown, Yellow and Red Kandosols.	Open forest. Narrow-leaved ironbark, spotted gum, bloodwoods, with an understorey of *Casuarina* species and wattles.	VII–VIII m6, pd3, nd3, ts7–8, r5, e7
LU4	10	Lower slopes, 2–15%. Few surface cobble and rock outcrop may be present.	Moderately deep to deep, occasionally mottled, brown, yellow and grey, sodic duplex soils with loose to firm surfaces; coarse sand to sandy clay loam, thick to very thick A horizons often with bleached A2 horizons; sandy light to medium clay B horizons; acid to neutral soil reaction trend. Brown, Yellow and Grey Sodosols and Chromosols.	Open forest to woodland. Moreton Bay ash, swamp mahogany, Queensland blue gum, red bloodwood and narrow-leaved ironbark often with an understorey of wattles and *Casuarina* species.	VI–VII m6, nd3, r3–5, e6

(cont.)

HOGBACK (continued)

Land Unit	Area %	Landform Attributes	Soils	Remnant Vegetation	Land Class
LU5	15	Mid slopes, 10–20%. Rock outcrop common.	Shallow to deep, uniform, coarse textured soils over rock and brown and yellow, gradational soils with loose to firm surfaces; coarse sand to sandy clay loam, medium to very thick A horizons, often with bleached A2 horizons over rock; (when present) coarse sand to sandy clay loam B horizons; acid to neutral soil reaction trend. Bleached Leptic Tenosols, Orthic Tenosols and Brown and Yellow Kandosols.	Open forest. Narrow-leaved ironbark, spotted gum, bloodwood and yellow stringybark occasionally with Queensland blue gum, swamp mahogany, red ash, wattles, bottle trees and grass trees.	VII m6, pd3–4, nd3, ts6, r5, e4–6
LU6	13	Crests and upper slopes, 3–15%. Few to common large surface gravel and cobble. Rock outcrop common.	Shallow to moderately deep, uniform coarse textured soils over rock and brown and red, gradational soils with loose to firm surfaces; coarse sand to fine sandy loam, thick to very thick A horizons often with bleached A2 horizons overlying rock; (when present) sandy loam to sandy clay loam B horizons; few to many fine gravel to cobbles may be present; acid to neutral soil reaction trend. Bleached Leptic Tenosols, Bleached Orthic Tenosols and Brown and Red Kandosols.	Open forest. Narrow-leaved ironbark, spotted gum, red bloodwood, swamp mahogany and yellow stringybark occasionally with grass trees, wattles and *Casuarina* species.	VI–VII m6, pd3–4, nd3, r3–5, e2–4
LU7	2	Drainage depressions. Seeps may be present.	Deep, mottled, grey, non sodic duplex soils with hardsetting surfaces; sandy loam to sandy clay loam, thick A horizons with bleached A2 horizons; sandy light clay B horizons; acid soil reaction trend. Grey Chromosols and Redoxic Hydrosols.	Shrubland. *Melaleuca* species.	V pd3, nd3, w5
LU8	10	Mid slopes, 4–15%. Few to common surface gravel and rock outcrop may be present.	Moderately deep to deep, usually mottled, brown, yellow and grey sodic duplex soils; sandy loam to sandy clay loam, thick to very thick A horizons; sandy light to medium clay B horizons occasionally with granitic fragments; neutral to alkaline soil reaction trend. Brown, Yellow and Grey Sodosols and Chromosols.	Open forest. Red bloodwood, spotted gum, Queensland blue gum, yellow stringybark, gum-topped bloodwood and swamp mahogany often with an understorey of wattles, *Casuarina* and *Grevillea* species.	VI–VII m6, pd3–4, nd3, (ts6), r2–3, e6–7

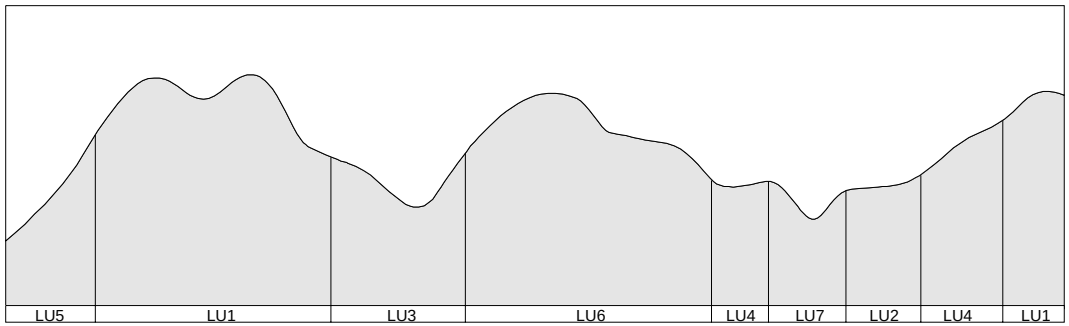
LAND SYSTEM – MIRIAM VALE 7 (Mv7)

General Description: Rolling hills to steep mountains on acid intrusive rocks. Major soils are shallow to moderately deep, uniform coarse textured soils (Orthic Tenosols) and gradational soils (Red and Brown Kandosols and Dermosols).

Geology: Miriam Vale Granodiorite – Granodiorite, adamellite, and quartz diorite and minor pegmatite, gneiss and gabbro.

Landform: Rolling hills to steep mountains.

Vegetation: Open forest with no effective disturbance to limited clearing. Spotted gum, narrow-leaved ironbark, brush box, bloodwoods with minor swamp mahogany and Queensland blue gum.



Land Unit	Area %	Landform Attributes	Soils	Remnant Vegetation	Land Class
LU1	20	Crests, 5–10% and upper slopes 10–30%. Many to abundant cobbles and boulders on surface. Rock outcrop common.	Shallow to moderately deep, uniform coarse textured soils; loamy coarse sand to coarse sandy loam, medium A horizons with soft to firm surfaces; loamy coarse sand to coarse loamy sand B horizons, often with many fine granitic fragments throughout; acid to neutral soil reaction trend. Orthic Tenosols.	Open forest. Spotted gum, narrow-leaved ironbark, bloodwoods with minor Queensland blue gum, swamp mahogany and broad-leaved white mahogany.	VII m6, pd3, ps3, nd3, r5, ts6–7, e7
LU2	5	Lower slopes and footslopes, 10–15%. Few to common cobbles on surface and rock outcrop.	Shallow to moderately deep, red and brown gradational soils with firm to hardsetting surfaces; sandy loam to sandy clay loam, medium A horizons; sandy clay loam B horizons with few to many granitic coarse fragments; acid to neutral soil reaction trend. Red Kandosols and Dermosols.	Open forest. Bloodwoods, swamp mahogany and Queensland blue gum.	VI m6, pd3, ps3, nd3, r3–5, e6
LU3	5	Concave lower slopes and drainage lines, 3–10%. Many to abundant cobble and stone on surface and rock outcrop.	Moderately deep to deep, brown, gradational soils with firm to hardsetting surfaces; sandy loam to sandy clay loam, medium A horizons; sandy clay loam to sandy light clay B horizons with medium gravel at depth; acid to neutral soil reaction trend. Brown Kandosols and Dermosols.	Open forest. Swamp mahogany and Queensland blue gum, with minor *Casuarina* species.	VI m6, ps3, nd3, r3–5, e6
LU4	15	Concave mid slopes, 10–30%. Surface cobble may be present.	Shallow to moderately deep, red and brown gradational soils with firm to hardsetting surfaces; coarse sandy loam to sandy clay loam, medium A horizons; sandy loam to coarse sandy clay loam B horizons; few to common fine granitic fragments throughout profile ; acid to neutral soil reaction trend. Brown Kandosols.	Open forest. Swamp mahogany, spotted gum, Queensland blue gum and minor bloodwoods and narrow-leaved ironbark.	VI–VII m6, pd3, ps3, nd3, ts6–7, (r3), e6–7

(cont.)

MIRIAM VALE 7 (continued)

Land Unit	Area %	Landform Attributes	Soils	Remnant Vegetation	Land Class
LU5	30	Mid slopes, 20–50%. Common surface cobble and boulders and rock outcrop.	Moderately deep to deep, uniform coarse textured soils with soft to firm surfaces; coarse sandy loam to sandy loam, medium A horizons; coarse sand to coarse sandy loam B horizons; neutral soil reaction trend. Orthic Tenosols.	Open forest. Spotted gum, rough-barked apple, narrow-leaved ironbark and brush box with *Casuarina* species and wattle often in understorey.	VII–VIII m6, ps3, nd3, ts7–8, (r3–5), e7–8
LU6	20	Crests and upper to mid slopes, 10–40%. Few to abundant surface cobble and boulders and rock outcrop.	Shallow to moderately deep, red and brown gradational and sodic duplex soils with firm to hardsetting surfaces; sandy loam to sandy clay loam, thick A horizons; sandy clay loam to sandy light clay B horizons with few to common granitic fragments; acid to neutral soil reaction trend. Red and Brown Kandosols, Dermosols and Chromosols.	Open forest. Spotted gum, narrow-leaved ironbark, bloodwoods, brush box with *Casuarina* species and wattles.	VI–VII m6, pd3, ps3, nd3, ts6–7, r3–5, e6–7
LU7	5	Lower slopes and drainage lines 2–5%. Surface cobble and stone may be present	Deep, usually mottled, grey and brown sodic duplex soils with hardsetting surfaces; sandy loam to clay loam, medium to thick A horizons usually with bleached A2 horizons; light medium to medium clay B horizons; neutral to alkaline soil reaction trend. Grey and Brown Sodosols and Chromosols.	Open woodland. Queensland blue gum, swamp mahogany, Moreton Bay ash often with *Casuarina* species in channels.	VI m6, pd3–4. ps3, nd2, r2–4, e3, f3

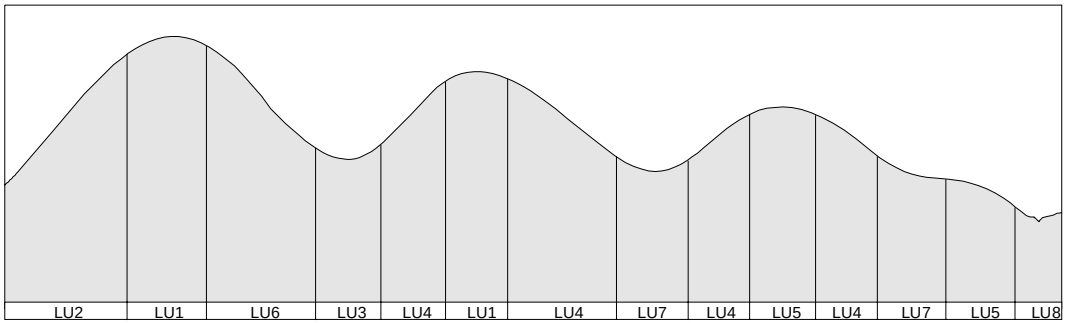
LAND SYSTEM – CASTLETOWER (Cw)

General Description: Rolling hills to steep mountains on acid intrusive rocks. Major soils are very shallow to shallow, uniform coarse textured, (Bleached Leptic and Leptic Tenosols), shallow to moderately deep, red, brown and yellow, gradational soils and non sodic duplex soils (Red, Brown and Yellow Dermosols, Kandosols and Chromosols).

Geology: Castle Tower Granite – Leucocratic granite.

Landform: Rolling hills to steep mountains.

Vegetation: Open forest to woodland with no effective disturbance to limited clearing. Spotted gum, narrow-leaved ironbark, bloodwoods, Moreton Bay ash, Queensland blue gum and swamp mahogany with minor areas of semi-evergreen vine forest.



Land Unit	Area %	Landform Attributes	Soils	Remnant Vegetation	Land Class
LU1	15	Narrow crests, ridges and upper slopes, 10–20%. Rock outcrop abundant.	Very shallow to shallow, uniform, coarse textured soils with firm to hardsetting surfaces; sand to sandy loam, thin to medium A horizons, overlying weathered granite, neutral soil reaction trend. Leptic Tenosols.	Open forest. Spotted gum, bloodwoods, narrow-leaved ironbark and yellow stringybark.	VI m6, pd4, ps3, nd3, r5, ts6, e4–6
LU2	30	Steep slopes, 40–60%. Rock outcrop abundant.	Very shallow to shallow, uniform, coarse textured soils with firm to hardsetting surfaces; coarse sand to sandy loam, thin to medium A horizons often with bleached A2 horizons overlying weathered granite; neutral soil reaction trend. Bleached Leptic and Leptic Tenosols.	Open forest. Spotted gum, bloodwoods, narrow-leaved ironbark and yellow stringybark.	VIII m6, pd4, ps3, nd3, r5, ts7–8, e7–8
LU3	15	Concave slopes, 5–15%. Common to abundant surface stone and rock outcrop.	Moderately deep, brown and yellow, uniform and gradational soils with firm to hardsetting surfaces; sandy loam to sandy clay loam, medium A horizons; sandy clay loam to sandy light clay B horizons; few to common medium gravel at depth; neutral soil reaction trend. Brown and Yellow Dermosols and Chromosols.	Open forest. Moreton Bay ash, Queensland blue gum, narrow-leaved ironbark and bloodwoods.	VI-VII m6, pd3, ps3, nd3, r4–5, ts4, e3–6
LU4	15	Mid to upper slopes, 30–45%. Common to abundant surface stone.	Shallow to moderately deep, red, brown and yellow, non sodic duplex and gradational soils with hardsetting surfaces; sandy loam to sandy clay loam, medium to thick A horizons; sandy clay loam to light medium clay B horizons, with few to common fine to medium gravel; neutral soil reaction. Red, Brown and Yellow Chromosols and Kandosols.	Open forest to woodland. Narrow-leaved ironbark, spotted gum, bloodwoods and yellow stringybark.	VII m4–6, (pd3), ps3, nd3, ts7, r3–5, e7

(cont.)

CASTLE TOWER (continued)

Land Unit	Area %	Landform Attributes	Soils	Remnant Vegetation	Land Class
LU5	10	Hillcrests and ridges, 5–10%. Few to common surface stone and rock outcrop.	Shallow to moderately deep, red and brown, gradational and non sodic duplex soils with hardsetting surfaces; sandy loam to sandy clay loam, medium A horizons; sandy clay loam to sandy light clay B horizons with few to many fine to coarse gravel; neutral soil reaction trend. Red and Brown Kandosols and Chromosols.	Open forest. Narrow-leaved ironbark and spotted gum.	VI m6, pd3, ps3, nd3, r3–4, e3–4
LU6	5	Steep mid and upper slopes, 35–50%. Few to common surface stone and rock outcrop.	Very shallow to shallow, uniform coarse textured soils with firm to hardsetting surfaces; sand to sandy loam, thin to medium A horizons often with bleached A2 horizons, overlying weathered granite; neutral soil reaction trend. Bleached Leptic Tenosols.	Semi evergreen vine forest.	VII-VIII m6, pd3–4, ps3, nd3, ts7–8, r3–4, e7–8
LU7	5	Concave mid slopes, 4–10%. Few medium gravel on surface and occasionally rock outcrop.	Moderately deep, mottled, brown and grey, sodic duplex soils with hardsetting surfaces; loamy sand to sandy loam, medium to thick A horizons with bleached A2 horizons; light medium to medium clay B horizons with few to many fine to medium gravel; neutral soil reaction trend. Brown and Grey Chromosols.	Open forest. Moreton Bay ash, Queensland blue gum, narrow-leaved ironbark, swamp mahogany and bloodwoods.	VI m6, pd3–4, ps3, nd3, r2–3, e4 or 6
LU8	5	Valley flats and drainage lines, 1–5%.	Deep, brown, black and grey, non cracking clays and sodic duplex soils with hardsetting surfaces; clay loam to light clay, medium to thick A horizons; light to medium clay B horizons; often overlying D horizons with few fine gravel at depth; neutral soil reaction trend. Brown, Black and Grey Dermosols and Sodosols.	Open woodland. Queensland blue gum, narrow-leaved ironbark and Moreton Bay ash with river she oak, swamp mahogany and rainforest species common in the channels.	VI m4 or 6, pd3, ps3, e6, r2–3

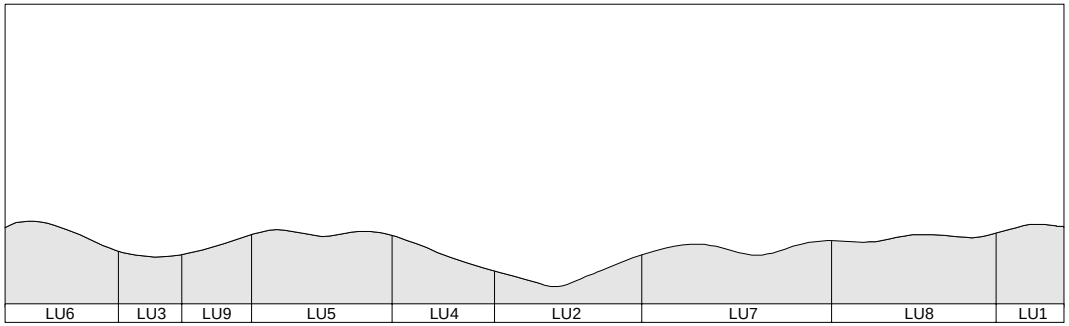
LAND SYSTEM – LOWMEAD (Lm)

General Description: Gently undulating rises on sedimentary rocks. Major soils are deep, grey, sodic duplex soils (Grey Kurosols) and moderately deep to deep, grey and brown, non cracking clays (Grey and Brown Dermosols)

Geology: Lowmead Beds – Shale, claystone, mudstone, siltstone, argillaceous sandstone, lignite and conglomerate.

Landform: Gently undulating rises.

Vegetation: Closed forest with extensive to limited clearing. Yellow stringybark, spotted gum, bloodwoods, narrow-leaved ironbark, Queensland blue gum and swamp mahogany with minor gum-topped box, with wattles dominating the lower stratum.



Land Unit	Area %	Landform Attributes	Soils	Remnant Vegetation	Land Class
LU1	10	Crests, 1–3%. Few to many medium ironstone on surface	Moderately deep, usually mottled, brown, sodic duplex soils with hardsetting surfaces; clay loam, medium A horizons; light medium to medium clay B horizons; acid soil reaction trend. Brown Kurosols.	Closed forest. Yellow stringybark, spotted gum and bloodwoods.	VI m6, pd4, ps4, nd3, r2–4
LU2	10	Lower slopes, 1–3%.	Moderately deep, grey, sodic duplex soils with hardsetting surfaces; loamy sand to sandy loam, medium A horizons with bleached A2 horizons; light medium clay B horizons; acid soil reaction trend. Grey Kurosols.	Closed forest. Yellow stringybark, Moreton Bay ash and spotted gum with minor Queensland blue gum and swamp mahogany with wattles and cabbage palms dominating the lower stratum.	VI m6, pd4, ps4, nd3, e3
LU3	5	Lower slopes and flats, 0–2%.	Deep, mottled, grey and brown, gradational soils and non cracking clays with hardsetting surfaces; clay loam to light clay, medium to thick A horizons often with bleached A2 horizons; light to light medium clay B horizons; acid soil reaction trend. Brown and Grey Dermosols.	Closed forest. Queensland blue gum, swamp mahogany, Moreton Bay ash with wattles dominating the understorey. *Melaleuca* species, and cabbage palms may be present.	VI m4 or 6, pd3, ps4, nd3, e2
LU4	10	Mid to lower slopes, 2–6%.	Deep, mottled, grey, sodic duplex soils with hardsetting surfaces; sandy clay loam, thick A horizons; coarse sandy light to coarse sandy light medium clay B horizons with few to common fine gravel; acid soil reaction trend. Grey Kurosols.	Closed forest. Yellow stringybark, swamp mahogany, Queensland blue gum and bloodwoods with wattles and swamp mahogany dominating the lower stratum.	VI m6, pd3, ps4, nd3, e3

(cont)

LOWMEAD (continued)

Land Unit	Area %	Landform Attributes	Soils	Remnant Vegetation	Land Class
LU5	10	High crests, 1–3%. Few to many surface medium gravel may be present.	Very shallow to shallow, grey, non cracking clays and sodic duplex soils with hardsetting surfaces; clay loam to light clay, medium A horizons; light medium to medium clay B horizons with few to abundant large gravel ; acid soil reaction trend. Grey Dermosols, Kurosols and Sodosols.	Open forest. Broad-leaved ironbark, narrow-leaved ironbark, and spotted gum with wattles dominating the lower stratum.	VI m6, pd4, ps3, nd3, r2–3, e3
LU6	5	Crests and upper slopes, 3–8%.	Deep, red, gradational soils and non cracking clays with hardsetting surfaces; clay loam to light clay medium A horizons; light to light medium clay B horizons; acid soil reaction trend. Red Dermosols.	Open forest. Yellow stringybark, bloodwoods, and broad-leaved ironbark.	VI m6, pd4, ps4, nd3, e3 or 6
LU7	20	Mid to upper slopes, 1–6%.	Deep, grey, mottled, sodic duplex soils with hardsetting surfaces; sandy clay loam to clay loam, thick A horizons with bleached A2 horizons; light medium to medium heavy clay B horizons; acid soil reaction trend. Grey Kurosols.	Closed to open forest. Yellow stringybark, bloodwoods, spotted gum, smooth-barked apple, Queensland blue gum and narrow-leaved iron bark with grass trees in understorey.	VI m6, pd4, ps4, nd3, e3
LU8	20	Crests and upper slopes, 1–3%.	Deep, grey, non cracking clays with hardsetting surfaces; light clay, medium A horizons; medium to medium heavy clay B horizons; acid soil reaction trend. Grey Dermosols.	Closed forest. Narrow-leaved ironbark, spotted gum and broad-leaved iron bark.	VI m6, pd4, ps4, nd3, e3
LU9	10	Mid slopes, 3–5%.	Moderately deep to deep, mottled, grey non cracking clays with hardsetting surfaces; light clay medium A horizons; medium clay B horizons; acid soil reaction trend. Grey Dermosols.	Bloodwoods, broad-leaved ironbark, smooth barked apple and yellow stringybark.	VI m6, pd4, ps4, nd3, e3

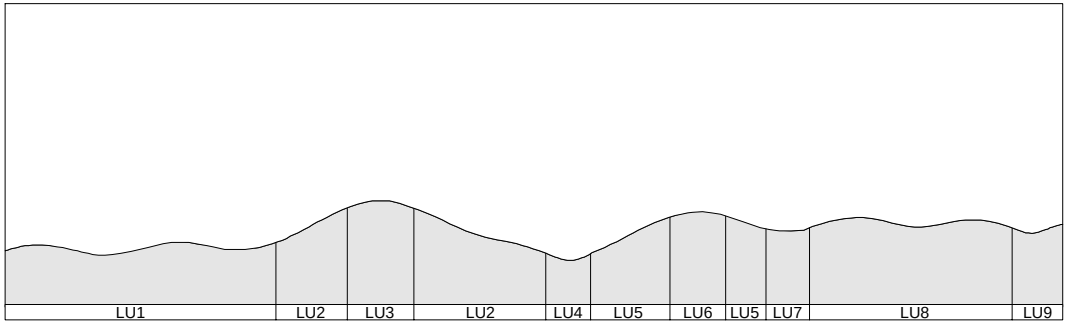
LAND SYSTEM – BROOWEENA (Bw)

General Description: Gently undulating rises to undulating rises on sedimentary rocks. Major soils are moderately deep to deep, brown and red sodic duplex soils and deep, brown and grey sodic duplex soils (Brown, Red and Grey Sodosols and Kurosols) and shallow to moderately deep, uniform coarse textured soils (Bleached-Leptic Tenosols).

Geology: Brooweena Formation – Sandstone, siltstone, mudstone, shale, conglomerate and minor tuff.

Landform: Gently undulating rises to undulating rises.

Vegetation: Open forest with limited clearing. Bloodwoods, yellow stringybark, spotted gum, gum-topped box, Queensland blue gum, swamp mahogany and *Melaleuca* species with an understorey of wattles and grass trees.



Land Unit	Area %	Landform Attributes	Soils	Remnant Vegetation	Land Class
LU1	10	Gently undulating slopes, 1–4%.	Shallow to moderately deep, uniform, coarse textured soils with hardsetting surfaces; loamy sand to sandy loam, thick A horizons usually with bleached A2 horizons; (when present) sandy loam B horizons; abundant to very abundant medium to coarse gravel throughout the profile; neutral soil reaction trend. Bleached Leptic Tenosols.	Open forest. Yellow stringybark, bloodwoods, spotted gum and narrow-leaved ironbark with wattles and *Casuarina* species dominating the understorey.	VI m6, pd3, ps3, nd3, r3, e2
LU2	15	Mid slopes, 5–10%.	Moderately deep, often mottled, brown and red, sodic duplex soils with hardsetting surfaces; clay loam medium to thick A horizons with bleached A2 horizons; medium clay B horizons with common to many medium gravel at depth; acid soil reaction trend. Brown Kurosols and Sodosols.	Open forest. Broad-leaved ironbark, gum-topped box, narrow-leaved ironbark, yellow stringybark and spotted gum often with wattles and grass trees dominating the lower stratum. Gum-topped box occasionally dominant.	VI m6, pd4, ps3,. nd3, e6
LU3	15	Crests and upper slopes higher in the landscape, 2–4%. Common to many gravel to cobble on surface. Rock outcrop may occur.	Shallow (occasionally very shallow) to moderately deep, red, sodic duplex soils with hardsetting surfaces; fine sandy loam to clay loam, medium to thick A horizons; light medium to medium clay B horizons; usually few to many medium gravel throughout the profile; acid soil reaction trend. Red Kurosols.	Open forest. Bloodwoods, yellow stringybark, spotted gum, narrow-leaved ironbark and gum-topped box.	VI m6, pd4, ps3, nd3, r3, e3

(cont.)

BROOWEENA (Continued)

Land Unit	Area %	Landform Attributes	Soils	Remnant Vegetation	Land Class
LU4	5	Concave lower slopes and drainage lines, 1–3%.	Deep to very deep, often mottled, brown and grey, sodic duplex soils with hardsetting surfaces; clay loam, medium A horizons; light medium to medium clay B horizons; acid soil reaction trend. Brown Kurosols and Sodosols.	Open forest. Gum-topped box, Queensland blue gum and swamp mahogany with an understorey of *Melaleuca* species and wattles.	VI m6, pd4, ps3, nd3, sa4, e6
LU5	15	Mid slopes, 3–8%.	Deep to very deep, mottled, brown, sodic duplex soils with hardsetting surfaces; loamy sand to sandy loam, thick to very thick A horizons with bleached A2 horizons; light medium to medium clay B horizons; abundant medium gravel may be present in upper profile; acid soil reaction trend. Brown Kurosols.	Closed forest. Bloodwood and spotted gum with *Melaleuca* species and grass trees dominating the lower stratum.	VI m6, pd3, ps3, nd3, r2, e6
LU6	15	Crests and upper slopes, 2–5%.	Moderately deep, yellow and grey, mottled, sodic duplex soils with hardsetting surfaces; fine sandy loam to sandy clay loam, medium to thick A horizons with bleached A2 horizons; medium clay B horizons; acid soil reaction trend. Yellow and Grey Kurosols.	Open forest. Yellow stringybark and bloodwoods.	VI m6, pd3, ps3. nd3, e3–4
LU7	10	Lower slopes, 2–4%.	Deep to very deep, occasionally mottled, brown and yellow, sodic duplex soils with hardsetting surfaces; fine sandy loam to loam fine sandy, medium to thick A horizons with bleached A2 horizons; sandy light medium to medium clay B horizons; acid to neutral soil reaction trend. Brown and Yellow Sodosols.	Closed forest. Bloodwoods and yellow stringybark with *Melaleuca* species.	VI m6, pd3, ps3, nd3, sa4, e3–4
LU8	15	Gently undulating rise with slopes of 2–6%. Few to many medium surface gravel.	Shallow to moderately deep, usually mottled, grey, sodic duplex soils with hardsetting surfaces; sandy loam to sandy clay loam, medium to thick A horizons with bleached A2 horizons; medium to medium heavy clay B horizons; fine to many medium gravel throughout profile; acid to neutral soil reaction trend. Grey Sodosols and Kurosols.	Open forest. Brown bloodwoods, narrow-leaved ironbark, yellow stringybark, spotted gum, smooth-barked apple with wattles dominating the lower stratum.	VI m6, pd3–4, ps3, nd3, r2, e3–4
LU9	5	Few to many medium gravel on surface. Lower slopes and drainage lines, 0–2%.	Deep, mottled, seasonal wet, grey sodic duplex soils with soft to firm surfaces; sand to sandy loam, thick to very thick A horizons usually with bleached A2 horizons; sandy light clay to medium clay B horizons; acid soil reaction trend. Redoxic Hydrosols.	Open forest. *Melaleuca* species with an understorey dominated by grass trees.	VI m6, pd3, ps3, nd3, sa4, w4, e2

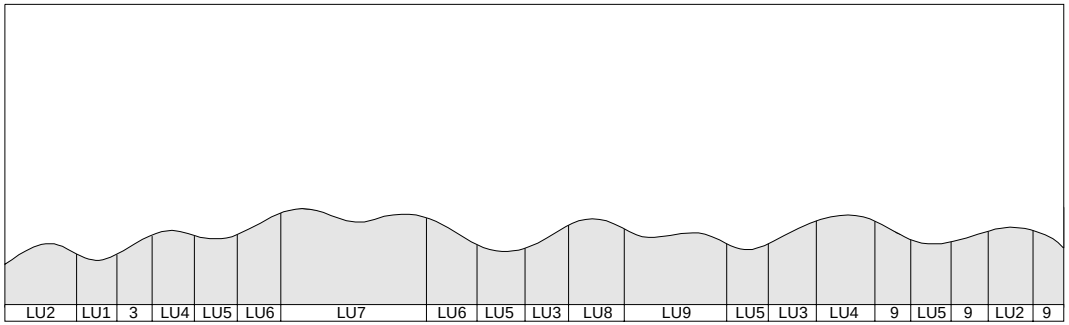
LAND SYSTEM – ROSEDALE 1 (Rd1)

General Description: Gently undulating to undulating rises on sedimentary rocks. Major soils are moderately deep to deep, often stony, brown, grey, yellow and red gradational soils and sodic duplex soils (Brown, Grey, Yellow and Red Dermosols, Sodosols and Kurosols).

Geology: Biggenden Beds – Sandstone, shale, mudstone, conglomerate, andesitic volcanics, chert, rare limestone.

Landform: Gently undulating rises to undulating rises.

Vegetation: Open forest to woodland, extensively cleared. Narrow-leaved ironbark, bloodwoods, spotted gum, Queensland blue gum, gum-topped box, yellow stringybark, swamp mahogany and Moreton Bay ash, with *Melaleuca* species and wattles often dominating the lower stratum.



Land Unit	Area %	Landform Attributes	Soils	Remnant Vegetation	Land Class
LU1	5	Concave lower slopes and open depressions, 1–6%. Gilgai may be present.	Moderately deep to deep, occasionally mottled, brown, grey and black, cracking and non cracking clays with self mulching to hardsetting surfaces; light clay A horizons occasionally with bleached A2 horizons; medium to medium heavy clay B horizons; neutral to alkaline soil reaction trend. Brown, Grey and Black Vertosols and Dermosols.	Open forest. Queensland blue gum and Moreton Bay ash.	IV m3, ps2, pm2, sa2, tm2, w4, e2, (f2)
LU2	10	Crests and upper slopes, 1–7%. Rock outcrop may be present.	Shallow to moderately deep, often mottled, brown and grey, stony, sodic duplex soils with firm to hardsetting surfaces; sandy loam to clay loam, medium to thick A horizons usually with bleached A2 horizons; light medium to medium clay B horizons; common to many fine to coarse gravel throughout profile; acid soil reaction trend. Brown and Grey Sodosols and Kurosols.	Open forest. Spotted gum, narrow-leaved ironbark, Queensland blue gum, gum-topped box, bloodwoods and swamp mahogany with wattles dominating the lower stratum.	VI m6, pd3–4, ps3, nd3, (r3), e3
LU3	10	Mid slopes, 5–10%. Rock outcrop may occur.	Moderately deep to deep, often mottled, brown and yellow, gradational and sodic duplex soils with hardsetting surfaces; sandy clay loam to light clay, medium A horizons occasionally with bleached A2 horizons; light medium to medium clay B horizons; few to abundant, fine to coarse gravel throughout profile; acid to alkaline soil reaction trend. Brown and Yellow Dermosols and Sodosols.	Open forest. Narrow-leaved ironbark, Queensland blue gum, bloodwood, Moreton Bay ash and yellow stringybark.	VI m6, pd3, ps3, nd3, (r3), e6

(cont.)

ROSEDALE 1 (continued)

Land Unit	Area %	Landform Attributes	Soils	Remnant Vegetation	Land Class
LU4	10	Hillcrests, ridges and upper slopes, 2–8%. Small to medium surface gravel may be present. Rock outcrop occasionally present.	Moderately deep to deep, occasionally mottled, brown, sodic duplex soils with hardsetting surfaces; fine sandy loam to clay loam, medium to thick A horizons usually with bleached A2 horizons; light medium to medium clay B horizons; few to many fine gravel may be present in upper profile; acid to alkaline soil reaction trend. Brown Sodosols and Kurosols.	Woodland. Narrow-leaved ironbark, Queensland blue gum and bloodwoods and minor yellow stringybark and spotted gum.	VI m6, pd3–4, ps3, nd3, r2–3, e3 or 6
LU5	10	Concave lower slopes and drainage lines, 0–4%.	Moderately deep to deep, mottled, grey and brown, gradational soils and sodic duplex soils with hardsetting surfaces; fine sandy clay loam to clay loam, medium to thick A horizons often with bleached A2 horizons; light to medium clay B horizons; few to many fine gravel at depth; acid to neutral soil reaction trend. Brown and Grey Dermosols, Sodosols and Kurosols.	Open forest to woodland. Queensland blue gum, narrow-leaved ironbark, swamp mahogany and minor yellow stringybark and bloodwoods, often with understorey of *Melaleuca* species and wattles or prominent in drainage lines.	VI m6, pd3–4, ps3, sa2, w4, e3, f2
LU6	15	Concave mid slopes, 4–10%. None to common small to medium gravel on surface.	Deep, occasionally mottled, brown and red, gradational and sodic duplex soils with hardsetting surfaces; sandy clay loam to clay loam, medium to thick A horizons usually with bleached A2 horizons; light to medium heavy clay B horizons; few fine gravel may be present throughout profile; neutral soil reaction trend. Brown and Red Dermosols and Sodosols.	Open forest. Narrow-leaved ironbark, gum-topped box, bloodwoods, spotted gum and Queensland blue gum.	VI m6, pd3–4, ps3, nd3, (r2), e6
LU7	20	Crests and upper slopes, 4–12%.	Moderately deep, red, sodic duplex soils and gradational soils with hardsetting surfaces; clay loam, medium to thick A horizons occasionally with bleached A2 horizons; light clay to medium clay B horizons; common to many, fine to medium gravel throughout profile; acid to neutral soil reaction trend. Red Sodosols and Chromosols and Dermosols.	Open forest to woodland. Narrow-leaved ironbark, spotted gum, bloodwoods, gum-topped box and Moreton Bay ash, with wattles often dominating the lower stratum.	IV or VI m4 or 6, pd3, ps3, nd3, e4 or 6
LU8	10	Crests and ridges, 1–4%.	Shallow, uniform, medium textured soils with firm to hardsetting surfaces over rock; fine sandy loam to sandy clay loam, thick A horizons usually with bleached A2 horizons; few fine gravel may be present throughout profile; neutral soil reaction trend. Bleached Leptic and Leptic Tenosols.	Open forest. Yellow stringbark, spotted gum, narrow-leaved ironbark and bloodwoods, with wattles dominating the lower stratum.	VI m6, pd4, ps2, nd3, e4
LU9	10	Mid slopes, 4–10%. Few to many medium ironstone gravel on surface.	Deep, usually mottled, grey, stony, sodic, duplex soils with hardsetting surfaces; sandy loam to sandy clay loam, thick A horizons with bleached A2 horizons, usually with many to abundant medium ironstone gravel; light medium to medium clay B horizons usually with few to many, fine to medium gravel; acid soil reaction trend. Grey Kurosols and Sodosols.	Open forest. Queensland blue gum, swamp mahogany, brown bloodwood, narrow leaved ironbark and yellow stringybark with understorey of red ash, wattles, *Melaleuca* species and swamp mahogany.	VI–VII m6, ps2, nd3, r2–3, e6

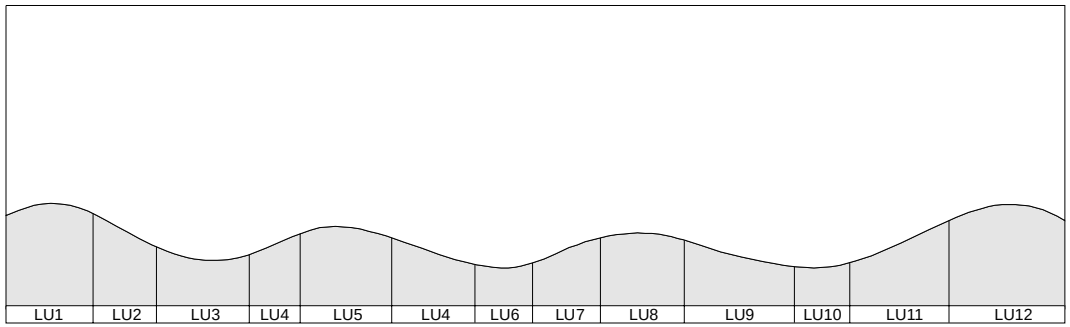
LAND SYSTEM – ELLIOT (Et)

General Description: Undulating rises to rolling rises on sedimentary rocks. Major soils are deep, red and brown gradational and non sodic duplex soils (Red and Brown Dermosols and Chromosols) deep, grey, brown and yellow, non sodic and sodic duplex soils (Grey, Brown and Yellow Chromosols and Sodosols), deep to very deep, grey, seasonally wet, gradational soils and sodic duplex soils (Oxyaquic and Redoxic Hydrosols) and shallow brown, stony, gradational and sodic duplex soils (Brown Dermosols and Sodosols).

Geology: Elliot Formation – Quartzose and subliable sandstone, conglomerate, mudstone, siltstone and shale.

Landform: Undulating rises to rolling rises.

Vegetation: Open forest with no effective disturbance to limited clearing. Broad-leaved white mahogany, bloodwoods, broad-leaved paperbark, narrow-leaved ironbark and yellow stringybark with minor swamp paperbark, swamp mahogany, smooth-barked apple, spotted gum, pink bloodwood and gum topped box with wattles, Casuarina species, grevilleas and coast banksia dominating the understorey.



Land Unit	Area %	Landform Attributes	Soils	Remnant Vegetation	Land Class
LU1	5	Crests and upper slopes, 5–10%. Few to common small surface gravel.	Deep, red, gradational soils and non sodic duplex soils with hardsetting surfaces; sandy clay loam to clay loam, medium to thick A horizons usually with bleached A2 horizons; light to light medium clay B horizons, usually with fine gravel; neutral to soil reaction trend. Red Dermosols and Chromosols.	Open forest. Smooth-barked apple, bloodwoods and narrow-leaved ironbark with *Casuarina* species dominating the lower stratum.	III m2–3, ps3, nd3, r2, e3
LU2	5	Mid slopes, 5–12%.	Deep, usually mottled, red, gradational soils with hardsetting surfaces; sandy clay loam to light clay, thick A horizons; light medium clay B horizons with few to many fine gravel; neutral soil reaction trend. Red Dermosols.	Open to open forest. Bloodwoods, narrow-leaved ironbark and yellow stringybark with minor brown bloodwood and swamp mahogany, with wattles and *Casuarina* species dominating the lower stratum.	III–IV m2–3, ps3, nd3, e3–4
LU3	5	Lower slopes, 1–3%.	Deep, usually mottled, brown and grey, gradational soils and sodic duplex soils with hardsetting surfaces; sandy clay loam to clay loam, thick to very thick A horizons often with bleached A2 horizons; sandy light clay to medium clay B horizons; acid to neutral soil reaction trend. Grey and Brown Dermosols, Sodosols and Chromosols.	Open forest. Broad-leaved paperbark, yellow stringybark and bloodwoods.	IV m3–4, ps3, nd3, sa4, w4, e2

(cont.)

ELLIOT (continued)

Land Unit	Area %	Landform Attributes	Soils	Remnant Vegetation	Land Class
LU4	10	Mid slopes, 4–10%. Few to common medium gravel on surface.	Deep, mottled, brown (occasionally red) gradational soils and sodic duplex soils with hardsetting surfaces; sandy loam to clay loam, thick to very thick A horizons with bleached A2 horizons; light clay B horizons usually over a mottled grey B3 horizon; ;acid to neutral soil reaction trend. Brown (occasionally Red) Dermosols and Chromosols.	Open forest. Broad-leaved white mahogany and bloodwoods, minor narrow-leaved ironbark and broad-leaved paperbark and swamp mahogany, with wattles and *Grevillea* species dominating the lower stratum.	IV m4, pd3, ps3, nd3, e3.
LU5	15	Crests and ridges, 1–4%. None to common medium to large gravel on surface.	Moderately deep, mottled, brown and yellow, non sodic and sodic duplex soils with hardsetting surfaces; sandy loam to sandy clay loam, medium to thick A horizons often with bleached A2 horizons; light medium to medium heavy clay B horizons; few to many ironstone and quartz throughout profile; neutral soil reaction trend. Brown and Yellow Chromosols.	Open forest. Brown bloodwood, broad-leaved white mahogany, yellow stringybark, narrow-leaved ironbark, minor smooth-barked apple and spotted gum with *Casuarina* species dominating the lower stratum.	VI m6, pd3–4, ps3, nd3, (r2–3), e2–3
LU6	10	Lower slopes and flats, 0–1%.	Moderately deep to deep, grey, seasonally wet, gradational soils with hardsetting surfaces; clay loam, medium A horizons occasionally with bleached A2 horizons; light clay B horizons, often with a pan lower in the B horizon; neutral to alkaline soil reaction trend. Oxyaquic Hydrosols.	Closed forest. Swamp paperbark, broad-leaved paperbark, *Casuarina* species and *Banksia* species with emergent Queensland blue gum and broad-leaved white mahogony.	VII m6, pd3, ps3, nd3, sa4, w5
LU7	10	Mid slopes, 2–4%. Few to many fine to medium gravel on surface.	Deep to very deep, grey, seasonally wet, gradational soil with loose surfaces; sand to loamy sand, very deep A horizons with bleached A2 horizons; coarse sandy clay loam to coarse sandy light clay B horizons; neutral soil reaction trend. Oxyaquic Hydrosols.	Open forest. Broad-leaved paperbark and swamp paperbark with coast banksia dominating the lower stratum.	VII m6, ps3, nd3, sa4, w5, e2
LU8	10	Crests, 1–4%. Few to many fine surface gravel.	Deep, mottled, yellow and brown, gradational soils, with loose surfaces; coarse sand to coarse sandy loam, very thick A horizons with bleached A2 horizons; coarse sandy clay loam coarse sand to coarse sandy light clay B horizons; few to common fine gravel throughout solum; acid to neutral soil reaction trend. Yellow and Brown Dermosols.	Open forest. Pink bloodwood and gum-topped bloodwood with wattles dominating the lower stratum.	IV m4, ps3, nd3, r2, e2
LU9	5	Mid slopes, 1–5%.	Deep, mottled, grey, usually seasonally wet, sodic duplex soils with firm to loose surfaces; loamy sand to fine sandy loam, very thick A horizons with bleached A2 horizons; sandy light clay to medium clay B horizons; acid to neutral soil reaction trend. Grey Sodosols and Redoxic Hydrosols.	Open forest. Pink bloodwood, yellow stringybark and broad-leaved white mahogany with broad-leaved paperbark dominating the lower stratum.	VII m6, ps3, nd3, w4, e3
LU10	5	Broad drainage lines and flats, 0–2%.	Deep, mottled, grey, seasonally wet, gradational and sodic duplex soils often with a silty clay loam to light clay, sedimentary layer on the surface; coarse sand to loamy sand, thick to very thick A horizons with bleached A2 horizons; coarse sandy clay loam to sandy light clay B horizons; acid to neutral soil reaction trend. Oxyaquic and Redoxic Hydrosols.	Open forest. Broad-leaved paperbark and swamp paperbark with brown bloodwoods as emergents with sedges and grass trees dominating the lowest stratum.	VII m6, ps3, nd3, sa4, w5, e2

(cont.)

ELLIOT (continued)

Land Unit	Area %	Landform Attributes	Soils	Remnant Vegetation	Land Class
LU11	10	Mid slopes, 1–6%. Few to common fine to medium gravel on surface.	Deep, mottled, grey, gradational soils and sodic duplex soil, with hardsetting surfaces; fine sandy clay loam to clay loam, medium to thick A horizons with bleached A2 horizons; light to medium clay B horizons often with iron nodules; acid to neutral soil reaction trend. Grey Dermosols and Sodosols.	Open forest. Broad-leaved white mahogany, brown bloodwood, broad-leaved paperbark and minor yellow stringybark with wattles, *Grevillea* species and *Melaleuca* species dominating the lower stratum.	VI m6, pd3–4, ps3, nd3, e3
LU12	10	Crests and ridges, 1–3%. Few to common fine gravel on surface.	Shallow, brown, stony, sodic duplex soils and gradational soils with hardsetting surfaces; clay loam, medium A horizons with bleached A2 horizons; light clay B horizons with many to abundant fine gravel; acid soil reaction trend. Brown Dermosols and Sodosols.	Open forest. Bloodwoods, narrow-leaved ironbark, spotted gum and yellow stringybark.	VI m6, pd4, ps4, nd3, e3

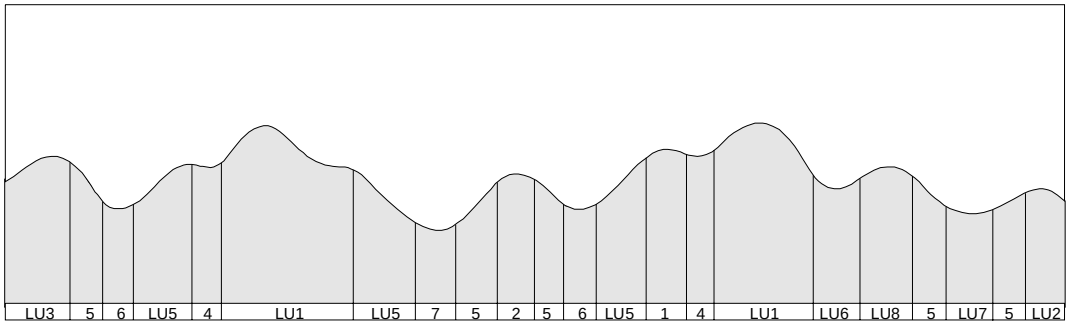
LAND SYSTEM – ROSEDALE 2 (Rd2)

General Description: Rolling low hills to steep hills on sedimentary rocks. Major soils are shallow to moderately deep, stony, brown, yellow and red, sodic duplex and gradational soils (Brown, Yellow and Red Sodosols, Dermosols and Kandosols), and shallow, uniform, medium textured soils over rock (Bleached Leptic and Chernic Leptic Tenosols), deep, grey and brown, sodic duplex soils, (Grey and Brown Sodosols).

Geology: Biggenden Beds – Sandstone, shale, mudstone, conglomerate, andesitic volcanics, chert, rare limestone.

Landform: Rolling low hills to steep hills.

Vegetation: Open forest to woodland limited to extensively cleared. Narrow-leaved ironbark, bloodwoods, spotted gum, gum-topped box, Queensland blue gum, yellow stringybark, swamp mahogany and Moreton Bay ash, with wattles, she oaks and *Melaleuca* species dominating the lower stratum.



Land Unit	Area %	Landform Attributes	Soils	Remnant Vegetation	Land Class
LU1	15	Crests (2–10%) and upper slopes (20–40%). Many to abundant small to medium surface gravel and rock outcrop.	Shallow, occasionally mottled, brown, stony, gradational soils and sodic duplex soils with hardsetting surfaces; sandy loam to sandy clay loam, medium A horizons often with bleached A2 horizons; clay loam sandy to light clay B horizons; few to abundant small to medium gravel throughout profile; neutral soil reaction trend. Brown Kandosols and Sodosols .	Open forest. Narrow-leaved ironbark, bloodwoods, broad-leafed ironbark and minor spotted gum and *Brachychiton* species, with *Casuarina* species often dominating the lower stratum.	VII–VIII m6, pd4, ps3, nd3, ts7, r4–5, e7–8
LU2	15	Crests and upper slopes, 6–20%. Common to abundant small gravel on surface and rock outcrop may be present.	Shallow to moderately deep, occasionally mottled, stony, uniform medium textured soils over rock and brown and yellow, gradational and sodic duplex soils with hardsetting surfaces; sandy clay loam to clay loam, medium to thick A horizons usually with bleached A2 horizons; (when present) light to medium clayB horizons; few to abundant fine to coarse gravel throughout profile; neutral soil reaction trend. Bleached Leptic Tenosols, Brown and Yellow Dermosols and Sodosols .	Open forest to woodland. Narrow-leaved ironbark, spotted gum, bloodwoods Queensland blue gum, with wattles often dominating the lower stratum. Gum-topped box with minor spotted gum and narrow-leaved ironbark occasionally dominant.	VI–VII m6, pd3–4, ps3, nd3, r3–5, e6–7
LU3	10	Crests and upper slopes, 8–20%. Few to many medium gravel on surface. Volcanic rock outcrop present, in some areas abundant.	Shallow to moderately deep, red and brown, stony, non sodic duplex and gradational soils and non cracking clays with hardsetting surfaces; clay loam to light clay, medium A horizons (occasionally over rock); light medium to medium clay B horizons; few to many medium to coarse gravel throughout profile; neutral soil reaction trend. Red and Brown Chromosols and Dermosols (occasionally Chernic Leptic Tenosols).	Open forest. Narrow-leaved ironbark, bloodwoods and silver-leaved ironbark occasionally with Queensland blue gum.	IV–VI m4 or 6, pd3–4, ps3, nd2, r2–5, e4 or 6

(cont.)

ROSEDALE 2 (continued)

Land Unit	Area %	Landform Attributes	Soils	Remnant Vegetation	Land Class
LU4	10	Higher concave mid slopes, 3–10%.	Moderately deep, brown, stony, gradational soils with hardsetting surfaces; coarse sandy loam to sandy clay loam, medium A horizons; sandy clay loam to clay loam sandy B horizons; few to common fine gravel throughout profile; acid to neutral soil reaction trend. Brown Kandosols.	Open forest. Gum-topped box and spotted gum.	VI m6, pd4, ps3, nd3, e6
LU5	15	Mid slopes, 8–20%.	Shallow to moderately deep, occasionally mottled, stony, brown and yellow, gradational soils and sodic duplex soils with hardsetting surfaces; clay loam, medium A horizons with bleached A2 horizons; light medium to medium clay B horizons; few to many fine to medium gravel throughout profile; acid to neutral soil reaction trend. Brown Dermosols and Sodosols.	Open forest. Narrow-leaved ironbark, Moreton Bay ash, Queensland blue gum, bloodwoods and yellow stringybark.	VI–VII m6, pd4, ps3, nd3, e6–7
LU6	15	Concave lower slopes higher in the landscape, 4–10%. Gravel common to abundant on surface.	Moderately deep to deep, brown, stony, sodic duplex soils with hardsetting surfaces; sandy clay loam to clay loam, medium to thick A horizons occasionally with bleached A2 horizons; light medium to medium clay B horizons; few to abundant fine to medium gravel throughout profile; neutral soil reaction trend. Brown Sodosols and Chromosols.	Open forest to woodland. Spotted gum, Queensland blue gum, narrow-leaved ironbark and swamp mahogany with minor gum-topped box.	VI m6, pd3–4, ps3, nd3, ts4, e6
LU7	10	Lower slopes and drainage lines, 0–5%.	Deep to very deep, mottled, brown and grey, sodic duplex soils and non cracking clays with hardsetting surfaces; silty clay loam to light clay, medium to thick A horizons occasionally with bleached A2 horizons; light clay to medium clay B horizons usually with few to many fine to medium gravel; neutral to alkaline soil reaction trend. Brown and Grey Sodosols and Dermosols.	Open forest to woodland. Queensland blue gum, Moreton Bay ash, swamp mahogany gum topped box and bloodwoods with *Melaleuca* species common in the drainage lines.	VI m6, pd3, ps3, ts4, w4, e3, f2
LU8	10	Crests and upper slopes, 2–12%. Few to many mudstone gravel on surface.	Shallow to moderately deep, red, sodic duplex soils and gradational soils with hardsetting surfaces; clay loam to light clay, medium A horizons occasionally with bleached A2 horizons; light medium to medium clay B horizons; few to abundant medium coarse gravel throughout profile; acid to neutral soil reaction trend. Red Chromosols and Dermosols.	Open forest. Narrow-leaved ironbark, bloodwoods, Moreton Bay ash, silver-leaved ironbark and Queensland blue gum.	IV–VI m4 or 6, pd3, ps3, nd3, r2–3, e3–6

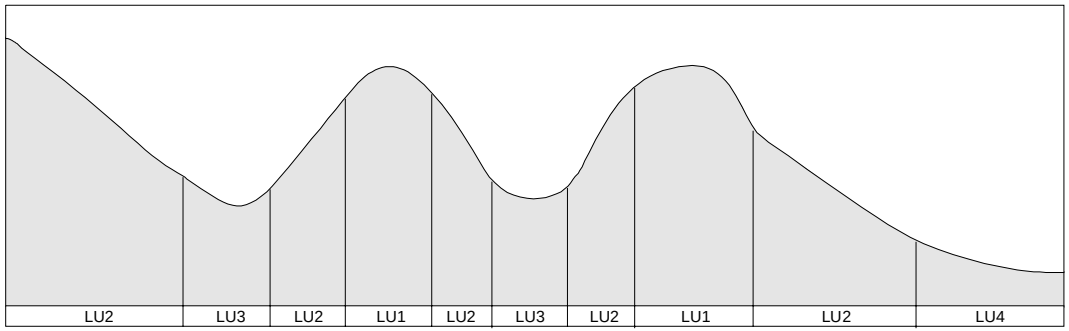
LAND SYSTEM – BANIA 1 (Ba1)

General Description: Rolling hills to steep hills on sedimentary and metamorphic rocks. Major soils are shallow to moderately deep, red and brown, gradational soils and non cracking clays (Red and Brown Kandosols and Dermosols).

Geology: Wandilla Formation – Mudstone, arenite, siltstone, jasper, chert, slate, schist.

Landform: Rolling hills to steep hills.

Vegetation: 'Softwood scrub' forest with no effective disturbance in forestry reserves but usually extensively to completely cleared on other lands. "Softwood scrub" species with minor silver-leaved ironbark and Queensland blue gum.



Land Unit	Area %	Landform Attributes	Soils	Remnant Vegetation	Land Class
LU1	30	Crests and upper slopes, 5–30%. Common to abundant medium gravel on surface. Rock outcrop common in places.	Shallow to moderately deep, red and brown, gradational soils and non cracking clays with loose surfaces; clay loam to light clay, medium to thick A horizons; light to light medium clay B horizons; few to abundant, medium to large gravel throughout profile; acid to neutral soil reaction trend. Red Kandosols and Brown Dermosols.	Forest. 'Softwood scrub' species with emergents of bloodwood, narrow-leaved ironbark and Moreton Bay ash.	VI–VII m3–4, pd3–4, ps3, ts6–7, r3–5, e6
LU2	40	Mid slopes, 15–30%, some as high as 60%. Medium gravel and rock outcrop may occur.	Shallow to moderately deep, red, gradational soils and non cracking clays with firm to hardsetting surfaces; clay loam to light clay A horizons; light clay, weakly to moderately structured B horizons; usually few to common medium gravel throughout profile; acid soil reaction trend. Red Kandosols and Dermosols.	Forest. 'Softwood scrub' species.	VI–VIII m3–4, pd3-4, ps3, ts6–8, r2–4, e6–7
LU3	25	Lower concave slopes, 15–25%. Medium gravel may occur on surface.	Shallow to moderately deep, red and brown, gradational soils and non cracking clays with firm to hardsetting surfaces; clay loam to light clay, medium A horizons; light clay, weakly to moderately structured B horizons; few to common, medium gravel either throughout profile or in B horizon; acid soil reaction trend. Red and Brown Kandosols and Dermosols.	Forest. 'Softwood scrub' species.	VI m3–4, pd3-4, ps3, ts6, r2–3, e6
LU4	5	Lower slopes and drainage lines, 5–15%.	Moderately deep to deep, red, brown and black, gradational and non cracking clays with hardsetting surfaces; clay loam to light clay, medium A horizons; light clay B horizons; acid to neutral soil reaction trend. Red, Brown and Black Dermosols.	Woodland. Silver-leaved ironbark, Queensland blue gum and minor 'softwood scrub' species.	IV m3, ps3, e4

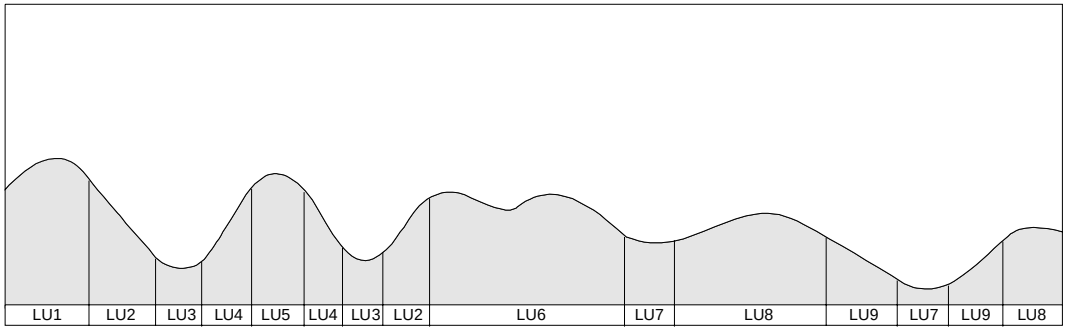
LAND SYSTEM – BANIA 2 (Ba2)

General Description: Rolling hills to steep hills on sedimentary rocks. Major soils are very shallow to shallow, stony, medium textured soils over rock (Leptic Rudosols and Bleached Leptic Tenosols), and shallow, to moderately deep brown, yellow and red, gradational soils and non cracking clays (Brown, Yellow and Red Dermosols and Kandosols) and sodic duplex soils (Brown, Yellow and Red Chromosols and Sodosols).

Geology: Wandilla Formation – Mudstone, arenite, siltstone, jasper, chert, slate, schist.

Landform: Steep hills with minor rolling hills with some plateau surfaces.

Vegetation: Woodland to open forest and shrubby woodland with no effective disturbance to limited clearing. Spotted gum, narrow-leaved ironbark, bloodwoods, gum-topped box, Queensland blue gum, swamp mahogany, *Casuarina* species, wattles and zamia palms dominating the lower stratum.



Land Unit	Area %	Landform Attributes	Soils	Remnant Vegetation	Land Class
LU1	20	Crests and upper slopes, 5–15%. Common to abundant gravel or cobble on surface and rock outcrop.	Very shallow to shallow, stony, uniform, medium textured soils over rock, and brown and yellow gradational soils with hardsetting surfaces; clay loam, medium A horizons often with bleached A2 horizons; (if present) light clay B horizons; usually many to abundant medium gravel throughout profile; acid to neutral soil reaction trend. Leptic and Bleached Leptic Tenosols and Brown and Yellow Dermosols.	Shrubby woodland. Narrow-leaved ironbark, spotted gum, swamp mahogany, *Casuarina* species, wattles and zamia palms.	VII m6, pd4 or 6, ps3, nd3, r5, e6
LU2	20	Mid slopes, 30–40%. Common to many cobble on surface. Rock outcrop present.	Shallow, yellow and brown, gradational and sodic duplex soils with hardsetting surfaces; sandy clay loam to clay loam, medium A horizons occasionally with bleached A2 horizons; light to medium clay B horizons; often many to abundant, medium gravel throughout profile; acid to neutral soil reaction trend. Yellow and Brown Dermosols, Sodosols and Chromosols.	Open forest to woodland. Spotted gum, narrow-leaved ironbark and zamia palms.	VII m6, pd3–4, ps3, nd3, ts7, r4–5, e7
LU3	5	Lower concave slopes, 10–15%. Gravel and cobble and rock outcrop present.	Shallow to moderately deep, brown, sodic duplex soils and gradational soils with hardsetting surfaces; clay loam, medium A horizons often with bleached A2 horizons; light to medium clay B horizons; many to abundant gravel and cobble throughout profile; acid to neutral soil reaction trend. Brown Sodosols and Dermosols.	Woodland. Gum-topped box, apple tree and Queensland blue gum. *Casuarina* and *Melaleuca* species in drainage lines.	VI–VII m6, pd3-4,ps3, nd3, ts4, r3–5, e6

(cont.)

BANIA 2 (continued)

Land Unit	Area %	Landform Attributes	Soils	Remnant Vegetation	Land Class
LU4	5	Mid to lower slopes, 20–50%. Medium to coarse gravel common on surface.	Moderately deep to deep, red (occasionally brown), gradational soils and non cracking clays with hardsetting surfaces; clay loam to light clay, medium A horizons; light to medium clay B horizons; often many to abundant, medium to coarse gravel throughout profile; acid to neutral soil reaction (may be alkaline in lower slopes). Red Dermosols.	Woodland. Narrow-leaved ironbark, bloodwoods, spotted gum, broad-leaved ironbark, yellow stringybark, *Casuarina* species and zamia palm, with Queensland blue gum and swamp mahogany usually dominant on the lower slopes.	VII–VIII m3–4, ps3, nd3, ts6–7, r2–4, e7–8
LU5	5	Crests and upper slopes, 15–20%. Medium gravel common to abundant on surface.	Shallow, red, gradational soils and non cracking clays with hardsetting surfaces; clay loam to light clay, medium A horizons; light to light medium clay B horizons; few to abundant, medium gravel throughout profile; acid to neutral soil reaction trend. Red Dermosols.	Woodland. Narrow-leaved ironbark and bloodwoods.	VI m4 or 6, pd3, ps3, nd3, ts6, r2–4, e6
LU6	25	Undulating rises on a plateau, 6–12%. Medium gravel to cobble common to abundant on surface. Rock outcrop common in places.	Very shallow to shallow, stony, uniform, medium textured soils over rock, and brown, gradational soils and sodic duplex soils with hardsetting surfaces; sandy loam to clay loam, medium to thick A horizons usually with bleached A2 horizons; (if present) light to medium clay B horizons; few to abundant medium gravel throughout profile; acid to neutral soil reaction trend. Bleached Leptic Tenosols and Brown Kandosols, Dermosols and Sodosols.	Open forest. Spotted gum, narrow-leaved ironbark, swamp mahogany, red ash, *Casuarina* species, wattles and grass trees, with gum-topped box often dominant on lower slopes.	VII m6, pd4 or 6, ps3, nd3, ts4, r5, e6.
LU7	5	Lower concave slopes, 5–10%.	Shallow to moderately deep, brown and red, gradational soils, non cracking clays and sodic duplex soils with hardsetting surfaces; sandy clay loam to light clay, medium to thick A horizons; light to medium heavy clay B horizons; few to common small to medium gravel throughout profile; acid to alkaline soil reaction trend. Brown and Red Dermosols, Chromosols and Sodosols.	Woodland. Spotted gum, Moreton Bay ash, narrow-leaved ironbark, gum-topped box and wattles.	IV–VI m3–4, ps3, nd3, e4 or 6
LU8	10	Crests, ridges and upper slopes, 6–12%.	Moderately deep, red, gradational soils with hardsetting surfaces; clay loam, medium A horizons often with bleached A2 horizons; light clay B horizons; few to common, medium gravel throughout or in lower part of profile; acid soil reaction trend. Red Dermosols.	Shrubby woodland. Bloodwoods, spotted gum, smooth barked apple, swamp mahogany, with *Casuarina* species and wattles dominating the understorey.	IV m4, ps3, nd3, e3–4
LU9	5	Mid slopes, 6–12%.	Moderately deep, occasionally mottled, brown and yellow, gradational and sodic duplex soils with hardsetting surfaces; loam to light clay, medium A horizons; light to medium clay B horizons; usually few to abundant medium gravel throughout profile or in A horizons; acid to neutral soil reaction trend. Yellow and Brown Dermosols, Sodosols and Chromosols.	Shrubby woodland. Spotted gum, bloodwoods, narrow-leaved ironbark, with wattles and *Casuarina* species dominating the understorey.	VI m6, pd3, ps3, nd3, e6

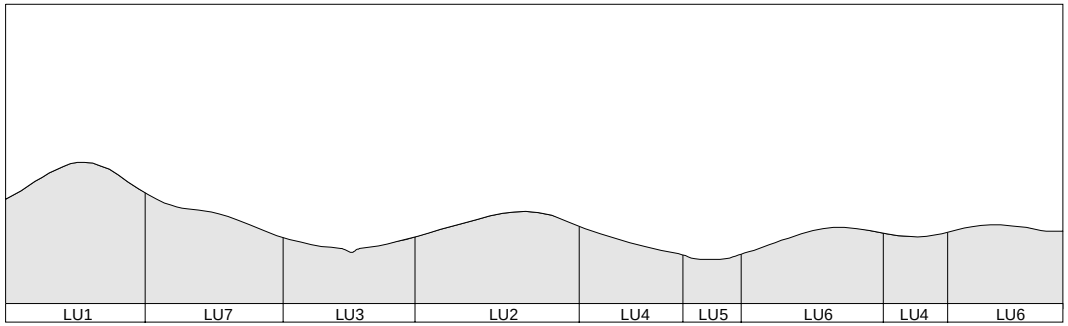
LAND SYSTEM – ELECTRA 1 (Ec1)

General Description: Gently undulating rises to undulating low hills on sedimentary and metamorphic rocks. Major soils are moderately deep to deep, grey, yellow and brown, and red and brown, gradational and sodic duplex soils, (Red and Brown Dermosols and Chromosols) and sodic duplex soils, (Grey, Yellow and Brown Sodosols and Kurosols).

Geology: Undifferentiated Curtis Island Group – Greywacke, siltstone and shale; andesitic volcanics and chert.

Landform: Gently undulating rises to undulating low hills.

Vegetation: Open forest to woodland extensive to limited clearing. Narrow-leaved ironbark, yellow stringybark, Queensland blue gum, gum-topped box, Moreton Bay ash and swamp mahogany with wattles and *Melaleuca* species dominating the understorey.



Land Unit	Area %	Landform Attributes	Soils	Remnant Vegetation	Land Class
LU1	10	Crests and ridges, 3–10%. Few to common medium to coarse gravel on surface.	Moderately deep to deep, red and brown, gradational and sodic duplex soils with hardsetting surfaces; fine sandy loam to fine sandy clay loam, medium to thick A horizons; light clay B horizons, acid to neutral soil reaction trend. Red Chromosols, Sodosols and Dermosols.	Open forest. Narrow-leaved ironbark, broad-leaved ironbark, spotted gum, Queensland blue gum, Moreton Bay ash with wattles dominating the understorey.	IV–VI m4 or 6, pd3, ps3, nd3, r2–3, e3–4
LU2	10	Lower crests and ridges, 2–5%. Few to common cobbles on surface with some rock outcrop.	Shallow to moderately deep, red and brown, gradational and sodic duplex soils with hardsetting surfaces; sandy clay loam to clay loam, medium A horizons; light to light medium clay B horizons with many to abundant pebbles throughout; acid soil reaction trend. Red and Brown Dermosols and Chromosols.	Open forest. Narrow-leaved ironbark, yellow stringybark and swamp mahogany with wattles dominating the understorey.	IV–VI m6, pd3, ps3, nd3, r2–3, e3
LU3	15	Lower slopes, 0.5–2% and drainage lines.	Deep to very deep, mottled, grey and yellow, sodic duplex soils with hardsetting surfaces; sandy loam to clay loam, medium to thick A horizons with bleached A2 horizons; fine sandy light to medium clay B horizons; neutral soil reaction trend. Grey and Yellow Sodosols.	Open forest to woodland. Queensland blue gum, gum-topped box, occasionally with *Melaleuca* species dominant.	VII m6, pd4, ps3, nd3. sa4 or 6, e6

(cont)

ELECTRA 1 (continued)

Land Unit	Area %	Landform Attributes	Soils	Remnant Vegetation	Land Class
LU4	25	Mid to lower slopes, 2–4%.	Moderately deep to deep mottled, yellow, brown and grey, sodic duplex soils with hardsetting surfaces; fine sandy loam to sandy clay loam, medium A horizons usually with bleached A2 horizons; light medium to medium clay B horizons; with few to many medium gravel; acid to alkaline soil reaction trend. Yellow, Brown and Grey Sodosols.	Open forest. Yellow stringybark, brown bloodwood, narrow-leaved ironbark, Queensland blue gum, and swamp mahogany.	VI m6, pd4, ps3, nd3, e3
LU5	5	Narrow drainage lines, 0–2%.	Deep to very deep, mottled, grey, gradational and sodic duplex soils with hardsetting surfaces; fine sandy clay loam to sandy clay loam, medium to thick A horizons with bleached A2 horizons; light to medium clay B horizons; acid soil reaction trend. Grey Dermosols and Kurosols.	Closed forest. Swamp mahogany.	VI m6, pd3, ps3, nd3, sa4, w4, e3
LU6	20	Crests and ridges, 2–5%.	Moderately deep, mottled, grey and yellow, sodic duplex soils with hardsetting surfaces; fine sandy loam to sandy clay loam, thin to medium A horizons usually with bleached A2 horizons; light to light medium clay B horizons, with few to many pebbles throughout; alkaline soil reaction trend. Grey and Yellow Sodosols.	Open woodland. Narrow-leaved ironbark and Queensland blue gum.	VI m6, pd4, ps3, nd3, e3
LU7	15	Mid slopes, 10–15%.	Shallow to moderately deep, brown and yellow sodic duplex soils with hardsetting surfaces; sandy clay loam to clay loam to thick A horizons with bleached A2 horizons; light to medium clay B horizons with many to abundant medium to coarse gravel; acid soil reaction trend. Brown and Yellow Sodosols and Kurosols.	Open forest. Narrow-leaved ironbark and yellow stringybark.	VI m6, pd3–4, ps3, nd3

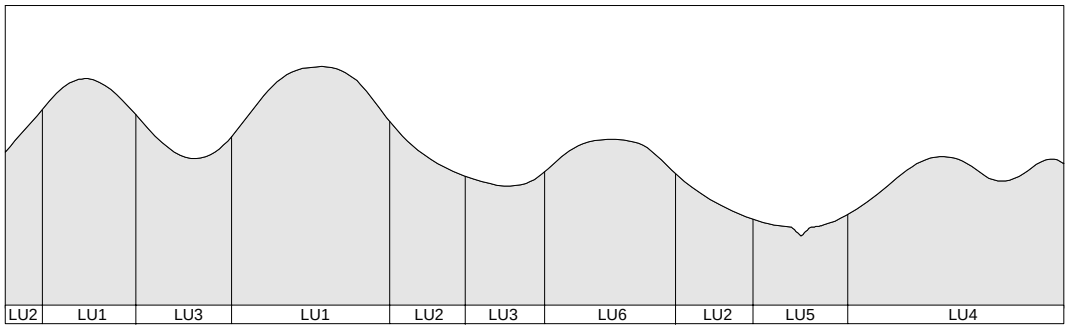
LAND SYSTEM – ELECTRA 2 (Ec2)

General Description: Undulating low hills to rolling hills on sedimentary and metamorphic rocks. Major soils are shallow uniform medium textured soils (Bleached-Leptic Tenosols) and brown, sodic duplex soils (Brown Sodosols) and moderately deep to deep, brown, grey and red, sodic duplex soils (Brown, Grey and Red Sodosols and Chromosols)

Geology: Undifferentiated Curtis Island Group – Greywacke, siltstone and shale, andesitic volcanics and chert.

Landform: Undulating low hills to rolling hills.

Vegetation: Eucalypt open forest to open forest with limited clearing. Narrow-leaved ironbark, spotted gum, gum-topped box, bloodwoods, yellow stringybark, Queensland blue gum and swamp mahogany.



Land Unit	Area %	Landform Attributes	Soils	Remnant Vegetation	Land Class
LU1	15	High crests 5–10%. Slope and upper to mid slopes, 10–30%. Common to abundant surface cobble and stone and rock outcrop.	Very shallow to shallow, uniform, medium to coarse textured soils over rock and brown, sodic duplex soils with hardsetting surfaces; sandy clay loam to clay loam, medium to thick A horizons with bleached A2 horizons; (when present) light medium clay B horizons; common to many medium to coarse gravel throughout the profile; acid to neutral soil reaction trend. Bleached Leptic Tenosols and Brown Sodosols.	Open forest. Spotted gum and narrow-leaved ironbark.	VI–VII m6, pd4 or 6, ps3, nd3, ts6–7, r3–5, e6–7
LU2	25	Mid slopes, 5–20%. Some as high as 40%. Few to many medium to coarse surface pebbles.	Moderately deep, mottled, brown, sodic duplex soils with hardsetting surfaces; clay loam, thick A horizons with bleached A2 horizons; light medium to medium clay B horizons; usually few to many fine to coarse gravel throughout profile; acid to neutral soil reaction trend. Brown Sodosols.	Open forest. Spotted gum, narrow-leaved ironbark and gum-topped bloodwood.	VI–VII m6, pd3–4, ps3, nd3, ts6–7, e6–7, r3–4
LU3	10	Concave lower slopes, 3–6%.	Deep, brown and grey, sodic duplex soils with hardsetting surfaces; loam to clay loam, thick A horizons with bleached A2 horizons; light to medium clay B horizons with few to common fine to medium gravel; alkaline soil reaction trend. Brown and Grey Sodosols.	Open forest. Queensland blue gum, swamp mahogany, gum-topped bloodwood and narrow-leaved ironbark.	VI m6, pd3, ps2, nd3, e6

(cont.)

ELECTRA 2 (continued)

Land Unit	Area %	Landform Attributes	Soils	Remnant Vegetation	Land Class
LU4	30	Crests upper, mid and lower slopes 5–12%. Few to many medium to coarse surface gravel.	Very shallow to shallow, stony, coarse and medium textured soils over rock, and sodic duplex soils with hardsetting surfaces; sandy loam to sandy clay loam, medium to thick A horizons with bleached A2 horizons; (when present) clay loam to light medium clay B horizons; few to abundant fine to coarse gravel throughout profile; acid to neutral soil reaction trend. Bleached Leptic Tenosols and Brown Sodosols.	Closed to open forest. Narrow-leaved ironbark, spotted gum, gum-topped box, yellow stringybark, occasionally with Queensland blue gum and swamp mahogany.	VI m6, pd4 or 6, ps3, nd3, r3–4, e6
LU5	10	Concave lower slopes and major drainage lines, 2–4%.	Moderately deep to deep, mottled, grey and brown, sodic duplex soils with hardsetting surfaces; clay loam, thick A horizons with bleached A2 horizons; light medium to medium clay B horizons; few to many medium gravel throughout profile; alkaline soil reaction trend. Grey and Brown Sodosols.	Open forest. Gum-topped box and Queensland blue gum.	VI m6, pd3–4, ps3, nd3, e6
LU6	10	Crests and slopes, 10–15%. Few medium pebbles on surface.	Moderately deep, red, sodic duplex soils with hardsetting surfaces; sandy clay loam to clay loam, medium A horizons usually with bleached A2 horizons; light medium to medium clay B horizons; few to abundant medium to coarse gravel throughout profile; neutral soil reaction trend. Red Sodosols and Chromosols.	Open forest. Narrow-leaved ironbark and spotted gum.	VI m6, pd3, ps3, nd3, e6

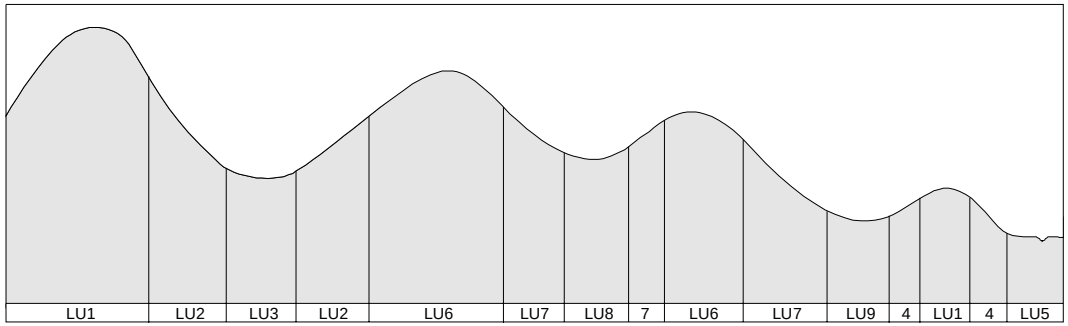
LAND SYSTEM – GOODNIGHT 1 (Gn1)

General Description: Rolling low hills to hills primarily on metamorphosed sedimentary rocks. Major soils are shallow to moderately deep, brown sodic duplex soils (Brown Sodosols) and red and brown, gradational soils and non cracking clays (Red and Brown Dermosols), and moderately deep to deep, mottled, grey and yellow, sodic duplex soils (Grey and Yellow Sodosols).

Geology: Goodnight Beds – Slate, phyllite, argillite, chert, jasper, arenite, limestone, basic metavolcanics, diamictite.

Landform: Rolling low to hills.

Vegetation: Microphyll rainforest with no effective disturbance to complete clearing or under hoop pine plantation. 'Softwood scrub' species and hoop pine with minor narrow-leaved ironbark, Queensland blue gum and Moreton Bay ash.



Land Unit	Area %	Landform Attributes	Soils	Remnant Vegetation	Land Class
LU1	10	Crests and upper slopes, 10–30%. Few to common medium gravel to cobble on surface.	Shallow, brown and red, gradational soils, with hardsetting surfaces; clay loam, thin to medium A horizons; clay loam to light clay B horizons; with few to many medium gravel; acid to neutral soil reaction trend. Brown and Red Dermosols.	Vine forest. 'Softwood scrub' species with emergent hoop pine.	VI-VII m6, pd3–4, ps3, ts6–7, r2–3, e6–7
LU2	10	Mid slopes, 15–30%. Medium gravel to cobble on surface.	Shallow to moderately deep, red and brown, gradational soils and non cracking clays; clay loam to light clay, medium A horizons; light to light medium clay B horizons; few to many medium gravel throughout profile; acid to neutral soil reaction trend. Red and Brown Dermosols.	Vine forest. 'Softwood scrub' species.	VI-VII m4 or 6, pd3-4, ps3, ts6–7, r3–4, e6–7
LU3	10	Lower concave slopes, 5–10%. Medium gravel on surface.	Shallow to moderately deep, brown and yellow, gradational soils and non cracking clays; clay loam to light clay, medium A horizons; light to light medium clay B horizons; few to many medium gravel throughout profile; neutral soil reaction trend. Brown and Yellow Dermosols.	Vine forest. 'Softwood scrub' species.	VI m4 or 6, pd3–4, ps3, ts4, r3–4, e6
LU4	10	Mid slopes, 8–12%.	Shallow to moderately deep, brown, gradational soils and non cracking clays with hardsetting surfaces; clay loam to light clay, medium A horizons; light clay B horizons; neutral soil reaction trend. Brown Dermosols.	Vine forest. 'Softwood scrub' species with emergent hoop pine.	IV or VI m4 or 6, pd3–4, ps3, e4 or 6

(cont.)

GOODNIGHT 1 (continued)

Land Unit	Area %	Landform Attributes	Soils	Remnant Vegetation	Land Class
LU5	5	Lower slopes and drainage lines, 2–8%.	Shallow to moderately deep, usually mottled, brown and yellow, sodic duplex soils with hardsetting surfaces; sandy clay loam to clay loam, thin to medium A horizons with bleached A2 horizons; medium clay B horizons; few to many medium gravel throughout profile; neutral to alkaline soil reaction trend. Brown and Yellow Sodosols.	Shrubby open forest to woodland. Queensland blue gum, Moreton Bay ash, narrow-leaved ironbark with an understorey of 'softwood scrub' species.	VI m6, pd4, ps3, e6
LU6	15	Crests and upper slopes, 5–15%. Medium to coarse gravel may be present on surface.	Shallow, brown, sodic duplex soils with hardsetting surfaces; sandy clay loam to clay loam, medium A horizons with bleached A2 horizons; light medium to medium clay B horizons; few to abundant medium gravel throughout profile; neutral soil reaction trend. Brown Sodosols.	Vine forest. 'Softwood scrub' species.	VI m6, pd4, ps3, ts6, (r2–3), e6
LU7	20	Mid slopes, 15–20%. Medium to coarse gravel may be present on surface.	Shallow to moderately deep, brown, sodic duplex soils with hardsetting surfaces; clay loam, medium A horizons with bleached A2 horizons; medium clay B horizons; few to many medium gravel throughout profile; neutral to alkaline soil reaction trend. Brown Sodosols.	Vine forest. 'Softwood scrub' species.	VI m6, pd4, ps3, (r2–3), ts6, e6
LU8	10	Concave mid to lower slopes, 8–15%.	Moderately deep, mottled, grey and yellow, sodic duplex soils, with hardsetting surfaces; fine sandy clay loam to clay loam, medium to thick A horizons, with bleached A2 horizons; light medium clay B horizons; common to many gravel throughout profile; acid to neutral soil reaction trend. Grey and Yellow Sodosols.	Vine forest. 'Softwood scrub' species.	VI m6, pd4, ps3, e6
LU9	10	Concave lower slopes and drainage lines, 4–8%.	Deep to very deep, mottled, brown and grey, sodic duplex and gradational soils with hardsetting surfaces; clay loam, medium to thick A horizons with bleached A2 horizons; light to medium clay B horizons; occasionally with few to common fine gravel; neutral to alkaline soil reaction trend. Brown and Grey Sodosols and Dermosols.	Vine forest. 'Softwood scrub' species with hoop pine, narrow-leaved ironbark and Queensland blue gum as emergents	VI m6, pd3–4, ps3, e6, f3

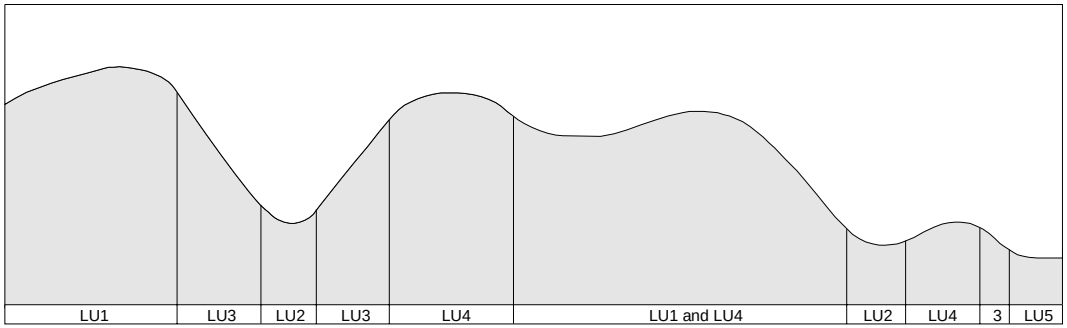
LAND SYSTEM – GOODNIGHT 2 (Gn2)

General Description: Rolling low hills to steep hills on metamorphosed sedimentary rocks. Major soils are very shallow, medium textured soils over rock (Bleached Leptic Tenosols) and shallow to moderately deep, brown and yellow, sodic duplex soils (Brown and Yellow Sodosols and Chromosols).

Geology: Goodnight Beds – Slate, phyllite, argillite, chert, jasper, arenite, limestone, basic metavolcanics, diamictite.

Landform: Rolling low hills to steep hills.

Vegetation: Open forest with limited clearing and minor areas extensively cleared. Spotted gum, narrow-leaved ironbark, bloodwoods, gum-topped box and Queensland blue gum with minor Moreton Bay ash and rough-barked apple.



Land Unit	Area %	Landform Attributes	Soils	Remnant Vegetation	Land Class
LU1	25	Crests and upper slopes, 2–10%. Minor rock outcrop and few to common surface cobble.	Shallow, brown, sodic duplex soils with hardsetting surfaces; sandy loam to clay loam, medium A horizons with bleached A2 horizons; light to light medium clay B horizons; common to many medium gravel in upper profile or throughout; acid to neutral soil reaction trend. Brown Sodosols and Chromosols.	Open forest. Spotted gum, narrow-leaved ironbark, bloodwoods and Moreton Bay ash.	VI m6, pd3–4, ps3, nd3, r2–3, e6
LU2	10	Lower concave slopes high in the landscape, 3–10%. Surface stone may be present in drainage lines.	Moderately deep, usually mottled, brown, sodic duplex soils with hardsetting sufaces; sandy loam to loam, medium to thick A horizons with bleached A2 horizons; medium clay B horizons; usually with few to many medium pebbles (occasionally only in A horizons); acid to alkaline soil reaction trend. Brown Sodosols and Chromosols.	Open forest. Queensland blue gum, narrow-leaved ironbark, spotted gum, rough-barked apple and wattles, or gum-topped box with occasional Queensland blue gum.	VI m4 or 6, pd3–4, ps3, nd3, (r2–4), e6, f3
LU3	25	Upper and mid slopes, 10–40%. Few to many coarse gravel to cobble. Rock outcrop present in some areas.	Shallow to moderately deep, brown, sodic duplex soils with hardsetting surfaces; sandy loam to clay loam, thin to medium A horizons with bleached A2 horizons; light medium clay B horizons; usually common to many medium pebbles and gravel; acid to alkaline soil reaction trend. Brown Sodosols and Chromosols.	Open forest. Spotted gum, narrow-leaved ironbark, gum-topped box and bloodwoods.	VII–VIII m6, pd3–4, ps3, nd3, ts6–7, e6–8

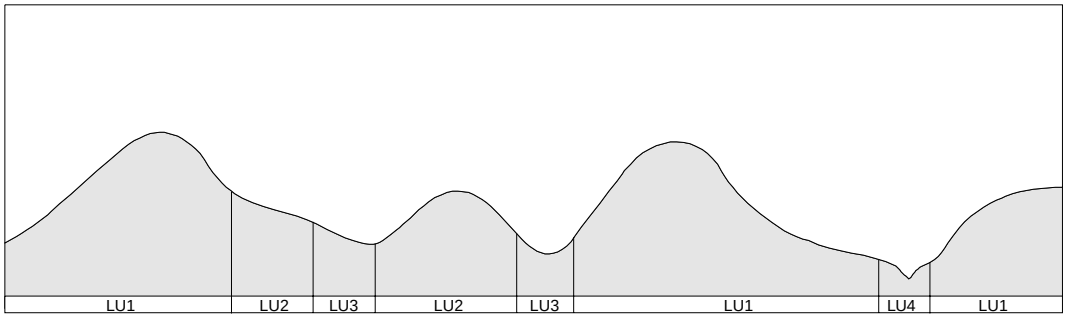
(cont.)

GOODNIGHT 2 (continued)

Land Unit	Area %	Landform Attributes	Soils	Remnant Vegetation	Land Class
LU4	30	Crests and slopes, 5–20%. Few to common medium gravel on surface.	Very shallow to shallow, medium textured soils over rock, red and brown, sodic duplex soils with hardsetting surfaces; sandy clay loam to clay loam, medium A horizons, usually with bleached A2 horizons; (when present) medium clay B horizons; common to abundant, medium gravel or pebbles; acid to neutral soil reaction trend. Bleached-Leptic Tenosols and Red and Brown Sodosols and Chromosols	Woodland. Narrow-leaved ironbark, spotted gum and Moreton Bay ash.	VII m6, pd4 or 6, ps3, nd3, ts6–7, r2–3, e6–7
LU5	10	Major drainage depressions and flats, 1–5%. Surface stone may be present in drainage lines.	Moderately deep to deep, brown, yellow and grey, sodic duplex soils with hardsetting surfaces; sandy clay loam to clay loam, medium A horizons, with bleached A2 horizons; light to medium clay B horizons; acid to alkaline soil reaction trend. Brown, Yellow and Grey Sodosols.	Woodland to open forest. Moreton Bay ash, narrow-leaved ironbark, Queensland blue gum or gum-topped box. *Melaleuca* species and river she oak fringe major drainage lines.	VI m6, pd3–4, ps3, nd3, r2–3, e6, f3

LAND SYSTEM - CURTIS (Ct)

General Description: Rolling low hills to steep hills on metasediments. Major soils are very shallow, stony, uniform, coarse to medium textured soils with minor brown and red, gradational soils (Leptic and Stratic Rudosols, Leptic Tenosols, Red and Brown Dermosols and Chromosols).
Geology: Undivided formation of the Carboniferous Curtis Island Group – Mica schist, gneiss, amphibolite, quarzite.
Landform: Rolling hills to steep hills.
Vegetation: Woodland with no effective disturbance to limited clearing. Spotted gum, narrow-leaved ironbark, Queensland blue gum, Moreton Bay ash and wattles.



Land Unit	Area %	Landform Attributes	Soils	Remnant Vegetation	Land Class
LU1	60	Crests and steep slopes, 30–40%, some as high as 60%. Common cobble and stone on surface. Rock outcrop may be present.	Very shallow to shallow, stony, uniform, medium textured soils over rock with hardsetting surfaces; sandy clay loam to clay loam, medium A horizons; with common to abundant, medium gravel; acid soil reaction trend. Leptic Tenosols and Rudosols.	Woodland. Spotted gum, narrow-leaved ironbark and wattles.	VII–VIII m6, pd4 or 6, ps3, nd3, r3–4, ts7–8, e7–8
LU2	20	Lower ridges and crests and midslopes, 15–25%.	Shallow to moderately deep, red and brown, gradational soils and non sodic duplex soils with hardsetting surfaces; sandy clay loam to clay loam, medium A horizons; light clay B horizons, usually with fine to medium gravel at depth; acid to neutral soil reaction trend. Red and Brown Dermosols and Chromosols.	Woodland. Spotted gum and Queensland blue gum.	VI–VII m4 or 6, pd3, ps3, nd3, ts6–7, e6
LU3	10	Concave slopes in upper landscape, 10–15%.	Moderately deep to deep, alluvial soils and brown, gradational soils with hardsetting surfaces; clay loam, medium to thick A horizons; light clay B or D horizons, often with common to abundant medium pebbles and cobble; neutral soil reaction trend. Leptic Tenosols and Brown Dermosols.	Woodland. Queensland blue gum, Moreton bay ash and narrow-leaved ironbark.	VI m3–4, ps3, nd3, ts4, e6
LU4	10	Major drainage lines and lower slopes, 2–10%. Cobble and stone common on surface.	Deep, alluvial soils and brown, gradational soils with hardsetting surfaces; sandy clay loam to clay loam, medium A horizons; light clay B or D horizons; pebbles, cobble and stone common throughout the profile; neutral soil reaction trend. Stratic Rudosols and Brown Dermosols.	Woodland. Queensland blue gum and Moreton Bay ash. River she oak and *Melaleuca* species border major drainage lines.	VI m3, ps3, nd3, r3–4, e6, f3

APPENDIX II

Common names of the major native plant species of the area

Botanical name	Common name
Acacia spp.	Wattles
Alphitonia excelsa	Red ash / Soap tree
Angophora floribunda	Rough-barked apple
Angophora leiocarpa	Smooth-barked apple
Banksia aemula	Wallum banksia
Banksia integrifolia	Coast banksia
Banksia robur	Broad-leaved banksia
Banksia spp.	
Beilschmiedia obtusifolia	Hard bolly gum
Brachychiton spp.	Bottle tree
Callistemon spp.	Bottlebrush
Casuarina cunninghamiana	River oak
Casuarina littoralis	Black she oak
Casuarina spp.	
Casuarina torulosa	Forest she oak
Corymbia citriodora	Spotted gum
Corymbia erythrophloia	Gum-topped bloodwood
Corymbia gummifera	Red bloodwood
Corymbia intermedia	Pink bloodwood
Corymbia polycarpa	Long-fruited bloodwood
Corymbia tessellaris	Moreton Bay ash
Corymbia trachyphloia	Brown bloodwood
Corymbia spp.	Bloodwoods
Cyperus spp.	Sedges
Diospyros geminata	Scaly ebony
Eucalyptus acmenoides	Yellow stringybark
Eucalyptus crebra	Narrow-leaved iron bark
Eucalyptus fibrosa	Broad-leaved iron bark
Eucalyptus melanophloia	Silver-leaved iron bark
Eucalyptus moluccana	Gum-topped box
Eucalyptus tereticornis	Queensland blue gum
Eucalyptus umbra	Broad-leaved white mahogany
Exocarpos latifolius	Native cherry
Flindersia australis	Crows ash
Flindersia schottiana	Bumpy ash
Grevillea spp.	
Livistonia decipiens	Cabbage palm
Lomandra spp.	Matrush
Lophostemon confertus	Brush box
Lophostemon suaveolens	Swamp mahogany
Macrozamia miquellii	Zamia palm
Melaleuca quinquenervia	Swamp paperbark
Melaleuca spp.	
Melaleuca viridiflora	Broad-leaved paperbark
Planchonia careya	Cockatoo apple
Pleiogynium timorense	Burdekin plum
Podocarpus elatus	She-pine
Pteridium esculentum	Bracken fern
Syncarpia glomulifera	Swamp turpentine
Xanthorrhoea johnsonii	Grass tree

APPENDIX III

Summary of fertility attributes for the bulk surface samples

Site	Land system	Land system group	ASC Order	ASC Suborder	Texture	pH	EC dS/m	Cl mg/kg	Exchangeable Cations meq/100g Ca	K	Mg	Na	CEC	Org C%	NO_3N mg/kg	P mg/kg	SO_4-S mg/kg	Cu mg/kg	Mn mg/kg	Zn mg/kg
112	Wr		TE	DS	FS	5.4	0.03	17	1.5	0.13	0.9	0.1	2.6	1.7	1.6	12	2.6	0.15	33.6	0.2
1	Dw		SO	AB	FSCL	5.6	0.03	15						1.3	0.65	4	4.6	0.08	35.0	0.8
123	Dw	Alluvial	DE	AD	CL	6.3	0.05	56	1.1	0.09	0.9	0.5	2.5		0.65					
459	Ck	Landscapes	HY	ED	SL	5.4	0.03	24	0.3	0.07	0.4	0.1	0.9	2.1	1.7	4	4.5	0.10	1.0	0.7
481	Ck		PO	AM	SL	5.0	0.01	6						3.1	0.65	3	2.0	0.08	0.0	0.1
488	Ck		PO	EJ	LS	4.5	0.03	6						3.5	0.65	1	3.2	0.08	0.0	0.2
12	Bf		SO	AE	CL	6.3	0.03	9						1.5	0.65	7	4.4	0.52	53.2	1.4
415	Bf		DE	AD	FSCL	5.4	0.03	16	2.7	0.25	1.4	0.1	4.4	1.9	3.1	7	4.2	0.13	31.6	1.0
536	Bd		VE	AE	LMC	8.9	0.44	269	15.0	0.22	30.0	4.3	46.0							
538	Bd		SO	AD	SCL	6.4	0.03	10	2.4	0.18	1.5	.11	4.0							
307	Mn2	Basic and	DE	AB	LC	5.5	0.03	17	11.7	1.16	6.7	0.2	19.7	4.4	1.6	94	8.9	2.04	35.3	6.1
1014	Ga	Intermediate,	DE	AB	LC	6.8	0.13	10	13.0	0.68	4.3	0.0	18.0	2.1	3.1	23	6.3	0.45	37.0	2.0
175	Ga	Intrusive and	DE	AB	CL	5.6	0.02	12	5.7	0.47	2.6	0.1	8.9	2.8	1.7	10	6.1	0.17	27.7	1.9
1011	Mo	Extrusive	DE	AB	LC	5.4	0.04	7	6.3	0.23	3.9	0.0	10.4	1.4	4.8	8	5.4	1.10	18.0	0.7
1012	Mo	Igneous	VE	AE	MC	6.3	0.06	7	15	0.92	15.0	0.4	31.0	2.6	1.5	12	7.8	5.20	35.0	1.2
1013	Mo	Rocks	DE	AB	CL	6.4	0.04	6	8.1	0.37	4.2	0.0	12.7	1.6	5.3	10	5.0	1.40	29.0	1.3
337	Bm		DE	AB	LC	6.4	0.05	18	11.4	0.75	5.5	0.1	17.8	3.8	6.5	18	6.9	1.09	37.8	3.2
1007	Aw1		DE	AE	LC	6.8	.06	BQ	11	.66	6.3	.27	12.6	2.8		11	10	1.7	47	2.5
1009	Aw1		DE	AD	LMC	8.1	0.25	40	7.2	0.15	12.0	1.4	21.0	2.6	10.6	13	7.6	1.20	20.0	0.9
1010	Aw1	Acid to	DE	AC	LC	6.3	0.04	6	4.3	0.24	3.2	0.1	7.8	1.6	2.4	10	11.0	1.30	140.0	0.7
243	Aw3	Intermediate	SO	AB	CL	5.7	0.11	16	1.0	0.18	1.1	0.2	2.4	1.2	6.7	4	4.2	0.10	22.0	0.4
244	Aw3	Volcanic	SO	AD	SL	6.1	0.03	16	0.7	0.20	1.0	0.1	2.0	1.6	1.7	3	5.2	0.10	3.2	0.8
267	Aw3	Rocks	SO	AD	L	5.5	0.03	19	2.1	0.16	1.4	0.3	4.0	1.2	1.6	5	5.8	0.10	8.1	0.3
440	Ed		CH	AB	CL	5.3	0.05	40	14.4	2.31	8.1	0.1	24.9	4.7	1.8	94	8.6	1.90	39.8	9.2
443	Ed		DE	AB	LC	6.4	0.04	14	14.5	0.65	16.0	0.2	31.3	3.8	1.7	27	8.5	4.01	119.0	2.9
534	Cw	Acid to	CH	AD	SL	6.3	0.03	6						1.5	0.65	6	3.0	0.28	9.3	0.9
202	Wb	Intermediate	SO	AB	SL	6.4	0.03	6						2.1	0.65	17	2.6	0.14	5.7	1.1
173	Hb	Intrusive Rocks	CH	AD	SL	5.5	0.03	13	1.5	0.18	0.8	0.1	2.6	2.0	3.5	6	3.6	0.10	2.5	0.5
152	Mb1		SO	AD	SL	5.8	0.03	10	0.5	0.13	0.8	0.2	1.5	1.6	5.3	4	4.1	0.10	1.2	0.5
107	Mb1		SO	AD	LFS	6.2	0.06	31	1.0	0.25	1.1	0.2	2.5	1.4	6	6	4.5	0.10	4.9	0.4

APPENDIX III (cont)

Site	Land system	Land system group	ASC Order	ASC Suborder	Texture	pH	EC dS/m	Cl mg/kg	Exchangeable Cations meq/100g Ca	K	Mg	Na	CEC	Org C%	$N0_3N$ mg/kg	P mg/kg	$S0_4$-S mg/kg	Cu mg/kg	Mn mg/kg	Zn mg/kg
161	Mb1		HY	ED	CL	5.7	0.02	8	1.1	0.12	1.1	0.3	2.6	1.7	1.6	4	5.7	0.10	32.1	0.5
170	Mb1	Acid to	CH	AB	SL	5.7	0.03	29	2.5	0.30	1.2	0.1	4.1	2.7	1.5	5	4.4	0.10	14.7	1.4
1004	Mv2	Intermediate	SO	AD	KSCL	5.5	0.04	13	2.2	0.09	1.5	0.1	3.8	1.1	1.9	8	4.7	0.54	7.7	0.5
1008	Mv2	Intrusive	KU	AD	KS	6.9	0.03	6	1.6	0.03	0.6	0.0	2.3	0.8	1.9	5	1.9	0.10	6.3	0.2
521	Mv3	Rocks (cont)	SO	AB	CLS	6.3	0.02	9	3.7	0.11	1.8	0.1	5.7	1.7	6	5	3.8	0.35	11.7	0.6
524	Mv3		SO	AB	SCL	6.6	0.03	12	4.1	0.12	2.9	0.1	7.3	1.6	4.4	7	4.4	0.50	22.5	0.4
1003	Mv3		SO	AD	SL	6.3	0.04	9	4.9	0.23	1.6	0.0	6.7	1.3	10.3	6	3.8	0.29	10.0	0.6
1005	Mv3		SO	AB	FSL	5.5	0.04	10	2.1	0.15	1.9	0.1	4.2	1.2	4.1	5	4.2	0.10	6.3	0.5
1006	Mv3		SO	AB	SCL	6.5	0.05	6	4.7	0.17	2.8	0.1	7.8	1.2	2.8	5	5.1	0.42	12.0	0.5
340	Mv4		VE	AD	MC	6.1	0.08	12	13.5	0.30	13.0	0.9	27.7	3.6	4.2	19	9.4	2.56	52.7	1.8
1000	Mv4		VE	AE	MC	5.8	0.08	8	20	0.84	15.0	0.3	36.1	3.3	6.7	38	7.7	2.50	37.0	2.2
1001	Mv4		DE	AB	CL	7.7	0.04	6	4.4	0.09	3.0	0.1	13.0	1.5	4.4	13	4.8	0.85	27.0	1.4
1002	Mv4		DE	AA	LC	6.7	0.07	7	19.0	0.72	7.7	0.1	27.5	3.2	4.7	14	8.6	1.50	29.0	1.6
518	Mv6		TE	AW	SL	6.4	0.02	6						2.5	0.65	8	2.5	0.08	11.7	1.0
124	Wt1		DE	AE	LC	6.3	0.03	12	14.1	0.47	7.0	0.3	21.8	3.4	5	12	5.0	2.26	56.8	2.3
127	Wt1		TE	AW	SCL	6.3	0.04	14	3.1	0.45	2.1	0.1	5.8	3.0	9	3	4.0	0.10	15.5	1.7
135	Rd1		SO	AD	SCL	5.4	0.05	23						4.6	0.65	1	8.6	0.24	22.0	4.2
236	Rd1		DE	AB	LC	6.3	0.04	15	7.7	0.38	4.3	0.3	12.6	3.2	3.8	12	8.2	0.65	36.6	1.4
69	Rd2		CH	AA	CL	5.6	0.03	20	3.8	0.42	2.7	0.2	7.1	2.3	2.6	10	6.8	0.34	21.5	1.3
72	Rd2		DE	AC	CL	5.6	0.04	15	7.0	0.40	5.9	0.4	13.7	3.2	4.3	5	10.9	1.41	75.0	1.5
500	Rd2		DE	AB	CL	6.4	0.04	13	6.2	0.30	2.8	0.1	9.4	2.1	10.6	10	5.0	0.35	34.3	2.5
541	Rd2	Sedimentary	CH	AB	CL	6.8	0.05	9						5.3	0.65	23	5.1	1.59	76.7	2.9
349	Rd2	Rocks	DE	AB	ZCL	5.3	0.05	44						1.7	0.65	1	8.1	0.82	38.9	2.6
49	Lm		CH	AB	CL	6.2	0.03	9	3.6	0.28	1.9	0.2	6.0	3.7	4.8	9	6.0	0.45	8.9	0.7
414	Lm		KU	AD	CLS	6.5	0.06	19	1.3	0.23	1.2	0.1	2.8	2.1	3.1	7	5.3	0.10	5.5	0.8
420	Lm		KU	AD	LC	6.1	0.03	12	1.6	0.35	2.3	0.3	4.6	4.5	6.5	8	15.8	0.41	4.8	0.7
483	Bw		KU	AB	CL	5.7	0.06	43	5.3	0.35	5.0	0.6	11.2	3.6	3.6	9	13.2	1.10	30.0	1.7
486	Bw		KU	AB	SL	5.5	0.03	16	1.4	0.12	0.8	0.1	2.4	2.5	3	5	4.6	0.10	3.5	0.7
158	Et		CH	AB	SL	5.3	0.03	18	0.5	0.08	0.6	0.1	1.2	1.2	1.6	5	3.4	0.10	1.0	0.2
162	Et		HY	DT	CL	6.0	0.04	29	0.4	0.10	0.9	0.3	1.6	1.3	2	4	4.0	0.10	15.9	0.7
276	Et		HY	ED	FSL	6.1	0.05	35	0.8	0.08	0.5	0.1	1.5	1.1	1.8	3	3.3	0.10	2.8	0.2

APPENDIX III (cont)

Site	Land system	Land system group	ASC Order	ASC Suborder	Texture	pH	EC dS/m	Cl mg/kg	Exchangeable Cations meq/100g Ca	K	Mg	Na	CEC	Org C%	$N0_3N$ mg/kg	P mg/kg	$S0_4$-S mg/kg	Cu mg/kg	Mn mg/kg	Zn mg/kg
449	Gn1		SO	AB	CL	5.2	0.06	26	3.2	0.22	1.5	0.1	5.1	2.2	10.3	14	8.4	0.27	41.2	1.3
450	Gn1	Metamorphic	SO	AB	CL	6.2	0.05	17	5.5	0.95	3.5	0.2	10.1	2.6	2.9	26	8.5	0.81	68.5	4.9
429	Gn2	Rocks	TE	AW	SCL	5.2	0.05	33	4.6	0.86	3.7	0.2	9.4	3.2	1.8	25	10.2	2.68	107.0	2.1
430	Gn2		SO	AB	SCL	5.9	0.06	22	2.8	0.19	2.3	0.3	5.5	2.2	9.9	8	6.9	0.32	10.0	0.9
56	Ec1		SO	AC	SCL	5.7	0.04	18	5.0	0.12	3.0	0.2	8.3	2.1	2	8	3.5	0.46	30.3	0.6
61	Ec1		DE	AA	SCL	6.5	0.04	14	3.0	0.28	2.5	0.3	6.0	3.2	7.5	10	7.1	0.33	16.4	1.7

Appendix IV

Summary of the soil chemical attributes of the analysed subsoils

Site	Land System	Morphological type	ASC Order	ASC Suborder	Texture	Depth (m)	pH	EC dS/m	Cl mg/kg	Exchangeable Cations meq/100g Ca	K	Mg	Na	Al	Acid	CEC	Ca/Mg	Sodicity ESP	Exch. magnesium %
Alluvial Landscapes																			
12	Bf	F	SO	AE	MC	0.25–0.4	7.2	0.76	950	4.1	0.18	18.2	8.8			31.3	0.22	28.2	58.2
445	Bf	V	KA	AB	FSLC	0.8–1	6.9	0.03	13	5.8	0.13	3.3	0.2			9.3	1.78	1.6	34.9
536	Bd	V	VE	AE	MC	0.2–0.4	8.8	0.29	102	15.0	0.10	30.0	3.1			45.0	0.30	6.9	66.7
536	Bd	V	VE	AE	MC	1.2–1.5	9.0	0.15	16	15.0	0.02	18.0	0.71			25.0	0.61	2.8	72.0
538	Bd	F	SO	AD	MC	0.2–0.4	7.0	0.11	109	4.9	0.02	11.0	0.75			17.0	0.44	4.4	64.7
538	Bd	F	SO	AD	LC	1–1.2	8.8	0.67	926	9.5	0.09	19.0	4.5			23	0.08	19.6	82.7
100	Dw	F	DE	AD	SLMC	1.15–1.3	5.8	0.74	865	0.1	0.07	3.9	6.8	0.5	0.5	10.8	0.02	62.8	36.0
122	Dw	F	DE	AD	LC	0.6–0.7	7.7	0.26	322	0.6	0.07	4.0	2.0			6.7	0.16	32.8	66.7
122	Dw	F	DE	AD	LMC	1.1–1.2	8.4	0.22	635	1.9	0.11	4.0	2.6			8.6	0.48	37.7	57.1
123	Dw	F	DE	AD	LC	0.5–0.6	6.8	0.31	429	0.0	0.04	3.3	2.5			5.9	0.01	42.6	56.3
123	Dw	F	DE	AD	LC	0.7–0.8	7.5	0.49	654	0.0	0.06	5.3	4.3			9.7	0.00	44.4	54.7
123	Dw	F	DE	AD	LC	1–1.2	7.7	0.79	1108	0.1	0.08	7.9	6.8			14.9	0.02	45.6	53.0
Basic and Intermediate Intrusive and Extrusive Igneous Rocks																			
1014	Ga	R	DE	AB	LMC	0.3–0.45	7.0	0.03	15	12.0	0.24	7.9	0.3			20.5	1.52	1.7	38.6
1011	Mo	M	DE	AB	LMC	0.4–0.6	6.8	0.16	187	7.0	0.10	6.3	1.1			14.5	1.11	7.6	43.4
1012	Mo	L	VE	AE	MC	0.2–0.4	6.3	0.21	233	15.0	0.54	20.0	2.3			35.8	0.75	6.4	55.8
1012	Mo	L	VE	AE	MC	1.1–1.3	8.2	0.93	921	12.0	0.07	24.0	4.6			37.0	0.50	12.4	64.9
1013	Mo	U	DE	AB	LMC	0.25–0.4	7.1	0.04	20	18.0	0.18	5.7	0.3			24.2	3.16	1.2	23.6
Acid to Intermediate Volcanic Rocks																			
1007	Aw1	M	DE	AE	MHC	0.2–0.4	7.5	0.09	65	8.9	0.08	9.4	1.8			25.0	0.91	10.2	37.6
1007	Aw1	M	DE	AE	MHC	0.9–1	8.5	0.59	612	14.0	0.08	16.0	6.8			33.0	0.95	7.2	48.5
1009	Aw1	L	DE	AD	MC	0.55–0.7	8.7	0.18	37	13.0	0.01	11.0	1.0			21.0	1.18	4.7	52.4
1010	Aw1	M	DE	AC	LMC	0.6–0.9	6.7	0.03	11	1.7	0.02	4.6	0.3			6.6	0.37	4.5	69.5
1010	Aw1	M	DE	AC	MC	1.1–1.3	5.6	0.02	15	0.7	0.05	20.0	2.0			22.7	0.03	8.8	88.1
238	Aw2	L	SO	AB	MC	0.4–0.6	6.4	0.17	211	7.2	0.11	11.0	2.2			20.5	0.65	10.7	53.6
118	Aw3	L	DE	AD	MC	0.6–0.7	5.7	0.05	44	0.0	0.20	6.7	0.8	0.5	0.6	8.8	0.00	9.0	76.1
118	Aw3	L	DE	AD	MC	1.1–1.2	5.8	0.09	93	0.0	0.21	10.0	1.3	0.3	0.3	12.1	0.00	10.7	83.3
243	Aw3	F	SO	AB	LMC	0.35–0.55	7.1	0.13	121	0.0	0.31	4.8	2.0			7.2	0.01	27.9	67.0
243	Aw3	F	SO	AB	LC	0.8–1.1	7.9	0.22	271	0.1	0.32	5.1	3.1			8.6	0.01	36.1	59.4

Appendix IV (continued)

Site	Land System	Morphological type	ASC Order	ASC Suborder	Texture	Depth (m)	pH	EC dS/m	Cl mg/kg	Exchangeable Cations meq/100g Ca	K	Mg	Na	Al	Acid	CEC	Ca/Mg	Sodicity ESP	Exch. magnesium %
Acid to Intermediate Intrusive Rocks																			
107	Mb1	M	SO	AD	MC	0.5–0.7	5.4	0.18	189	0.0	0.33	12.0	2.4	0.6	0.9	16.2	0.00	14.8	74.1
109	Mb1	F	KU	AD	LMC	1.1–1.3	5.3	0.04	27	0.0	0.05	2.0	1.0	4.9	5	12.0	0.00	8.3	16.6
153	Mb1	V	HY	ED	LC	0.6–0.8	6.1	0.04	41	0.0	0.02	3.4	1.0			4.4	0.00	22.1	76.8
153	Mb1	V	HY	ED	MC	1–1.2	6.1	0.22	275	0.0	0.04	5.4	3.5			9.0	0.00	39.0	60.2
159	Mb1	L	DE	AB	LMC	0.8–0.9	6.5	0.06	65	0.1	0.16	7.0	0.8			8.0	0.01	9.4	87.9
156	Mb1	M	SO	AD	MC	0.3–0.4	5.5	0.12	122	0.0	0.04	4.0	1.7	2	2.1	9.9	0.00	17.2	40.4
156	Mb1	M	SO	AD	MC	0.9–1.1	5.5	0.44	559	0.0	0.07	6.7	7.1	0.3	0.3	14.6	0.00	48.6	45.9
202	Wb	M	SO	AB	MC	0.4–0.6	4.9	0.25	353	1.3	0.12	7.5	2.3	1.1	1.5	13.9	0.18	16.5	53.9
42	Wt2	L	DE	AB	LC	0.3–0.5	4.8	0.09	104	4.5	0.24	4.4	0.8	2	2.4	14.3	1.02	5.6	30.8
43	Wt2	C	SO	AC	KSLMC	0.5–0.7	4.8	0.12	138	0.1	0.15	8.6	2.3	2.6	3.1	16.8	0.01	13.7	51.2
549	Mv1	L	VE	AD	MHC	0.12–0.3	8.2	0.17	145	14.0	0.11	19.0	1.3			35.0	0.74	3.7	54.3
549	Mv1	L	VE	AD	MHC	0.7–1	8.6	0.92	1050	9.8	0.06	21.0	4.1			32.0	0.47	3.5	65.6
87	Mv1	M	DE	AB	MC	0.15–0.4	6.8	0.06	57	22.0	0.20	14.0	0.7			36.9	1.57	2.0	37.9
87	Mv1	M	DE	AB	LMC	0.7–0.9	8.3	0.27	155	39.0	0.15	14.0	1.0			54.1	2.79	1.8	25.9
372	Mv1	C	CH	AB	MC	0.3–0.5	7.4	0.05	22	6.6	0.04	8.4	0.4			21.0	0.78	1.8	40.0
372	Mv1	C	CH	AB	MC	0.5–0.7	7.5	0.06	30	13.0	0.01	14	0.7			27.0	0.93	2.7	51.8
93	Mv1	M	CH	AB	MC	0.3–0.6	7.3	0.1	72	8.2	0.17	11.0	1.1			20.5	0.75	5.4	53.7
1004	Mv2	L	SO	AD	LMC	0.8–0.9	4.6	0.05	32	1.4	0.08	5.5	1.0			8.0	0.25	12.4	69.1
1008	Mv2	C	KU	AD	KSLC	0.9–1	5.0	0.02	11	0.1	0.02	1.0	0.0			1.1	0.11	1.1	87.2
1008	Mv2	C	KU	AD	LMC	1.2–1.3	4.8	0.03	31	0.1	0.03	1.5	0.1			1.7	0.05	6.9	86.7
529	Mv3	M	SO	AC	MC	0.3–0.6	7.2	0.16	155	6.6	0.12	16.8	3.2			26.8	0.39	12.1	62.8
1003	Mv3	M	SO	AD	LMC	0.2–0.35	5.7	0.06	31	2.0	0.27	9.0	1.2			12.5	0.22	9.6	72.2
1005	Mv3	U	SO	AB	MC	0.2–0.3	7.2	0.58	672	5.2	0.03	13	6.5			23.0	0.40	28.3	56.5
1006	Mv3	M	SO	AB	MC	0.3–0.4	5.9	0.37	428	9.3	0.06	14	2.4			25.7	0.66	9.3	54.5
1006	Mv3	M	SO	AB	MC	0.5–0.6	8.1	0.57	578	13.0	0.01	16.0	2.6			28.0	0.81	9.3	57.1
340	Mv4	L	VE	AD	MHC	0.3–0.5	7.4	0.07	12	11.0	0.08	22.0	0.8			37.0	0.50	2.2	59.5
340	Mv4	L	VE	AD	MC	0.9–1.1	8.6	0.22	32	11.0	0.05	26.0	1.8			37.0	0.42	4.9	70.2
1000	Mv4	L	VE	AE	MC	0.5–0.7	8.3	0.25	207	15.0	0.14	25.0	1.6			40.0	0.6	4.0	62.5
1000	Mv4	L	VE	AE	MC	1.1–1.2	8.2	0.77	887	10.0	0.08	29.0	3.2			38.0	.35	8.4	76.3
1001	Mv4	M	DE	AB	LMC	0.4–0.6	7.8	0.04	22	6.1	0.01	7.6	0.6			16.0	0.80	3.4	47.5

Appendix IV (continued)

Site	Land System	Morphological type	ASC Order	ASC Suborder	Texture	Depth (m)	pH	EC dS/m	Cl mg/kg	Exchangeable Cations meq/100g Ca	K	Mg	Na	Al	Acid	CEC	Ca/Mg	Sodicity ESP	Exch. magnesium %
Acid to Intermediate Intrusive Rocks (continued)																			
1001	Mv4	M	DE	AB	LMC	1.2–1.3	8.2	0.25	298	6.9	0.01	13.0	2.3			21.0	0.53	11.0	61.9
1002	Mv4	R	DE	AA	MC	0.2–0.4	6.9	0.05	34	32.0	0.24	13.0	0.7			46.0	2.46	1.6	28.3
Sedimentary Rocks																			
147	Rd1	M	SO	AA	MC	0.5–0.6	4.6	0.54	782	0.1	0.03	5.2	2.9	1.8	1.9	12.0	0.02	24.2	43.3
147	Rd1	M	SO	AA	MHC	0.8–1	4.7	0.57	782	0.2	0.05	9.0	5.5	2.2	2.3	19.2	0.02	28.6	46.8
503	Rd1	L	DE	AB	MC	0.5–0.7	9.6	0.38	79	0.4	0.01	12.0	13.0			21.0	0.03	61.9	57.1
503	Rd1	L	DE	AB	MC	1.2–1.4	9.7	0.28	21	0.50	0.01	15.0	7.7			22.0	0.03	35.0	68.2
545	Rd1	M	CH	AA	MC	0.45–0.75	6.1	0.1	131	10.6	0.21	15.7	1.5			28.0	0.68	5.2	56.2
563	Rd1	L	SO	AD	LC	0.3–0.6	7.6	0.21	190	1.0	0.10	6.9	2.7			10.7	0.14	25.0	64.7
72	Rd2	M	DE	AC	LMC	0.4–0.5	6.0	0.05	43	1.0	0.13	8.9	1.0			11.0	0.11	8.9	80.8
541	Rd2	L	SO	AB	LC	0.5–0.7	4.9	0.68	1119	2.2	0.22	16.1	7.3			25.8	0.13	28.3	62.4
566	Rd2	U	KU	AB	MHC	0.4–0.6	5.0	0.5	766	0.3	0.18	16.9	4.1			21.5	0.02	19.2	78.5
52	Lm	F	DE	AD	LMC	0.3–0.5	4.7	0.14	148	0.0	0.04	3.2	1.1	1.9	2.2	8.5	0.01	12.9	37.6
52	Lm	F	DE	AD	LMC	1–1.2	4.2	0.48	649	0.0	0.03	2.2	3.0	2.0	2.4	9.7	0.01	30.9	22.7
486	Bw	M	KU	AB	MC	0.65–0.95	5.4	0.051	60	0.0	0.08	6.6	0.6	2.3	2.6	12.2	0.01	4.9	54.1
157	Et	L	SO	AB	MC	0.3–0.4	8.1	0.39	382	0.6	0.05	11.0	10.8			22.5	0.05	4.8	48.8
157	Et	L	SO	AB	MC	0.8–0.9	8.2	0.54	578	0.5	0.04	7.4	10.2			18.1	0.06	56.4	40.9
164	Et	C	SO	AB	MC	0.5–0.6	6.2	0.05	28	0.0	0.10	6.8	0.9			7.8	0.00	10.9	87.5
Metamorphic Rocks																			
55	Ec1	R	SO	AD	LMC	0.1–0.25	6.8	0.11	77	6.5	0.12	13.0	2.2			21.8	0.50	10.1	59.6
62	Ec1	F	SO	AD	SLMC	0.2–0.4	7.1	0.4	473	0.3	0.05	7.5	4.8			12.7	0.04	37.9	59.2

APPENDIX V

Dominant and subdominant land capability classes of the mapping units for the Miriam Vale–Kolan Shires

UMA Number	Code	Land System	Land Capability D*	Land Capability S+	Area (ha)	UMA Number	Code	Land System	Land Capability D*	Land Capability S+	Area (ha)
213	Mn1	Muncon 1	II	III	214	6	Em	Eurimbula	VI	-	147
140	Bf	Baffle	III	IV	349	7	Mb2	Matchbox 2	VI	-	440
143	Bf	Baffle	III	IV	468	8	Em	Eurimbula	VI	-	1028
163	Bf	Baffle	III	IV	222	10	Em	Eurimbula	VI	-	365
172	Bf	Baffle	III	IV	126	14	Em	Eurimbula	VI	-	1414
206	Mn2	Monduran 2	III	IV	529	17	Mv3	Miriam Vale 3	VI	-	14623
221	Mn2	Monduran 2	III	IV	444	22	Em	Eurimbula	VI	-	270
225	Mn2	Monduran 2	III	IV	649	24	Aw2	Agnes Water 2	VI	-	14
231	Mn2	Monduran 2	III	IV	190	25	Aw2	Agnes Water 2	VI	-	921
250	Wg	Wateranga	III	IV	420	27	Aw2	Agnes Water 2	VI	-	1083
201	Mn2	Monduran 2	III	VI	690	30	Dw	Deepwater	VI	-	2908
211	Mn2	Monduran 2	III	VI	83	32	Em	Eurimbula	VI	-	619
218	Mn2	Monduran 2	III	VI	145	36	Bf	Baffle	VI	-	1013
228	Mn2	Monduran 2	III	VI	40	38	Aw2	Agnes Water 2	VI	-	1928
229	Mn2	Monduran 2	III	VI	70	43	Wr	Wreckrock	VI	-	2917
28	Bf	Baffle	IV	VI	184	45	Em	Eurimbula	VI	-	1079
69	Mv1	Miriam Vale 1	IV	VI	2568	51	Ec1	Electra 1	VI	-	4012
74	Mv1	Miriam Vale 1	IV	VI	319	56	Mv2	Miriam Vale 2	VI	-	739
80	Mv1	Miriam Vale 1	IV	VI	214	57	Dw	Deepwater	VI	-	2687
83	Mv1	Miriam Vale 1	IV	VI	291	58	Mb1	Matchbox 1	VI	-	3000
87	Mv1	Miriam Vale 1	IV	VI	201	59	Et	Elliot	VI	-	1702
152	Mv1	Miriam Vale 1	IV	VI	190	62	Aw2	Agnes Water 2	VI	-	911
158	Mc1	Muncon 1	IV	VI	769	64	Bf	Baffle	VI	-	76
167	Mv1	Miriam Vale 1	IV	VI	1780	65	Mb1	Matchbox 1	VI	-	1784
173	Mc1	Muncon 1	IV	VI	1219	67	Bf	Baffle	VI	-	1290
175	Hm	Hindmarsh	IV	VI	88	70	Ck	Cook	VI	-	3612
192	Bf	Baffle	IV	VI	530	72	Mv2	Miriam Vale 2	VI	-	7088
209	Mv1	Miriam Vale 1	IV	VI	182	73	Mb1	Matchbox 1	VI	-	589
235	Bf	Baffle	IV	VI	228	75	Mv2	Miriam Vale 2	VI	-	257
214	Mn2	Monduran 2	IV	VII	737	76	Et	Elliot	VI	-	7101
33	Bf	Baffle	VI	III	227	77	Aw2	Agnes Water 2	VI	-	5722
137	Bf	Baffle	VI	III	396	82	Mb1	Matchbox 1	VI	-	1164
142	Bf	Baffle	VI	III	158	86	Mv3	Miriam Vale 3	VI	-	1029
164	Bf	Baffle	VI	III	82	88	Mv1	Miriam Vale 1	VI	-	162
224	Mo	Moonta	VI	III	2943	89	Mb1	Matchbox 1	VI	-	8245
23	Aw1	Agnes Water 1	VI	IV	2096	93	Et	Elliot	VI	-	238
26	Aw1	Agnes Water 1	VI	IV	462	94	Mv1	Miriam Vale 1	VI	-	135
53	Bd	Boondilla	VI	IV	8704	95	Mv2	Miriam Vale 2	VI	-	202
66	Bf	Baffle	VI	IV	3336	97	Mb2	Matchbox 2	VI	-	1295
84	Aw1	Agnes Water 1	VI	IV	6891	99	Mv3	Miriam Vale 3	VI	-	640
90	Aw1	Agnes Water 1	VI	IV	436	100	Lm	Lowmead	VI	-	691
102	Bd	Boondilla	VI	IV	69	103	Mb2	Matchbox 2	VI	-	319
139	Bf	Baffle	VI	IV	254	105	Bm	Blackman	VI	-	1972
153	Bf	Baffle	VI	IV	247	106	Lm	Lowmead	VI	-	298
249	Bf	Baffle	VI	IV	44	107	Et	Elliot	VI	-	162
253	Bf	Baffle	VI	IV	176	109	Aw2	Agnes Water 2	VI	-	1244
2	Mb2	Matchbox 2	VI	-	3219	111	Bf	Baffle	VI	-	323
4	Em	Eurimbula	VI	-	506	112	Mv4	Miriam Vale 4	VI	-	1581
5	Mv3	Miriam Vale 3	VI	-	964	114	Mv3	Miriam Vale 3	VI	-	1048

* D – Dominant
\+ S – Subdominant

UMA Number	Code	Land System	Land Capability D*	Land Capability S+	Area (ha)	UMA Number	Code	Land System	Land Capability D*	Land Capability S+	Area (ha)
115	Rd1	Rosedale 1	VI	-	5526	248	Tw	Tawah	VI	-	982
117	Wr	Wreckrock	VI	-	425	251	Et	Elliot	VI	-	37
118	Lm	Lowmead	VI	-	3373	252	Et	Elliot	VI	-	38
119	Mv2	Miriam Vale 2	VI	-	170	254	Et	Elliot	VI	-	35
121	Et	Elliot	VI	-	772	29	Ec2	Electra 2	VI	VII	4033
125	Bw	Broweena	VI	-	2387	34	Mb2	Matchbox 2	VI	VII	1904
127	Mv3	Miriam Vale 3	VI	-	531	42	Ec2	Electra 2	VI	VII	1653
130	Bf	Baffle	VI	-	715	46	Mb2	Matchbox 2	VI	VII	588
131	Rd1	Rosedale 1	VI	-	692	54	Ba2	Bania 2	VI	VII	806
132	Et	Elliot	VI	-	297	55	Mb2	Matchbox 2	VI	VII	234
133	Mv1	Miriam Vale 1	VI	-	234	63	Mb2	Matchbox 2	VI	VII	1637
134	Mv3	Miriam Vale 3	VI	-	47	68	Mb2	Matchbox 2	VI	VII	785
135	Bw	Broweena	VI	-	264	79	Mv6	Miriam Vale 6	VI	VII	2340
141	Mv4	Miriam Vale 4	VI	-	426	108	Mb2	Matchbox 2	VI	VII	851
144	Et	Elliot	VI	-	313	110	Ec2	Electra 2	VI	VII	3006
148	Rd1	Rosedale 1	VI	-	39	113	Mv6	Miriam Vale 6	VI	VII	6698
150	Bw	Broweena	VI	-	1258	116	Mv6	Miriam Vale 6	VI	VII	39823
151	Rd1	Rosedale 1	VI	-	8083	120	Rd2	Rosedale 2	VI	VII	19788
154	Mv3	Miriam Vale 3	VI	-	206	122	Mv6	Miriam Vale 2	VI	VII	1637
155	Mv4	Miriam Vale 4	VI	-	8102	123	Ec2	Electra 2	VI	VII	766
159	Mv3	Miriam Vale 3	VI	-	1643	126	Ec2	Electra 2	VI	VII	4296
160	Mv3	Miriam Vale 3	VI	-	490	157	Mv6	Miriam Vale 6	VI	VII	1943
161	Mb1	Matchbox 1	VI	-	282	166	Ec2	Electra 2	VI	VII	19081
162	Mb1	Matchbox 1	VI	-	531	168	Ba2	Bania 2	VI	VII	25819
165	Mv3	Miriam Vale 3	VI	-	601	169	Ec2	Electra 2	VI	VII	410
170	Bw	Broweena	VI	-	45	174	Ba1	Bania 1	VI	VII	106
171	Mv3	Miriam Vale 3	VI	-	774	176	Ba1	Bania 1	VI	VII	327
177	Bw	Broweena	VI	-	460	181	Mv5	Miriam Vale 5	VI	VII	27290
179	Wt1	Watalgan 1	VI	-	1186	182	Ba1	Bania 1	VI	VII	107
180	Mv3	Miriam Vale 3	VI	-	1720	186	Ec2	Electra 2	VI	VII	1003
183	Mv4	Miriam Vale 4	VI	-	867	188	Ba1	Bania 1	VI	VII	49
184	Hm	Hindmarsh	VI	-	325	190	Ec2	Electra 2	VI	VII	679
189	Bf	Baffle	VI	-	367	197	Rd2	Rosedale 2	VI	VII	4120
191	Sp	Serpent	VI	-	127	199	Mv6	Miriam Vale 6	VI	VII	11302
194	Mv4	Miriam Vale 4	VI	-	5406	200	Mv6	Miriam Vale 6	VI	VII	834
195	Wt1	Watalgan 1	VI	-	2117	203	Mv6	Miriam Vale 6	VI	VII	9529
196	Mv4	Miriam Vale 4	VI	-	4138	207	Rd2	Rosedale 2	VI	VII	9731
198	Rd1	Rosedale 1	VI	-	3357	210	Ec2	Electra 2	VI	VII	8493
202	Wt1	Watalgan 1	VI	-	82	219	Ba2	Bania 2	VI	VII	8368
212	Mv4	Miriam Vale 4	VI	-	2778	220	Rd2	Rosedale 2	VI	VII	46
216	Rd1	Rosedale 1	VI	-	110	223	Gn2	Goodnight 2	VI	VII	9657
217	Rd1	Rosedale 1	VI	-	165	226	Ec2	Electra 2	VI	VII	2577
222	Rd1	Rosedale 1	VI	-	260	230	Gn2	Goodnight 2	VI	VII	955
227	Mv1	Miriam Vale 1	VI	-	138	234	Wb	Wonbah	VI	VII	4668
233	Ga	Goyan	VI	-	2477	236	Mv6	Miriam Vale 6	VI	VII	435
237	Ed	Eddington	VI	-	477	241	Mv6	Miriam Vale 6	VI	VII	39
239	Pr	Perry	VI	-	498	243	Gn1	Goodnight 1	VI	VII	12142
242	Mv3	Miriam Vale 3	VI	-	209	245	Gn2	Goodnight 2	VI	VII	935
244	Ed	Eddington	VI	-	3111	246	Gn2	Goodnight 2	VI	VII	664
247	Et	Elliot	VI	-	36	255	Gn2	Goodnight 2	VI	VII	953

* D – Dominant
\+ S – Subdominant

UMA Number	Code	Land System	Land Capability D*	Land Capability S+	Area (ha)
1	Aw3	Agnes Water 3	VI	VIII	581
12	Em-Bt	Eurimbula	VI	VIII	172
15	Aw3	Agnes Water 3	VI	VIII	31901
16	Em-Bt	Eurimbula	VI	VIII	1380
31	Aw3	Agnes Water 3	VI	VIII	16295
35	Aw3	Agnes Water 3	VI	VIII	180
39	Aw3	Agnes Water 3	VI	VIII	137
41	Em-Bt	Eurimbula-Bustard	VI	VIII	464
47	Mc2	Muncon 2	VI	VIII	520
48	Aw3	Agnes Water 3	VI	VIII	22
50	Em-Bt	Eurimbula-Bustard	VI	VIII	1051
60	Aw3	Agnes Water 3	VI	VIII	19
71	Aw3	Agnes Water 3	VI	VIII	237
78	Aw3	Agnes Water 3	VI	VIII	157
81	Mc2	Muncon 2	VI	VIII	1448
85	Aw3	Agnes Water 3	VI	VIII	82
91	Aw3	Agnes Water 3	VI	VIII	43
96	Aw3	Agnes Water 3	VI	VIII	5692
101	Mc2	Muncon 2	VI	VIII	350
128	Mc2	Muncon 2	VI	VIII	19139
208	Ab	Aranbanga	VII	VI	724
215	Ab	Aranbanga	VII	VI	560
37	Mv7	Miriam Vale 7	VII	VIII	707
49	Mv7	Miriam Vale 7	VII	VIII	152
52	Cw	Castletower	VII	VIII	539
61	Cw	Castletower	VII	VIII	5313
92	Cw	Castletower	VII	VIII	2675
98	Mv7	Miriam Vale 7	VII	VIII	4299
124	Cw	Castletower	VII	VIII	1191
129	Mv7	Miriam Vale 7	VII	VIII	3188
136	Mv7	Miriam Vale 7	VII	VIII	4899
147	Mv7	Miriam Vale 7	VII	VIII	1422
156	Mv7	Miriam Vale 7	VII	VIII	911
178	Mv7	Miriam Vale 7	VII	VIII	717
185	Wt2	Watalgan 2	VII	VIII	5709
187	Mv7	Miriam Vale 7	VII	VIII	2753
193	Mv7	Miriam Vale 7	VII	VIII	2456
204	Mv7	Miriam Vale 7	VII	VIII	4485
205	Mv7	Miriam Vale 7	VII	VIII	2660
232	Hb	Hogback	VII	VIII	13957
238	Hb	Hogback	VII	VIII	120
240	Ct	Curtis	VII	VIII	94
3	Bt	Bustard	VII		2507
9	Bt	Bustard	VII		939
11	Bt	Bustard	VII		4196
13	Bt	Bustard	VII		2272
18	Bt	Bustard	VII		2661
19	Bt	Bustard	VII		96
20	Bt	Bustard	VII		45
21	Bt	Bustard	VII		108
40	Bt	Bustard	VII		576
44	Bt	Bustard	VII		1383
104	Bt	Bustard	VII		323
138	Bt	Bustard	VII		381
145	Bt	Bustard	VII		69
146	Bt	Bustard	VII		16
149	Bt	Bustard	VII		66

* D – Dominant
\+ S – Subdominant

APPENDIX VI

Correlations between soil classifications

With a view to assist readers less familiar with the now accepted Australian Soil Classification system (Isbell 1996), this appendix correlates the Isbell system with some of the older classification systems ie. Great Soil Groups (Stace *et al.* 1968) and Principal Profile Form (Northcote 1979) as found in this study area.

Vertosols

Vertosols are clay soils with shrink-swell properties that exhibit strong cracking when dry. Vertosols in the Australian Soil Classification (Isbell 1996) are subdivided into suborders by colour, namely red, brown, yellow, grey and black.

Dermosols

Dermosols lack a clear or abrupt textural B horizon, do not have free iron oxide content greater than 5%, are not calcareous throughout and have moderate to strongly structured B2 horizons. The suborders are differentiated by colour, namely red, brown, yellow, grey and black. In terms of Stace *et al.* (1968), prairie soils and some red and yellow podzolic soils qualify as Dermosols. In the Factual key (Northcote, 1979), a wide range of Gn3 and Gn4 soils together with Um4.4, Um6.3 and Uf6.3 soils are Dermosols. Chromosols, Vertosols and Sodosols are often found associated with Dermosols.

Chromosols

Chromosols are soils with strong texture contrast between A and B horizons and the major part of the upper 0.2 m of the B horizons is not sodic and not strongly acid. However, the lower B horizons may be sodic but this property is not distinguished until the subgroup level of the Australian Soil Classification. Many non calcic brown soils, some red brown earths and range of podzolic soils of Stace *et al*. (1968) may be called Chromosols. Chromosols are represented by D in the Factual key of Northcote (1979) and are further subdivided by the colour of the B horizons.

Ferrosols

Ferrosols are soils with B2 horizons which are high in free iron oxide and which lack strong texture contrast between A and B horizons.

Kandosols

Kandosols are soils that lack a clear or abrupt textural B horizons, are not calcareous throughout, and the B horizons are massive or only weakly structured and clay content exceeds 15%. These soils are close equivalents to the red, yellow and calcareous red earth groups of Stace *et al*. (1968) and Gn2 and many of the Um 5.2–5 soils of Northcote (1979).

Sodosols

Sodosols are soils with clear or abrupt textural B horizons and in which the major part of the upper 0.2 m of the B2 horizon is sodic (ESP >6) and not strongly acid (pH <5.5). Suborders within the order Sodosols are separated by colour. These soils have been described as sodic duplex soils in this report

although this terminology also includes Chromosols which are sodic at depth. As other soil classifications systems have used surrogate features instead of quantitative measure of sodicity levels it is difficult to compare equivalent soils from other systems. However solonetz, solodised solonetz and solodic soils as well as some soloths are the major groups from Stace *et al*. (1968) that are similar. Some of the duplex soils (D — primary profile forms) with conspicuously bleached A2 horizons may be equivalent in the system of Northcote (1979).

Kurosols

Kurosols are soils with a clear or abrupt textural B horizon and in which the major part of the upper 0.2 m of the B2 horizon is strongly acid (pH <5.5). Suborders within the order Kurosols are separated by color. It is difficult to compare equivalent soils with the other classification systems for the soil order of the Australian Soil Classification. However similar soils groups to that of the Sodosols may be equivalent.

Hydrosols

Hydrosols are soils which are permanently or seasonally wet for prolonged periods (2–3 months) in most years. Soils such as Podosols and Vertosols are excluded from this Soil Order as other profile characteristics have greater significance than wetness. The suborders within Hydrosols are differentiated by such factors as tidal affects and saline and non saline watertable influences.

Humic gleys and gleyed podsolic soils are the main soils equivalent to Hydrosols in Stace *et al*. (1968). A wide range of equivalent soils occur in Northcote (1968) with the Dg and some Uf soils the most common.

Podosols

Podosols are soils which possess B horizons which contain illuvial accumulations of organic matter – aluminium or aluminium-silica complexes with or without iron in various combinations. Iron compounds are usually recognised by bright colours while dark colours indicate organic compounds. The suborders of Podosols are separated by the degree of saturation in the profile caused by soil and site drainage conditions. In this report, these soils have usually been described as deep uniform coarse textured soils dominated by the accumulation of iron and organic compounds at depth.

Podosols are equivalent soils in Stace *et al.* (1968) while many Uc2 soils and some Uc3 and Uc4 soils in Northcote (1979) are equivalent.

Tenosols and Rudosols

Tenosols and Rudosols are usually shallow soils with negligible or weak pedologic organisation. Rudosols grade to Tenosols but Tenosols in comparison to Rudosols have either a more than weakly developed A1 horizon and A2 horizon or a weakly developed B horizon. In Stace *et al.* (1968) Tenosols and Rudosols equate to lithosols, siliceous sands and alluvial soils. Some Uc, Um and Uf classes in the Factual key (Northcote 1979) would be classified as Tenosols and Rudosols.

APPENDIX VII

List of Adjoining Surveys to Land Resources of the Miriam Vale and Kolan Shires

Report name	Author	Maps
Report not published Capricornia Coastal Lands		P3409, P3410, P3411 Land Systems of the Capricornia Coast Sheets 1,2 and 3: 1:250 000
DNRQ980142 Soils and Irrigated Land suitability of the Bundaberg Area	Donnollan TE, Wilson PR, Zund PR, Irvine SA	P 3211 - Bundaberg Area North Section - Soils; 1:50000P 3216 - Bundaberg Area South Section - Soils; 1:50000
DNRQ97158 Soils and Agricultural Suitability of the Childers Area	Wilson PR	P 3006 - Soils - Childers Area; 1:100000 Suitability maps available on request
DNRQ990052 Soils and Agricultural suitability of the Maryborough - Hervey Bay Area	Wilson PR, Anderson HM, Brown DM	P 3185 - Maryborough - Hervey Bay - Soils - Sheet 1; 1:50000 A2 3236 - Maryborough Hervey Bay - Land Suitability for Sugar Cane; 1:100000
QNRM01027 Soils and Agricultural Suitability of the Maryborough - Tiaro Area, Queensland	Zund PR, Brown DM	A0 3284 - Maryborough - Tiaro Soils; 1:50000 Suitability maps available on request
QNRME04046 Soils and Agricultural Suitability of the Gundiah-Curra Area	Zund PR	A0 3334 Soils 1: 50 000 A1 3371 Agricultural Land Classes 1: 50 000 Suitability maps available on request
QNRME04010 Land Resource Assessment Lowlands – Curra to Imbil, Mary River Catchment	Pointon SM, Collins AW	Soils (Scale 1:50 000) NR&M Ref No: MRC-I-A0 3327
DNRQ990067 Land Resources of the Burnett Region Part 3 North Burnett	Donnollan TE and Searle RD (1999))	Land Systems 1: 250 000 Land Capability Classes 1:250 000
QNRM01026 Land Resources of the Burnett Region Part 2 Central Burnett	Kent DJ (2002)	Mapping Units 1: 250 000 Land Capability 1: 250 000
QV83001 Land Resources of the Burnett Region: Part 1 South Burnett	Vandersee BE and Kent DJ (1983)	Mapping Units 1: 250 000 Land Capability – Land Suitability 1: 250 000 Current Land Use 1: 250 000