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Q085032

PROJECT REPORT

EVALUATION OF AGRICULTURAL LAND IN TAROOM SHIRE

B. A. Forster
Land Resources Branch

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Queensland Government Technical Report

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Queensland Department of Primary Industries
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1. INTRODUCTION

This report presents the findings of a study undertaken by the Land Resources Branch, Queensland Department of Primary Industries to identify and evaluate the agricultural land resources within Taroom Shire.

The study was undertaken at the request of the Taroom Shire Council, which had no single report or map describing the land resources of the whole shire at a suitable scale for Shire planning. Previous land resource surveys had covered major or minor sections of the shire, or had abutted the shire boundary. They were at different scales and had different legends, so comparative assessments across the whole shire were difficult. This study aimed to amalgamate the data from the earlier studies and to present it in a form and at a scale which could assist the Shire Council with forward planning of land use and management of land under its influence or control.

Agriculture is the main industry in the shire. Of the 1.86 m ha of land in the shire, 1.69 m ha were held under 477 agricultural holdings in 1983 and, of this, 89 000 ha were cultivated for grain, field and fodder crops. This represents a 45% increase in area cultivated over the previous 5 years (A.B.S. 1979, 1984). Some 16 700 ha of the shire are reserved in two National Parks and 271 500 ha are reserved in State Forests, within which there are a number of grazing leases and licences.

With the existing transport infrastructure and economics, grain cropping occurs predominantly within a radius of about 80 km around the Wandoan railhead. However, considerably more land is suitable for grain cropping both within and outside that radius, and there is a strong outlook for a continuing expansion of grain cropping in the shire in the future.

This study has identified the most valuable agricultural land, where the expansion of the grain cropping activity should occur. Wherever possible, this land should be retained for agricultural use in sufficiently large economic holdings and managed in such a manner to prevent degradation and to ensure long term productivity.

2. CLIMATE

The climate of the shire is characterised by hot summers and cool winters. Rainfall is summer dominant with generally light winter falls in most years. Rainfall data for three centres are shown in Table 1.

There is a general decrease in total rainfall from north to south, due mainly to variation in summer rainfall, while winter rainfall is generally more uniform throughout the shire.

Rainfall is the major limiting factor to successful long term cropping in the area (Gray and Macnish, 1985). Evaporation exceeds

Table 1. Rainfall distribution for three centres

Centre	Mean Annual (mm)	Summer (Oct-March) Amount (mm)	Summer (Oct-March) % of Annual	Winter (April-Sept) Amount (mm)	Winter (April-Sept) % of Annual
Coorada	731	521	71	210	29
Taroom	687	473	69	214	31
Wandoan	687	472	69	215	31

rainfall in all months of the year (Figure 1). For both summer and winter cropping, this moisture deficit must be met by stored soil moisture and this highlights the importance of the clay soils with high plant available water capacity for cropping.

A major drought of 2-3 years duration can be expected once in 8 years. Seasonal droughts also occur and cause crop failures.

Mid-summer temperatures can be very high and heat wave conditions (>37.8 C) are common. Crop production can be reduced by heat waves at critical periods such as seedling establishment and anthesis.

Frosts are common throughout the shire. An average of 14 frosts per year has been recorded at Taroom.

3. LAND RESOURCE CLASSIFICATION

Previous land resource surveys within and around the shire were used as background information for this study. The CSIRO land system survey of the Dawson-Fitzroy Area (Perry, 1968) covers the majority of the shire. A gap in the far north-west from that survey is covered by the CSIRO land system survey of the Isaac-Comet Area (Story *et al.*, 1967). A more recent DPI land system survey of the Miles Area (Dawson, 1972) abuts the south-eastern boundary of the shire.

From those three surveys, there are 45 different land systems described and mapped at two different scales covering the shire. The approach with this study was to amalgamate land systems, where they are broadly similar, into a limited number of LAND RESOURCE AREAS (LRA) and thus simplify the interpretation of land capability for planning purposes.

A LRA can be defined as an area of land with certain geological and landform characteristics (e.g. undulating plains and rises on labile sandstone) with a recurring pattern of soils and vegetation (e.g. softwood scrub on shallow clays and brigalow, belah forest on deep clays).

Using the information from the previous surveys, LRA's were delineated on high level aerial photographs (1:85 000 scale) and checked during reconnaissance field surveys. The dominant components of each LRA were described in terms of geology, landform, drainage, soils and vegetation.

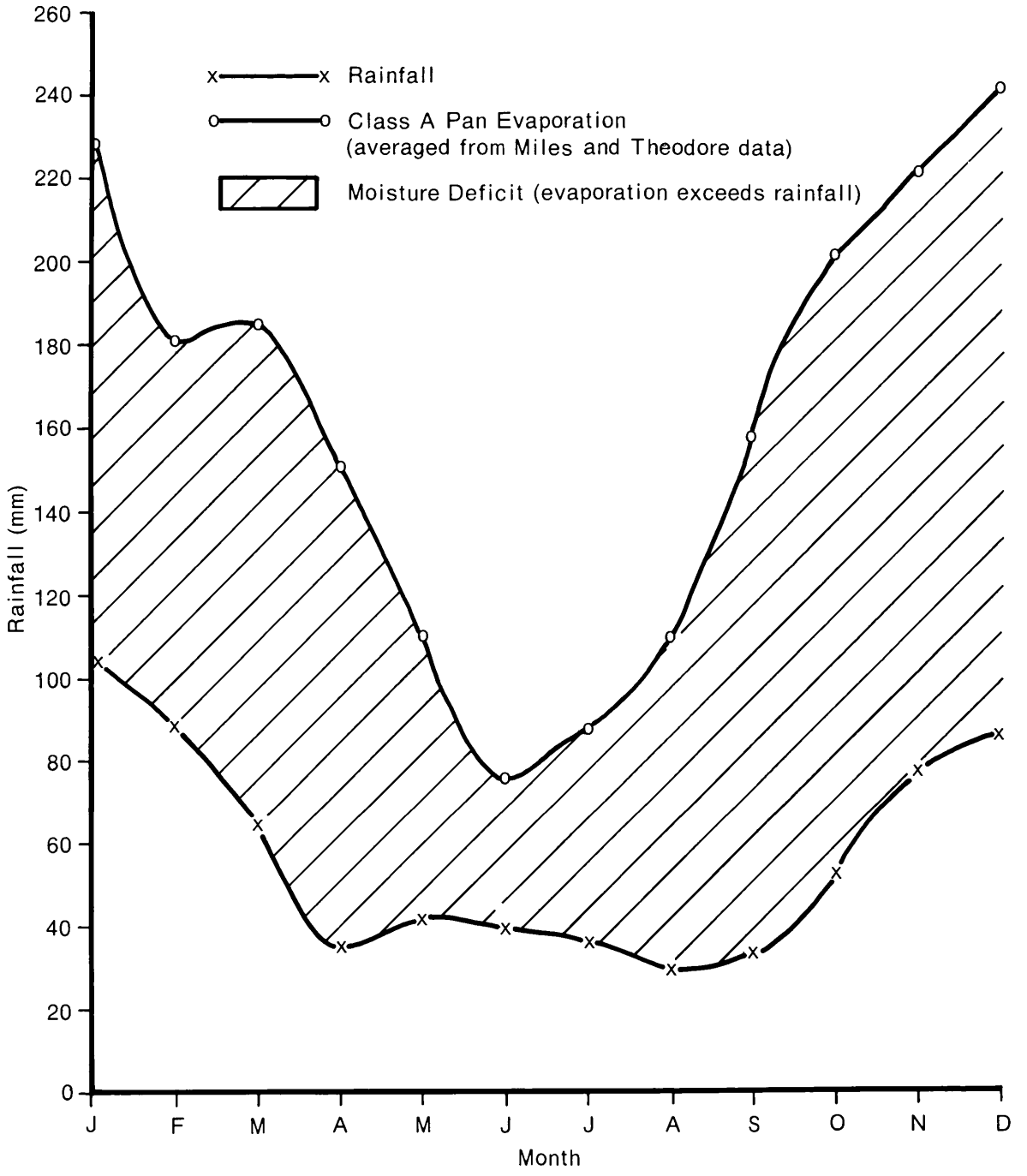

FIGURE 1 MEAN MONTHLY RAINFALL AND EVAPORATION FOR TAROOM

The shire has been mapped at a scale of 1:250 000 (Map 1) into 16 LRA's, which can be grouped on the basis of their dominant landform and geological characteristics, as indicated in Table 2. A brief description of each LRA is provided in Appendix I. A brief description of the dominant soils is provided in Appendix II.

The name assigned to each LRA has been selected from the land system most closely representing the largest proportion of the LRA. For example, within Wandoan LRA, Wandoan land system is the dominant land system, but other closely related land systems, namely Eurombah, Kiddell, Hinchley and Thomby, occur within it. One new name, Hornet LRA, has been given to distinguish characteristic alluvial plains at the upper end of Coolibah LRA.

The land systems, from the three previous surveys, which occur in each LRA are tabulated in Appendix III. More detailed descriptions of the component units of a LRA can be found by referring to the appropriate land system description in the relevant land system survey report.

4. AGRICULTURAL LAND SUITABILITY CLASSIFICATION

The land resource map forms the basis for the evaluation of the agricultural land suitability in the shire. Sources of information used in assessing the land suitability in the shire include:

- previous land resource reports and other reports
- report on Potential Distribution of Major Commercial Crop, Grass and Legume Species in Queensland (Weston *et al.*, 1984).
- local landholders, with their views of current land use and potential future use
- DPI agriculture and soil conservation advisers.

A DPI Land Management Field Manual for the Wandoan Soil Conservation District (Gray and Macnish, 1985), published after the completion of the field survey, contains the most recent interpretation of the land suitability of the important soil types in the shire. This information has also been used in the current assessments.

For this study, six land suitability classes were used, falling into three groups, namely Arable, Marginal Arable and Non-Arable Land. Non-Arable Land is further divided into two sub-groups, namely Pastoral and Marginal or Non-Pastoral Land. The land suitability classification system and the area of each class are described in Table 3 and the distribution of the classes within the shire is shown in Map 2.

Because the LRA's mapped at 1:250 000 contain a range of component units with different slopes, soils, vegetation and drainage, the assessment for this study must reflect the land suitability of the dominant component of the LRA, even though other land suitability classes occur in the LRA, but to a lesser extent. For example, the undulating slopes and crests of 2-6% slope with brigalow, belah forest and softwood scrub (now cleared) on cracking grey and brown clays and

Table 2. Grouping of Land Resource Areas

ALLUVIAL PLAINS

Fine Alluvium
1. Coolibah
2. Hornet

Fine and Coarse Alluvium
3. Juandah

VALLEY FLOORS

Fine and Coarse Alluvium
4. Palmtree
5. Montana

PLAINS AND RISES

Basalt
6. Westwood

Clay Sheet
7. Tara

Labile Sandstone
8. Wandoan

Lateritised Sandstone and Basalt
9. Narowie

TABLELANDS

Quartzose Sandstone
10. Hookswood
11. Duaringa

LOW HILLS

Basalt
12. Grevillea

Labile Sandstone
13. Mundell

Mixed Sediments
14. Narran

Quartzose Sandstone
15. Glenhaughton

HILLS

Quartzose Sandstone and Basalt
16. Nathan

Table 3. Agricultural land suitability classification

Agricultural Land Suitability Class	Description	Component LRA	Area (ha)
ARABLE LAND			
A1	Land suitable for long term cropping. Few limitations to use and productivity.	Coolibah	33 900
A2	Land suitable for long term cropping, but crop and/or pasture rotation phase required to maintain productivity. Moderate limitations to use and productivity. Intensive soil conservation measures, including contour banks, required on sloping land.	Hornet Wandoan	607 700
MARGINAL ARABLE LAND			
B1	Marginal arable land suitable for occasional cropping with careful management, but better suited to pasture improvement and grazing. Severe limitations to use and productivity. Intensive soil conservation measures, including contour banks, required on sloping land.	Juandah Westwood Tara	79 700
NON-ARABLE LAND			
Pastoral Land			
C1	Land suitable for pasture improvement and grazing. Protective ground cover should be maintained.	Montana Narowie Hookswood Grevillea Mundell (Narran)*	254 100
C2	Land suitable for grazing of native pastures. Limitations generally preclude pasture improvement. Protective ground cover should be maintained.	Palmtree Duaringa Narran Glenhaughton	460 800
Marginal or Non-Pastoral Land			
C3	Marginal grazing land, suitable for limited grazing of native pastures or land with severe limitations which preclude grazing. Suited to forestry, catchment protection or environmental conservation uses.	Nathan	427 900

* Estimated 25% of Narran LRA is Class C1.

black earths are the dominant component unit in Wandoan LRA. It is assessed as Class A2 land and is the main area suitable for grain cropping in the shire. In some locations, areas of gently undulating slopes, <2%, with similar or deeper soils would be assessed as Class A1, while areas of steep upper slopes, >6%, with shallow clay soils and rock shelf may be assessed as Class B1 or C1 land. However, at the scale of mapping used for this study, the overall assessment of Wandoan LRA is Class A2, based on the dominant component unit.

5. CROP SUITABILITY

The grain and fodder crops suitable for those LRA's assessed as suitable for cropping are shown in Table 4. Two LRA's, Narowie and Hookswood, which have some potential for fodder cropping are also included. The range of crops includes the main ones currently grown in the shire but is not exclusive. Other crops, such as cotton which was grown under irrigation on one property during the 1985 season, may be suitable.

6. PASTURE SUITABILITY

The pasture species suitable for those LRA's assessed as suitable for pasture improvement are shown in Table 5. The range of species is not exclusive.

7. CONSTRAINTS TO AGRICULTURAL DEVELOPMENT

The areas which have the major constraints to agricultural development are delineated in Map 3.

The major constraints are:

- Erosion of cropping land
- Flooding and poor drainage
- Salinity
- Restricted access

7.1 Erosion of cropping land

The lands delineated as most erosion prone include all the sloping arable lands of Wandoan and Westwood LRA's.

Land degradation as a result of sheet, rill and gully erosion is evident on much of the cultivated sloping lands. Its severity is related to the degree and length of slope, soil type, cropping history and land management. The resultant problems include a decline in agricultural productivity, restriction on cultivation, silt deposition on roads, fences, table drains, with sedimentation in streams and water storages and water pollution. The whole shire community can be affected, particularly if there is a general decline in agricultural productivity and increased shire infrastructure maintenance costs.

Table 4. Grain and fodder crops suitable for Land Resources Areas†

Land Resource Area	Grain Crops						Fodder Crops	
	Wheat	Barley	Sorghum	Sunflower	Safflower	Millet*	Oats	Forage Sorghum
1. Coolibah	s	s	s	s	s	ls	s	s
2. Hornet	s	s	s	s	s	ls	s	s
3. Juandah	ls	ls	ls	ls	ls		s	s
6. Westwood	s	s	s	ls	s	ls	s	s
7. Tara	ls	ls	ls	ls	ls		ls	ls
8. Wandoan	s	s	s	s	s	ls	s	s
9. Narowie							ls	ls
10. Hookswood							ls	ls

Table 5. Pasture species suitable for Land Resource Areas†

Land Resource Area	Pasture Species						
	Buffel grass	Rhodes grass	Green panic	Bambatsi	Pangola grass	Barrel medic	Snail medic
1. Coolibah				s		s	s
2. Hornet				s		s	s
3. Juandah	ls	ls		s	ls	ls	ls
5. Montana	ls	s			ls	ls	ls
6. Westwood	s	s	s	s		s	s
7. Tara	ls	ls		s		s	s
8. Wandoan	s	s	s	s		s	s
9. Narowie	s	ls	ls		ls		
10. Hookswood		ls			ls		
12. Grevillea	ls	ls	ls		ls	ls	ls
13. Mundell	s	s	s		ls	s	s
14. Narran	ls	ls	ls		ls	ls	ls

s - Suitable; ls - Limited Suitability.

* Small seeded crops (millet) have low germination rates on hard setting and coarse structured soils. Millet is shallow rooted and not drought tolerant.

† Based on data from Gray and Macnish (1985) and V. French (pers. comm.).

In 1984, 10 000 ha of arable land were severely eroded, with a further 60-70 000 ha having suffered some erosion without obviously affecting crop yields (J. Gray and L. Markey, pers. comm.).

The soil erosion problem has been recognised by landholders and Departmental advisers for a long time and measures have been undertaken over the years to reduce the erosion risk. These measures include crop rotation, crop/pasture rotation, return of land unsuited to cropping back to pasture and construction of single and double spaced contour banks and waterway systems. More recently, stubble mulching techniques, reduced tillage and selection of crops which provide some soil erosion protection have been introduced.

By 1984, 51 000 ha or 57 % of the existing cultivated land had soil conservation measures planned and surveyed, comprising 30 000 ha of contour banks and 21 000 ha of grass strips. However, only 35-40% of this is implemented and maintained (L. Markey, pers. comm.). Further expansion of the cropping areas can only increase the problem, unless sound land management practices and soil conservation measures are implemented as new land is cropped.

Practical and economic measures are available to control soil erosion on sloping cultivated land. Departmental soil conservation officers, based at Wandoan, are available to provide advice on soil conservation measures and land management practices suitable for the district and to assist with farm planning. To complement the Department's work, the Council could assist by promoting the use of sound land management practices and soil conservation systems.

Within the grazing lands, the sandy surfaced texture-contrast soils on the low hills of Narran and Glenhaughton LRA's are inherently very erodible, but, providing they are lightly grazed and a protective surface pasture cover is maintained, the erosion hazard remains low to moderate.

7.2 Flooding and poor drainage

The lands delineated as most prone to flooding include Coolibah, Hornet, Juandah and Palmtree LRA's.

While the Queensland Water Resources Commission has a number of stream gauging stations along the Dawson River and its major tributaries, specific data relating to flood frequency, height and duration at defined sites are not available. Floodplain cross-section surveys and hydraulic studies are required for this level of detail.

The alluvial plains along the Dawson River and its tributaries are subject to occasional flood flows. Under undisturbed natural conditions, the alluvial plains remain relatively stable during flood flows. That stability can alter after clearing of the native timber and subsequent cultivation. Comparison of aerial photographs pre- and post- clearing/cultivation indicates that soil erosion from flood flows has been a problem in the middle reaches of the Dawson River and Robinson Creek within Hornet LRA.

The alluvial plains along the Dawson River and its major tributaries contain valuable agricultural land, which can be cropped using sound land management techniques and by avoiding erosion prone areas. However, there is an inherent financial risk associated with cropping these areas, as the capital cost of planting and growing a crop can be lost during a flood. This risk lies with the individual landholder. A more insidious risk is associated with soil erosion which may result from flood flows. Particularly vulnerable areas occur at the breakouts along the stream bank and levee, where flood flows pour out onto the alluvial plain. For this reason, the native timber and grass cover should be left undisturbed along the stream bank and levee.

The erosion prone areas or areas which have suffered erosion in the past are best returned to pasture for grazing. These areas may include old infilled stream channels which concentrate flows or areas with a loose, sandy surface.

Cropping should be restricted to those areas where flood flow velocities are low, generally on the more elevated sites or where flows spread out over a wide floodplain. Soil conservation structures, such as diversion banks, are not appropriate on the floodplains, but wide waterways to carry away low flow floodwaters are useful. Strip cropping is one soil conservation technique that can reduce soil erosion on floodplains. However, for the Taroom Shire, there can be difficulties in maintaining summer crops in the rotation because of the unreliability of the summer rainfall and in designing practical layouts.

Swamps and lagoons have certain flood mitigation advantages for small floods so they are best left undisturbed. They also have value as wildlife and waterbird habitats, particularly along Palmtree Creek and Tualka Creek.

7.3 Salinity

The lands delineated as having an existing salinity hazard occur along sections of Woleebee Creek, Conloi Creek, Ogle Creek and Frank Creek, south-west and south of Wandoan. They are sites of seepage salting associated with the adjacent quartzose sandstone hills which have been extensively cleared. The incidence of salted land is confined to small areas at present. Further clearing of timber on the catchment slopes should be restricted to prevent further salinity outbreaks. The inherent salinity hazard may preclude irrigation in these areas. Further investigations of the subsoil salinity of the texture-contrast soils in Juandah LRA is required.

A potential salinity hazard occurs in an area of swampy springs, locally known as Boggomoss, located between Mt Moss and the Dawson River, near Glebe Weir. Seepage salting may occur following clearing of surrounding slopes.

Another potential salinity hazard occurs on those sections of the alluvial plains along Robinson Creek which have a high water table, indicated by the adjacent perched lakes and swamps. If the soils have

high salt levels and they are irrigated, salinity problems may occur. More detailed survey is required to delineate specific problem areas. Similar situations may exist on the narrow alluvial plains along Palm Tree Creek and Tualka Creek, but there is less potential for irrigation of these small areas.

The subsoils of the grey clays and brown clays in Wandoan and Tara LRA have varying salinity and sodicity levels, but some are recorded as highly saline and highly sodic (Gray and Macnish, 1985). It has not been possible to map out these saline, sodic soils at this level of survey. No severe salinity problems have been recorded for these soils, however the loss of topsoil by soil erosion can expose the subsoil or bring the saline, sodic layer closer to the surface. Structural and productivity decline may then occur. Sound land management practices and soil conservation measures are essential to prevent these salinity, sodicity problems occurring.

7.4 Restricted access

The areas with restricted access include most of Nathan LRA in the east, west and north of the shire.

The terrain consists of steep hills and dissected tablelands, often with precipitous scarps and deeply incised narrow valleys. Much of the area is reserved for State Forests and National Parks, which are appropriate uses. Of the remaining land under freehold or pastoral lease, there is little grazing pressure on the sparse pastures growing on very shallow, infertile soils. Mustering can be extremely difficult and vehicular access is very restricted.

There is little or no potential for further agricultural development beyond the existing light grazing of native pastures.

8. PLANNING IMPLICATIONS

The most important aspect of planning in the context of future agricultural use is to retain as much as possible of the valuable agricultural land for productive agricultural use.

8.1 Valuable agricultural land

Valuable agricultural land can be considered as areas with Agricultural Land Suitability Class A1 and A2, with Class B1 a lower priority. At the scale of mapping for this study, it must be appreciated that within a particular LRA assessed as valuable agricultural land, there will be areas which are not suitable for cropping and do not rate as valuable agricultural land. Such areas may be set aside for some other more appropriate use. However, overall that particular LRA will still rate as valuable agricultural land.

Class A1 land comprises Coolibah LRA, the flood prone alluvial plains along the lower reaches of the Dawson River, Eurombah Creek, Horse Creek and Juandah Creek. These areas are unlikely to receive any

pressure for development other than for agriculture, because of flooding and deep swelling soils. These areas should remain as the prime sites for continuing riparian irrigation from adjoining streams.

Class A2 land comprises Hornet and Wandoan LRA's.

The planning implications for Hornet LRA, the flood prone alluvial plains along the middle reaches of the Dawson River, Robinson Creek and Scott Creek are similar to those for Coolibah LRA described above. However, because of its greater erosion hazard from flood flows, it has lower priority as agricultural land than Coolibah LRA.

Wandoan LRA, the undulating brigalow plains and rises on labile sandstone, is likely to be the area of valuable agricultural land most under pressure for other land uses. For example, areas west of Wandoan may be used for coal mining in the future, but this may only represent a loss of agricultural production for a short to medium period, providing land is rehabilitated for agricultural use.

The existing population centres of Taroom and Wandoan are surrounded by this Class A2 land and there may be pressure to expand the town boundaries onto this land or to sub-divide it for smaller holdings. Where possible, such schemes should incorporate land with a higher proportion of crests and upper slopes, which have lower agricultural potential, but which are better suited in terms of drainage and foundations for urban or rural residential development. The lower slopes with deep, swelling clays should be retained for agricultural use.

Class B1 land comprises Juandah, Westwood and Tara LRA's.

Juandah LRA, the narrow alluvial plains and low rises along tributary streams, has arable soils, some of which are suitable for irrigation. However, significant areas are unsuitable for cropping. As for Coolibah and Hornet LRA's, the flooding constraint should preclude uses other than agriculture. Where there is pressure to locate rural-residential development in an area with "creek flat frontage", this should be the preferred site rather than Coolibah or Hornet LRA.

The limited extent and remoteness of Westwood LRA, the undulating plains and rises on basalt in the north, should allow it to remain in agricultural use. Where basalt material is won for road building, it is taken from stony hillslopes which are not suitable for cropping.

Tara LRA consists of relict alluvial plains with deep swelling clay soils and areas of severe gilgai, which should preclude uses other than agriculture. Structural foundations would be hazardous in the swelling soils.

8.2 Other land

The remaining land in the shire, incorporating Classes C1, C2 and C3, is classed as pastoral or marginal pastoral land. Small areas of land within them may be a higher rating, but overall these areas do not rate as valuable arable land.

Class C1 land comprises Montana, Narowie, Hookswood, Grevillea, Mundell and parts of Narran LRA's. Significant areas of these lands are ideally suitable for pasture improvement and can be considered as valuable lands for beef cattle production. Retention of this land for pastoral use is desirable.

Class C2 land comprises Palm Tree, Duaringa, Narran and Glenhaughton LRA's. These areas are pastoral lands suitable for beef cattle production on native pastures. **Class C3** land, comprising Nathan LRA, is marginal or non-pastoral land, which contains some areas which are marginally suitable for beef cattle production on native pastures and the remainder which is not suitable for pasture production. Retention of the Class C2 and C3 lands for agricultural use is not critical if there is some other more appropriate land use which will benefit the shire.

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APPENDIX I

DESCRIPTION OF THE LAND RESOURCE AREAS

ALLUVIAL PLAINS

Land Resource Areas 1 - Coolibah

General Description

Coolibah LRA consist of the broad alluvial plains along the lower reaches of the Dawson River, Eurombah Creek, Horse Creek and Juandah Creek. The plains are subject to occasional flooding at low flow velocities. Soils are predominantly deep black earths and grey clays. Large areas have been cleared of their coolibah woodland. This is valuable agricultural land and significant areas have been cultivated principally for grain crops and, more recently, for cotton.

Landform

Broad, level alluvial plains up to 5 km wide. Dissected by relict meander channels. Stable surface, with little evidence of erosion from flood flows on cleared and cultivated land.

Geology

Recent alluvium derived from the erosion of the catchment sedimentary rocks.

Distribution

Lower reaches of the Dawson River (within the shire) and Eurombah Creek, Horse Creek and Juandah Creek.

Drainage

Imperfectly drained plains, with some poorly drained swamps and billabongs. Subject to occasional and prolonged deep flooding, but generally low velocity flows over the broad plains.

Soils

Deep black earths and grey clays. Moderate to high fertility levels and plant available water capacity (PAWC).

Vegetation

Coolibah grassy woodland, predominantly cleared. Queensland blue grass, tall oat grass, grassland and sedges. Queensland blue gum, carbeen fringing forest along streams.

Agricultural Land Suitability

Arable Land. Class A1. Suitable for long term grain and fodder cropping, providing suitable soil conservation measures are developed

to prevent soil erosion from flood flows. Suitable for irrigated cropping.

Constraints to Agricultural Development

The main constraint is flooding which is most hazardous adjacent to the stream courses and in the low lying areas. Fringing vegetation along stream banks should be retained to prevent stream bank erosion and any areas experiencing higher velocity flows and scour returned to pasture.

Land Resource Area 2 - Hornet

General Description

Hornet LRA consists of broad alluvial plains along the middle reaches of the Dawson River, and along Robinson Creek and Scott Creek. The plains are subject to occasional flooding and generally experience faster velocity flows than Coolibah LRA and unprotected areas are susceptible to scouring. Soils are deep dark loams, black earths and grey clays. The dominant native vegetation community is poplar box, Queensland blue gum woodland, with areas of coolibah woodland. This is valuable agricultural land and large areas have been cleared and cultivated for grain cropping.

Landform

Broad, level alluvial plains, up to 4 km wide. Dissected by relict meander channels and lagoons. Unstable surfaces adjacent to floodouts from stream channels and evidence of surface scouring in cultivated paddocks from flood flows.

Geology

Recent alluvium derived from the erosion of the catchment sedimentary rocks. Significant areas of coarser alluvia than for Coolibah LRA.

Distribution

Middle reaches of the Dawson River and Eurombah Creek and the lower reaches of Robinson Creek and Scott Creek.

Drainage

Imperfectly drained plains with some poorly drained swamps and billabongs, particularly along Robinson Creek. Subject to occasional flooding, generally experiencing faster velocity flows than Coolibah LRA.

Soils

Deep, dark loams (affinities with minimum developed prairie soils) with hard setting surfaces and moderate fertility levels and PAWC. Smaller areas of deep black earths and grey clays, with moderate to high fertility levels and PAWC.

Vegetation

Predominantly poplar box, Queensland blue gum grassy woodland on the dark loams; extensively cleared. Coolibah woodland on the black earths and grey clays. Carbeen, Queensland blue gum and fan palm line the stream banks.

Agricultural Land Suitability

Arable Land. Class A2. Suitable for long term grain and fodder cropping providing suitable soil conservation measures are developed to prevent soil erosion from flood flows. Suitable for irrigated cropping.

Constraints to Agricultural Development

The main constraints are flooding and potential erosion hazard along stream banks and floodout sites and other susceptible areas. Fringing vegetation along stream banks should be retained to prevent stream bank erosion and any areas experiencing erosion returned to pasture.

Land Resource Area 3 - Juandah

General Description

Juandah LRA consists of narrow alluvial plains along southern watercourses, particularly Juandah Creek, Woleebee Creek, Horse Creek and Roche Creek. Poplar box woodland is the dominant vegetation on solodics, solodized-solonetz and grey clays. These plains have limited cultivation and are marginal arable lands.

Landform

Narrow, level alluvial plains dissecting the brigalow plains of Wandoan LRA, broadening to 2 km wide in the lower reaches. Incised by shallow streams and flanked by rises.

Geology

Recent alluvium and colluvium. Coarser, sandy deposits in the narrow upper reaches flanked by quartzose and lithic sandstone terrain and finer alluvium in the lower reaches flanked by labile sandstone and siltstone terrain.

Distribution

Located along tributaries in the centre and south, namely Juandah Creek, Woleebee Creek, Kangaroo Creek, Horse Creek and Roche Creek.

Drainage

Imperfectly to poorly drained with periods of waterlogging. Subject to irregular flooding in the lower reaches.

Soils

Predominantly deep texture contrast soils, solodics and solodized-solonetz. Low surface fertility, moderate PAWC, moderately to strongly saline and sodic subsoils. Occurrences of seepage salting along Woleebee Creek, Ogle Creek and Conloi Creek adjacent to sandstone hills. Areas of cracking and non-cracking grey clays and brown clays.

Vegetation

Poplar box woodland, often with sandalwood, wilga understorey. Merging with brigalow forest on adjacent slopes of Wandoan LRA. Silver-leaved ironbark woodland on rises.

Agricultural Land Suitability

Marginal Arable Land. Class B1. Significant areas suitable for grain and fodder cropping with crop rotation, providing suitable soil conservation measures to protect against flood flows are implemented. Potential for irrigation of non-saline, non-sodic soils. Non-arable areas suitable for pasture improvement and grazing.

Constraints to Agricultural Development

Occasional flooding and inundation are constraints. Potential problems with texture contrast soils due to low to moderate PAWC of sandy surface, poor drainage and saline and sodic subsoils. These problems require more detailed investigation prior to any irrigation development. Potential seepage salting sites need to be identified.

VALLEY FLOORS

Land Resource Area 4 - Palmtree

General Description

Palmtree LRA consists of narrow valley floors with numerous small lakes, seasonal swamps and low rises along Palm Tree Creek, Tualka Creek and Robinson Creek. The land is occasionally flooded and poorly drained. Vegetation communities on the valley floor range from poplar box woodland on texture contrast soils to coolibah woodland on black earths. Silver-leaved ironbark, cypress pine woodlands occur on the shallow texture contrast soils on the rises. The lands are primarily used for grazing of native pasture.

Landform

Narrow valley floors up to 1 km wide within quartzose sandstone terrain, and characterised by numerous small lakes and seasonal swamps along old stream meander channels and sandstone rises.

Geology

Recent alluvium and colluvium. Jurassic quartzose sandstone on rises.

Distribution

Principally along Palm Tree Creek and Tualka Creek, with limited occurrence along the middle reaches of Robinson Creek.

Drainage

Poorly drained and inundated for prolonged periods after floods.

Soils

Deep solodics, solodized solonetz, black earths and grey clays along valley floors. Moderate fertility and PAWC. Imperfectly to poorly drained soils. Shallow solodics and soloths on sandstone rises.

Vegetation

Poplar box, Queensland blue gum, carbeen and fan palm open woodland on better drained alluvium and along creek banks. Coolibah woodland in poorly drained sites. Swamp grasses and sedges in seasonal swamps. Silver-leaved ironbark and cypress pine woodland on rises.

Agricultural Land Suitability

Pastoral Land. Class C2. Low lying areas suitable for grazing of native pastures. Better drained alluvium suitable for pasture improvement.

Constraints to Agricultural Development

Occasional flooding and poor drainage main constraints. Access restricted during prolonged rain periods.

Land Resource Area 5 - Montana

General Description

Montana LRA consists of broad valley floors and rises within quartzose sandstone terrain in the north, east and west. Poplar box woodland is the dominant vegetation on solodic soils. The land is primarily used for grazing of native pasture, but there is potential for pasture improvement and limited cultivation of suitable soils.

Landform

Broad valley floors, up to 3 km wide, with narrow alluvial flats, side slopes and rises within the undulating to steep quartzose sandstone terrain of LRA 14, 15 and 16. Relief up to 20 m. Incised by shallow streams.

Geology

Recent alluvium and colluvium in the valley floors. Predominantly Jurassic quartzose sandstone and some labile sandstone and siltstone on the side slopes and rises.

Distribution

North, east and west.

Drainage

Narrow alluvial flats poorly drained and subject to infrequent inundation. Well drained slopes.

Soils

Moderately deep to deep solodics, solodized solonetz and grey clays, some with saline and sodic subsoils. Shallow solodics, soloths and lithosols on sandstone on the rises.

Vegetation

Poplar box woodland, sometimes with sandalwood understorey on the valley floors and lower slopes. Queensland blue gum, rough-barked apple and carbeen woodland along streams. Silver-leaved ironbark, cypress pine and bulloak woodland or forest on the rises.

Agricultural Land Suitability

Pastoral Land. Class C1. Lower slopes and valley floor suitable for pasture improvement. Remainder suitable for grazing of native pastures.

Constraints to Agricultural Development

Inundation and poor drainage are the main constraints on valley floors, along with soils with saline, sodic subsoils. Soils on rises erodible, infertile and low PAWC.

PLAINS AND RISES

Basalt

Land Resource Area 6 - Westwood

General Description

Westwood LRA consists of gently undulating basalt plains and rises in the central north. The soils are stony black earths, brown clays and red clays of variable depth. Vegetation communities include blue grass grassland and silver-leaved ironbark and bloodwood open woodland, extensively cleared. These are marginal arable lands with lower, rock free slopes suitable for cultivation and grain cropping.

Landform

Gently undulating plains and undulating rises. Slopes 2-10%. Relief 10-25 m. Rock outcrop on upper slopes and crests of rises.

Geology

Tertiary basalt.

Distribution

Limited occurrence in the central north.

Drainage

Well drained.

Soils

Black earths, brown clays and red clays. Shallow, gravelly profiles with basalt floaters on upper slopes and crests. Deep profiles with <10% floaters on lower colluvial slopes. Moderate to high fertility and PAWC.

Vegetation

Queensland blue grass, pitted blue grass and bunch spear grass grassland. Silver-leaved ironbark, bloodwood open woodland. Extensively cleared.

Agricultural Land Suitability

Marginal Arable Land. Class B1. Lower colluvial slopes with <10% basalt floaters suitable for grain and fodder cropping. Intensive soil conservation measures required along with crop or pasture rotation. Upper slopes with <50% floaters suitable for pasture improvement.

Constraints to Agricultural Development

Potential erosion of cultivated land on slopes. Rock floaters >10% will hinder cultivation and necessitate rock picking.

Clay Sheet

Land Resource Area 7 - Tara

General Description

Tara LRA consists of relict, level brigalow plains of restricted occurrence in the south-east. The plains are gilgaied and poorly drained. The soils are cracking grey clays suppporting brigalow, belah forest, now largely cleared. These areas are currently used for grazing but are suitable for cultivation and grain cropping.

Landform

Broad, level alluvial plains with small areas of severe gilgai, becoming gently undulating on the western edges because of dissection. Slopes <2%. Relief 10 m.

Geology

Alluvium deposited as a clay sheet in the early Quaternary.

Distribution

Limited occurrence in the south-east.

Drainage

Generally imperfectly to well drained plains, except for areas of very poorly drained and ponded gilgaied terrain.

Soils

Deep non-cracking and cracking grey clays on well drained plain. Deep cracking grey clays in gilgaied terrain. Moderate to high fertility and PAWC and variable sodic to strongly sodic subsoils.

Vegetation

Belah forest on well drained slopes. Brigalow, belah occupy the mounds of the gilgai, while sedges and reeds grow in the ponded depressions.

Agricultural Land Suitability

Marginal Arable Land. Class B1. Well drained plains suitable for grain and fodder cropping, with soil conservation measures. Severely gilgaied areas best left under native pasture. Drainage and planning of these areas may expose saline, sodic subsoils.

Constraints to Agricultural Development

Severe gilgai and poor drainage are constraints in some areas. Sodic subsoils may affect plant water availability and reduce yield.

Labile Sandstone

Land Resource Area 8 - Wandoan

General Description

Wandoan LRA consists of undulating plains and rises with brigalow and softwood scrub over a very large area predominantly in the centre, south and north-east. The soils are dark cracking clays developed on labile sandstone and siltstone. These areas have been extensively cleared, cultivated and cropped and are the main agricultural lands of the shire.

Landform

Undulating plains and rises, with lower and middle slopes generally in the range 2-8% and upper slopes in the range 5-12%. Relief to 30 m. Occasional rock outcrop on steeper upper slopes and narrow crests. Slight to moderate melonhole and linear gilgai found in the virgin state. Merges with the steeper slopes and low hills of Mundell LRA.

Geology

Jurassic labile sandstone, siltstone, mudstone and conglomerate.

Distribution

Mainly the southern, central and north-eastern sections, with smaller areas in the north and north-west.

Drainage

Moderately well drained lower slopes and well drained upper slopes and crests.

Soils

Moderately deep to deep cracking grey clays, brown clays and black earths. Characteristically, shallower profiles on crests and steep upper slopes, sometimes with surface stone and rock shelf. Some profiles are non-cracking, with very thin (1-2 cm) loamy surfaces. Moderate to high fertility and high PAWC for deeper profiles. Sodic and saline subsoils occur.

Vegetation

Brigalow, belah, bauhinia forest and softwood scrub with some Dawson gum in the north. Areas of blue grass grassland, merging to brigalow grassy open woodland.

Agricultural Land Suitability

Arable Land. Class A2. Slopes <6% suitable for grain and fodder cropping with crop or pasture rotation. Intensive soil conservation measures required. Slopes >6% and stony crests with shallow soils not suitable for cultivation, and best left under pasture.

Constraints to Agricultural Development

The main constraint is sheet and gully erosion on unprotected cultivated soils. All cultivated land requires crop and/or pasture rotation, stubble mulch retention and intensive soil erosion control measures. The occurrence of some soils with saline or sodic subsoils may affect plant water availability and reduce yields.

Lateritised Sandstone and Basalt

Land Resource Area 9 - Narowie

General Description

Narowie LRA consists of gently undulating plains and rises on lateritised sandstones and basalt in the central north. Narrow-leaved ironbark, spotted gum open forests grow on the red earths and yellow earths. The lands are used for forestry and grazing of the sparse native pastures.

Landform

Gently undulating plains and rises with broad crests. Slopes 1-5%. Relief to 20 m.

Geology

Deeply weathered, lateritised Jurassic quartzose sandstone and Tertiary basalt.

Distribution

Limited occurrence in the central north.

Drainage

Well drained.

Soils

Moderately deep to deep loamy red earths are the dominant soils. Low fertility and moderate PAWC. Minor occurrence of yellow earths on lower slopes.

Vegetation

Narrow-leaved ironbark, spotted gum, silver-leaved ironbark and yellow jack open forest with understory of wattles and red ash and sparse grasses.

Agricultural Land Suitability

Pastoral Land. Class C1. Suitable for improved pasture, but productivity may be reduced by low fertility and moderate PAWC. Some of the northern areas with better rainfall may be suitable for fodder cropping under pasture rotation, providing soil conservation measures are implemented.

Constraints to Agricultural Development

Major constraints are the light soil texture, moderate PAWC and low fertility resulting in reduced pasture yield. Wattle regrowth could be a problem after clearing.

TABLELANDS

Quartzose Sandstone

Land Resource Area 10 - Hookswood

General Description

Gently undulating slopes and crests on dissected tablelands of deeply weathered sandstone in the south-east. Narrow-leaved ironbark, bulloak forests occur on red earths, yellow earths, soloths and solodics. Large areas remain uncleared, and the dominant land use is grazing of native pastures.

Landform

Gently undulating slopes and crests on dissected tablelands with steep scarps. Slopes 1-3%. Relief to 20 m.

Geology

Deeply weathered Tertiary quartzose sandstone and siltstone, lateritised in some areas.

Distribution

Limited occurrence in the south-east.

Drainage

Generally well drained, but almost level lower slopes are imperfectly drained.

Soils

Moderately deep loamy red earths on upper slopes and shallow gravelly yellow earths on broad crests. Low fertility and low to moderate PAWC. Deep soloths and solodics on lower slopes. Low fertility and saline, sodic subsoils.

Vegetation

Narrow-leaved ironbark, spotted gum open forest with wattle and red ash understorey on red earths and yellow earths. Narrow-leaved ironbark, bulloak, poplar box forest on soloths and solodics.

Agricultural Land Suitability

Pastoral Land. Class C1. Suitable for improved pastures but productivity may be reduced by low fertility, moderate PAWC and saline, sodic subsoils. Some areas of loamy red earths may be suitable for fodder crops under pasture rotation, providing soil conservation measures are implemented.

Constraints to Agricultural Development

Major constraints with red earths are erodibility, low PAWC and low fertility. Major constraints with soloths and solodics are moderate fertility, moderate PAWC and saline, sodic subsoils.

Land Resource Area 11 - Duaringa

General Description

Level to gently undulating slopes and crests on dissected tablelands. Narrow-leaved ironbark, spotted gum, cypress pine forest on lithosols, and shallow yellow earths, red earths and pale earthy sands. Lancewood low forest on steep, rocky scarps. Used for grazing of native pasture.

Landform

Level to gently undulating slopes and crests on dissected tablelands. Steep rocky scarps. Slopes to 4%. Relief to 20 m.

Geology

Jurassic, Cretaceous and Tertiary quartzose sandstone.

Distribution

Principally in the centre and south. Often occurs as isolated tableland remnants within the brigalow plain.

Drainage

Well drained.

Soils

Lithosols, shallow yellow earths, red earths, pale earthy sands, solodics and strong brown clays. Low PAWC and fertility.

Vegetation

Monospecific and mixed forest of narrow-leaved ironbark, spotted gum and cypress pine with wattle and red ash understorey. Small pockets of brigalow on shallow stony brown clays. Lancewood low forest on steep, rocky scarps.

Agricultural Land Suitability

Pastoral Land. Class C2. Suitable for grazing of native pasture. Stocking rates should be managed to maintain ground cover and prevent erosion of the sandy soil surface.

Constraints to Agricultural Development

Low fertility and PAWC. Erodible soils. Restricted access.

LOW HILLS

Basalt

Land Resource Area 12 - Grevillea

General Description

Grevillea LRA consists of rolling to steep low basalt hills in the far north. The soils are shallow, stony black earths, red clays and brown clays supporting silver-leaved ironbark and narrow-leaved ironbark woodland. The land is used for grazing of native pasture.

Landform

Rolling to steep low hills. Slopes 5-45%. Relief to 40 m. Rock outcrop on crests and upper slopes. Stony lower slopes.

Geology

Tertiary basalt.

Distribution

Limited occurrence in far north.

Drainage

Well drained.

Soils

Shallow, stony black earths, red clays and brown clays. Moderate fertility and low to moderate PAWC.

Vegetation

Silver-leaved ironbark and narrow-leaved ironbark woodland with blue grasses and bunch spear grass.

Agricultural Land Suitability

Pastoral Land. Class C1. Suitable for pasture improvement, except for steep, rocky upper slopes and crests, which should be left uncleared.

Constraints to Agricultural Development

Erosion hazard is a constraint on steep slopes. Stocking rates should be managed to maintain a protective surface cover.

Labile Sandstone

Land Resource Area 13 - Mundell

General Description

Mundell LRA consists of softwood scrub and brigalow on rolling to steep low hills, often in association with Wandoan LRA. The soils are shallow grey clays, brown clays and black earths on labile sandstone and siltstone. The lands have been extensively cleared for grazing and are suitable for pasture improvement.

Landform

Rolling to steep low hills. Slopes 5-40%. Relief to 80 m. Rock outcrop and shelf on steep upper slopes and crests.

Geology

Jurassic labile sandstone and siltstone.

Distribution

Predominantly in the east, north-east and centre, with scattered areas in the far north-west, north and south.

Drainage

Well drained.

Soils

Shallow cracking and non-cracking grey clays, brown clays and black earths, often stony. Moderate to high fertility and moderate PAWC.

Vegetation

Softwood scrub on crests and steep slopes. Brigalow, bauhinia forest on lower slopes. Extensively cleared.

Agricultural Land Suitability

Pastoral Land. Class C1. Suitable for pasture improvement, except steep, upper slopes which should be left uncleared. Gentler, lower slopes (<6%, merging with Wandoan LRA) are suitable for rotational cropping to control sucker regrowth, providing intensive soil conservation measures are implemented.

Constraints to Agricultural Development

Soil erosion is a hazard on these steep slopes. Stocking rates should be managed to maintain a protective pasture cover on the surface. Steep, rocky upper slopes may restrict vehicular access and mustering.

Mixed Sediments

Land Resource Area 14 - Narran

General Description

Rolling low hills on mixed sediments of quartzose sandstone, lithic sandstone, labile sandstone and siltstone predominantly in the south and east. Rock shelf exposed on upper slopes and crests. Variable soils and vegetation including silver-leaved ironbark, narrow-leaved ironbark, poplar box woodland, cypress pine, spotted gum forest and brigalow forest on shallow solodics, lithosols and shallow grey and brown clays.

Landform

Rolling low hills. Slopes 5-30%, locally 45%. Relief to 80 m, occasionally to 120 m.

Geology

Mixed Jurassic sediments including quartzose sandstone, lithic sandstone, labile sandstone and siltstone.

Distribution

Predominantly in the south and east.

Drainage

Well drained.

Soils

Range of soils depending on lithology. Predominantly shallow solodics and earthy sands on quartzose sandstone. Lithosols on lithic sandstone. Small areas of shallow, stony grey clays and brown clays on labile sandstone and siltstone. One occurrence of euchrozem on ferruginised siltstone. Overall, soils have low fertility and low PAWC. Solodics and clays may have saline, sodic subsoils.

Vegetation

Silver-leaved ironbark, narrow-leaved ironbark, poplar box, bulloak woodland on the shallow solodics. Cypress pine, spotted gum, rusty gum forest dominant on the lithosols and earthy sands. Brigalow forest dominant on the shallow clays.

Agricultural Land Suitability

Pastoral Land. Class C2/C1. Predominantly suitable for grazing of native pastures, but significant areas of shallow grey clay and brown clay suited to pasture improvement. Ground cover should be maintained to prevent surface sheet and gully erosion.

Constraints to Agricultural Development

Erosion of the sandy surface solodics on moderate to steep slopes is a constraint, along with low fertility and low PAWC.

Quartzose Sandstone

Land Resource Area 15 - Glenhaughton

General Description

Glenhaughton LRA consists of rolling low hills on quartzose sandstone, predominantly in the west, north and north-east. Rock shelf is exposed on upper slopes and crests. The dominant soils are shallow solodics, solodized-solonetz, soloths and earthy sands supporting silver-leaved ironbark, narrow-leaved ironbark, poplar box, cypress pine and bulloak woodlands and open forests. Glenhaughton LRA lacks significant areas of brigalow forest growing on shallow clays found in Narran LRA. The lands are used for grazing of native pasture and forestry.

Landform

Rolling low hills. Slopes 5-30%. Relief to 50 m, occasionally to 100 m.

Geology

Jurassic quartzose sandstone and lithic sandstone.

Distribution

Predominantly in the west, north-west, north and north-east.

Drainage

Well drained.

Soils

Predominantly shallow texture contrasts soils on sandstone, including solodics, solodized-solonetz, soloths and pale earthy sands. Areas of shallow gravelly yellow earth. Low fertility and PAWC and sodic subsoils.

Vegetation

Woodland and open forest communities of silver-leaved ironbark, narrow-leaved ironbark, poplar box and bulloak on texture contrast soils. Cypress pine, spotted gum, rusty gum forest on earthy sands. Rough-barked apple on drainage floor.

Agricultural Land Suitability

Pastoral Land. Class C2. Suitable for grazing of native pastures. Ground cover should be maintained to prevent surface sheet and gully erosion.

Constraints to Agricultural Development

Erodibility of sandy surface soils on moderate to steep slopes. Low soil fertility and low PAWC limit pasture productivity.

HILLS

Land Resource Area 16 - Nathan

General Description

Nathan LRA contains the rugged terrain comprised of the steep hills and dissected tablelands in the west, north and east. The soils are shallow lithosols, texture contrast soils and earthy sands supporting eucalypt and cypress pine forests. Much of the land is reserved as State Forest and National Park, while the remainder is used for grazing of native pastures.

Landform

Steep hills and dissected tablelands with precipitous scarps and deeply incised valleys. Slopes commonly >40%. Relief 100-300 m. Rock outcrop.

Geology

Predominantly resistant Triassic and Jurassic quartzose sandstone and lithic sandstone. Small inclusions of Tertiary basalt in the north and Carboniferous acidic tuff, agglomerate and adamellite in the east.

Distribution

Large areas in the west, north-west, north and east.

Drainage

Excessively well drained.

Soils

Shallow lithosols, solodics, soloths and earthy sands. Low fertility and low PAWC.

Vegetation

Narrow-leaved ironbark, spotted gum open forests, cypress pine forests and silver-leaved ironbark woodlands.

Agricultural Land Suitability

Pastoral Land. Class C3. Limited suitability for grazing of native pastures.

Constraints to Agricultural Development

Erodible sandy surface soils on steep slopes. Stocking rates should be managed to maintain a protective cover of native pasture. Low fertility and PAWC limit pasture productivity. Steep hills and precipitous scarps severely limit access and mustering.

APPENDIX II

BRIEF DESCRIPTION OF THE DOMINANT SOIL GROUPS

Alluvial Soils

Black earths	Deep uniform clay soils. Very dark greyish brown to black self-mulching and cracking light to medium clay surface overlying black to very dark grey medium to light clay. Alkaline soil reaction trend.
Dark loams	Deep gradational soils. Very dark greyish brown hard setting clay loam surface overlying very dark greyish brown to dark brown light clay. Neutral soil reaction trend.
Solodized-solonetz	Moderately deep texture contrast soils. Dark brown hard setting sandy loam surface, with a pale subsurface, abruptly overlying dense greyish brown sandy clay to medium clay. Alkaline soil reaction trend.

Soils on Basalt

Red clays	Shallow to moderately deep uniform soils. Dark brown self-mulching light clay overlying dark reddish brown medium clay with stone and gravel. Neutral soil reaction trend.

Soils on Labile Sandstone and Siltstone

Grey clays	Moderately deep uniform soils. Very dark grey self-mulching and cracking light clay surface overlying dark grey to grey medium to heavy clay. Alkaline soil reaction trend. Non-cracking types also occur.
Brown clays	Moderately deep uniform soils. Very dark greyish brown self-mulching and cracking light clay surface overlying dark greyish brown to brown medium to heavy clay. Alkaline soil reaction trend. Non-cracking types also occur.

Soils on Quartzose and Lithic Sandstone

Lithosols	Very shallow to shallow soils with stone and rock outcrop. Very dark greyish brown loamy sand to sandy loam grading to greyish brown to dark brown gritty sandy loam to clay loam over weathering rock. Acid soil reaction trend.
Solodics	Shallow to moderately deep texture contrast soils. Very dark greyish brown loamy sand to sandy loam, with a pale subsurface, abruptly overlying a brown to yellowish brown light to medium clay. Alkaline soil reaction trend.

Soloths — Moderately deep to deep texture contrast soils. Very dark grey hard setting sandy loam surface with pale subsurface abruptly overlying a dark greyish brown light to medium clay. Acid soil reaction trend.

Earthy sands — Shallow to moderately deep uniform soils. Thin, very dark greyish brown loamy sand surface, with a thick very pale clayey sand subsurface, over greyish brown clayey sand subsoil. Acid soil reaction trend.

Soils on Lateritised Sandstone and Basalt

Red earths — Moderately deep gradational soils. Dark brown hard setting sandy loam grading through dark reddish brown sandy clay loam to dark red clay loam to light clay. Acid soil reaction trend.

Yellow earths — Shallow to moderately deep gradational soils. Very dark greyish brown hard setting loamy sand to sandy loam grading through brown sandy clay loam to dark yellowish brown clay loam. Acid soil reaction trend.

Soils on Ferruginised Siltstone

Euchrozems — Shallow gradational soils. Dark brown hard setting clay loam surface grading to dark reddish brown gritty light-medium clay subsoil. Neutral soil reaction trend.

APPENDIX III

COMPARISON OF LAND RESOURCE AREAS AND LAND SYSTEMS

Land Resource Areas Current Study	Land Systems		
	Dawson-Fitzroy Area (Perry, 1968)	Isaac-Comet Area (Story et. al., 1967)	Miles Area (Dawson, 1972)
1. Coolibah	Coolibah Dakenba		
2. Hornet	Coolibah, Kroombit		
3. Juandah	Juandah Woleebee		
4. Palmtree	Palmtree		
5. Montana	Montana Woleebee,Juandah	Rewan Connors	
6. Westwood	Westwood		
7. Tara			Tara Hopelands
8. Wandoan	Wandoan Eurombah, Kiddell, Hinchley, Thomby, Mimosa	Bedourie	Ulimaroa, Dulacca
9. Narowie	Narowie		
10. Hookswood			Hookswood Wieambilla
11. Duaringa	Duaringa		Ferret
12. Grevillea	Grevillea		
13. Mundell	Mundell Eurombah, Malakoff, Womblebank, Orana, Redrange, Oakleigh	Bedourie	
14. Narran	Narran Yebna, Oakleigh, Conloi, Redrange		Wallan
15. Glenhaughton	Glenhaughton Yebna, Surprise	Rewan	
16. Nathan	Nathan, Carborough, Doonkuna, Grevillea	Carborough, Planet	