

7. Environmental constraints and growth management

This Section examines the key biophysical elements that define the most appropriate locations for new urban and rural growth in Upper Lachlan.

7.1 Flora and fauna

7.1.1 Introduction

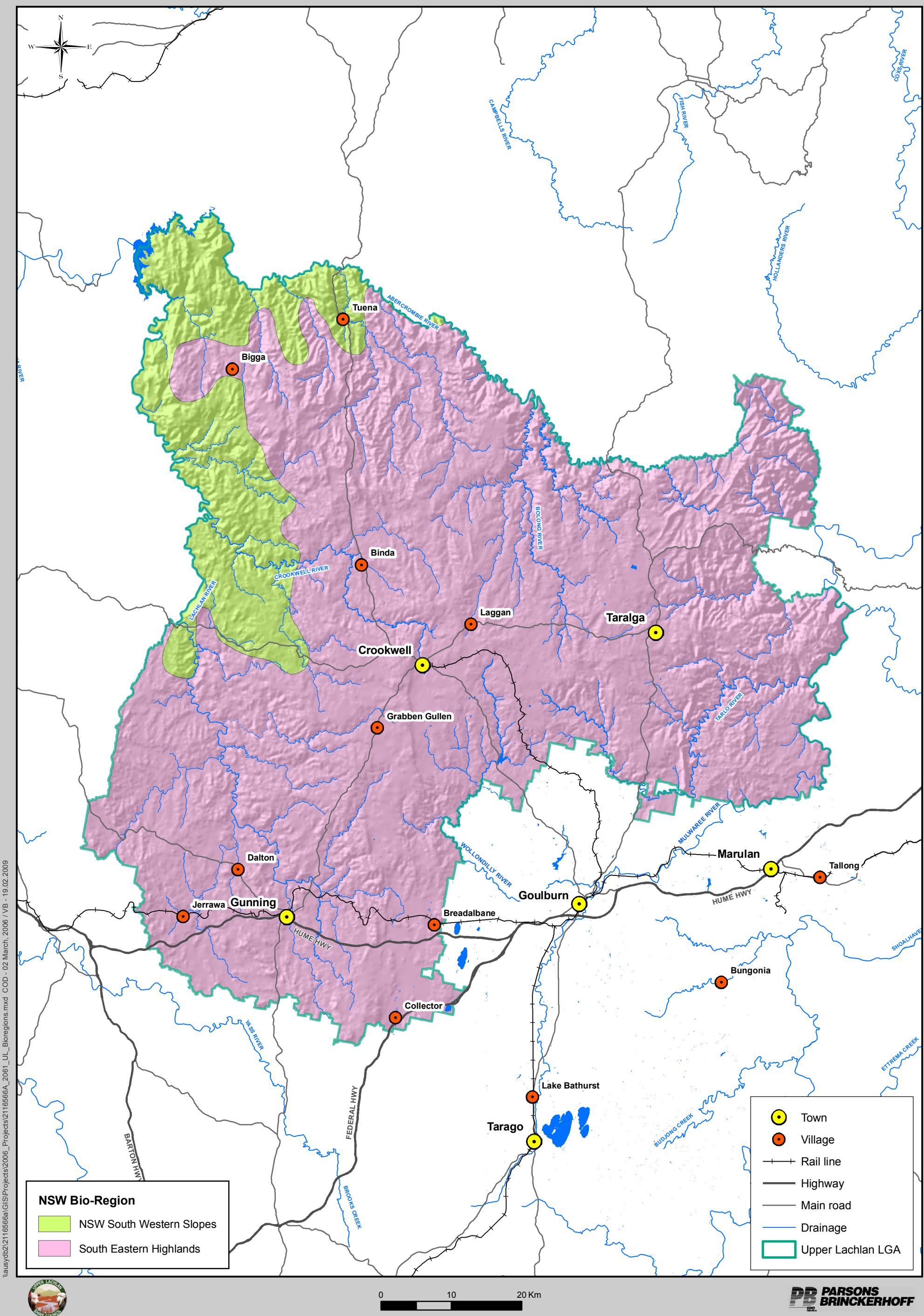
This section reviews flora and fauna issues and presents a broad-scale summary of ecological features. Further details are contained in the Upper Lachlan Shire Biodiversity Planning Framework Report which is attached as *Appendix D*.

7.1.2 Administrative areas

The Upper Lachlan local government area is located in several environmental administrative areas. Administrative areas that relate to jurisdictional areas in the care of environmental organisations that protect and manage biodiversity values. These include:

- South Eastern Highland Bioregion
- NSW Western Slopes Bioregion
- Central Tablelands Botanical Subdivision
- Southern Tablelands Botanical Subdivisions
- Central Coast Botanical Subdivision
- Central Western Slopes Subdivision
- Murrumbidgee CMA
- Lachlan CMA
- Hawkesbury Nepean CMA.

Figure 7-1 identifies the two bioregions that apply to Upper Lachlan.



7.1.3 Vegetation communities

The Comprehensive Regional Assessment of Forests in New South Wales (Thomas et al. 2000) identified fifty-three forest ecosystems occurring within the Upper Lachlan local government area. (refer Appendix D, Table A-1-2).

The distribution of native vegetation remaining within the Upper Lachlan local government area closely matches the less accessible land associated with the ranges to the north and the east. Figure 7-2 illustrates the native vegetation remaining within the local government area. The broad flat to gently undulating valley floors throughout the central and southern portions of the local government area possess arable soils derived from alluvium and colluvium. These areas have been extensively cleared of native vegetation in association with agricultural and grazing activities over a long period and are also predominantly privately owned.

7.1.4 Threatened ecological communities

Endangered Ecological Communities are listed under the *Threatened Species Conservation Act 1995* and the *Environment Protection and Biodiversity Conservation Act 1999*. Within Upper Lachlan local government area, three Endangered Ecological Communities may occur, they include:

- White Box Yellow Box Blakely's Red Gum Woodland
- Natural Temperate Grassland of the Southern Tablelands (NSW and ACT)
- Montane Peatlands and Swamps of the New England Tableland, NSW North Coast, Sydney Basin, South East Corner, South Eastern Highlands and Australian Alps

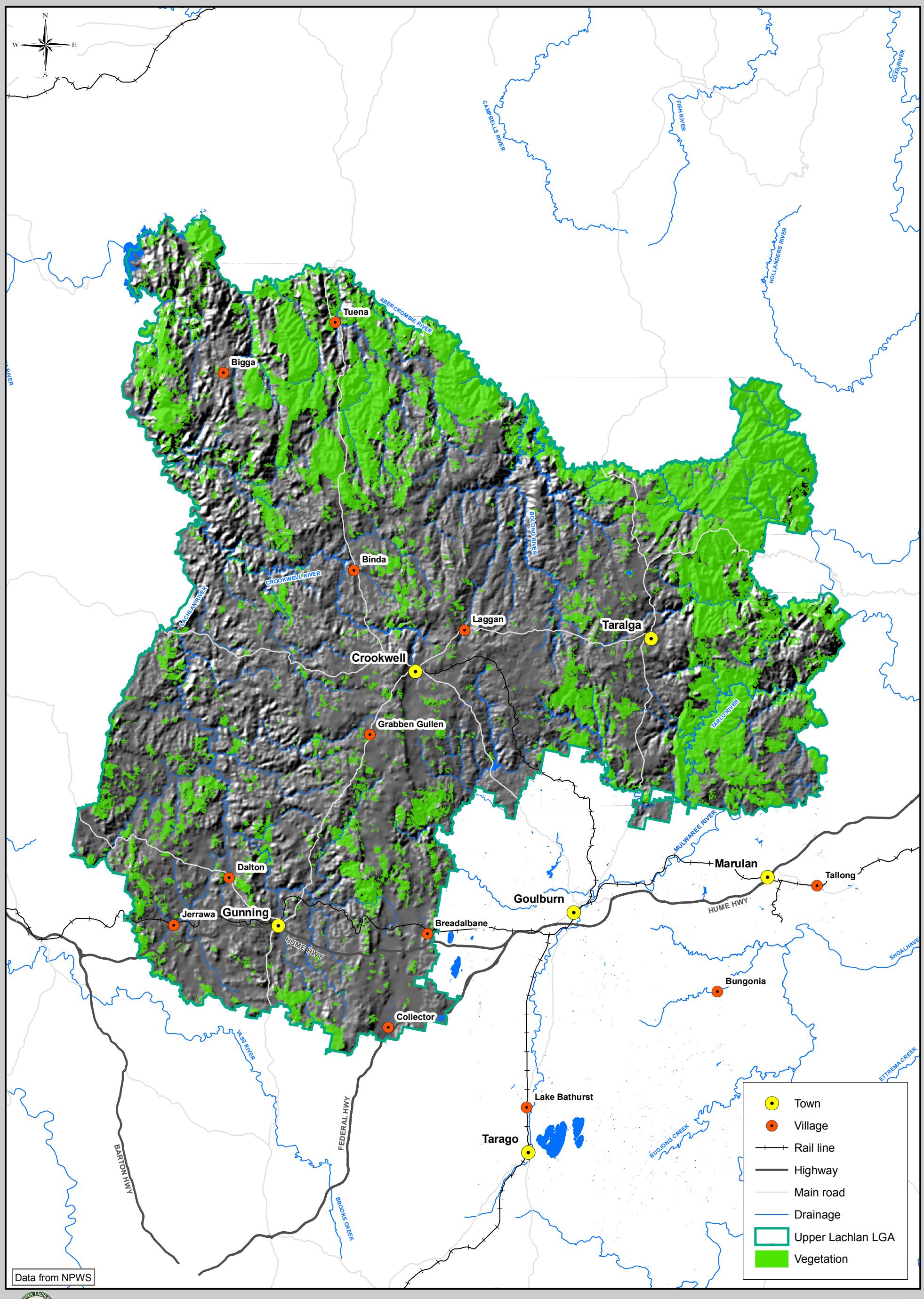
Appendix D (Section 1.2.3) provides further details on these three threatened plant species including details on communities where the species can be found, characteristics and threats to the communities.

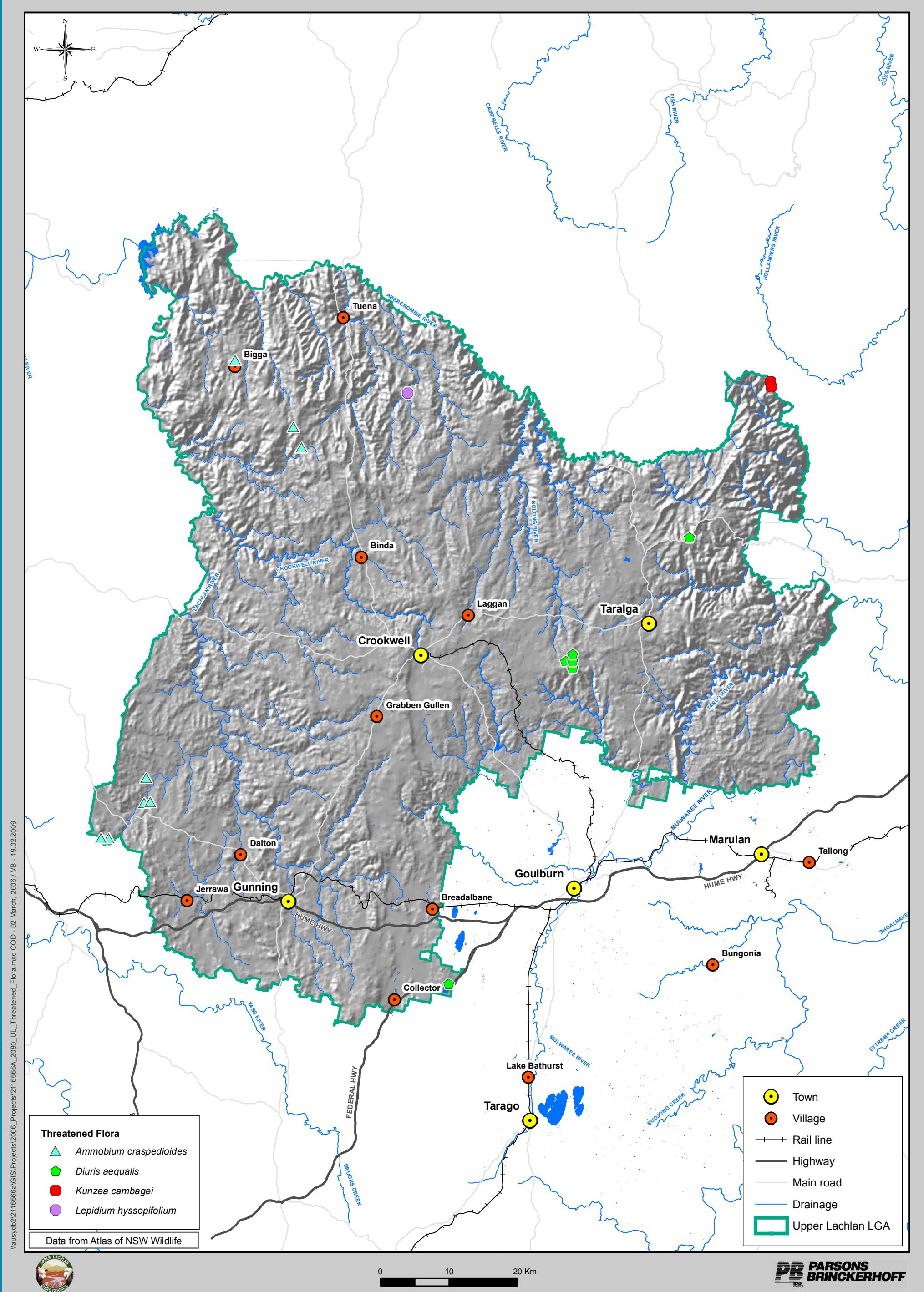
7.1.5 Endangered populations

Endangered populations are listed under Schedule 1 Part 2 of the *Threatened Species Conservation Act 1995*. To date, no populations are listed as Endangered under the *Threatened Species Conservation Act 1995*.

7.1.6 Threatened plant species

A total of 13 threatened plant species have been recorded within the Upper Lachlan local government area. Details of threatened species previously recorded in the Upper Lachlan local government area are listed in *Appendix D* (Table 1-3). It should be noted however that while records of Threatened species confirm their presence, the absence of a species should not be assumed based on the lack of records, which may instead reflect a paucity of survey in the area. Figure 7-3 illustrates the location of threatened floral species in the local government area.





7.1.7 Noxious weeds

Noxious weeds are listed under the *Noxious Weeds Act 1993*, and it falls to Councils to direct and control their spread. Pursuant to Sections 7 and 8 of the *Noxious Weeds Act 1993*, the Minister for Primary Industries, by Order on 23 December 2005, declared 97 plants as noxious weeds within the control area of Upper Lachlan. Species of plant listed as a Noxious Weeds are listed in Appendix D (Table 1-4).

Weeds are a significant environmental and economic burden within the region and require ongoing management and control to ensure adverse affects are appropriately managed and mitigated against. Most areas within NSW have now been invaded by a diversity of weed species which affect the environment, productivity of agricultural areas and rural aesthetics.

Any control strategy for weeds is dependant on land-use objectives and land management. In undisturbed areas, weed management generally relates to reducing adverse impacts and aesthetic and recreational value of lands. In agricultural areas across the Upper Lachlan , priority should be given to controlling species which have the potential to infiltrate produce and result in adverse economic impact.

Weeds of National significance

In a response to the need for improved management of weeds and in recognition of the significant advantages to be gained from improving coordination, all levels of government have endorsed a *National Weeds Strategy: A Strategic Approach to Weed Problems of National Significance* in June 1997. A second edition of the Strategy was published in March 1999.

Weeds of National significance are those weeds which have been identified as causing environmental damage.

The National Weeds Strategy provides the framework to reduce the impact of weeds on the sustainability of Australia's productive capacity and natural ecosystems, through the establishment of a number of goals, objectives for action and outcomes.

The second goal of the National Weeds Strategy is *to reduce the impact of existing weed problems of national significance*. The first objective under this goal is to develop a process for determining and ranking weed problems of national significance.

Determining weeds of national significance is the first attempt to manage weeds at the national level. This approach draws together indicators on which to base future weed decision-making. It also provides a framework for prioritising weeds at the State, regional and local levels.

There are 16 weeds of national significance and three weeds with potential distribution into NSW located within Upper Lachlan. These include:

- alligator weed
- athel pine
- Bitou bush/boneseed
- Blackberry
- Bridal creeper
- Cabomba
- Chilean needle grass
- Gorse
- Hymenachne (potential distribution)
- Parthenium weed

- lantana
- mesquite
- Parkinsonia (potential distribution)
- Pond apple
- prickly acacia
- rubber vine (potential distribution)
- salvinia
- serrated tussock
- willows (except weeping willows, pussy willow and sterile pussy willow)

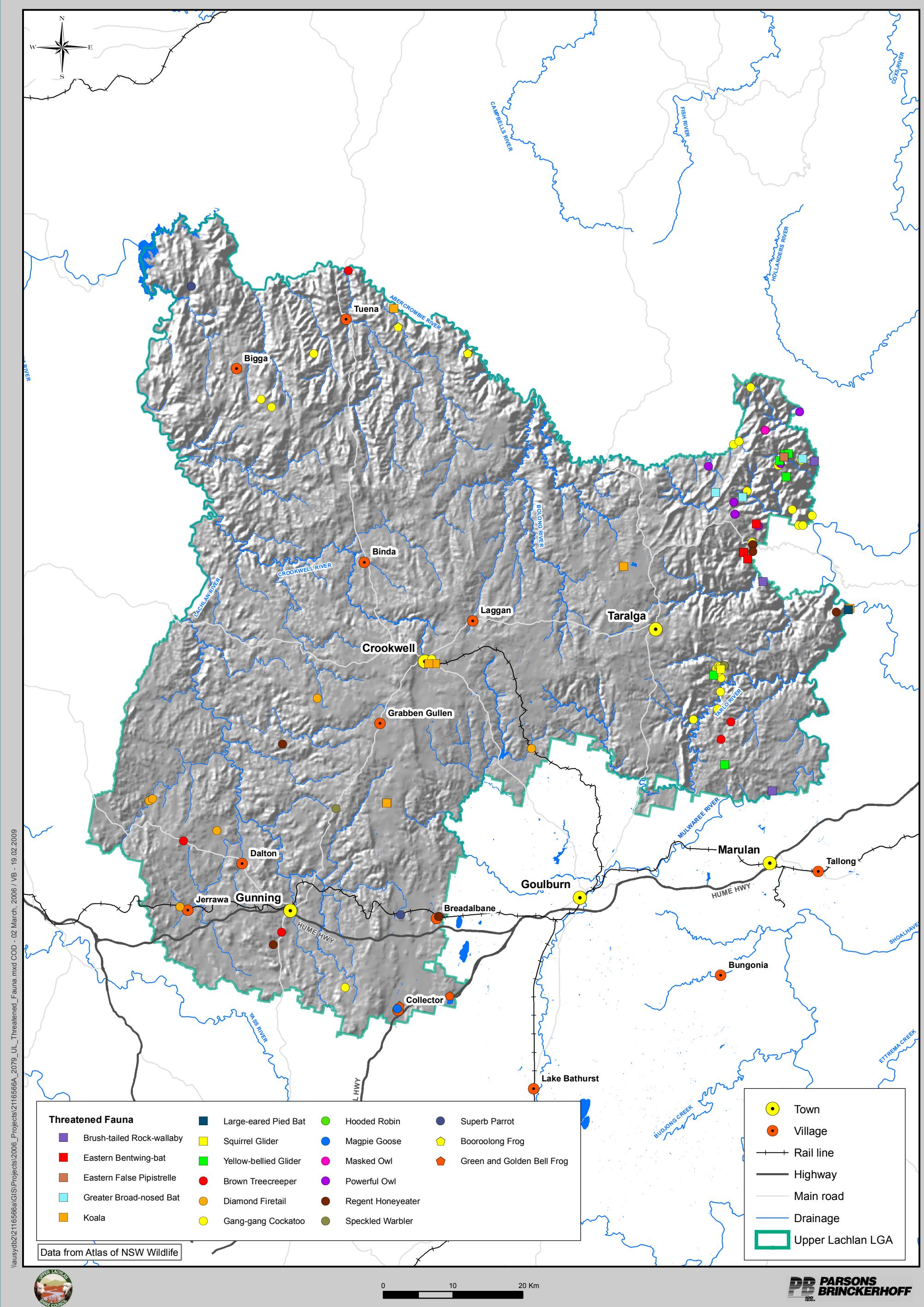
Source: Thorp & Lynch 2000

Of the noxious weeds identified under the Noxious weeds Act 1993, eight of these species are listed as Weeds of National Significance (Thorp & Lynch 2000), these include:

- Blackberry
- Cabomba
- Gorse
- Parthenium weed
- Salvinia
- Serrated tussock
- Willows
- Chilean Needle Grass.

7.1.8 Threatened species of animals

A total of 23 threatened species of animal has been recorded or have predicted habitat within the Upper Lachlan local government area including three species of amphibians, twelve species of bird and eight species of mammal. These threatened species are detailed in Appendix D (Table 1-5). Figure 7-4 illustrates the location of threatened animal species within the Upper Lachlan local government area. As with the plants, it should be noted that while records of Threatened species confirm their presence, the absence of the species should not be assumed based on the lack of records, which may instead reflect a paucity of survey in the area.



7.1.9 Migratory species

Migratory species are protected under international agreements to which Australia is a signatory including the Japan Australia Migratory Bird Agreement (JAMBA), the China Australia Migratory Bird Agreement (CAMBA) and the Bonn Convention on the Conservation of Migratory Species of Wild Animals. Migratory species are considered Matters of National Environmental Significance and are protected under the *Environment Protection and Biodiversity Conservation Act 1999*.

Only two migratory birds have been recorded within the Upper Lachlan local government area. However, more species or species habitat is predicted to occur within the area, these are listed in Appendix D (Table 1-5).

7.1.10 Aquatic habitats

Four major river systems are situated (partially) within Upper Lachlan and are illustrated in Appendix D (Figure 1-5). These are the:

- Lachlan River which defines the western boundary of the local government area and flows into the Murray-Darling Basin.
- Abercrombie River which defines the northern boundary of the local government area and converges with the Lachlan River at Lake Wyangala.
- Crookwell River which is a major tributary to the Lachlan River. These rivers converge on the western perimeter of the local government area.
- Wollondilly River which flows in a northerly direction into the Hawkesbury Nepean Catchment.

These rivers provide permanent water and a range of habitats for riparian vegetation communities and associated aquatic and terrestrial fauna. Major river and creek systems within Upper Lachlan have been illustrated at Figure 7-5.



Tributaries, ephemeral drains and farm dams

The tributaries of the major river systems provide a network of drainage line that provides specific habitat requirements for various vegetation communities and fauna. On the valley slopes ephemeral drainage lines catch runoff from storm events and retain water for a short time only. Many of these tributaries have been altered through the construction of farm dams to provide water for agricultural activities including grazing. Farm dams also provide a water source for native species including amphibians, water birds and mammals.

Drainage lines formed in the alluvium of the valley floors provide a more permanent water source by retaining water in series of pools and riffles. These drainage lines are sourced by runoff from the ephemeral drainage lines on the valley slopes and subterranean flow through the floodplain.

Wetlands

No Nationally significant wetlands are listed within the Upper Lachlan local government area.

Lakes and control dams

Two lakes have formed over time within Upper Lachlan including the Burra Burra Lake located north of Taralga and Lake Wyangala. Although the Burra Burra Lake is currently dry, these lakes provide deep water habitats for fish and water birds.

Control dams included within Upper Lachlan include:

- Crookwell Dam in the Crookwell River
- Pejar Dam in the Upper Wollondilly River

7.1.11 Threatened fish species

Four threatened species of fish listed under the *Fisheries Management Act 1994* have been recorded within the Upper Lachlan Local Government Area. Appendix D (Table 1-6) lists these.

7.1.12 Corridors and connectivity

Vegetation and non-developed sites within the study area largely form part of a broad-scale corridor network covering much of the local government area. The native vegetation within the Blue Mountains and Tarlo River National Parks in the eastern portion of the LGA forms part of an extensive habitat corridor between the Blue Mountains and Kanangra Boyd National Parks to the north and Morton National Park within the Shoalhaven local government area to the south.

Native vegetation along the northern boundary of the local government area is linked to the Abercrombie National Park to the north thereby into the Blue Mountains and Kanangra Boyd National Parks.

Fauna habitat corridors are generally associated with the areas of continuous native vegetation as habitat features in the cleared agricultural and grazing areas are generally limited. However, remnant trees scattered throughout these areas can be important in agricultural landscapes to maintain connectivity between larger patches of vegetation thus contributing to the viability of local fauna populations (Gibbons & Boak 2000).

7.1.13 Conservation significance

Assessment of the conservation significance of native plants and animals is according to the hierarchy:

- National
- State
- regional
- local.

Details of the how the following criteria were used to assign the site to an appropriate conservation significance category are provided at *Appendix D* (Section 1.2.12).

7.1.14 Conservation reserves

Upper Lachlan local government area wholly contains two National Parks and Nature Reserves and partly contains three National Parks and Nature Reserves which are illustrated in Figure 7-6. These comprise a total of 32,457 hectares (4.57 % of the total local government area) and include the following five areas.

National Parks and Nature Reserves wholly within Upper Lachlan

- Razorback Nature Reserve
- Tarlo River National Park.

National Parks and Nature Reserves partly within Upper Lachlan

- Abercrombie River National Park
- Blue Mountains National Park
- Mundoonen Nature Reserve
- Wombeyan Caves Conservation Area.

State Forests within Upper Lachlan

Keverstone State Forest is located south east of Bigga and is the only state forest which occurs within Upper Lachlan (refer Figure 7-6)

Grabine Lakeside State Park comprises an 800 hectare State park on the north east shores of Lake Wyangala. This Park is a popular natural holiday destination and provides a variety of recreational activities including water skiing, boating, fishing and numerous bushwalking paths

Wombeyan Karst Conservation Reserve covers an area of 417 hectares and is located mostly within the Upper Lachlan LGA.

The Reserve encompasses the spectacular terrain of the Wombeyan Caves area and contains a range of geomorphological features and vegetation communities. Blue Mountains National Park adjoins the Reserve to the north.

Since its declaration in 1865 the Wombeyan Caves have been administered by various Government agencies including the Mines Department, Department of Intelligence, Department of Sport, Recreation and Tourism and the Tourism Commission of New South

Wales. However, it is currently administered by the Department of Environment and Climate Change.

Mundoonen Nature Reserve (Part)

Mundoonen Nature Reserve is located approximately 70 km north of Canberra. Mundoonen Nature Reserve is one of several conservation areas that protect Southern Tableland dry sclerophyll forest, with associated animal and plant communities. The primary vegetation type within the reserve is dominated by scribbly gum *Eucalyptus rossii* and red stringybark *E. macrorhyncha*. The landscape surrounding the reserve is largely cleared with some remnants of Yellow Box, Blakelys Red Gum (*E. melliodora* - *E. blakelyi*) woodland. A small pocket of this woodland occurs in the reserve (NSW National Parks and Wildlife Service 2005).

Tarlo River National Park

Tarlo River National Park is located about 30 kilometres north-east of Goulburn. Most of the Park consists of steep forested country along the Cookbundoon Range and rugged land east of the range. The Tarlo River meanders south to north through the Park, creating a 40 km long gorge. Several uncommon plant communities and threatened plant and animal species occur in the park and it has a type of land system which does not occur elsewhere in the Goulburn district (NSW National Parks and Wildlife Service 1998).

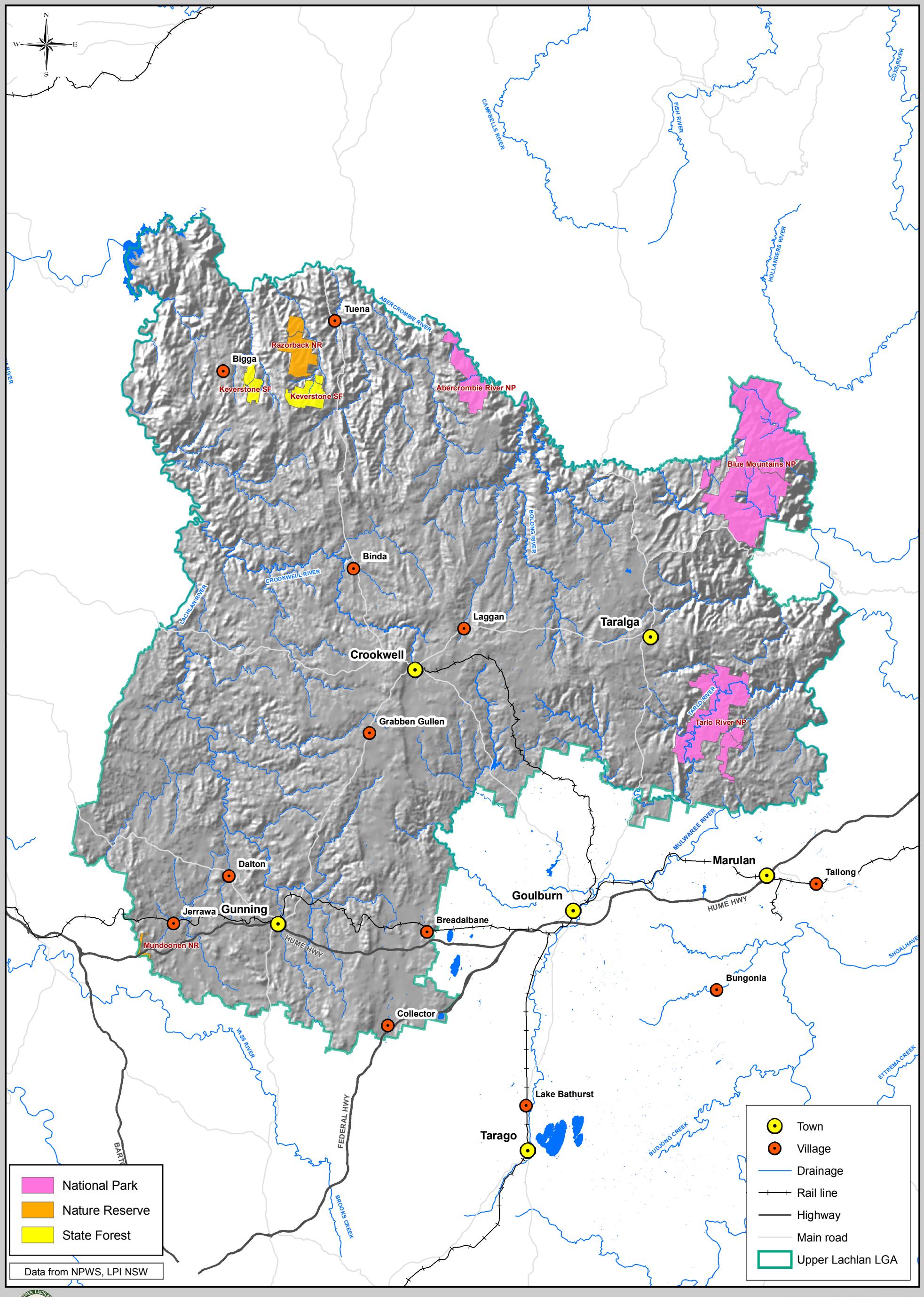
Blue Mountains National Park covers over 247,000 hectares of the Blue Mountains plateau, between the coastal lowlands of the Cumberland Plain and the Great Dividing Range (NSW National Parks and Wildlife Service 2001a). The Park has been listed as a World Heritage Area under the International Convention for the Protection of the World Cultural and Natural Heritage and as such is provided with protection under the *Environment Protection and Biodiversity Conservation Act 1999*. Criteria for listing includes:

- outstanding examples of significant ongoing ecological and biological processes in the evolution and development of ecosystems and communities of plants and animals (criterion II), particularly eucalypt-dominated ecosystems
- important and significant natural habitats for in-situ conservation of biological diversity (criterion IV), including the eucalypts and eucalypt-dominated communities, primitive species with Gondwanan affinities such as the Wollemi Pine, and a diversity of rare or threatened plants and animals of conservation significance.

Abercrombie River National Park

Abercrombie River National Park is approximately 19,000 hectares and is located 60 kilometres north of Goulburn. The majority of the Park is located north of the Abercrombie River within the Oberon LGA, but one section is located south of the river in the Upper Lachlan LGA. Abercrombie River National Park protects a large area of remnant bushland within the south-western Central Tablelands of New South Wales, containing a diversity of vegetation communities characteristic of montane and tableland species as well as of the western slopes of New South Wales (NSW National Parks and Wildlife Service 2003d).

Figure 7.6 National Parks, Nature Reserves & State Forests



Razorback Nature Reserve

Razorback Nature Reserve is located within the catchment of the Abercrombie River. Together with the Abercrombie River National Park, Copperhannia Nature Reserve and the Mt Werong area of the Blue Mountains National Park which covers the headwaters of the Abercrombie River, assist in conserving the natural features of the area and protecting the water quality of the Abercrombie River (NSW National Parks and Wildlife Service 2003a).

Keverstone State Forest

Keverstone State forest comprises a high conservation value as well as a high mineral potential and is therefore recommended to be conserved.

7.1.15 Threats to biodiversity

Biodiversity can be threatened by a number of anthropogenic disturbances. Key threatening processes are listed under Schedule 3 of the *Threatened Species Conservation Act 1995* and also under the Environment Protection and Biodiversity Conservation Act 1999.

The *Threatened Species Conservation Act 1995* currently lists 27 Key Threatening Processes many of which will currently be acting within the local government area and are identified in Appendix D (Table 1-7). Of particular note is clearing of native vegetation.

7.1.16 Future directions and management approaches

As part of the overall future management of the Upper Lachlan local government area, the following aims should be included:

- Protection of native vegetation
- A net gain in the extent (and/or quality) of native vegetation
- Protection of regionally significant communities and fauna habitats within a suitable reserve system
- A comprehensive network of wildlife corridors that has been identified and protected
- Protection of riparian vegetation and waterways.

This may be achieved through the implementation of a biodiversity strategy which the BPF forms part of.

7.1.17 Specific areas

Within Upper Lachlan local government area, several towns have been identified as likely areas for increased growth in the short to mid term. The following sections provide a brief outline of the suitability of these towns for urban or industrial expansion and likely environmental constraints.

7.1.18 Gunning

Detailed below are the likely environmental constraints affecting the suitability for growth in Gunning.

Reserves and conservation areas

No reserves or conservation areas are situated close to the township of Gunning that would restrict future development.

Rivers and wetlands

Gunning is situated on the western side of Meadow Creek, a tributary of the Lachlan River. The township is approximately four kilometres to the west of the Lachlan River and approximately four kilometres southwest of the confluence of the Lachlan River with Fish River. These watercourses are not a restricting factor to the potential development of the township.

No international or nationally significant wetlands are situated within close proximity to the township of Gunning that would restrict future development.

Vegetation communities

The land surrounding the existing Gunning township is dominated by gently undulating landforms and arable land that have been predominantly cleared of native vegetation for over five kilometres within all directions of the existing town centre, (refer Figure 7-7). One small remnant of native vegetation (forest ecosystems S114 – Tablelands Dry Shrub/Tussock Grass Forest) is situated to the north of the existing town centre (Thomas et al. 2000).

Endangered ecological communities

Two Endangered Ecological Communities were identified as having potential habitat within a ten kilometre radius of Gunning (Department of the Environment and Heritage 2006). These were Grassy White Box Woodlands and Natural Temperate Grasslands of the Southern Tablelands of NSW and the Australian Capital Territory.

These ecological communities have potential to prevent development of the areas where they occur, however they are unlikely to limit the general development and expansion of the township.

Threatened floral species

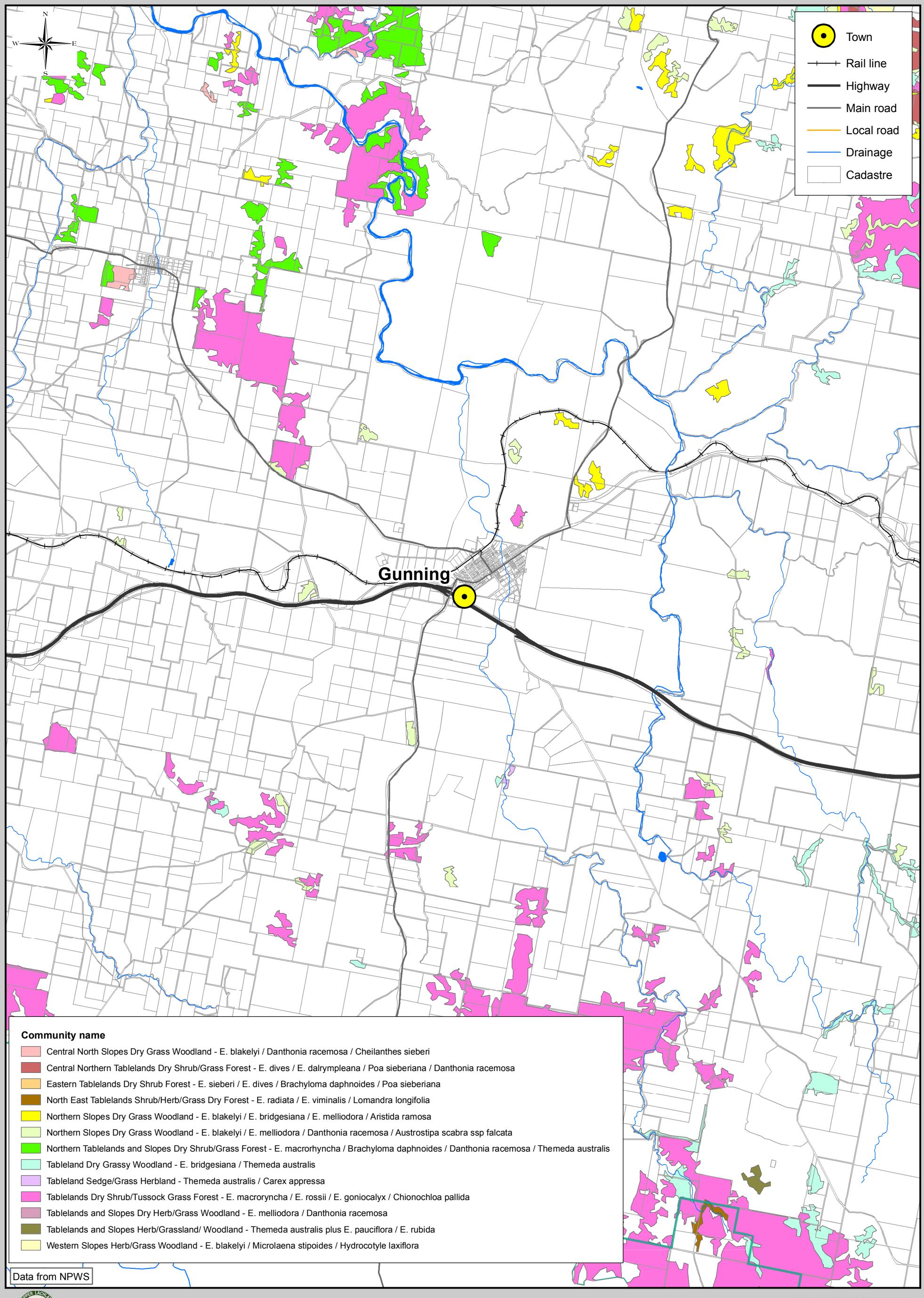
No threatened floral species have previously been identified within a ten kilometre radius of Gunning (Department of the Environment and Heritage 2006). Increased growth around Gunning would be required to consider potential impacts to these species. However, they are unlikely to limit the general expansion of the township.

Threatened and migratory faunal species

An Environmental Impact Statement prepared for the Gunning wind farm (Connell Wagner 2004) identified five Threatened species likely to occur within the vicinity of the wind farm. This included four species of bird and one species of mammal (refer to *Appendix D*).

Habitat for a further nine Threatened species and four Migratory species listed under the *Environmental Protection and Biodiversity Conservation Act 1999* was predicted to occur within a ten kilometre radius of Gunning (refer to *Appendix D*).

Increased growth around Gunning would be required to consider potential impacts to these species. However, they are unlikely to limit the general expansion of the township.



7.1.19 Crookwell

Detailed below are the likely environmental constraints affecting the suitability for growth in Crookwell.

Reserves and conservation areas

No reserves or conservation areas are situated near Crookwell that would restrict future development.

Rivers and wetlands

Crookwell is situated at the confluence of the Crookwell River and Kiamma Creek, within the Lachlan River catchment. These watercourses are generally not restricting factors to general development of the township and flood impacts would need to be considered as part of individual site developments.

Vegetation communities

The land surrounding the Crookwell is dominated by gently undulating landforms and arable land that have been predominantly cleared of native vegetation in all directions of the existing town centre. (refer Figure 7-8) The remaining native vegetation mapped within the vicinity of the township (approximately ten kilometres) consists of a fragmented mosaic of remnants.

Endangered ecological communities

Two Endangered Ecological Communities were identified as having potential habitat within a ten kilometre radius of Crookwell (Department of the Environment and Heritage 2006). These were Grassy White Box Woodlands and Natural Temperate Woodlands of the Southern Tablelands of NSW and the Australian Capital Territory.

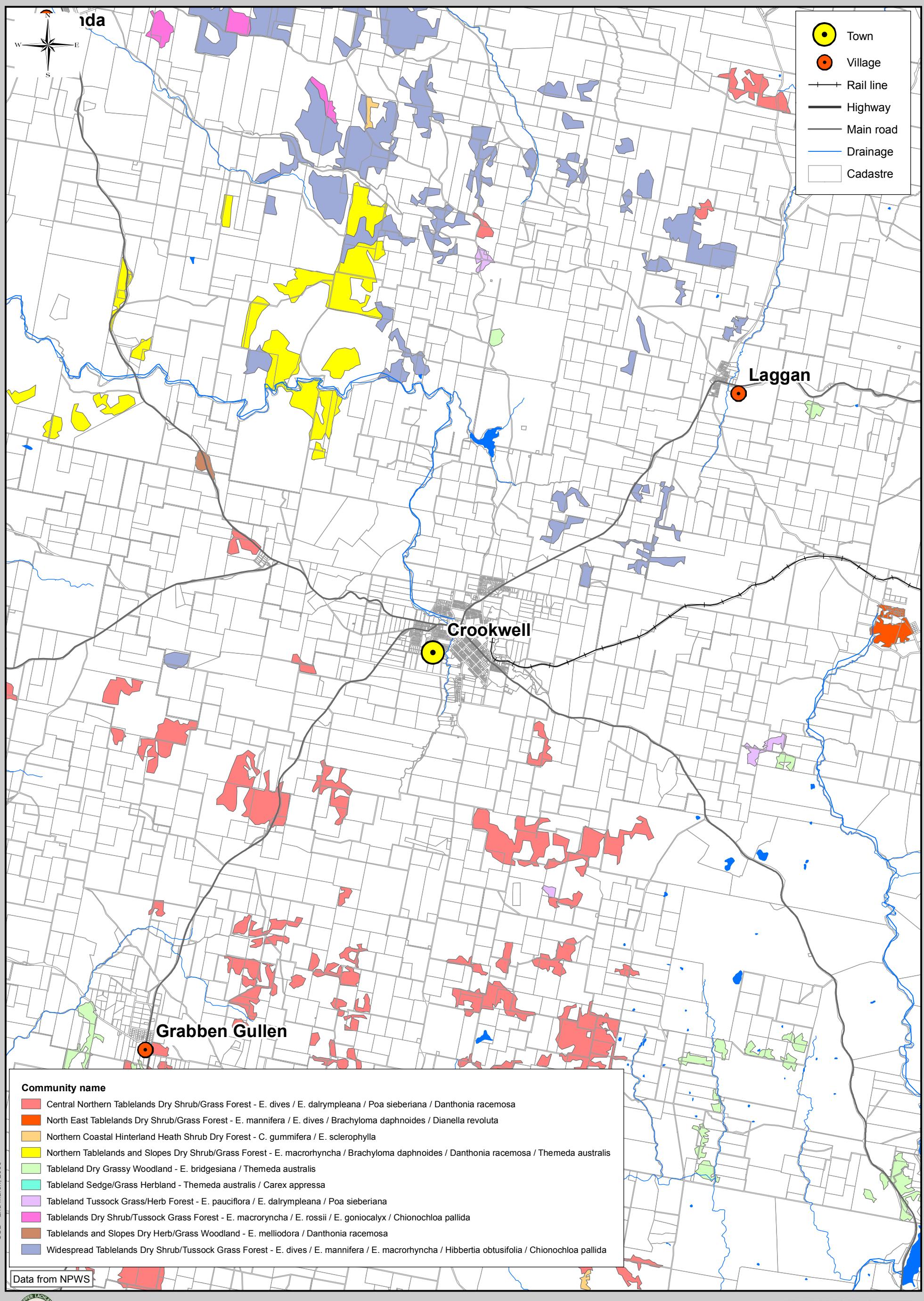
A remnant of native vegetation, mapped as Tablelands and Slopes Dry Herb / Grass Woodland, occurs five kilometres to the west of the existing township and corresponds with Grassy White Box Woodlands.

These ecological communities have potential to prevent develop of the areas where they occur, however they are unlikely to limit the general development and expansion of the township.

Threatened floral species

Diuris aequalis (a terrestrial orchid) was the only record of a Threatened floral species identified that was previously recorded within the locality of the township or the proposed wind farm to the south of the township (Department of Environment and Conservation 2006; URS 2004). Diuris aequalis is listed as Endangered under the *Threatened Species Conservation Act 1995* and Vulnerable under the *Environmental Protection and Biodiversity Conservation Act 1999* and occur in a range of grassy habitats including forest, low open woodland with grassy understorey and secondary grassland (Department of Environment and Conservation 2005b).

Thesium australe (Austral Toadflax) and Amphibromus fluitans (Floating Swamp Wallaby-grass), which are both listed as Vulnerable under both the *Threatened Species Conservation Act 1995* and the *Environmental Protection and Biodiversity Conservation Act 1999*, were predicted to have potential habitat within the locality of the Crookwell township (Department of the Environment and Heritage 2006).



Increased growth around Crookwell would be required to consider potential impacts to these species. However, they are unlikely to limit the general expansion of the township.

Threatened migratory faunal species

A literature review undertaken for the Crookwell II wind farm proposal (URS 2004) identified seven Threatened species listed under the *Threatened Species Conservation Act 1995* that were considered to have potential to occur near the proposed wind farm. This included five bird species, one reptile species and one fish species (refer Appendix D Table 3-1).

A field survey for microbats was undertaken for the wind farm proposal (URS 2004) which tentatively identified two species listed as Vulnerable under the *Threatened Species Conservation Act 1995*, the Eastern bent-wing Bat and the Eastern False Pipistrelle.

Silver Perch, listed as Vulnerable under the *Threatened Species Conservation Act 1995*, was also previously recorded within a ten kilometre radius of Crookwell (Department of Environment and Conservation 2006). Silver Perch occur in fast-flowing, open waters, however will also inhabit warm, sluggish water with cover provided by large woody debris and reeds.

Increased growth around Crookwell would be required to consider potential impacts to these species. However, they are unlikely to limit the general expansion of the township.

7.1.20 Taralga

Detailed below are the likely environmental constraints affecting the suitability for growth in Taralga.

Reserves and conservation areas

Tarlo River National Park is situated nine kilometres to the south east of Taralga. The Tarlo River National Park is listed on the Register of the National Estate as a natural area and provides a very viable and comparatively extensive sample of *Eucalyptus rossii*, *E. macrorhyncha* dominated dry sclerophyll open forests and woodlands in association with other vegetation communities and habitats. The Park is situated in a geologically unique area and provides habitat ecological communities not found elsewhere in the Upper Lachlan LGA.

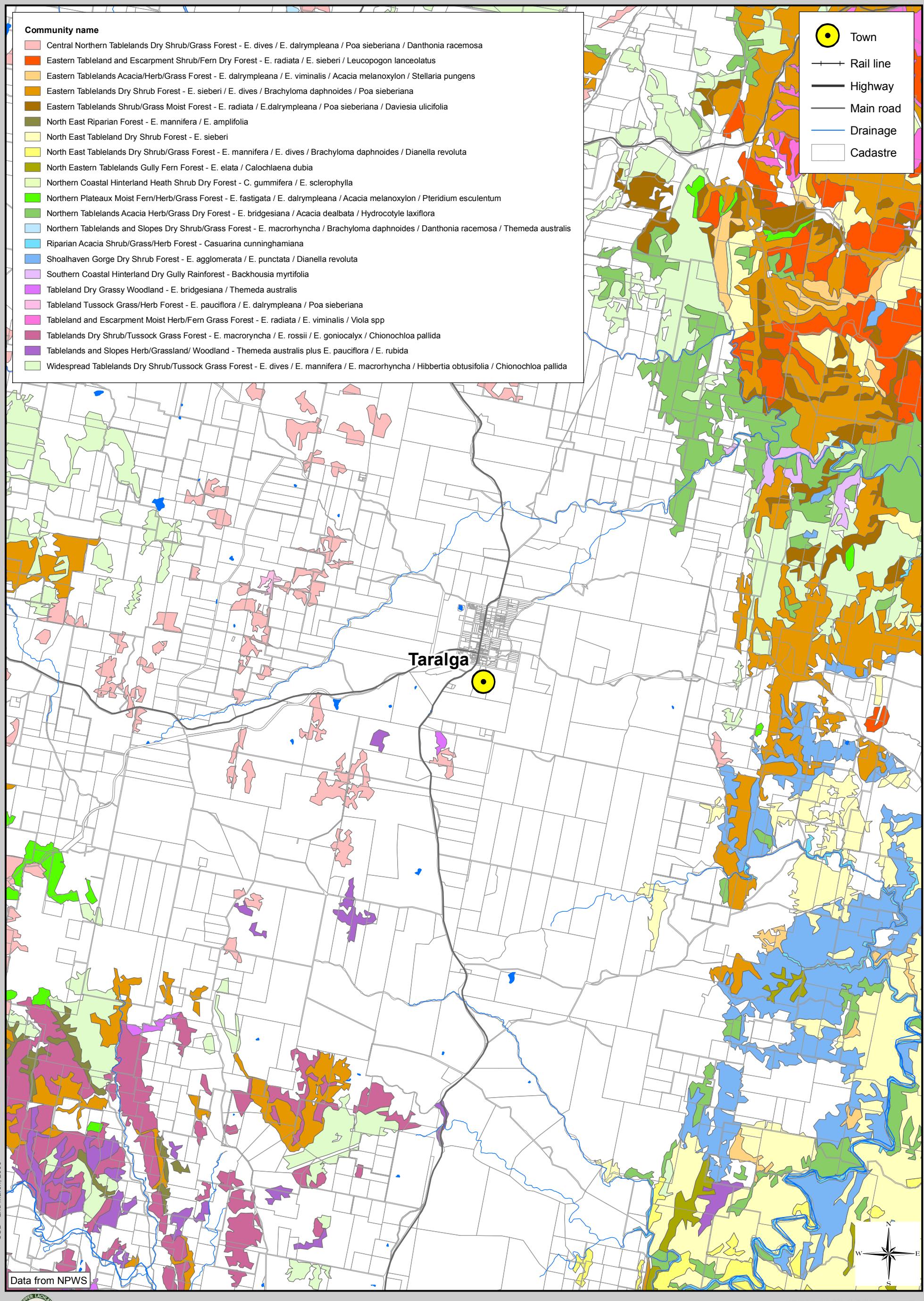
Although Tarlo River National Park is situated close to Taralga, it would not prevent future development around the township.

Rivers and wetlands

Taralga is situated between Meadow Creek (a different watercourse from the Meadow Creek near Gunning) and Woolshed Creek, tributaries of the Wollondilly River. These watercourses are not considered to be a restricting factor to the potential development of the township.

Vegetation communities

The land surrounding the existing Taralga township is dominated by gently undulating landforms with a pronounced range to the east. The arable land associated with gently undulating landforms has been predominantly cleared of native vegetation in all directions of the existing town centre. (refer Figure 7-9)



Endangered ecological communities

Two Endangered Ecological Communities were identified as having potential habitat within a ten kilometre radius of Taralga (Department of the Environment and Heritage 2006). These were Grassy White Box Woodlands and Natural Temperate Woodlands of the Southern Tablelands of NSW and the Australian Capital Territory.

However, none of the vegetation communities mapped within the vicinity of the township by the Forest Ecosystem Classification and Mapping project (Thomas et al. 2000) correspond with either of the Endangered ecological communities. These ecological communities have potential to prevent development of the areas where they occur, however they are unlikely to limit the general development and expansion of the township.

Threatened floral species

An ecological assessment undertaken for the Taralga wind farm environmental impact statement (Geolyse 2004) identified three Threatened floral species likely to occur within the vicinity of the proposed wind farm site. Habitat for an additional two Threatened floral species listed under the *Environmental Protection and Biodiversity Conservation Act 1999* was predicted to occur within a ten kilometre radius of Taralga (refer Appendix D Table 3-1).

Increased growth around Taralga would be required to consider potential impacts to these species. However, they are unlikely to limit the general expansion of the township.

Threatened and migratory faunal species

An ecological assessment undertaken for the Taralga wind farm Environmental Impact Statement (Geolyse 2004) identified fourteen Threatened faunal species likely to occur within the vicinity of the proposed wind farm site. This included eleven bird species, two mammal species and one reptile species (refer Appendix D Table 3.1).

Koala was the only Threatened species previously recorded within a ten kilometre radius of the township of Taralga (Department of Environment and Conservation 2006). Koalas are listed as Vulnerable under the *Threatened Species Conservation Act 1995*.

Habitat for an additional eight Threatened faunal species and five Migratory faunal species listed under the *Environmental Protection and Biodiversity Conservation Act 1999* was predicted to occur within a ten kilometre radius of the township of Taralga (Appendix D Table 3.1).

Increased growth around Taralga would be required to consider potential impacts to these species. However, they are unlikely to limit the general expansion of the township.

7.2 Bushfire hazard

7.2.1 Bushfire prone lands

Bush fire prone lands have been mapped in consultation with the NSW Rural Fire Service under Section 146 of the *Environmental Planning and Assessment Act 1979* and identify lands that are likely to be subject to bushfire risk (refer Figure 7-10). Bush fire prone areas are defined as those areas:

- within or within 100 metres of high or medium bushfire hazards, or

- within or within 30 metres of low bushfire hazards (PlanningNSW and NSW Rural Fire Service 2001).

On 1 August, 2002 the *Rural Fires and Environmental Assessment Legislation Amendment Act 2002* came into effect in NSW amending the *Rural Fires Act 1997* and the *Environmental Planning and Assessment Act 1979*. The amendments were designed to better protect life, property and the environment as part of the planning process.

The amendments require development and subdivision applications submitted with Council to comply with either 79BA of the *Environmental Planning Assessment Act 1979* for single dwelling developments or Section 91 of the *Environmental Planning Assessment Act 1979* (Section 100B of the *Rural Fires Act 1997*) for subdivisions and special fire protection developments.

Pursuant to Section 100B of the *Rural Fires Act 1997*, subdivision of land that would be used for residential or rural residential purposes would trigger integrated development provisions pursuant to the *Environmental Planning and Assessment Act 1979* and require separate approval from the Rural Fire Service.

Special fire protection development would also trigger integrated development provisions and require separate approval. The *Rural Fires Act 1997* defines special fire protection purpose as:

- a school
- a child care centre
- a hospital (including a hospital for the mentally ill or mentally disordered)
- a hotel, motel or other tourist accommodation
- a building wholly or principally used as a home or other establishment for mentally incapacitated persons
- housing for older people or people with disabilities within the meaning of State *Environmental Planning Policy (Housing for Seniors or People with a Disability 2004)*
- a group home within the meaning of *State Environmental Planning Policy No 9 — Group Homes*
- a retirement village
- any other purpose prescribed by the *Rural Fires Regulation 2002*.

Bush fire prone areas do not include urban areas or grasslands, which can readily be managed.

Bushfire prone areas are found mainly east of Taralga. Bushfire prone areas west of Taralga tend to be more fragmented and isolated along areas of steeper terrain. Villages located close to known bushfire prone areas include Collector, Tuena, Jerrawa, Bigga, Grabben Gullen, Breadalbane and Dalton. Those areas which experience lower bushfire risk include Crookwell, Gunning, Laggan and Bindia.

The Rural Fire Service requires that residential development in bushfire prone areas comply with the criteria set out in *Planning for Bushfire Protection* (Planning NSW and NSW Rural Fire Service 2006). This document provides criteria for Asset Protection Zones, property access, water for effective fire fighting, controls that avoid placing inappropriate

developments in hazardous areas and methods and materials for the construction of buildings within bushfire prone areas under the *Building Code of Australia*.

Under Section 4(8) and Section 117(2) of the *Environmental Planning and Assessment Act 1979*, the Minister for Planning has issued a direction outlining matters to be considered by Councils in preparing draft local environmental plans in relation to Bushfire Protection, including consulting with the Commissioner of the Rural Fire Service and consideration of Planning for Bushfire Protection.

Management issues

Where a bush fire hazard exists on or adjacent to potential development (near a habitable building), the NSW Rural Fire Service requires an asset protection zone be established. The asset protection zone acts as a buffer zone between any development and potential hazard area. The primary purpose of asset protection areas is to ensure that a progressive reduction of bush fire fuels occurs between development areas and bushfire prone areas. The required asset protection zone is determined by the slope and amount of vegetation on or adjacent to a property and should be incorporated as part of the overall planning of future growth areas.

The asset protection zone comprises an inner protection area and an outer protection area, both of which would be required as part of overall site planning for subdivision applications.

An inner protection area refers to the area immediately adjacent to a dwelling and requires ongoing management to minimise the level of material that would support the spread of fire. These areas are to be kept free of flammable/combustible material with no continuous tree canopy leading to dwellings.

An outer protection area is the transition from the inner protection area to the main bush fire hazard area. These areas contain material that would reduce the spread rate of fire.

Recommendations

Growth within areas identified as bushfire prone within Upper Lachlan has be restricted to minimise potential risk to life and property.

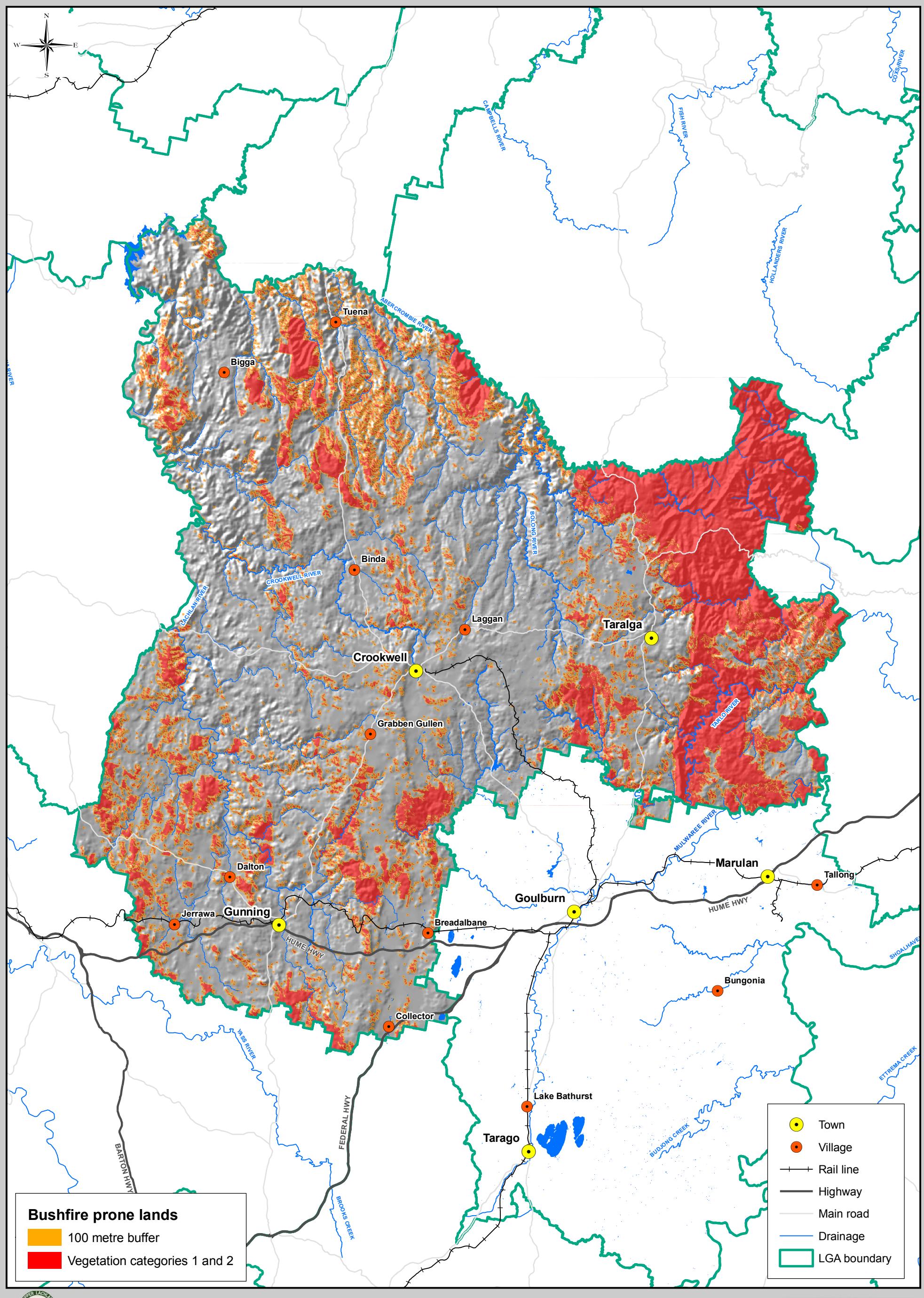
Upper Lachlan is fortunate as many of the towns and villages are generally free of significant bushfire areas. Future development to the east of Taralga would need to be cognisant of bushfire risk with primary reference to sensitive land uses including residential.

7.3

Geotechnical characteristics

The following addresses various geotechnical issues associated with growth within the Upper Lachlan. Although assessment has been undertaken across the Local Government Area, areas targeted for more detailed investigations have been around the existing towns and villages.

The majority of land within Upper Lachlan has been determined as generally suitable for development activity from a geotechnical perspective. Detailed investigations of the following issues would need to be undertaken prior to any further development taking place for the purposes of sensitive land uses.



0 10 20 Km



- potential for gullying or sheet erosion
- flooding
- saline or acidic soils
- shallow depths to rock
- moderately to highly reactive soils or high plasticity soils.

These issues are generally of minor to moderate concern and may be mitigated by implementing engineering and environmental management measures. Areas that would not be considered suitable for residential development without detailed geotechnical investigation include land adjacent to rivers and floodplains and areas where slope angles are in excess of 20 percent.

Land capability has been determined based on the severity of the issues that have been highlighted around each town centre. Land capability has been classified using the Department of Planning's definitions:

- *Minor limitations for urban development*: areas with little or no physical limitations.
- *Moderate limitations for urban development*: areas where physical limitations may influence design and impose management requirements on development.
- *High to severe limitations for urban development*: areas where limitations are difficult to overcome, requiring detailed investigation and design. Some areas unsuitable for development.

The towns that have been targeted for geotechnical investigations include:

- Crookwell
- Gunning
- Taralga.

The following issues have been identified for each town:

- slope stability
- erosion hazard
- salinity hazard
- foundation hazard including soft soils and reactivity
- drainage hazards and potential flooding
- shallow depths to rock and excavation difficulties
- potential contamination related to land use history.

Town centres

Geotechnical issues associated with future development of the various landscapes within Upper Lachlan town centres including Crookwell, Taralga and Gunning and surrounding areas are generally minor to moderate and include the following issues:

- gullying or sheet erosion
- moist ground conditions following prolonged rainfall

- localised flooding after prolonged rainfall on lower slopes of some landscapes
- saline or acidic soils
- contamination associated with land usage
- shallow depths to rock
- moderately to highly reactive soils or high plasticity soils.

The Lickinghole Landscape found approximately six kilometres north west of Crookwell and three kilometres north-east of Taralga presents high to severe limitations associated with steep slopes and potential landslide activity. Any development activity within this area would require detailed investigation and landslide risk management in accordance with *Landslide Risk Management Concepts and Guidelines* prepared by Australian Geomechanics Society (2000).

Figure 7-11, Figure 7-12, and Figure 7-13 demonstrate areas within and surrounding Crookwell, Taralga and Gunning that are suitable for future development from a geotechnical perspective and areas that are likely to be unsuitable. Confirmation of these boundaries will require detailed geotechnical investigation.

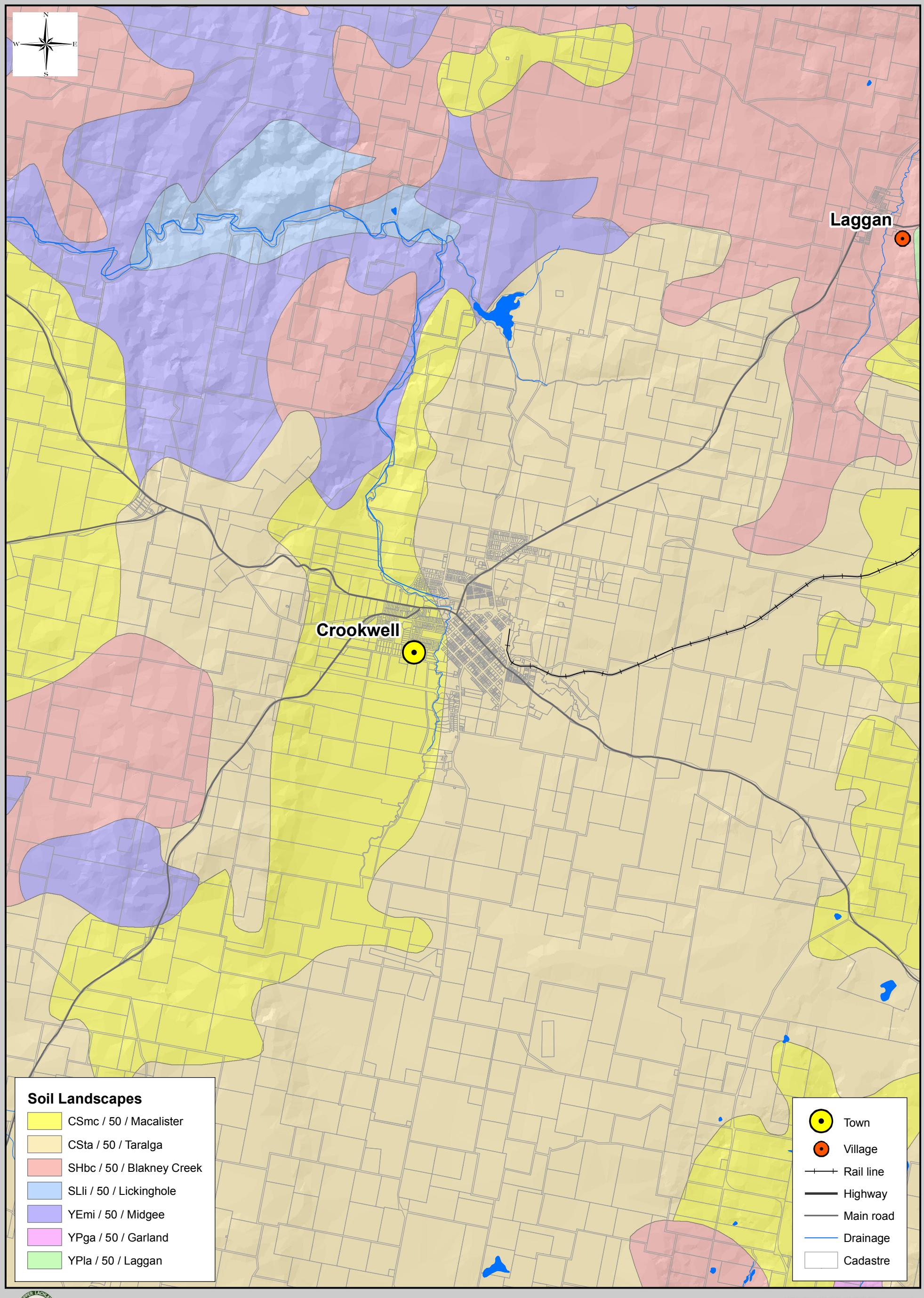
The soil landscapes discussed above for each town centre are representative of the soil landscapes which characterise the entire Local Government Area. Constraints to development outside of town centres, are therefore likely to be similar to the constraints identified above for each town.

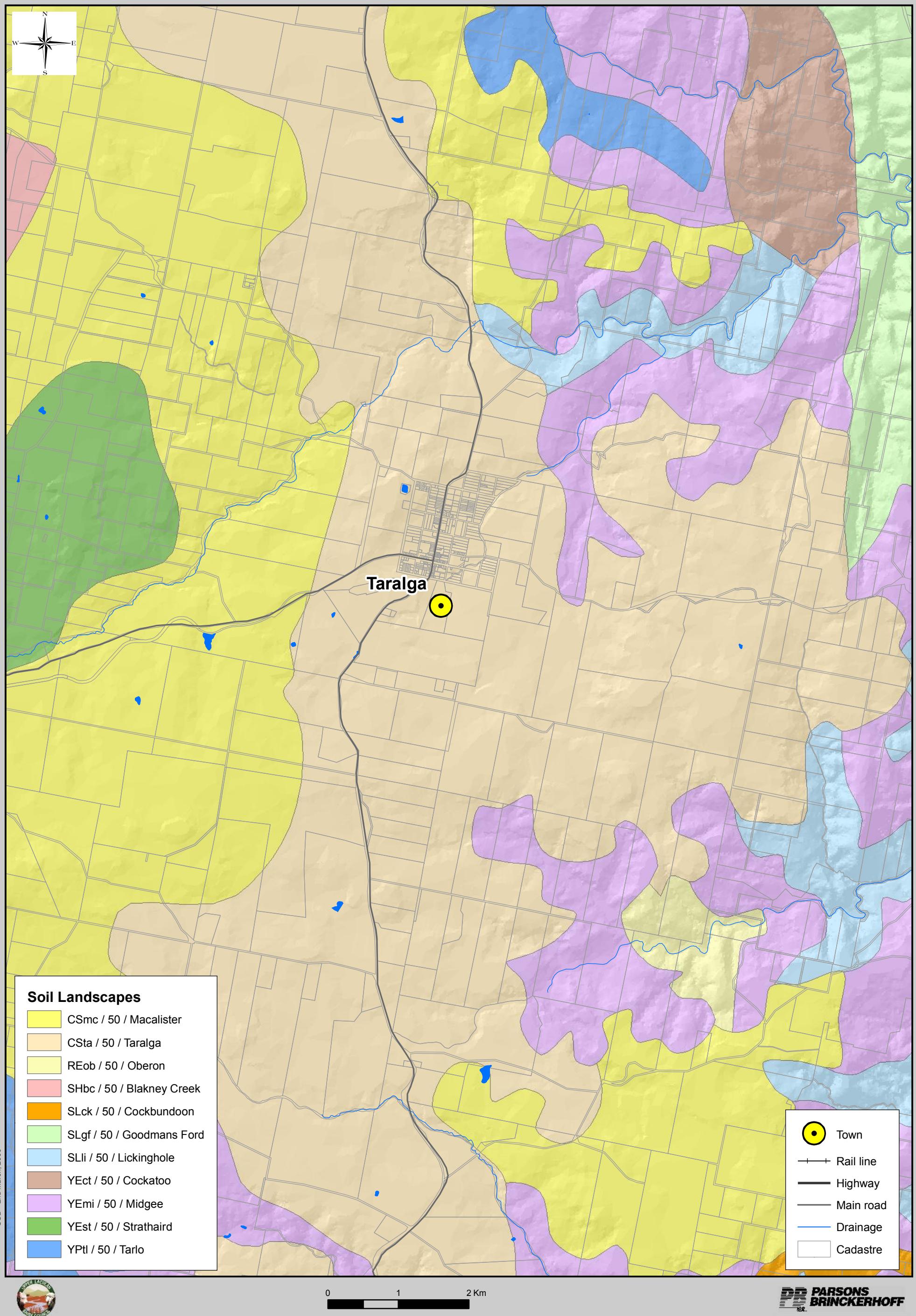
Areas comprising steep topography or close to creek lines, including low lying areas, are subject to an elevated risk of soil related issues including erosion, salinity, flooding and moist ground conditions. These areas are generally not suitable for development and should be avoided where possible.

Villages within Upper Lachlan are generally suitable for sensitive land uses including residential and are subject to various minor to moderate soil constraints. Prior to any further release of lands for residential development outside of the 2(v) zoned village areas, detailed assessment of surface and sub-surface conditions should be incorporated to minimise any potential for risk.

Constraints

Although the Department of Environment and Climate Change records indicate there are no areas within Upper Lachlan declared as remediation sites under Section 21 of the *Contaminated Land Management Act 1997*, Council records indicate two confirmed contaminated sites and six potential sites (refer **Error! Reference source not found.**).





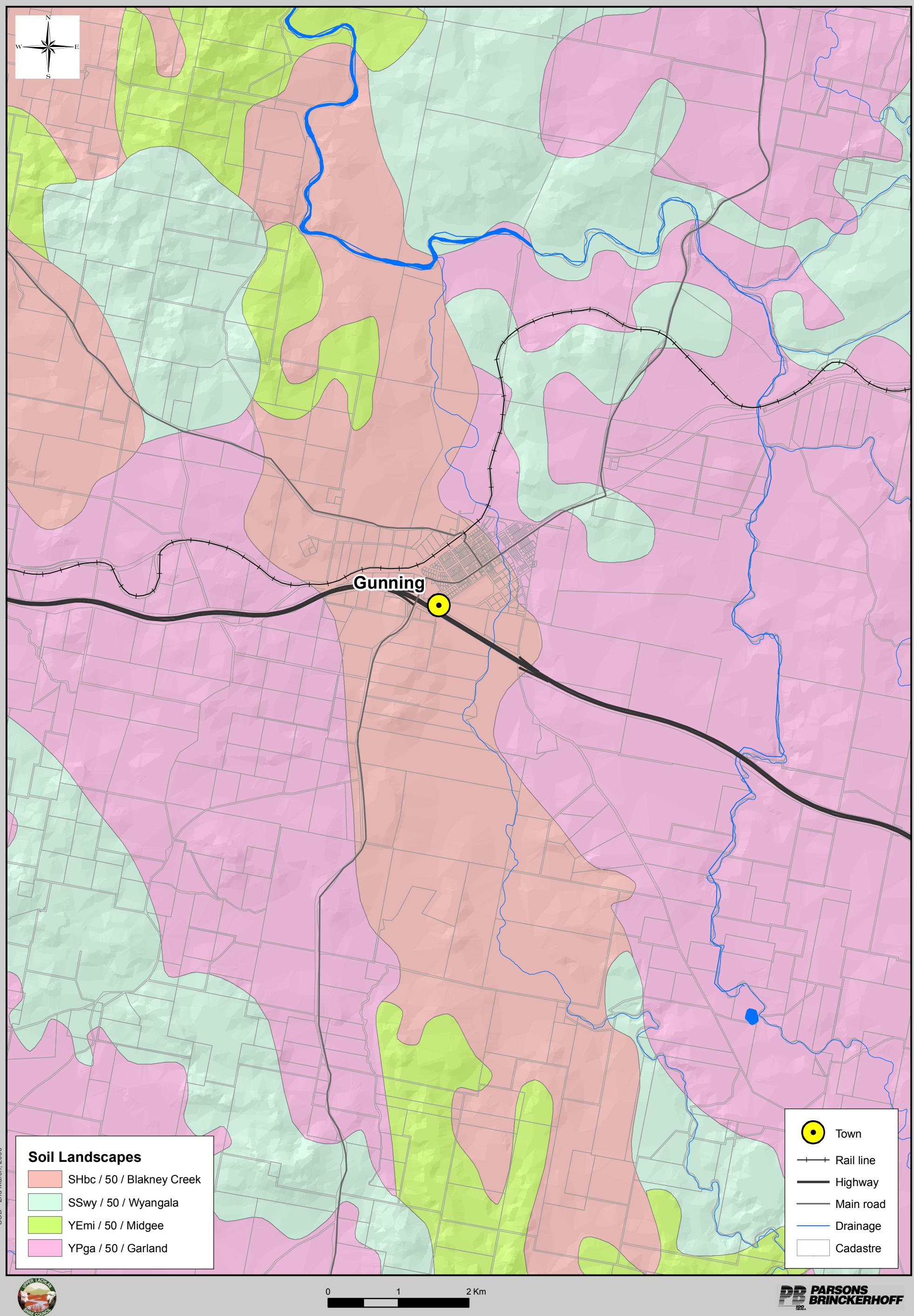


Table 7-1 Confirmed and potential contaminated sites (2004)

Location	Site type	Confirmed or potentially contaminated	Activity	Area
Collector		Confirmed	Contaminant (mineral)	1,500 hectares
Crookwell	Tip	Potential	Landfill - waste	Unknown
Crookwell	Petrol Station	Potential	Petrol station	Unknown
Crookwell	Petrol Station	Potential	Petrol station	Unknown
Gunning	Tip	Potential	Landfill - waste	Unknown
Gunning	Petrol Station	Potential	Petrol station	Unknown
Laggan	Tip	Potential	Landfill - waste	Unknown
Taralga	Tip	Confirmed	Landfill - waste	50 hectares

Source: Upper Lachlan Shire Council

As wool production has historically been an important industry within Upper Lachlan, it is likely that decommissioned sheep dip sites may also exist. The number and location of these sites is unknown.

Potential areas within Upper Lachlan that may affect future activity (in terms of geotechnical and contamination issues) are dependant on the soil landscape as illustrated above with particular reference to Lickinghole soil landscapes characterised by very steep hills with slope gradients of 30 to 50 percent and erosional stream channels a landscape feature. This soil landscape is located close to Crookwell and Taralga and has the potential to result in excavation difficulties, moderate to severe gullying and sheet erosion and is unable to be controlled during and after any earthworks. Further, this soil landscape presents the potential for landslide activity due to the severity of the topography.

This soil landscape has been identified as a high constraint to future development and would require additional environmental and engineering controls during development for either urban or rural residential purposes and would incur additional costs during any development within these areas.

7.4 On-site effluent disposal capability

Most dwellings in Upper Lachlan's rural areas dispose of wastewater and sewage via an on-site septic tank system and dedicated effluent disposal areas. In village zones and rural residential areas, proximity between dwellings raises potential odour and contamination issues.

A detailed development control approach is required to guide Council in assessing on-site systems. However, it is likely that future development in urban areas would be located and designed to take advantage of reticulated sewer systems. The following provides an outline of factors to be considered as part of on-site effluent disposal systems.

Limiting factors for system selection

A range of on-site effluent disposal systems are identified and detailed under AS/NZS 1547:2000 (refer Table 7-2). This standard provides a sound basis that defines the minimum requirements for most system designs. The following provides a summary of the typical limiting factors of the selected system types and should be considered as part of any future development control plan regulating on-site effluent systems.

Table 7-2 On-site effluent disposal systems

Conventional Absorption Trenches	Evapotranspiration Assisted Absorption Bed/Trench
<ul style="list-style-type: none"> ▪ trenches are difficult to construct on slopes >25% slope; ▪ require soil depth > 1.2m. A minimum depth of 0.4m below bottom of dripper lines is desirable; ▪ low permeability soils require impractical trench lengths and long dripper lines; ▪ require water table >1.2m deep; ▪ dispersive soils require impractical trench lengths, and may result in failure; ▪ high rock or cobble content reduces water storage capacity; ▪ small lot sizes are unfavourable. 	<ul style="list-style-type: none"> ▪ maximum slope of 5% recommended for bed or surface irrigation; ▪ trenches are difficult to construct on slopes >25% slope; ▪ minimum soil depth of >1.2m for trench or bed, minimum 0.4m below lines for irrigation; ▪ clay soils preferred; ▪ require >1.2m depth to water table; ▪ dispersive soils require impractical trench lengths, and may result in failure; ▪ high cobble or boulder content reduces water storage capacity.
Surface Irrigation Area <ul style="list-style-type: none"> ▪ maximum recommended slope of 6%. Steep slopes can cause high runoff; ▪ require soil depth > 1.2m. A minimum depth of 0.4m below bottom of dripper lines is desirable; ▪ clay soils require large dripper line systems; ▪ require water table >1.2m deep; ▪ best where intense rainfall events are uncommon. ▪ Sub-surface Irrigation ▪ trenches are difficult to construct on slopes >25% slope; ▪ require soil depth > 1.2m. A minimum depth of 0.4m below bottom of dripper lines is desirable; ▪ low permeability soils require impractical trench lengths and long dripper lines; ▪ require water table >1.2m deep; ▪ dispersive soils require impractical trench lengths, and may result in failure; ▪ high rock or cobble content reduces water storage capacity; ▪ requires less space than a conventional absorption trench or evapotranspiration assisted absorption or evapotranspiration assisted seepage. 	Mounds <ul style="list-style-type: none"> ▪ maximum practical slope 15%. Steeper slopes require large quantity of imported sand and induce risk of soil seepage; ▪ soil depth not important; ▪ can be used for all soil types (i.e. categories 1-6 as defined by DLG 1998); ▪ preferred >0.6m to water table. Can design for shallower water table if required; ▪ can occupy smaller area on flat land. Require larger area on steep slopes.

Source: AS/NZS 1547:2000

Effluent disposal capability

Based on a preliminary review of the soil landscapes surrounding the main town centres the following soil landscapes are considered most suitable for on-site effluent disposal:

Crookwell

- Macalister
- The lower slopes of Taralga, Garland and Midgee.

Taralga

- Macalister and Strathaird (provided erosion is controlled)
- The lower slopes of Taralga and Midgee
- Lickinghole Soil Landscape is unsuitable for effluent disposal due to shallow soils or slope instability.

Gunning

- Blakney Creek (some areas have shallow soils)
- Lower slopes of Garland and Midgee

Suitable effluent disposal systems

Based on the above information the following on-site effluent disposal systems are likely to be suitable for the above mentioned soil landscapes:

- conventional absorption trenches
- subsurface irrigation systems
- evapotranspiration assisted absorption beds (on slopes of <5%) or trenches
- surface irrigation areas (on slopes of <6%)
- mound systems would be appropriate for areas where soil depth is expected to be less than 1.2 metres.

The above recommendations for effluent disposal systems are based on a preliminary study and a detailed effluent disposal analysis of specific lots (including subsurface investigation) is recommended once a subdivision layout is finalised.

Sizing of effluent disposal systems

Sizing of beds, trenches and mounds for the soil landscapes would be required at the detailed design phase of any development and would give consideration to the type and scale of development likely to eventuate. Sizing of the proposed effluent disposal system should be in accordance with the ASI 547.200 or as determined by a qualified specialist.

Location and construction

Buffer distances shown below have been obtained from the Environment and Health Protection Guidelines for On-site Sewage Management for Single Households (1998). These buffer distances are a recommended minimum based on good site and soil conditions (see Table 7-3). If site conditions are poor, then these distances may need to be increased based on a detailed site specific assessment.

Table 7-3 Recommended buffer distances for location of disposal areas

System	Buffer Distance
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All On-Site Disposal Systems	<ul style="list-style-type: none"> ▪ 100m to permanent surface waters (eg. River, streams, lakes etc). ▪ 250m to domestic groundwater well. ▪ 40m to other waters (eg. Farm dams, intermittent waterways and drainage channels etc).
Spray Irrigation System	<ul style="list-style-type: none"> ▪ 6m if area up gradient and 3m if area down gradient of property boundaries and driveways. ▪ 15m from dwellings. ▪ 6m to swimming pools. ▪ 3m to paths and walkways.
Subsurface/Trickle Irrigation Systems	<ul style="list-style-type: none"> ▪ 6m if area up gradient and 3m if area down gradient of property boundaries, buildings and swimming pools and driveways.
Absorption Systems	<ul style="list-style-type: none"> ▪ 12m if area up gradient and 3m if area down gradient of property boundaries ▪ 6m if area up gradient and 3m if area down gradient of buildings and swimming pools and driveways.

Management issues

Factors that influence the minimum site area for on-site sewage management systems vary considerably and will need to be assessed on an individual site by site basis. Detailed site investigations would be required prior to subdivision or development of greenfield areas in order to:

- Identify areas where rock outcrop/subcrop may be present along ridges and steeper slopes, as they may impact on development.
- Map soil types to better assess current and potential erosion.

Other key considerations will include:

- Size of the site.
- Slope of the site – generally should not be in excess of fifteen degrees.
- Stability of the site, including history of site instability, such as land slip or ground creep.
- Soil type – soil should offer a minimum 300 millimetres of permeable cover, plasticity of soils is also of consideration and should be tested as this will influnece the level of permeability of the site.
- Ground water - ground water must not be higher than 1 metre from the surface at any time.
- Location within a Council water supply catchment area.
- Location within a SCA area.

As the economic base of Upper Lachlan is underpinned by cattle and sheep production, together with traditional seed potato production, precautions are needed when transforming agricultural lands into sensitive land uses including residential.

New and existing farmers within Upper Lachlan, however, are diversifying, with crops such as olives, flowers and grapes being introduced and new animals including alpaca and deer.

Additional environmental assessment would be required prior to further development activity to identify potential contaminants and to identify the following:

- parts of the land that may have been used historically for market gardening
- sheep dips that are, or may have been, associated with grazing activities.

7.5 Flooding and drainage

7.5.1 Flooding

Flooding across Upper Lachlan is generally restricted to depressed areas and along waterways. Areas of concern are generally focused on places where there is potential to impact on life and property and development areas. The Upper Lachlan has four key waterways that present the potential to impact on life and property:

- The town of Crookwell is divided by the Crookwell River and Kiamma Creek which are tributaries of the Lachlan River.
- Meadow Creek forms a tributary of the Lachlan river and flows through the village of Gunning.
- Tuena Creek lies adjacent to the village of Tuena.
- Corroboree Creek adjacent to Taralga including low lying areas through the middle of town.

Constraints

A key constraint to flood assessment for Upper Lachlan is the limited data available to analyse potential flood areas and associated impacts. Currently, there are no catchment based flood studies available for the Crookwell River, Kiamma Creek, Meadows Creeks and Tuena Creek within Upper Lachlan.

As broad flood mapping is not available, individual proposals seeking to develop for residential purposes may need to undertake independent flood assessments to determine minimum floor levels and appropriateness of development subject to flood risk. This is particularly relevant to properties located along creeks or within low lying areas within and surrounding villages where no data is available on flood potential.

Areas surrounding Crookwell River, south of Goulburn Street and surrounding Kiamma Creek are known to be flood prone and therefore are constrained for development. The Strategy has identified these areas and will ensure appropriate land use constraints are applied via the Upper Lachlan Local Environmental Plan.

Management issues

In accordance with the NSW Government's Flood Prone Land Policy, Council would need to consider preparing a floodplain risk management assessment. *The Floodplain Development Manual: the Management of Flood Liable Land* (April 2005) prepared by the then Department of Infrastructure Planning and Natural Resources details the process for floodplain risk management in NSW.

To ensure minimum risk is associated with future growth areas, the following principles should be considered by Council prior to any further land release:

- Development of land identified as flood liable should be undertaken in such a manner as to minimise changes to flood behaviour and be complimentary with the hazard classification of the land.
- Planning for development to ensure the risks to life and property as a result of flooding is minimised.

7.5.2 Drainage

Stormwater management refers to the management of surface water runoff from land and not within a watercourse. Stormwater drainage systems are designed to convey surface water runoff away from a defined area so that it would not impede the normal operations of that area.

There are no catchment based stormwater management plans for the urban or rural centres within Upper Lachlan. There are site specific stormwater assessments available for several developments submitted as part of development applications.

The *Gunning Water Master Plan* (2005) identified that minimal provision of stormwater drainage within Gunning would not constrain future growth of this town or its immediate surrounds. Although stormwater infrastructure is currently limited in Gunning, comprising mainly a surface drainage system, with a limited number of underground pipes and culverts, the existing system is unlikely to restrict growth due to minimal potential of flooding.

Constraints

As with flooding, a key constraint for drainage relates to the limited level of data assessment of existing drainage infrastructure and potential impacts associated with significant storm events. Individual development applications will be required to undertake the necessary assessment to illustrate adequate drainage off site. This approach, however, does not assess downstream impacts or impacts to the broader drainage system.

Drainage within urban areas is likely to become an important planning issue due to increased in fill and hardstand areas that would be proposed with any growth in villages or towns. The gradual reduction in infiltration in urban areas will place increasing pressure on the existing drainage network and will increase susceptibility to localised flooding.

Management issues

The NSW Environment Protection Authority issued a directive in 1999 for all Local Councils to prepare catchment-based stormwater management plans. The directive was issued under Section 12 of the *Protection of the Environment Administration Act 1991*. In accordance with the directive a series of Stormwater Management Plans will need to be undertaken for all the urban areas within the Local Government Area with populations of 1,000 people or more. This would include Crookwell and Gunning.

7.6 Archaeology and heritage

The following provides a contextual history of Upper Lachlan. The information presented has been based on previous studies prepared for areas within Upper Lachlan as well as

those which have focused more broadly on the region within which the Upper Lachlan is located.

7.6.1 Aboriginal history

Present archaeological evidence suggests that there have been Aboriginal inhabitants in the broader Upper Lachlan area for about 14,000 years. Prior to this, the area was subject to much different climatic conditions. The average temperatures were lower with a more severe winter which would have prevented, or at least restricted, occupation. However, some movements through and occupation of the more temperate areas may have occurred (Pearson 1981).

With the end of the Pleistocene era, the resultant rise in temperature allowed for a greater use of this region. Evidence of climatic change would demonstrate an expansion of occupation in the last 3,000 to 4,000 years and can be interpreted as previously unoccupied areas becoming populated (Lance & Truscott 1987).

Upper Lachlan seems to have been a convergence of four different Aboriginal groups including the Gundagarra, Ngawal, Wadi Wadi and Wandandian groups. These groups were distinct yet Marulan, south east of Taralga, is thought to have been a meeting place for the four groups, chosen for its good water supply and excellent geographical location (ERM 2004). Marulan probably marks the extent of the territory of the Wadi Wadi and Wandandian as they were predominantly coastal and less nomadic than their highland counterparts the Gundagarra and Ngawal.

Linguistically the Gundagarra and Ngawal were the dominant language groups of the area. They were bounded to the north and east by the Darug language group and, to the west it was the Wiradjuri. These groups could be further divided into clans or bands. In the north of the present local government area, around Tuena, there was the Burra Burra, a sub band of the Gundagarra. The Pajong group lived in the south, around Gunning, but it is uncertain whether they belonged to the Ngawal or Gundagarra groups. However, each language group understood the other.

The food supply in the tablelands was consistent but best exploited by mobile people due to its seasonal nature (fish from September to May, Orchid tubers in winter). This could explain the more nomadic lifestyle of the Gundagarra and Ngawal in comparison to the Wadi Wadi and Wandandian who could be relatively sedentary due to the more consistent food supply offered by coastal living.

Larger mammals were hunted for food all year round and there is evidence that the Aboriginal population was manipulating the landscape to achieve this. Early descriptions of the tall eucalypt woodlands tell us that they were open with grass growing below the canopy. This suggests that there was frequent burning to encourage the growth of grass to attract larger grazing animals. (Regional Histories 1996)

Apart from a brief expedition in 1798, organised European exploration did not occur until 1818 when Hamilton Hume, James Meehan, John Oxley and Charles Throsby reached the area. They thought the country excellent and opened up the potential of the area to colonists. Thus Europeans began to arrive, and as they did, this led to a decline in the stock of natural resources of the area. Consequentially there was also a corresponding impact on the nomadic lifestyle of the Indigenous population.

Whilst relations between the Indigenous population and Europeans were generally cordial, the changing lifestyle and disruption of natural resources were to have a negative effect on Indigenous culture. Some Aboriginal people adapted to change in their nomadic lifestyle by taking work with the settlers, washing sheep, gathering potatoes and cutting bark. Others chose to continue traditional lifestyles, but the erosion of traditional Aboriginal life was irreversible. To demonstrate, the practice of harvesting the Bogong moth for traditional ceremonies had continued for up to eight centuries, yet had completely ceased within 50 years of the first European contact in the area.

In addition to the erosion of traditional lifestyles, contact with Europeans led to a decrease in the Aboriginal population. Introduced diseases such as syphilis, smallpox, measles and the influenza epidemic of 1846-7 meant that traditional Aboriginal life had been effectively destroyed by 1850. (Regional Histories 1996)

Aboriginal heritage

There is no reference to Aboriginal cultural heritage in heritage studies or planning instruments relating to Upper Lachlan. Aside from a small portion of the local government area covered by the Draft Mulwaree Heritage Study 2002 – 2004, Upper Lachlan has not been subject to a regional heritage study. Site specific assessments have been undertaken where development / re-zoning has taken place however these studies do not offer a regional appreciation for the archaeological or historic integrity for the broader local government area.

Perhaps the most significant study of some relevance to this region conducted in recent years is a PhD study undertaken along the Macquarie Valley between the Oberon Plateau area of the Blue Mountains and Dubbo in the Central Western Plains (Pearson 1981). This study identified a number of geographic and corresponding archaeological land systems to which he designated “sub-region” titles, each comprised of a range of distinctive environmental characteristics.

The study identified that the areas of greatest Aboriginal population density focused along major and generally perennial water courses and that the most desirable locations for settlement within any subregion were the grasslands and savannah woodlands along river flats and the well watered undulating plains which occurred in pockets on the uplands and plateaus. The Study also proposed that the environmental characteristics of some areas would have discouraged their human use by Aboriginal people. In particular, the harsh winter climates of all the plateau subregions were argued to restrict Aboriginal use to the milder months (Davies 1993).

In order to assess patterns in the distribution of individual archaeological sites, the study examined the location characteristics of habitation or camp sites in four sample areas in the nominated study region. The following is a summary of the results concerning site type and location.

There is a strong relationship between site location and distance from water sources. Distance to water varies from 10 to 500m. Across the tablelands, the majority of campsite locations were found to occur within approximately 90 metres of water sources (Pearson 1979). Inconsistencies in site occurrence location between the different tablelands and slope locations appear only in the distance of open campsites from reliable sources of water. Occupation patterning is generally determined by factors such as climate, reliability of water sources (whether perennial or ephemeral in nature), landform gradient, ruggedness of

terrain and flooding patterns. Based on the above factors, occupation sites can generally found on hilly or undulating places rather than on river flats or the banks of waterways.

Good drainage and views over watercourses and river flats are also considered to be important site location criteria.

The relationship between site location and vegetation is not straightforward. Most sites are located in contexts which could support open woodlands. It was concluded that more sites would have been located in grasslands prior to the effects of European clearing and farming although a few scattered sites occurred in forests (Pearson 1981).

Other key findings identified:

- Burial sites and grinding grooves were situated as close to habitation areas as geological constraints would allow.
- Ceremonial sites such as earth rings ("bora grounds") were located in isolated places, well away from campsites.
- Stone arrangements were also located away from campsites in isolated places and in elevated subregions, tended to be associated with small hills or knolls, while in flatter areas such sites were mainly located on "bare patches of flat land." The bora rings were in open riverine country.
- Quarry sites were located where stone outcrops with desirable working qualities were recognised and were reasonably accessible

Based on ethno historical information, Aboriginal campsites were seldom used for longer than three nights and those large sites probably represent accumulations of short visits (Navin 1996).

The study prepared by Pearson indicated that the most common site type within the region is the occupation site, occurring mainly as stone artefact scatter. Stone artefact scatters may range from being relatively simple to more complex containing evidence of cooking fire hearths and food debris. Scarred tree sites are another site type which occurs with relatively high frequency across the region (Kelton 1995).

Locational characteristics

The following section provides a summary of the likely predictive scenario for the location of different Aboriginal site types within Upper Lachlan and is based on results of past studies, models of Aboriginal land use and registered site locations. These models are not without limitations, however, provide a broad overview of archaeological sites that may reflect Aboriginal occupation and use within Upper Lachlan. These locational characteristic should be considered in conjunction with Figure 7-14 which identifies the general location of identified sites taken from the Australian Heritage Inventory Management System database.

A brief description of the locational characteristics is provided below.

Open Campsites

It is highly likely that open campsites, identified by stone artefact scatters and isolated finds are the most common types to occur where suitable landform occurs (ie. relatively flat to gently sloping ground occurring as either alluvial creek flats, adjacent elevated terraces or low hill crests and ridge lines). These campsites usually occur near reliable water sources such as springs, soaks, perennial or ephemeral creek lines (Kelton 1997).

Open artefact scatters

Comprise scatters of artefacts located either on the surface and/or in subsurface contexts. They may constitute the remains of hunting and gathering activities, domestic camps, or the manufacture and maintenance of stone tools. The density of artefacts may vary considerably between and across individual sites. These sites are classed as "open" that is, occurring on the land surface unprotected by rock overhangs. These sites are sometimes referred to as "open camp sites" (Navin 1996).

Isolated finds

Include artefacts which occur without any associated evidence for prehistoric activity or occupation. They are generally defined as single artefacts located more than a certain distance from any other artefact, frequently used distances are 30, 60 or 100 metres. The distance used depends on variables such as "background" artefact densities, land use disturbance, geomorphic processes and research design objectives. Isolated finds can occur anywhere in the landscape and may represent the random loss or deliberate discard of artefacts, or the remains of dispersed artefact scatters (Navin 1996).

Scarred trees and carved trees

Scarred trees and possibly carved tree sites are likely to occur where suitable old growth timber remains. These site types will be generally limited to the following Eucalyptus species: yellow box (*Eucalyptus melliodora*), white box (*Eucalyptus albens*) and perhaps on rare occasions, red stringy bark trees (*Eucalyptus macrorhyncha*).

Aboriginal scarred trees can be expected to occur upon all landform units where suitable old-growth native timber remains, however, the greatest density of scarred tree sites tend to occur within proximity to known occupation areas generally associated with significant water sources. Whilst Upper Lachlan contains small spring fed and ephemeral creeks, the most likely area of past occupation would have been outside the study area, along the banks of Broken Shaft Creek and towards Bell River.

The occurrence of scarred trees is likely to be reduced as old-growth timber has been removed as a result of historic European land management practices.

Carved trees, used to indicate the presence of significant burial sites or ceremonial grounds, were a characteristic of Aboriginal culture in the central and southern tablelands region. Carved trees associated with initiation areas and referred to as teleglyphs (Bell & Wakelin-King 1984) have been recorded in the region (Kelton 1995).

Scarred trees occur where bark has been removed from a tree as a direct or indirect result of the manufacture of various goods and implements or the result of making foot holes in a tree to collect food or to facilitate the removal of bark. These sites may occur almost anywhere and identification of scars as Aboriginal in origin can often be problematic. Many remaining scarred trees date to the historic period when bark was removed by Aboriginals for both their own purposes and for roofing on early European houses, consequently, the distinction between European and Aboriginal scarred trees is often blurred. Scarred trees may occur anywhere where old growth trees remain and it is estimated that scars must be at least 90-100 years old to be indicative of an Aboriginal origin within the study area (Navin 1996).

Potential Archaeological Deposits (PADs):

These are deposits that are usually associated with actively aggrading landform features or rock shelter deposits, although the latter is not considered likely within Upper Lachlan. Potential Archaeological Deposits may exhibit no identifiable archaeological material on the surface but may contain sub-surface material. Potential Archaeological Deposits are usually identified by their context within, or associated with, a landscape feature that was likely to have been exploited in prehistory (Navin 1996).

Burial sites:

Aboriginal burial sites are known to have occurred along river systems, often near the river, and with locations usually relying on the softer, lighter sediments such as alluvial silts of river banks and Aeolian sands. Burials are also known to have occurred in locally elevated topographies on rocky hilltops (Bonhomme 1987, Navin 1996: 12). This is likely to have occurred in rocky hilltops in the north and east of Upper Lachlan.

Axe grinding grooves:

Due to the relatively hard, wear resistant nature of the volcanic rock formation in the broad area, particularly in exposed rock outcrops in creek beds and adjacent banks, the potential for axe grinding grooves to occur is low.

Quarry sites and procurement sites:

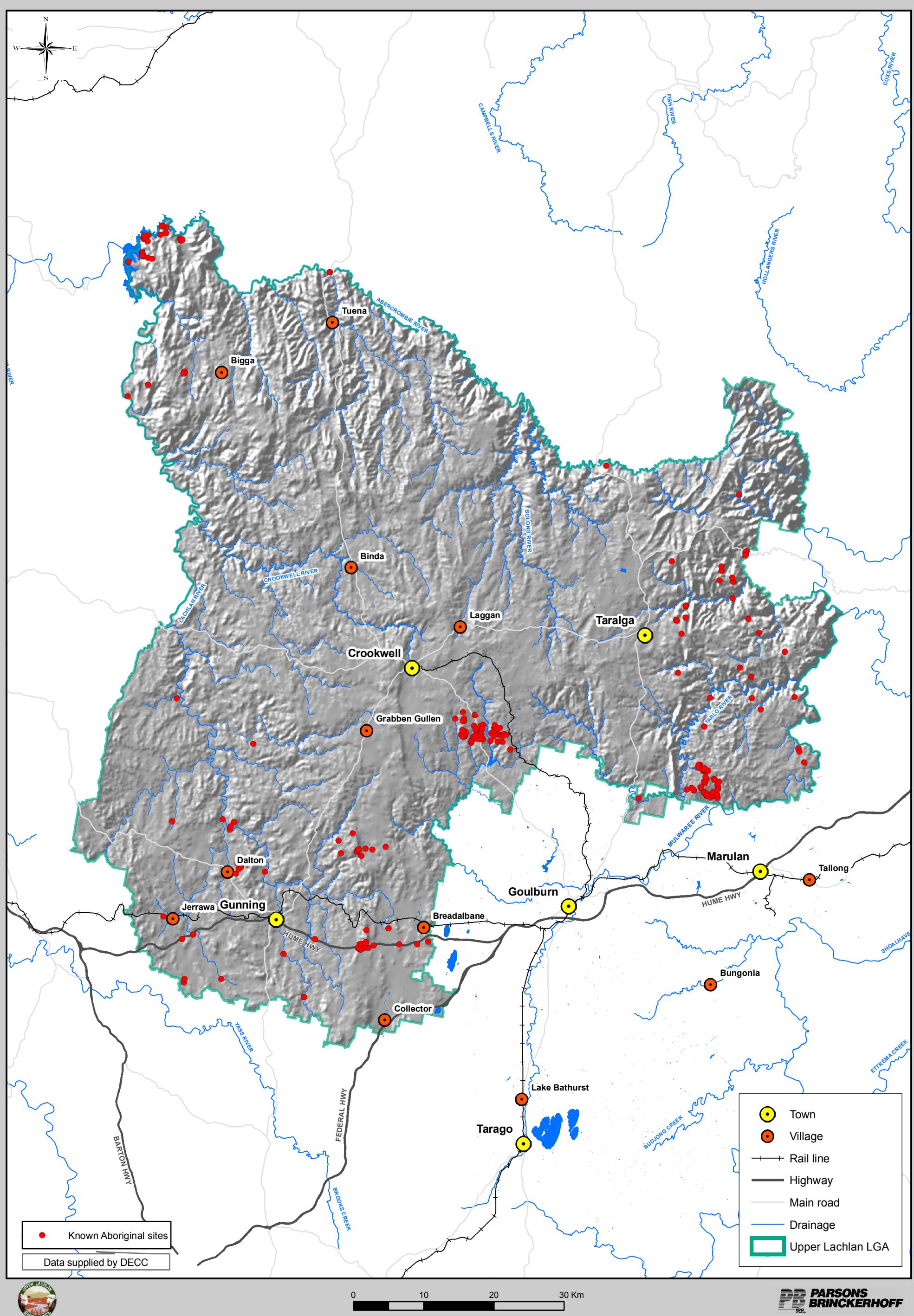
These sites are typically exposures of a geological raw material where evidence for human collection, extraction, and/or preliminary processing has survived. Typically, these involve the extraction of siliceous or fine grained igneous and meta-sedimentary rock types for the manufacture of tools, or the removal of ochre. The presence of quarry/extraction sites is dependent on the availability of suitable rock formations and ochre sources (Navin 1996). However, based on the broad geology of Upper Lachlan, the potential for quarry sites is considered to be low.

Contact sites:

Contact sites relate to places which contain evidence of Aboriginal occupation during the period of early European occupation. Evidence of this period of "contact" could potentially be Aboriginal flaked glass, burials with historic grave goods or markers, and debris from "fringe camps" where Aborigines who were employed by, or who traded with, the white community may have lived or camped. The most likely location for contact period site would be camp sites adjacent to permanent water, and located away from the focus of European settlements.

Sites identified under the Australian Heritage Management Information System

To enable an improved understanding of the spatial layout of known Aboriginal heritage a search of the Australian Heritage Information Management System was undertaken and illustrated, this is provided at Figure 7-14. This map gives an indication of the distribution of sites of potential Aboriginal artefact locations. This map is not exhaustive and serves as a general indication of the distribution of potential sites at this time. It is not intended as a definitive study.



There are a number of things which can be ascertained from the information shown in Figure 7-14. Firstly, it is apparent that approximately only ten percent of the land presently within the boundaries of Upper Lachlan, is made up of known places or sites of Aboriginal Cultural Heritage significance. Secondly, the site distribution seems to indicate concentrations along communication corridors. Also, where they are not located near communication corridors, there is particular concentration close to water courses and catchments. From this, a number of findings may be drawn. These are discussed below.

Rather than giving us an insight into how past Aboriginal communities have interacted and utilised the landscape, the distribution of known sites is more indicative of where development has taken place. The fact that the sites presently registered show significant concentration along transport corridors indicates that they relate to studies done prior to development going ahead.

Similarly, their concentration in watersheds and near water courses could indicate previous studies carried out in relation to the region's water supply infrastructure. Alternatively, it is well known that sites can be found near water courses due to erosion, visibility and current knowledge of past Aboriginal land use practices, so it could indicate the ease with which sites can be found in these areas rather than indicating the full extent of past landuse patterns in the region.

The following section identifies recommended actions to provide direction for enhancement of Aboriginal Heritage in Upper Lachlan.

7.6.2 Recommended actions – Aboriginal heritage

The Strategy recommends a series of strategies designed to provide Council direction on preparing its future heritage policy framework. It is based on a review of the existing reports and material relevant to the local government area and aims to ensure knowledge and expertise evidenced within them is effectively utilised in a move toward improving understanding the Upper Lachlan's heritage.

Actions

The preceding sections have provided an overview of the Aboriginal archaeological potential for Upper Lachlan. However, it is clear that this can only be a general guideline when investigating Aboriginal archaeology and that more information about sites, important landscapes and cultural heritage is required. There are a number of steps that council can take to further knowledge and enhance its understanding.

Socio-cultural

- Involvement of Aboriginal Stakeholder Groups in consultation processes in accordance with Department of Environment and Conservation guidelines. This will require that an advertisement be placed requesting Aboriginal stakeholders to register an interest in the project.
- Open discussions with all members of the Aboriginal community. This could take various forms, from an open forum to a series of workshops. The aim would be to emphasise the intention to protect and learn from sites and cultural landscapes.

- Utilising the knowledge of the local Aboriginal community and stakeholder groups to help produce comprehensive mapping of the important sites, scarred trees and cultural landscapes within the area. This may include significant landscapes, sensitive landscapes and places of cultural value not just archaeological sites or potential sites. Furthermore, it should not be limited to sites that are already registered on the Department of Environment and Conservation Aboriginal Heritage Information Management System database.
- Oral history programmes. Encouraging the dissemination of information regarding the area's history through the knowledge and experience of local people.

Places

- Developing Council's geographic information system as a planning tool to create an Aboriginal heritage layer for the local government area. After consultation with the Aboriginal community, this should take all the present information and produce a map of all sites to give a picture of past Aboriginal activity. In actively developing Council's inventory, geographic information systems may be continually added to with future development applications where an assessment of Aboriginal heritage is undertaken. This data may also be viewed alongside information from other local government areas to develop an understanding of how the region was utilised on a regional and state level.
- Develop protocols for any development applications that fall within the areas of potential Aboriginal significance to consult with Aboriginal stakeholders.

Professional Involvement

- Identification of significant landscapes, sites and places needs to be carried out by an archaeological or heritage specialist. This would ensure that all Department of Environment and Conservation guidelines are adhered to in the preparation of future policies and that all future studies follow the prescribed methodology.

7.6.3 European history

The first documented exploration into the area by Europeans occurred in 1798 when Governor Hunter sent an expedition of convict volunteers led by Lt Henry Hacking RN, to investigate the south west of Sydney. They reached the area now known as Mount Towrang where they camped before returning to Sydney.

It was Hamilton Hume who explored the area more thoroughly, making expeditions in 1814, 1815 and 1816. The major expedition being in 1818 when Surveyor James Meehan, accompanied by Hume and Charles Throsby discovered Lake Bathurst and Goulburn Downs naming the area after the then Secretary of State for War and Colonies Henry Goulburn. Their expedition suggested that the area had potential for agricultural and pastoral usage. Throsby thought the area excellent and believed it useful for grazing and agriculture.

When, in 1820, Governor Macquarie visited the area he echoed Throsby's opinion stating that the area was a 'beautiful rich tract of country' (Mulwaree Community Heritage Study 2002-2004). It was at this point that settlement of the area began in earnest, mainly to provide for cattle and sheep from the over crowded lands around Sydney. Settlement continued apace from here on. Even as early as 1821, there were 4,462 head of cattle and 6,000 sheep on the Breadalbane plain. (Regional Histories 1996)

The history of the region is one of exploration followed by settlement. Prominent colonists of the early 19th century were all eager to secure land in the central and southern tablelands, as it was considered to be of the highest quality for crops and stock. The region now within the boundaries of the Upper Lachlan local government area can essentially be described as a rural area of satellite communities around key urban centres, yet its character is owed to the minerals that have been discovered in the region.

Throughout the region, towns and villages were established in the 19th century. Binda was gazetted in 1850, Crookwell was named by the 1860s, Gunning's first Government land sales were in 1838, Taralga's by 1847 and Tuena was declared a town in 1859.

A detailed analysis of settlement growth across Upper Lachlan is provided at *Section 2.1.2*

European heritage

The region has a rich and varied European heritage. From the earliest years of settlement this region has been important in the development of Australia. Current studies clearly indicate that there is an extensive amount of built heritage in the region. All studies reviewed seem to focus on the built heritage of the area with relatively little consideration given either to archaeological sites, or to places which might hold some historical significance but do not contain a historical building, structure or other physical remains.

However, present studies have involved members of the community to conduct survey work and recognise heritage issues. The work carried out to date provides a valuable foundation to develop from, however, Council should aim to enhance its current understanding and knowledge of heritage, and consider preparing a local heritage strategy that would consolidate existing information and knowledge beyond the built environment and provide direction to managing Aboriginal and European heritage within Upper Lachlan.

Recommended actions – European heritage

The key issue for Upper Lachlan is the limited amount of consolidated heritage information. Heritage schedules do exist in the Gunning, Crookwell, and Mulwaree Local Environmental Plan's and the area is partially covered by the Draft Mulwaree Shire Heritage Study 2002-2004, however substantial knowledge gaps occur.

The Heritage Council of NSW has developed criteria to assist in determining whether an item should be recommended for listing on the State Heritage Register and whether it is of local, State or National significance. An item must satisfy one or more of the nominated criteria to be considered an item of heritage.

A Community Heritage Study is under preparation which will identify and assess heritage items that reflect the key historical themes for the local government area. It will also make recommendations for the protection and conservation of items identified for their heritage significance.

The Upper Lachlan Local Environmental Plan will include heritage items as as identified by the Community Heritage Study..

Whilst not undermining the importance of built heritage, the actions below seek to emphasise the importance of other heritage issues.

<insert commentary based on the current Community Heritage Study Project>

8. Rural planning issues

This Section — which was prepared with input from Hassall & Associates, describes the state of the agriculture sector in Upper Lachlan and factors affecting that sector. The potential impacts of small lot subdivision on the agricultural sector are also considered.

8.1 Introduction

Agriculture is the dominant land use in the Upper Lachlan LGA, using more than 70% of the land area. The major industries are pastoral based, including wool production, fat lambs and cattle grazing.

Soils types in the Upper Lachlan LGA area are predominantly yellow earth/podzolics. The less common basalt soils found around Crookwell and Taralga are the most valuable for agricultural cultivation. Based on the land capability system for classifying soils, 89 % of land in the local government area is suitable for grazing, with 6 % of land available for cultivation. Over the last 3 years, the Upper Lachlan LGA has received less rainfall on average than during the 1961 to 1990 reference period. Despite this, agricultural production has been able to continue and has coped reasonably well compared to other areas of NSW.

External factors affecting the agriculture sector include commodity markets, the provision of infrastructure, access to labour and drought. All of these external factors can place pressure on the agriculture sector.

The Standard Instrument specifies objectives for agricultural land in relation to its protection, maintenance and the avoidance of fragmentation. The NSW Department of Primary Industries has provided a number of guidelines/recommendations designed to protect agriculture in the Upper Lachlan LGA.

Agricultural sustainability can also be promoted by: encouraging people with independent means to invest in the sector, controlling stocking rates, encouraging the adoption of drought management strategies, and paying land managers for the care of ecologically sensitive areas. Overall, the system adopted for planning in rural areas needs to rely on a set of broad, outcome-orientated principles.

This section of the Upper Lachlan Strategy explores:

- current and historical land uses and patterns of agricultural activity
- agricultural resources documented in land capability and land suitability mapping
- climatic influences and water availability
- external influences such as market fluctuations as well as regulatory and statutory controls by local, State and Commonwealth Governments
- relevant rural and agricultural provisions in the Standard Instrument.

8.2 Definitions

The following definitions are relevant to the discussion in this Section. These definitions are from the Dictionary of the Standard Instrument.

- Agricultural produce industry – means a rural industry involving the handling, treating, processing or packing of produce from agriculture (including dairy products, seeds, fruit, vegetables or other plant material), and includes flour mills, cotton seed oil plants, cotton gins, feed mills, cheese and butter factories, and juicing or canning plants, but does not include a livestock processing industry.
- Agriculture – means extensive agriculture, cotton and rice cultivation, intensive livestock agriculture, horticulture, viticulture, turf farming, animal boarding or training establishments, aquaculture or farm forestry.
- Intensive livestock agriculture – means the keeping or breeding of cattle, poultry, goats, horses or other livestock, that are fed wholly or substantially on externally-sourced feed, and includes operation of feed lots, piggeries, poultry farms or restricted dairies, but does not include the operation of facilities for drought or similar emergency relief or extensive agriculture or aquaculture.

8.3 Agricultural land uses in Upper Lachlan

8.3.1 Area of land used for agriculture

A breakdown of agricultural land use by industry in the Upper Lachlan is provided in Table 8-1. In 2001, over 75 % of agricultural land in Upper Lachlan was used for grazing activities, primarily wool and fat lamb production. Grazing has been significant in the region for almost 200 years, particularly sheep grazing. The first farming in the area concentrated on wheat, however, fine wool soon became the speciality of the region. Potatoes are grown on the basalt soils around Crookwell and Taralga. There is limited horticultural activity in the Upper Lachlan LGA.

Table 8-1 Land area in Upper Lachlan used for agricultural production by industry

Industry	1997	2001
Total area of agricultural holdings:	441,959	456,025
By industry:		
▪ horticulture	166	166
▪ lucerne, hay and silage	551	2,097
▪ field crops	5,117	4,874
▪ cereals	3,853	2,164
▪ oilseeds	0	280
▪ grain legumes	3	19
▪ pastures	208,031	350,468
▪ irrigation		454

Source: ABS Census Comparison, South Eastern Statistical Division, 1997 and 2001.

8.3.2 Non-agricultural land uses

The Department of Natural Resources mapped land use within the Upper Lachlan local government area in 2003, identifying agricultural and non-agricultural land uses — see Table 8-2.

Table 8-2 Non-agricultural uses within Upper Lachlan

Land use class	Area (hectares)
Conservation areas	3,373
Mining and quarrying	187
National parks	32,242
Nature reserves	199
Power generation	138
River and drainage systems	6,081
State forests	2,714
Transport and other corridors	3,721
Tree and shrub cover	77,032
Urban	2,385
Wetland	509
Total	128,581

Source: Department of Natural Resources Land use mapping (2003).

8.3.3 Agricultural production value

Livestock and their products are the most significant agricultural commodities in the region. Sales of livestock and their products represented 89.3 % of the value of agricultural production in 2001, with close to 540,000 head of stock sold and over 7,400 tonnes of wool produced.

The large areas of grazing land in the Upper Lachlan LGA contribute to the significance of regional wool production, which was estimated at 7,402 tonnes in 2001. A breakdown of production by commodity for 1997 and 2001 is provided in Table 8-3. Livestock numbers and sales are provided separately in Table 8-4.

Table 8-3 Production of agricultural commodities

Industry	1997	2001
Vegetables (tonnes)	1,744	n/a
Pome fruit (tonnes)	149	n/a
Stone fruit (tonnes)	3.7	0.745
Grapes (tonnes)	35	n/a
Eggs (dozen)	2,626	3,487
Honey (tonnes)	92	71
Wool (tonnes)	6,646	7,403
Cereals (tonnes)	9,605	4,949

Note: n/a indicates that this item is not reported by the ABS.
 Source: ABS Census Comparison, South Eastern Statistical Division, 1997 and 2001.

Honey is also a significant commodity to the region, with 71 tonnes produced in 2001. The primary Eucalypt floral resources in the region are Red Stringy Bark, Apple Box, Manna Gum, Candle Bark, Bundy Apple, Brittle Gum and Yellow Box. Ground herbaceous plants are also vital for bee keepers (Hassall & Associates 2002). The total value of production in the Upper Lachlan local government area was estimated at \$148,000 in 2001.

Sheep are the dominant livestock in the Upper Lachlan local government area, with the regional flock estimated at over 1.5 million head in 2001. The number of cattle in the region is estimated at some 64,000 head. Pig production is a relatively minor industry in the Upper Lachlan. The number of sheep sold in 2001 increased by 39 % from 1997.

Table 8-4 Livestock total number and total sold

Industry	1997	2001
Cattle:		
number	74,760	64,273
sold	22,114	28,528
Sheep:		
number	1,464,914	1,578,030
sold	381,307	530,407
Pigs:		
number	3,006	4,772
sold	3,422	8,540

Source: ABS Census Comparison, South Eastern Statistical Division, 1997 and 2001.

The total value of agricultural production in the region was estimated at close to \$74 million in 2001, with livestock products, largely wool, contributing 58 % of value at \$43 million. The details are shown in Table 8-5.

The value of livestock slaughterings was also significant to the region, estimated at \$26 million in 2001. Other commodities of note included cropping and fruit production however, both declined in value by more than 20 % over the 4 years to 2001. The value of livestock slaughterings showed the largest increase in value since 1997, with an increase of 80 % as a result of increased livestock sales, improved prices and drought conditions.

Table 8-5 Value of agricultural production (\$ Millions)

Industry	1997	2001	% change
Fruit	0.21	0.16	-23%
Crops (excl. pastures and grasses)	4.30	3.46	-20%
Crops total	5.05	4.68	-7%
Livestock slaughterings	14.70	26.50	80%
Livestock products	37.10	42.79	15%
Total value of agriculture	61.36	77.59	26%

Source: ABS Census Comparison, South Eastern Statistical Division, 1997 and 2001.

The agriculture, forestry and fishery industries are the largest employers in the Upper Lachlan local government area. Figures provided by the Australian Bureau of Statistics in 2001, Census of Population and Housing indicate that over 35 % of the region's population is employed in these industries. For comparative purposes, the next largest employer is retail trade, which employs 8 % of the total population. The importance of this sector to the local government area's labour force is further demonstrated by comparing the proportion of people employed at the NSW level. The proportion of people employed in the agriculture, forestry and fishery industries across NSW in 2001 was estimated at only 3.4 % (Australian Bureau of Statistics 2001).

Apart from the traditional agricultural industries within the Upper Lachlan local government area, several smaller niche industries are growing in importance to the rural economy. Examples include olives and grapes, Lawson wheat, flowers (such as gladioli, lavender and daffodils) and a range of berries. Furthermore, a number of niche animal enterprises are present, including ostriches, alpaca and deer (Capital Region Development Board 2005).

8.4 Existing allotment sizes

The data in Table 8-6 provides an indication of the range of allotment sizes in the Upper Lachlan local government area. This Table, which was derived from the NSW Cadastre, shows that 83 % of the Upper Lachlan local government area consists of allotments less than 40 hectares.

Table 8-6 Range of allotment

Size (hectares)	Number of lots	Proportion of local government area (%)
< 5 ¹	8,536	35
5- 19.9	8,286	34
20-39.9	3,680	15
40-99.9	2,799	11
>100	1,355	5
Total	24,656	100

Note 1: Includes towns and villages

However, based on the size of agricultural holdings in the Upper Lachlan local government area, a majority of farm businesses operate on more than one allotment, as indicated by the average size of agricultural holdings reported in Table 8-7. For example, in 2001, the average size of agricultural holdings in the Upper Lachlan local government area was 549 hectares, while less than 1 % of allotments were more than 300 hectares. An indication of the consolidated ownership of allotments is that the Upper Lachlan has 5,849 land valuations.

There is a difference in the average size of agricultural holdings between the former Crookwell and Gunning s, the average holding size is approximately 28 hectares greater in the former Crookwell than in the former Gunning , as indicated in Table 8-7.

Table 8-7 Average size of agricultural holding (hectares)

Region	1997	2001
Former Crookwell	529	539
Former Gunning	549	567
Upper Lachlan	536	549

Source: ABS Census Comparison, South Eastern Statistical Division, 1997 and 2001.

Table 8-8 also identifies the number of agricultural holdings that are greater than 160 hectares in Upper Lachlan. Considering holdings is also relevant as subdivision applications submitted to Council may propose to consolidate numerous adjoining allotments within a holding and subdivide pursuant to any minimum allotment size.

Table 8-8 Average size of agricultural holdings

Area (hectares)	2006
160 – 200	213
200 – 400	503
400 – 600	213
600 – 1,000	137
1,000 – 3,000	66
3,000 – 6,500	7

Source: Upper Lachlan Council

The Standard Instrument does not provide clauses that aim to allow succession planning within a holding. Limited flexibility is provided by the Standard Instrument to enable retiring farmers to reside on a concessional allotment on an unproductive part of a holding while the next generation continues operations on the land.

8.5

External factors influencing the agricultural sector

There are a range of external factors that affect the agricultural sector, including policy and regulation, commodity markets, infrastructure provision and quality, access to labour resources and drought. Commodity markets affect the agricultural sector in a number of ways. Commodity markets are variable — prices rise and fall within and between years, meaning that returns to farmers on their production, and thus their incomes, are also variable. It is, therefore, challenging for producers to manage their farms from year to year.

In addition to fluctuating commodity prices, the terms of trade for farmers are continuing to decline, indicating that prices paid for farm inputs into agricultural commodity production have been rising at a faster rate than prices received for agricultural commodities sold by farmers, which in some cases, such as wool, have fallen. Given that approximately 80 % of the carrying capacity of the Upper Lachlan local government area is allocated to sheep enterprises, producers in this region face the challenge of continually improving their production efficiency and maintaining their incomes. Much of the wool produced in the Upper Lachlan is fine wool, of 16 to 17 microns, which attracts higher prices than coarser wools.

In general, where prices and returns in one industry are declining, producers will move to enterprises where returns are higher, to maintain viability or minimise losses. However, enterprise change can be constrained by a lack of knowledge, land use capability, or the requirement for additional capital to make a change.

Agriculture is affected by the availability of farm labour. Periods of drought, in particular, result in a decline in demand for labour and reduce farm production. As a result, farm labour often seeks work in other areas, making it difficult for farmers to recruit labour when production recommences following a drought.

Drought is an important factor, as it directly affects the productive capacity of agricultural producers. The map of New South Wales in Figure 8-1 indicates that the southern portion of Upper Lachlan Shire is subject to marginal drought conditions whilst the northern portion (north of Crookwell) is considered to be subject to drought conditions.

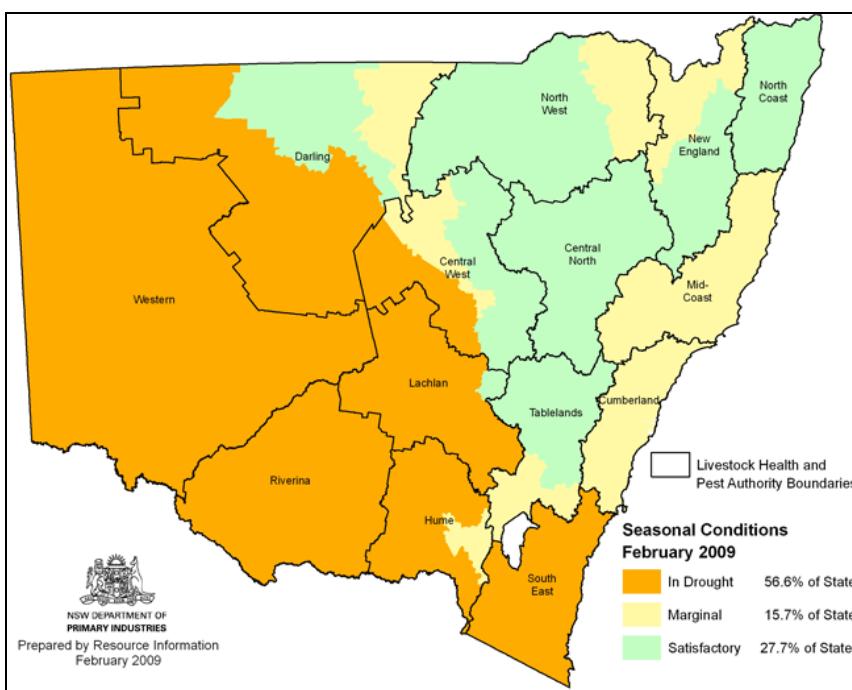


Figure 8-1 Seasonal conditions, Australia wide

Source: NSW Department of Primary Industries (2009).

The average annual rainfall in Crookwell is 881.8 mm. Since 2004/2005, average annual rainfall has consistently been below this average. In 2004/2005 the average was 707.8 mm, in 2005/2006 it was 751.5 mm, in 2006/2007 it was 632.2 mm and in 2007/2008 it was 563.5 mm. Similarly, in Taralga the average annual rainfall has been below the average of 882.9 mm. In 2004/2005 it was 760.9 mm, in 2005/2006 it was 796.2 mm, in 2006/2007 it was 675.3 mm, and in 2007/2008 it was 673.2 mm.

For summer to mid autumn in 2009, the outlook for rain greater than the historical median is cross between 40 and 60%, meaning that above average falls are about as equally likely as below average falls in these regions. These conditions are therefore expected to continue throughout 2009.

8.6 Pest and weed control

8.6.1 Overview

The control of feral animals and weeds is an important rural issue. In most cases, pest and weed control requires an integrated approach across all landholders within a region. Weeds of national significance found in the Upper Lachlan region include Blackberry (*Rubus fruticosus*), Bridal Creeper (*Asparagus asparagoides*), Gorse (*Ulex europaeus*), Serrated Tussock (*Nassella trichotoma*), Willow and Chilean needle grass. These weeds have a variety of adverse effects on agricultural production in the region, providing a habitat for feral animals, smothering crops and pastures, preventing stock from grazing affected areas, changing the nutrient status of local waterways and reducing water temperatures. Biological agents have been introduced, where appropriate, to help manage some weed infestations (Australian Weeds Committee 2004). The problem of serrated tussock is an ongoing concern.

Like the management of weeds in the region, pest animal management needs to be set within broader regional and local management plans. Common animal pests in the Upper Lachlan include feral pigs (*Sus scrofa*), the European red fox (*Vulpes vulpes*), the European rabbit (*Oryctolagus cuniculus*) and feral goats (*Capra hircus*).

The effects of these pests on agricultural production in the area include preying on livestock (in particular, lambs), uprooting and feeding on crops, and competing with livestock for pastures. Potential also exists for the spread of domestic and exotic diseases (DAFF 2005). Alternative pest management strategies adopted in the region include fencing, bulldozing rabbit warrens and baiting foxes.

8.6.2 Serrated tussock – a significant weed threat

Serrated tussock (*Nassella trichotoma*) is prevalent in the Upper Lachlan region and has been declared a Class 4 noxious weed under the *Noxious Weeds Act 1993* and also classified as a ‘weed of national significance’ by the Federal Government. This classification requires landholders/occupiers to take action to control serrated tussock in their area.

Serrated tussock management in the Upper Lachlan is an on-farm and regional issue. Its significant impacts on farm viability and the speed of its invasion are threats to what has traditionally been profitable agricultural land used for grazing. The primary impact of serrated tussock is to reduce the productive capacity of a farm. Being unpalatable, serrated tussock reduces the area of productive pasture. This reduces earning capacity and increases costs of production. The impacts of inadequate control can lead to a consequential spread of the weed.

Serrated tussock is widespread in the region. The extent of serrated tussock infestation in the Upper Lachlan region is shown in

Table 8-9.

Table 8-9 Estimated percentage of the Upper Lachlan region affected by serrated tussock

Infestation	Percentage Coverage
Scattered tussock	51.0%
10 – 50% of ground cover	4.8%
Over 50% of ground cover	6.3%
Tussock free	37.9%

Source: Upper Lachlan Regional Action Plan, 2000.

However, since these figures were prepared in 2000, there have been widespread changes to weed infestations particularly serrated tussock and pattersons curse principally due to the extended drought period. These figures therefore underestimate the extent of serrated tussock across the Upper Lachlan Shire.

Demographic changes in the farmer population of the region and the increasing demand for rural lifestyle lots are identified as key issues. A case study project completed by Hassall & Associates (2005) indicated that there is little incentive to engage in expensive and extensive control programs for this weed where there is no commercial incentive to do so. Consequently, the risk of spread of serrated tussock, which is a serious threat to farm viability, is increased by the presence of uncontrolled infestations on adjacent properties, whether they are rural lifestyle properties or commercial farming properties.

Serrated tussock is a community issue, as a result of the highly dispersive nature of the seed. Control is the responsibility of individual landholders. Local government also plays a role as it has the power to assist cooperative landholders and force non-cooperative landholders to control the weed.

Under Sections 12 and 13 of the *Noxious Weeds Act 1993*, private landholders/occupiers and public authorities are responsible for the control of noxious weeds on their land and under Council's management plan for the enforcement of Class 4 weeds. Serrated tussock 'must be fully and continuously suppressed and destroyed'. Therefore, both private landholders and relevant government authorities, including local, State and Commonwealth governments, are responsible for controlling the spread of serrated tussock on their lands.

Importantly, whilst control of serrated tussock on private land can be problematic, there are areas of Crown land in the Upper Lachlan Shire that are heavily infested with serrated tussock. Poor management of these areas in the past has been shown to lead to the spread of tussock into adjoining private landholdings areas.

8.7 Agricultural resources

8.7.1 Topography

The Upper Lachlan region has a general decrease in elevation from east to west. The highest lands, with elevations approaching 1,160 metres, occur in the north-east associated with the Great Dividing Range. The lowest points in the south-west fall below 400 metres. Much of the Upper Lachlan LGA features rolling country, varying in elevation from 700 metres to 1,000 metres above sea level. (refer Figure 1-2)

The area east of the Lachlan River is undulating with river valleys that become increasing incised to the north. The basalt areas of Crookwell and Taralga form flat-topped plateaux with flat valleys, but away from these areas the country becomes increasingly rugged.

Relief and slope have a major influence on soil within the Upper Lachlan LGA, as shown in Table 8-10 (Hird 1991). For example in the more rugged terrain (slopes 25–75 %), rock outcrops, lithosols and shallow earth soils predominate, restricting cultivation, whereas, the basaltic plateau produces conditions suitable for cultivation.

Table 8-10 Relationship between topography and soils

Terrain	Soils
Rugged terrain (25%-75% sideslopes)	Lithosols and shallow earth
Rolling terrain (5%-25% sideslopes)	Shallow earths and podsolic soils
Gently undulating terrain and fan slopes (0%-5% sideslopes)	Deep earth, podsolic soils and sloths
Alluvial terrain	Alluvial soils
Basaltic plateau uplands	Krasnozems, prairie soils and chocolate soils

Source: Hird, 1991.

8.7.2 Climatic factors

Soil forming processes (weathering, new mineral formation, leaching of soluble elements and the eluviation of colloids) are strongly influenced by climate. The average annual rainfall in the area ranges between 600 and 850 millimetres. The higher rainfall occurs in a belt around Crookwell and Taralga. Local topography may create rain shadows in some areas. Frost is common in the rolling and hilly terrains. The rainfall in the Upper Lachlan LGA over the past 2 years has been below that of the standard reference periods of 1961 to 1990. In Crookwell (elevation 887 m), the mean maximum temperature is 18.2 °C and the mean minimum temperature is 5 °C. In Taralga (elevation 845 m) the mean maximum temperature is 18.2 °C and the mean minimum temperature is 6 °C (Bureau of Meteorology, 2008). Temperature decreases with increases in elevation. Aspect also affects temperature, as north-west facing slopes are generally warmer than south-east facing slopes.

8.7.3 Land capability

The Soil Conservation Service, which is now within the Department of Environment and Climate Change, classifies land in terms of its inherent physical characteristics or physical constraints. The classification system denotes measures that are needed to protect land from soil erosion and other forms of land degradation. The eight classes, denoted by Roman numerals within the classification system, indicate the capability of the land to remain stable under particular land uses.

The features of the classification system are explained in Table 8-12. Class I identifies land that has no constraints to normal land use, including intensive cultivation, while at the other end of the scale, Class VIII refers to land that is best protected by green timber.

In the Upper Lachlan LGA, 89 % of land is suitable for grazing only, of which half has limited cultivation capacity (Classes IV and V), and the other half is not suitable for any form of cultivation (Classes VI and VII) (see Table 8-12). Only 6 % of land available in the Upper

Lachlan local government area is suitable for cultivation (Classes II and III). This land is associated with the basalt soils located around Crookwell and Taralga.

Figure 8-2 indicates that the majority of allotments in Classes II and III have an average allotment size of 12 hectares (excluding town allotments).

Table 8-11 Description of rural land capability classes

Broad category	Class	Description
Land capable of being regularly cultivated	Class I	No special soil conservation works or practices necessary
	Class II	Soil conservation practices such as strip cropping, conservation tillage and adequate crop rotation
	Class III	Structural soil conservation works such as diversion banks, graded banks and waterways, together with soil conservation practices as in Class II
Land not capable of being regularly cultivated, but suitable for grazing with occasional cultivation	Class IV	Soil conservation practices such as pasture improvement, stock control, application of fertiliser and minimal cultivation for the establishment or re-establishment of permanent pastures
	Class V	Structural soil conservation works such as absorption banks, diversion banks and contour ripping, together with the practices as in Class IV
Land not capable of being cultivated, but suitable for grazing	Class VI	Soil conservation practices including limitation of stock, broadcasting of seed and fertiliser, prevention of fire and destruction of vermin; this class may require some structural works
	Class VII	Land best protected by green timber
	Class VIII	Cliffs, lakes or swamps and other land incapable of sustaining agricultural or pastoral production

Table 8-12 Land capability in the Upper Lachlan LGA

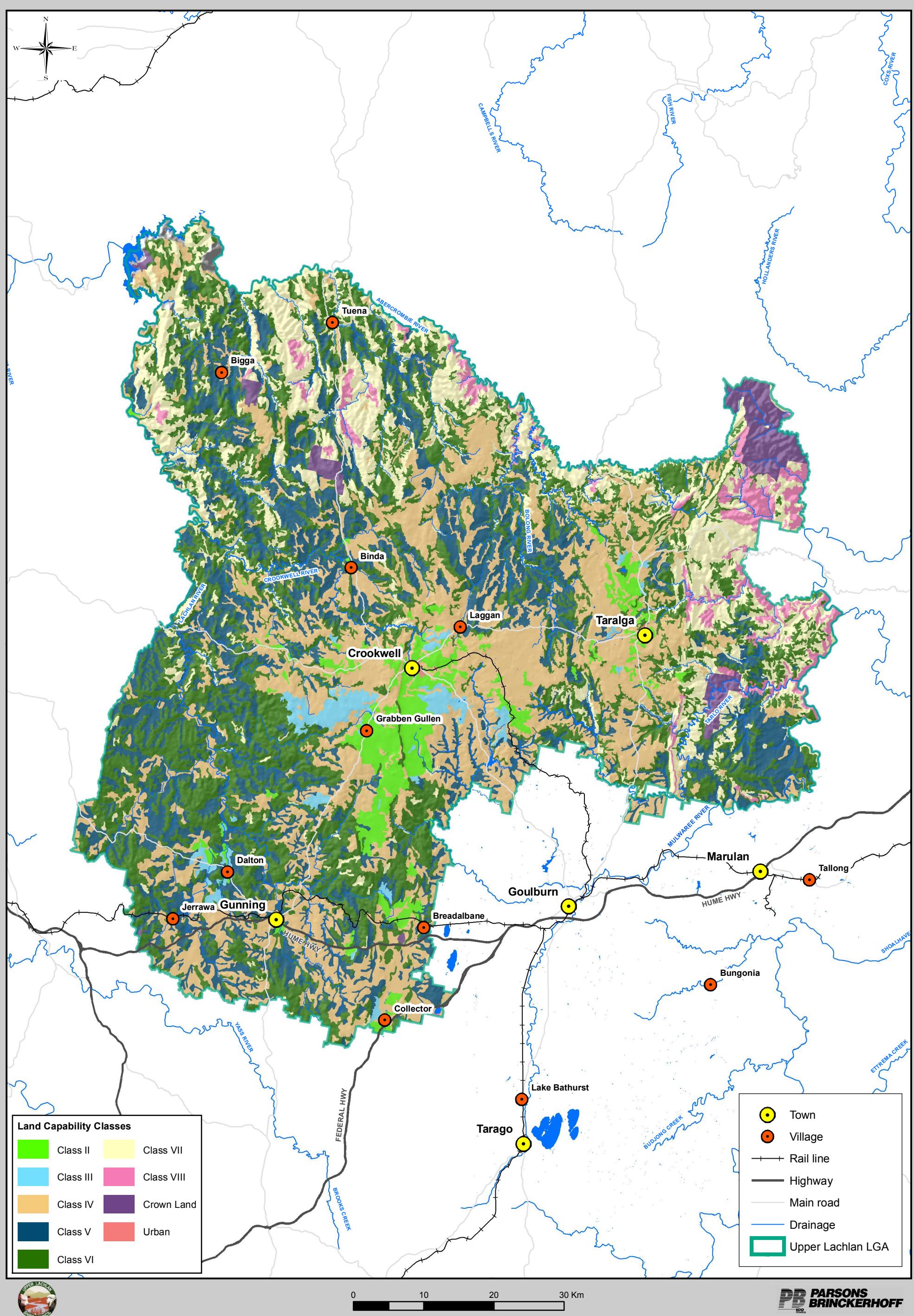
Class	Capability	Area (hectares)	Percentage of area
II & III	Land suitable for regular cultivation	40,136	5.6%
IV & V	Suitable for grazing (occasional cultivation)	320,245	45.1%
VI & VII	Not suitable for cultivation	311,659	43.9%
VIII	Not suitable for cultivation	20,572	2.9%
U	Urban	462	0.1%
NP	National Park	10,330	1.4%
O	Crown Land	7,179	1.0%

Source: Department of Primary Industries 2005.

8.7.4 Agricultural resources summary

The factors that influence the capability and suitability of the land under consideration include:

- soil type, as it influences the productive capacity of the land
- subsurface drainage for plants that are sensitive to waterlogging
- surface drainage where waterways preclude soil disturbance
- slope, as it influences the capacity to cultivate from a personal safety or erosion hazard viewpoint
- erosion risk, which is linked to rainfall pattern, slope and soil type
- high conservation value vegetation
- surrounding activities where one land use is placed at risk by another land use (e.g. the use of herbicides for weed control made necessary by the exclusion of livestock)
- proximity to markets and processing facilities
- vulnerability to weed invasion
- availability of water
- urban encroachment.



8.8 Relevant legislation and NSW Government policies

8.8.1 Water resources and regulation

The legislative framework is governed by the *Water Management Act 2000* (the WMA).

The WMA identifies the need to develop water sharing plans, requirements to provide water for the environment, identifying priorities between different types of access licences, defining basic rights and establishing new trading arrangements.

The WMA is being phased in geographically. It applies to those water sources (river, creek, groundwater source) where a water sharing plan has been developed. A water sharing plan has been developed for the Lachlan regulated river water source (i.e. the Lachlan River from the upper limits of the Wyangala Dam water storage, downstream to the junction with the Murrumbidgee River). The Wyangala Dam borders the north-west boundary of the Upper Lachlan local government area.

For other water sources in the Upper Lachlan, water sharing plans have not yet been developed. The *Water Act 1912* remains in force in those areas. Once a plan is developed, the WMA will commence for those water sources.

The Department of Water and Energy, under direction from the Minister for Natural Resources, is currently preparing a 'macro' water-sharing plan for water sources in the Lachlan River catchment, not covered by existing plans. It is anticipated that these macro plans will be implemented in July 2006. These macro plans will contain provisions to:

- share water between all water users and the environment
- improve the health of our rivers
- provide security of access for water users
- meet the social and economic needs of regional communities
- facilitate water trading.

Riparian rights

The WMA defines the riparian rights of landholders with river or stream frontages as a basic right. This right gives landholders access to water for stock and domestic use. Land subdivisions along rivers and streams result in the growth of these rights and can have potentially significant impacts on other water users and the environment. The WMA was amended in 2004 to permit the Minister to prepare guidelines to control such growth. This amendment requires the owners or occupiers of new landholdings (created by subdivision) to take and use water in a manner consistent with regulations. When developed, these guidelines are likely to provide a standard for 'reasonable use', which landholders will apply to themselves.

Town water supply

In NSW, outside the major metropolitan regions of Sydney, Newcastle and Wollongong, the provision of town water supplies is, with few exceptions, a responsibility the local water utility, of which Upper Lachlan Council is one such utility provider.

The Minister is able to increase the access licence of a local water utility in two ways:

- When a local water utility applies to the Minister to increase its licence to reflect any rapid growth of population within the utility's area that requires an immediate increase in the availability of water for supply (s66(4) of the WMA).
- Every 5 years, to account for variations in population together with variations in associated commercial activities (s.66(3) of the WMA). (Associated commercial activities are defined by the WMA in line with the *Australian and New Zealand Standard Industry Classification* (1993)).

One of the NSW Government's objectives in managing town water supply, as outlined in the *State Water Management Outcomes Plan* (Department of Land and Water Conservation 2002), is that water consumption in country towns should decline at least 5 % per head of population on average state-wide. Funding encouragement is given to local water utilities that implement strong demand management strategies.

8.8.2 Native vegetation

The *Native Vegetation Act 2003* seeks to protect the health of our land, rivers and wildlife, whilst delivering investment security and increased flexibility to landholders. The new system is based on voluntary agreements between landholders and catchment management authorities, referred to as 'property vegetation plans'.

The Lachlan Catchment Management Authority received funding in 2005 to invest in property vegetation plans, revegetation of native and riparian vegetation, and management of perennial pastures. This funding is to help encourage landholders to participate in creating property vegetation plans for their own properties.

The native vegetation reforms introduced a series of routine agricultural management activities that are not subject to approval processes, including:

- sourcing timber for farm structures
- noxious weed removal
- collection of firewood for non commercial purposes
- removal of imminent risks of serious personal injury or damage to property
- controlling pest animals in accordance with eradication orders
- rural infrastructure within appropriate buffer distances
- corridors for fire protection, power and water supply
- harvesting commercially planted timber.

The native vegetation reforms also establish maximum clearing distances around rural infrastructure, such as dams, permanent fences, buildings, windmills, bores, stockyards, farm roads. Different rules apply for small holdings (less than 10 hectares) and properties greater than 10 hectares. The Lachlan Catchment Management Authority is the active body dealing with these matters.

The Hawkesbury Nepean Catchment Management Authority also actively assists in catchment management and financially contributes to areas within the catchment area. Areas along the eastern boundary of the local government area, including Taralga, are within the Hawkesbury Nepean Catchment. The Hawkesbury Nepean Catchment

Management Authority has forecast to provide over \$5.4 million direct to landholders across the catchment to manage:

- river and creek bank vegetation
- native bushland and grasslands
- degraded and eroded land.

A brief description of each project has been provided below.

River restoration project

This Project aims to help landholders protect and restore creek and river banks, and provides landholders with grants of up to \$20,000 to:

- control invasive weeds (including willows) along waterways
- plant local native species to improve vegetation links and biodiversity
- fence creek and river banks to protect native vegetation
- provide off-river stock watering systems.

Bushland conservation project

This Project aims to maintain and further improve native vegetation, including native grasslands, woodlands and forests that are not directly associated with waterways.

Over \$1.1 million dollars is being made available to landholders in the rural local government areas of the catchment, including Upper Lachlan, Wollondilly, Wingecarribee, Goulburn Mulwaree, Greater Lithgow, Oberon, Blue Mountains, Gosford and Singleton local government areas.

The funds under this project will primarily be available to:

- fence remnant (original) native vegetation to protect it from stock
- plant local native species to connect patches of remnant native vegetation
- control weeds in remnant vegetation.

Catchment Protection Scheme

This Scheme is designed to repair land degradation within the Warragamba catchment and protect water supplies for the Sydney metropolitan region and the Blue Mountains.

Under this program, funding is being made available to:

- fence vulnerable areas, including gullies
- stabilise creek crossings
- install river bank and bed erosion controls works
- construct flumes (a concrete or rock chute that replaces an eroded gully to convey water)
- install sediment trapping weirs
- construct contour or graded banks
- reshape eroded gullies

- plant native vegetation in treated areas.

8.8.3 Department of Planning's Standard Instrument

The Department of Planning's Standard Instrument was gazetted on 31 March 2006 and comprises compulsory requirements which the new Upper Lachlan Local Environmental Plan will need to implement. There are elements of the Standard Instrument that are optional, resulting in some flexibility. The Standard Instrument identifies 34 land use zones that may be applied across the State. Two zones relevant to rural land uses in Upper Lachlan include:

- *Rural zones* with the following relevant sub-zones:
 - RU1 Primary Production
 - RU2 Rural Landscape
 - RU3 Forestry
 - RU4 Rural Small Holdings
 - RU5 Village
- *Residential zones* with the following relevant sub-zone:
 - R5 Large lot residential

Table 8-13 states the core objectives of each of these sub-zones, as delineated in the Standard Instrument. The Standard Instrument notes that additional objectives may be adapted to a zone to reflect local objectives of development, but only if they are consistent with the core objectives of development in the zone, as set out in Table 8-13.

Table 8-13 Objectives of rural land zonings

Zone	Sub-zone	Objective
Rural zone	RU1 Primary Production	To encourage sustainable primary industry production by maintaining and enhancing the natural resource base. To encourage diversity in primary industry enterprises and systems appropriate for the area. To minimise the fragmentation and alienation of resource lands. To minimise conflict between land uses within the zone and with adjoining zones.
	RU2 Rural Landscape	To maintain the rural landscape character of the land. To provide for a range of compatible land uses, including extensive agriculture.
	RU3 Forestry	To enable development for forestry purposes. To enable other development that is compatible with forestry land uses.
	RU4 Rural Small Holdings	To enable small-scale sustainable primary industry and other compatible land uses. To maintain the rural and scenic character of the land. To ensure that development does not unreasonably increase the demand for public services or public facilities. To minimise conflict between land uses within the zone and adjoining zones.
	RU5 Village	To provide for a range of land uses, services and facilities that are associated with a rural village.
Residential zone	R5 Large lot residential	To provide residential housing in a rural setting while preserving environmentally sensitive locations and scenic quality. To ensure that large residential allotments do not hinder the proper and orderly development of urban areas in the future. To ensure that development in the area does not unreasonably increase the demand for public services or public facilities. To minimise conflict between land uses within the zone and

	adjoining zones.
Source: Department of Planning 2006	

Subdivision

Clause 20 to the Standard Instrument stipulates (optional clause) a minimum subdivision lot sizes for rural zones to be provided through a Lot Size map that would define minimum lot sizes for rural areas across Upper Lachlan. The objective of Clause 20 is stated as:

“provide flexibility in the application of standards for subdivision in rural zones to allow land owners a greater chance to achieve the objectives for development in the relevant zone”.

Relevant to the strategic planning for the Upper Lachlan , this Clause applies to Zone RU1 Primary Production, Zone RU2 Rural Landscape and Zone RU4 Rural Small Holdings.

Although the Clause would permit the subdivision of an allotment below a nominated minimum lot size this would be restricted to agricultural purposes and would not enable a dwelling entitlement to occur.

Clause 23 to the Standard Instrument identifies exceptions to development standards stipulated within a local environmental plan. This Clause is designed to provide flexibility in applying certain development standards to particular development and achieve better outcomes for and from development through enabling an appropriate level of flexibility in particular circumstances. This Clause is designed to supersede State Environmental Planning Policy 1 and introduce flexibility within the local environmental plan framework.

Clause 23(6) however, restricts the level of flexibility in respect to subdivision within prescribed zones. This Clause stipulates that Consent must not be granted under this Clause for a subdivision of land in Zone RU1, RU2, RU3, RU4 or R5 if:

- (a) the subdivision will result in two or more lots of less than the minimum area specified for such lots by a development standard; or
- (b) the subdivision will result in at least one lot that is less than 90% of the minimum area specific for such a lot by a development standard.

This provision introduces limited flexibility in subdivision of properties and would enable any one property to fall below the minimum subdivision size defined under the Lot Size Map up to a maximum of ten percent, subject to satisfying all of the provisions of Clause 23.

8.8.4 Department of Primary Industries recommendations

The Department of Primary Industries has provided specific recommendations for the Upper Lachlan Strategy and Upper Lachlan Local Environmental Plan in relation to agriculture. The Department sought to highlight the need to protect, promote and sustain agriculture in the Upper Lachlan LGA. Underpinning its recommendation are two NSW Government policies:

- Policy for Sustainable Agriculture in NSW
- Policy for Protection of Agricultural Land 2004.

These Policies identify a range of tools to achieve the aims of the Policies, including education, coordinated natural resource policies and legislations, research and promotion of conservation farming practices, and government reforms. Planning policies and legislation

can be a vital part in managing threats to agriculture. Table 8-14 provides practical planning guidelines prepared by the Department of Primary Industries that can help achieve the aims of the two policies. Whilst not discussed in this Strategy, it is important to recognise that other tools suggested in the *Policy for Sustainable Agriculture in NSW* also play a crucial role in fulfilling the aims of the policies.

Table 8-14 Practical planning guidelines to protect and promote agriculture

Aim	Planning tool
<i>Ensure land is available for future generations with minimal conflict</i>	Plan location of rural residential Provide access to water supply Review subdivision laws, in particular minimum lot size
<i>Maintain ecologically sustainable development</i>	Identify suitable land for specific agricultural industries and ensure this is carried through to zoning and objectives In the definition of agriculture, allow a full range of agricultural industries
<i>Preserve the integrity of agriculture in the region</i>	Facilitate the structural adjustment of agricultural industries and rural communities
<i>Contribute to the regional and state economy</i>	Provide opportunities for agricultural processing facilities to provide confidence for investors

Source: NSW Department of Primary Industries

8.9 Issues for consideration in preparing the Upper Lachlan Local Environmental Plan

This Section identifies elements that would need to be considered in the preparation of the Upper Lachlan Local Environmental Plan with regard to rural and agricultural land uses.

8.9.1 Rural zone objectives of the Standard Instrument

Protecting agricultural land

A key aim of the RU1 Primary Production zone is to ‘minimise the fragmentation and alienation of resource lands’. This aim is also a key theme identified for the Strategy and will influence strategic planning for Upper Lachlan to 2020. It is important however, to identify that minimising fragmentation and reducing the alienation of productive lands is a key regional issue for NSW and the Department of Primary Industries.

Table 8-14 identifies planning guidelines prepared by the Department of Primary Industries, which are designed to protect and promote agriculture. The Department wishes to set minimum lot sizes to ensure land is available for future generations.

Major structural changes to the NSW rural sector have been occurring. Alternative methods to promote agriculture and maintain ecologically sustainable development could include:

- encouraging people with independent means to invest in agriculture
- controlling stocking rates
- encouraging drought management strategies
- paying land managers to care for ecologically sensitive areas.

If unrestricted, land uses will change. More valuable land uses will increase over time as demand shifts land away from lower value uses. The transfer of land to the highest land use activity is one form of rural adjustment (Musgrave 1986).

To ensure that agricultural lands are protected and to minimise fragmentation of agricultural land, the Department of Primary Industries recommends that housing density in rural areas be controlled. Rural dwellings on rural allotments, such as those located on the former concessional allotments, contribute to farm fragmentation and increase the incidence of land use conflict.

Houses on smaller rural lots do provide the opportunity to satisfy demand for small farms, the introduction of economic activity and generation transfer within farming families. If well planned and located away from the prime agricultural land, smaller lots and/or part-time farming can be compatible with rural land use.

The removal of concessional lots may have implications for intergenerational farm transfers. Intergenerational farm transfers have been an important process whereby the ownership of farming businesses is shifted to the younger generation. It is important to the ongoing sustainability of the agricultural sector that processes are allowed whereby farms can be transferred between generations, without the next generation left overly vulnerable. Some factors that will determine the ability of farmers to do this include: whether the property qualifies for exemption from stamp duties, the impact of capital gains tax, the effects of sibling rivalry and/or conflict, and the presence of pre-marital agreements (*Review and Evaluation: Family Farm Transfer in a Changing Rural Society*, RIRDC Research Paper 95/8, Barton 1997).

It is important that appropriate planning be undertaken so that future subdivision adjacent to viable farm land does not conflict with the activities of those farms. This typically requires segregation of agricultural land uses and large lot residential zones. Consideration of the impact of residential occupation on the adjoining agricultural will be required at the zoning and development application stage.

Apart from segregation, the use of development conditions on rural lifestyle residents can help to raise awareness in advance. Buffer zones and setbacks for dwellings are another means of dealing with the issue. It is important to plan the location of large lot residential blocks to ensure they are big enough to incorporate buffer zones.

The Strategy attempts to protect sterilisation of agricultural lands through hindrance on or encroachment by sensitive land uses including large lot residential development. Large lot residential land uses have been proposed contiguously with existing towns and villages where sensitive land uses are known and utilities and services are available.

Areas outside of towns and villages are generally zoned for their rural landscape and scenic qualities, primary productive values and environmental conservation. These zones comprise a large proportion of the zoning across the local government area and provide extensive potential for agricultural, intensive and extensive to be accommodated.

Where development has already taken place, steps can be taken to reduce the incidence of conflict. In particular, education of the farming and non-farming residents can help to reduce conflict and improve understanding of needs and farm operations..

Preventing land use conflicts and incompatible development

A number zones within the Standard Instrument aim to prevent land use conflicts and incompatible development from arising. There are currently a number of potential land use conflicts within the Upper Lachlan local government area, including:

- residential use and agriculture (such as spray drift which is incompatible with high density residential development)
- different agricultural enterprises (e.g. organic versus non-organic)
- agricultural enterprises and sensitive environments such as waterways, native habitats, wetlands, schools and public places.

The Department of Planning's policy for *Protection of Agricultural Land 2004* highlights the methods available to avoid non-target and off-site impacts, and to reduce these conflicts. The Policy highlights the potential conflict between residential encroachment onto land used for agricultural pursuits. Large lot residential properties and urban areas can create restrictions on adjoining agricultural pursuits, particularly in relation to spraying. The Policy is concerned that this may lead to land becoming effectively sterilised for agriculture, which in turn creates pressure to re-zone the land.

The three major intrusions are spray drift, dust and noise (see Table 8-15). In relation to spray drift, the *Pesticides Act 1990* directs that use of pesticides must avoid injury to other persons and other property, which places responsibility on the party applying the pesticides to act responsibly.

Table 8-15 Typical conflicts between agriculture and adjoining residential areas

Type of conflict	Description
Noise	Dogs, livestock Farming equipment, pumps, spray machines, transport Ancillary equipment associated with on-farm processing
Odour	Agricultural fertilisers and chemicals Intensive animal industries Application of effluent to pasture
Health concerns	Chemicals Spray drift Smoke
Water	Access Pumping Quantity
Smoke and ash	Burning of pasture, stubble or "rubbish"
Visual intrusion	Hail netting Polyhouses
Nuisance	Stray dogs Vandalism Trespass Noxious and environmental weeds

Source: NSW Department of Primary Industries, 2006.

Some conflicts are of residential origin, such as domestic animals, poor fencing and poor weed control. Buffers are an option that may be pursued to mitigate conflicting land uses and reduce the potential impact of one activity on an adjoining activity. When applying to construct dwellings in rural landscape or primary production areas, landowners would need to be made aware of the potential conflicts that may arise from agricultural operations which may impact rural residential amenity. Impacts from spray drift and dust can be substantially minimised by the creation of a vegetation buffer. By way of illustration, the use of

appropriate vegetation can reduce the desirable buffer distance from more than 300 metres to between 40 and 60 metres to deal with spray drift and dust (refer Figure 8-3). Whilst a vegetation buffer is less successful in eliminating noise impact, it will contribute to reducing the impact.

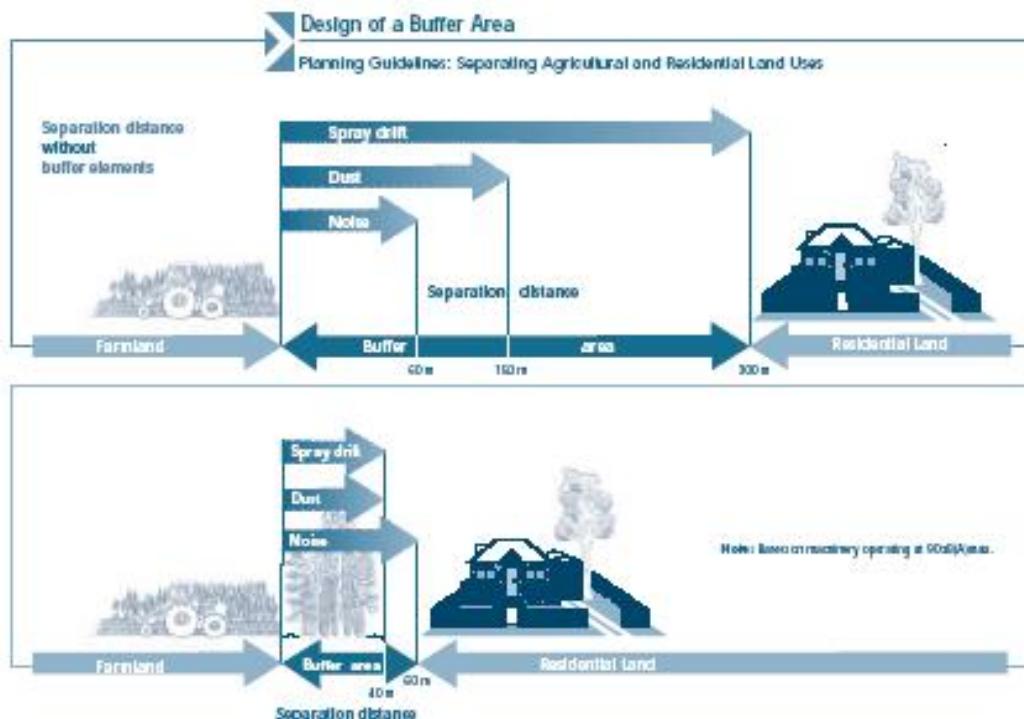


Figure 8-3 Example of a buffer area

Source: http://www.nrm.qld.gov.au/land/planning/pdf/public/plan_guide.pdf

Buffers can also be used to stabilise creeks and drainage lines. This can be achieved by use of a 25 metre buffer zone on both sides, and the exclusion of grazing in the short term.

Protection, enhancement and conservation of the environment

Scope is available through zoning and ongoing strategic planning to obtain positive environmental outcomes in rural areas where large lot residential development takes place. Often, residents of small rural holdings and part-time farmers exhibit high levels of concern for the environment and have access to financial resources to undertake conservation activities.

Positive environmental outcomes may be achieved on large lot residential lots for the following reasons:

- The development and implementation costs of property vegetation plans is less costly on small lots.
- Part-time farmers generally have sources of off-farm income that can be used to invest in the property, in activities such as fencing riparian zones and re-vegetation.
- Large lot residential land holders may be less dependent on the land for income and are, therefore, able to afford more sustainable land management practices.

Maintaining scenic amenity, landscape quality and rural character

The zone objectives in the Standard Instrument for the rural landscape zone and rural small holdings zone prescribe the maintenance of the 'scenic quality' and 'landscape character' of rural areas.

These qualities are particularly important for the Upper Lachlan. Community feedback showed a high level of appreciation of landscape and rural character. These qualities attract tourists and contribute strongly to the Upper Lachlan's sense of place.

The over-arching economic issue which arises as a result of constraints on subdivision, is whether the community benefit from restrictions to protect agricultural land is greater than the loss to the current landholders (farmers) and potential future land owners (rural land residents) (Musgrave 1986).

Essentially, the value of output of the land use guaranteed by the zoning (in this case agriculture) should be greater than the net value of output of each prohibited use (i.e. large lot residential development). This superior value should be reflected in the market value of the land (Musgrave 1986).

Alternative land uses are in competition with each other. In an unimpeded land market, more highly valued land uses will increase in prevalence. Transfer of land to the highest land use activity also underpins efficient rural adjustment.

8.9.2 Large lot residential sub-zone objectives under the Standard Instrument

The objectives of the large lot residential sub-zone in the Standard Instrument are designed to allow for large lot residential housing, whilst ensuring that lots created do not inhibit future urban development or increase the demand for public services or facilities.

Four factors affecting the location of large lot residential development are highlighted in *Better Rural Residential development - A guide for councils west of the Great Divide on preparing rural residential strategies* (Department of Planning 2001) (see Table 8-16).

Table 8-16 Rural residential strategies

Factor	Considerations
Salinity	Large lot residential development can help slow down the rate of salinity by: <ul style="list-style-type: none">▪ maintaining existing vegetation▪ revegetation, which can help to lower the watertable▪ efficient and effective use of water▪ avoiding land already affected by salinity.
Water balance	Connecting large lot residential properties to the town water supply leads to a higher level of water consumption than connection to a reticulated sewer or humus closet (dry toilet) system.
Land use harmony	To reduce land use conflict: <ul style="list-style-type: none">▪ Do not locate rural residential developments on roads leading to mines or plantations.▪ Do not fragment rural land with rural residential developments.

	<ul style="list-style-type: none"> ▪ Utilise existing barriers such as roads. ▪ Locate rural residential developments near or adjoining existing urban areas. ▪ Do not locate rural residential development where it will reduce opportunities for future urban growth.
Conserving biodiversity	Good rural residential design can result in areas where biodiversity value is managed and protected.

Source: Department of Planning, 2001.

To determine the appropriate lot size for large lot residential lots, the Department of Planning suggests the following principles be observed:

- *use land sparingly* — rural residential land should remove as little as possible productive agricultural land and be a manageable size
- *consider proximity to towns* — smaller lots should be closer to towns to utilise existing services
- *consider adjoining uses* — to minimise impacts on and from these uses
- *adjust for landscape* — tailor lot size to suit land capacity to deal with on-site effluent disposal and environmental constraints
- *adjust for lifestyle*.

8.10 Conclusion

This section of the Upper Lachlan Strategy has documented:

- current and historical land uses and patterns of agricultural activity
- agricultural resources through the use of land capability and land suitability mapping
- climatic influences and water availability
- external influences, such as market fluctuations and regulatory and statutory limitations imposed by local, State and Commonwealth Governments
- relevant rural and agricultural provisions in the Standard Instrument.

Agriculture is the dominant land use in the Upper Lachlan LGA, representing over 450,000 hectares (or more than 70 %) of the land area. Within the agriculture sector, the major industries are pastoral-based, including wool production, fat lambs and cattle grazing. Other industries in the Upper Lachlan LGA include horticulture, honey and cereal crop production.

The dominant soil type in the Upper Lachlan is yellow earth/podzolics. The less common chocolate (basalt) soils around Crookwell and Taralga are the most valuable for agricultural cultivation. Relief and slope are also important influences on soils in the Upper Lachlan LGA, with the basaltic plateau areas the most suitable for cultivation. Furthermore, 89 % of land in the LGA is only suitable for grazing, with only 6 % of land available for cultivation under this classification system.

During 2008, the Upper Lachlan LGA has received slightly less than the mean rainfall measured during the 1971 to 2000 reference period, but the has managed reasonably well compared to other areas of NSW. There is little irrigated agriculture in the Upper Lachlan local government area (Bureau of Meteorology, 2009).

There are a range of external factors affecting the agriculture sector, including commodity markets, the provision of infrastructure, access to labour, and drought. All of these external factors can place pressure on the agriculture sector and provide farm managers with a range of challenges.

The Department of Planning's Standard Instrument specifies objectives for agricultural land in relation to its protection, maintenance and the need to avoid fragmentation. The Department of Primary Industries has provided a number of guidelines/recommendations on how the objectives to protect agriculture in the Upper Lachlan LGA might be achieved. However, other planning options are available to promote agricultural sustainability, such as encouraging people with independent means to invest in the sector, controlling stocking rates, adopting drought management strategies and making payments to land managers for the care of ecologically sensitive areas.

Other important regulatory considerations include those in place for water resources and native vegetation. For most water resources in the Upper Lachlan LGA, water sharing plans have not been developed and will instead come under the 'macro' water sharing plans for water resources in the Lachlan River system. The Lachlan Catchment Management Authority received funding in 2005 for the promotion of property vegetation plans, revegetation activities and management of perennial pastures. In addition, the Hawkesbury Nepean Catchment Management Authority is also making available funding for a variety of catchment management projects aimed at protecting water and land resources. Section 8.8.2 identifies the various projects through which the Hawkesbury Nepean Catchment Management Authority is making funding available.

Overall, the system adopted for planning in rural areas needs to rely on a set of broad, outcome orientated principles. These principles include:

- the avoidance of conflict between rural land uses and, therefore, landholders
- reducing the impact of additional service provision responsibilities for local government
- encouraging the sustainability and protection of the environment.