

Ecological Assessment:

Quirindi North Rural Residential Area

Stringybark Ecological

8th August, 2015



Author:	David Carr, Stringybark Ecological dbcarr@bigpond.com 02 6772 4841 0418 651 263
Versions:	1. Draft 2. Edits after client review.
Scientific licence for collection of specimens:	S13246
Original records and voucher specimens stored at:	7 Taylor St, Armidale, 2350.
Client:	Liverpool Plains Shire Council. Kate Campbell kate.campbell@lpsc.nsw.gov.au

While reasonable care has been taken in preparing this report to ensure the information is true and correct, the author gives no assurance as to the accuracy of any information in this report.

The author expressly disclaims, to the maximum extent permitted by law, all responsibility and liability to any person, arising directly or indirectly from any act or omission, or for any consequences of any such act or omission, made in reliance on the contents of this publication, whether or not caused by any negligence on the part of the author.

Cover: Part of Box Gully in Lot 22, DP 818902.



STRINGYBARK ECOLOGICAL

7 Taylor Street,
Armidale. 2350
dbcarr@bigpond.com
(02) 6772 4841
0418 651 263

<i>Project Brief</i>	4
Aim of the Project	4
Scope of this assessment	4
<i>Methods</i>	7
Desktop analysis	7
Field Assessment	9
<i>Results</i>	11
Threatened Ecological Community	11
Presence of threatened species	11
Presence of koala core habitat (SEPP 44)	11
Presence of critical habitat	12
Presence of threatened populations	12
Results for each property	13
Lot 4, DP 627363	13
Lot 32, DP 573640	15
Lot 31, DP 861686	17
Lot 32, DP 861686	20
Lot 21, DP 818902	25
Lot 22, DP 818902	28
Lot 297, DP 751009; Lot 1, DP 1113250 and Lot 11 DP 113850	32
Lot 11, DP 878120	34
Roadsides in Brady's Lane and Bell's Gate Rd	38
<i>Discussion and recommendations</i>	39
Impact of minimum lot sizes	41
Use of a Development Control Plan	41
Impact of zoning	41
Use of Local Provisions in the LEP	43
Summary and Recommendations	44
<i>References</i>	46
<i>Appendix 1: Species and abundance in TSR reference site</i>	47
<i>Appendix 2: Plant species occurring on private land in the North Quirindi area</i>	50
<i>Appendix 3: Fauna observed during field assessment (20-21 May 2015)</i>	52

Project Brief

The *Liverpool Plains Local Environmental Plan 2011* (LEP) specifies the framework which guides the development of the Liverpool Plains Shire, and is based on the recommendations of the Liverpool Plains Growth Management Strategy 2009 (GMS). This Strategy explores, inter alia, land suitable for future residential development on the rural fringe of Quirindi. In this regard, the GMS examined constraints to future residential development as well as the provisions of previous environmental planning instruments (including Clause 17 of the Quirindi Local Environmental Plan 1991, now repealed). Four (4) separate areas were recommended by the GMS as being capable of rural residential development, including Quirindi North-West, Quirindi West, Werris Creek Road (Quirindi North Rural Residential Area) and Stanley Crescent – Wallabadah Road.

Liverpool Plains Shire Council is currently in the process of reviewing the properties that comprise the Quirindi North Rural Residential Area identified by the GMS in order to determine appropriate land zone/s and corresponding minimum lot size/s that will enable large residential allotments. The subject land was identified due to its proximity to Quirindi, the absence of a number of environmental constraints, its access from Bells Gate Road off Werris Creek Road and existing rural fringe development pattern. However, this area is not without limitation, due to the presence of Endangered Ecological Communities (EEC) and mapped bushfire prone land.

In February 2012, OzArk Environmental and Heritage Management Pty Ltd completed an ecological assessment of three (3) of the allotments that are within the subject area, being Lot 316 DP 751009, Lot 317 DP 751009 and Lot 12 DP 878120. Liverpool Plains Shire Council is now seeking a review of the remainder of the allotments included within the study area, for the purpose of informing a future Planning Proposal.

Aim of the Project

The project has the following primary aims and objectives:

- (a) To conduct an ecological assessment in relation to certain lands and verify their suitability, or otherwise, for future residential or rural residential purposes;
- (b) To review currently available data and reporting frameworks in the context of this suitability analysis;
- (c) To provide concise and realistic recommendations including, but not limited to the suitability of the lands for future residential or rural residential uses; and
- (d) To provide information in a format that is suitable for incorporation in a future Planning Proposal which will aim to rezone those land(s) to a higher order use (including residential or rural residential land uses).

Scope of this assessment

- a) Conduct an ecological assessment in relation to the lands identified (Table 1).
- b) Identify lands suitable for future residential/rural residential purposes.

The following lots were considered in this assessment:

Table 1: Properties considered in this study

Land Owner	Property Description	Street Address	Current Land Zone
Mr PJ and Mrs L Robinson	Lot 31 DP 861686	"Robinson" 89 Bradys Lane Quirindi	E4
Mr PJ and Mrs L Robinson	Lot 32 DP 861686	"Robinson" 45 Bradys Lane Quirindi	E3 & E4
Mr AG and Mrs AL Easton	Lot 4 DP 627363	"Leitelinna" 91 Bradys Lane Quirindi	R5 & E4
Willdan Investments Pty Ltd	Lot 1 DP 1113250	Bells Gate Road Quipolly	R5
Mr S J Roxborough	Lot 297 DP 751009	"La Cassa" 168 Bells Gate Road Quirindi	E4
Mr S J Roxborough	Lot 11 DP 113850	Bells Gate Road Quirindi	E4
Mr BH Gunning	Lot 22 DP 818902	"Emu Holes" Werris Creek Road, Quirindi	E3 & E4
Mr BH Gunning	Lot 21 DP 818902	"Emu Holes" Werris Creek Road, Quirindi	E3 & E4
Mr RL and Mrs RM Brady	Lot 32 DP 573640	"Bompa" 90 Bradys Lane Quirindi	E4
Mr PN and Mrs KH Mills	Lot 11 DP 878120	"Mills" Bells Gate Road Quirindi	E3 & E4

North Quirindi rezoning



Disclaimer: This report has been generated by various sources and is provided for information purposes only. Land and Property Information (LPI), a division of the Department of Finance and Services does not warrant or represent that the information is free from errors or omission, or that it is exhaustive. LPI gives no warranty in relation to the information, especially material supplied by third parties. LPI accepts no liability for loss, damage, or costs that you may incur relating to any use or reliance upon the information in this report.

Figure 1: Lot and DP locations for properties assessed in this report. Source-NSW Six Maps



Figure 2: Location of the study area in relation to Quirindi.

Methods

Desktop analysis

The report by OzArk into the ecological constraints of areas within Liverpool Plains Shire earmarked for possible rezoning identified environmental issues relevant to the target area (OzArk Environmental and Heritage Management Pty Ltd, 2012). The current study is contained within the same geographic area as the OzArk study, so the potential environmental issues are the same. That study searched a number of databases relevant to NSW and Commonwealth legislation (Table 7, p 34) and found a number of environmental matters that might occur in the region (Appendix 1 in OzArk report).

The environmental matters of interest in this study include:

- Threatened species (plants and animals),
- Threatened populations,
- Threatened Ecological Communities,
- Critical Habitat,
- Migratory species,
- Threatening Processes,
- Heritage sites,
- Core koala populations.

We used the results of these database searches (with the exception of the EPBC Protected Matters search) as a guide for our field inspections. The EPBC search in the OzArk report unfortunately searched the 'Liverpool' LGA rather than the 'Liverpool Plains' LGA, so the information was completely irrelevant. We conducted a search for EPBC Protected Matters within the Liverpool Plains Shire.

We then narrowed down the list of environmental issues to be actively searched for in the field. We eliminated issues that were unlikely to be found within the area of the study because of soils, habitat or land use. Table 2 shows the species which may occur in the study area and their specific habitat requirements.

Table 2: Threatened species possibly occurring in the study area and their habitat requirements.

Species	Common	Status	Act	Habitat
<i>Anthochaera phrygia</i>	Regent Honeyeater	CE	E, T	Flowering trees (<i>E. albens</i> , <i>E. melliodora</i> , <i>E. sideroxylon</i>), <i>Casuarina cunninghamiana</i>
<i>Burbinus grallarius</i>	Bush Stone Curlew	E	T	Coarse woody debris, Complex habitat, Open

				woodland
<i>Chalinolobus dryeri</i>	Large-eared Pied Bat	V	E, T	Well-timbered woodland for hunting, Caves or overhangs for roosting
<i>Circus assimilis</i>	Spotted Harrier	V	T	Large trees, grassy open woodland
<i>Climacteris picumnus victoriae</i>	Brown Treecreeper	V	T	Woodland trees, rough bark, open grassy woodland, CWD, litter
<i>Glossopsitta pusilla</i>	Little lorikeet	V	T	Flowering trees, tree hollows
<i>Grantiella picta</i>	Painted Honeyeater	V	T	Box Gum Woodland, Myall or Brigalow, <i>Amyema</i> mistletoe
<i>Hieraaetus morphnoides</i>	Little Eagle	V	T	Open woodland, large trees
<i>Hoplocephalus bitorquatus</i>	Pale-headed Snake	V	T	Woodlands, Loose bark, hollow trees
<i>Lathamus discolor</i>	Swift Parrot	E	E, T	Flowering White Box (March to October),
<i>Lophoictinia isura</i>	Square-tailed Kite	V	T	Dry woodlands, esp near watercourses
<i>Melanodryas cucullata cucullata</i>	Hooded Robin	V	T	Open woodland, complex habitat, low stumps and branches, CWD
<i>Melithreptus gularis gularis</i>	Black-chinned Honeyeater	V	T	Open Box Woodland, Large flowering trees.
<i>Neophema pulchella</i>	Turquoise Parrot	V	T	Woodlands, tree hollows
<i>Ninox connivens</i>	Barking Owl	V	T	Large areas of woodland, large hollows
<i>Petaurus norfolcensis</i>	Squirrel Glider	V	T	Tree hollows
<i>Petroica boondang</i>	Scarlet Robin	V	T	Complex woodland, CWD
<i>Phascolarctos cinereus</i>	Koala	V	T, E	Specific food trees including <i>E. albens</i>
<i>Pomatostomus temporalis temporalis</i>	Grey-crowned Babbler	V	T	Large areas of connected woodland. Trees, regeneration
<i>Pyrrholaemus sagittatus</i>	Speckled Warbler	V	T	Complex woodland habitat,

				CWD, Tussock grasses
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail Bat	V	T	Tree hollows
<i>Stagonopleura guttata</i>	Diamond Firetail	V	T	Grassy woodland, tussock grasses with seed, sparse shrubs.
<i>Thesium australe</i>	Austral Toadflax	V	T, E	Native tussock grasses,
<i>Dichanthium setosum</i>	Bluegrass	V	T, E	Grassland or Grassy Woodland
<i>Digitaria porrecta</i>	Finger Panic Grass	V	T, E	Grassland or Grassy Woodland
<i>Picris evae</i>	Hawkweed	V	T, E	Grassy woodland
<i>Swainsona murrayana</i>	Slender Darling Pea	V	T, E	Grassy woodland, cracking clay soil
<i>Merops ornatus</i>	Rainbow Bee-eater	M	E	Open or disturbed woodland or forest

V = vulnerable, E = endangered, CE = critically endangered, M= migratory; T = TSC Act, E = EPBC Act; CWD = coarse woody debris.



Figure 3: Flowering eucalypts such as this *Eucalyptus albens* are important food sources for a number of threatened species including parrots, honeyeaters and squirrel gliders.

Field Assessment

The field survey was constrained by a number of important factors. Firstly, the field work was carried out on the 20-21 May. There are many animals that are not active

during this period, many plant species that are dormant and many migratory species that are not in the region at this time. Secondly, the land is all private, so access was at the discretion of the landholders. Thirdly, the area received rainfall significantly below the long term average up until December 2014, so the impacts of grazing have been much greater than they would normally be.

I conducted a preliminary inspection on the 29th April involving a drive around the main roads in the area and looking over fences. This revealed that the land was predominantly agricultural, in a highly disturbed state and unlikely to support species that depend on complex habitat in good condition.

With these constraints in mind, a field assessment was planned to look at each of the identified properties and determine:

- If the identified environmental issues were present and detectable, and
- If there was a high likelihood of the environmental issue being present at another time.

Kate Campbell from LPSC contacted each of the landholders by email to alert them that a survey would be taking place. I contacted some landholders by phone a few days prior to the inspection to seek permission to come onto their properties. All the landholders I contacted gave their permission willingly and were very cooperative.

The field surveys involved the following activities:

- Plot-based plant and habitat surveys using the methodology described in Oliver et al (2010) at 3 sites on private land and 1 site on a Travelling Stock Route (TSR). The details of these surveys have not been included in this report but are available if required.
- Observations of tree cover and species, ground layer species and cover and habitat features at selected sites.
- Collection and identification of plant species using Harden (1991) and PlantNet as identification references.
- Active habitat searches (logs, rocks, bark, tree hollows, litter) looking for amphibians and reptiles.
- Constant binocular searches looking for bird species using Simpson and Day (1999) as the identification reference.

The public and private properties were inspected on foot during traverses, by car and by using binoculars from vantage points on the nearest road. It was not necessary to go onto every property as some were completely cultivated and very unlikely to support any of the environmental issues.

Any uncertain plant identifications were checked against specimens held in the N.C.W Beadle Herbarium at the University of New England.

Results

Threatened Ecological Community

The principal environmental issue to be considered in assessing possible rezoning of land in this area is the presence of White Box Grassy Woodland. Both the Commonwealth Environment Protection and Biodiversity Conservation (EPBC) Act (1999) and the NSW Threatened Species Conservation (TSC) Act (1995) list this community as ‘critically endangered’.

The preliminary inspection showed that the landholdings in question were either completely cleared and the vegetation was in a completely altered state, or that the vegetation community was *White Box grassy Woodland of the Nandewar and Brigalow Belt South bioregions* (Benson et al, 2010). In order to evaluate the condition of this community on the landholdings a reference site was identified and surveyed.

The small TSR on the corner of Werris Creek Rd and Bell’s Gate Rd (Lot 7001, DP 94219) supports an example of this community in good condition.

The community at the TSR site has a canopy of White Box trees and a grassy understorey. I found 18 native grass species and 26 other ground layer species. There is coarse woody debris, leaf litter, cryptogams and good regeneration of canopy species. These characteristics indicate that this site is in good to very good condition (Rawlings et al, 2010). There has been some changes at this community due to past grazing practices, but this site presents a good example of what the vegetation would have been like across all of the properties in this study. The community at this site is a very good example of the Threatened Ecological Community as described in the EPBC and TSC Acts.

The properties examined in this study all have some degree of disturbance. In some cases the canopy trees have been removed, leaving a “derived native grassland”, while in others the trees have been retained and the ground layer ploughed and destroyed. In other cases both the trees and ground layer has been disturbed.

Presence of threatened species

None of the threatened plant or animal species identified as possibly occurring in the area were found during this survey. This is not surprising, given the constraints on this survey described earlier. The ‘precautionary principle’ has been used to determine the likelihood of these species occurring in the area or using the properties at another time. The habitat requirements of each species have been considered in this determination. Each species has specific requirements such as nectar, hollows, long grass, or rocks. I have considered whether or not these habitat features are present to indicate the likelihood of a threatened species occurring in the descriptions for individual properties below.

Presence of koala core habitat (SEPP 44)

Koalas are known to occur and breed in the area (see Fig 4). Liverpool Plains is listed in SEPP 44 as a local government area where koalas are likely to occur. I did not find any koalas nor signs of their presence, such as scats at any of the properties I inspected, including the TSR site. While SEPP 44 should not constrain the rezoning of any of these properties, it should be considered as any developments of individual properties (such as subdivision) are proposed. At this stage fresh surveys to determine if koalas are present,

and if they form a core population, should be made. If necessary a koala plan of management should be prepared, as described by the SEPP.

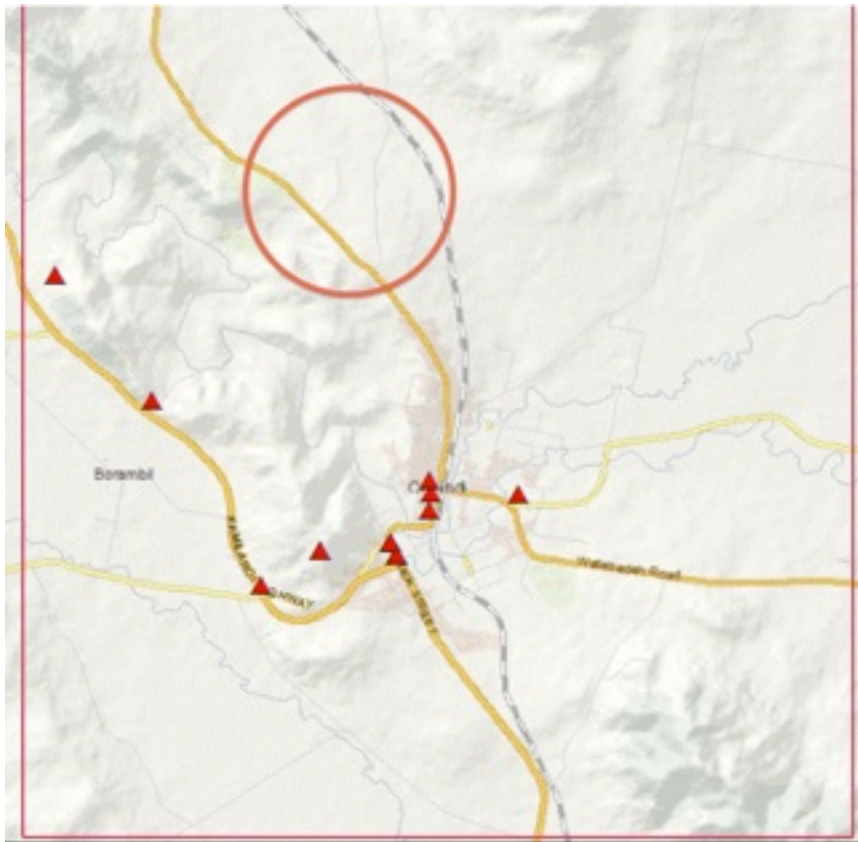


Figure 4: Location of koala sightings in the Quirindi area. The red circle shows the approximate location of the study area. (Source: NSW Wildlife Atlas).

Presence of critical habitat

Critical habitat, as described in the TSC Act, has not been declared over any of the properties in the study area.

Presence of threatened populations

No threatened populations, as described in the TSC Act, occur in the study area.

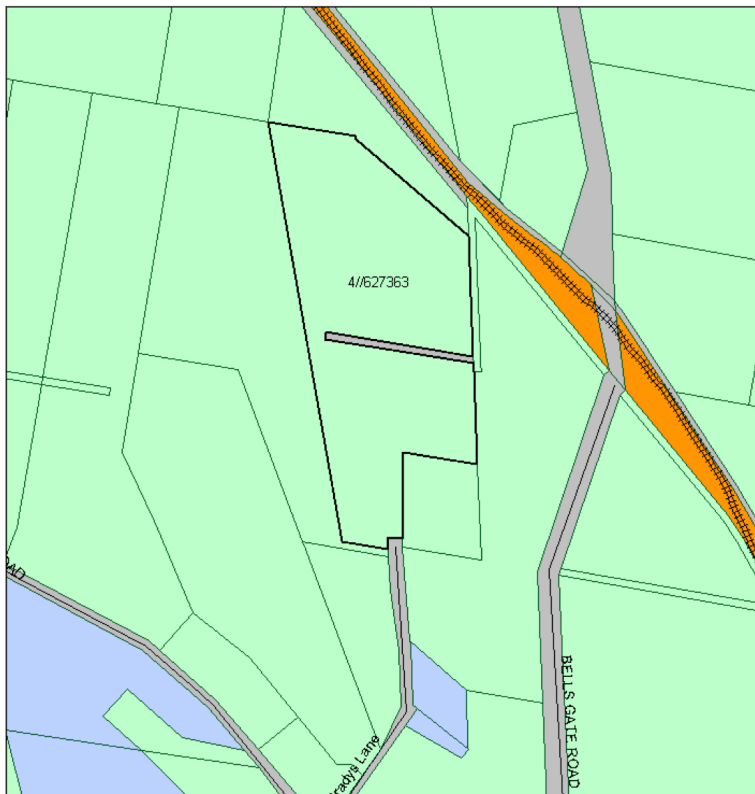
Results for each property

Lot 4, DP 627363

This property was inspected in three ways:

1. Walking over the paddock adjacent to Brady's Lane, with the permission of the owners, (Mr AG and Mrs AL Easton),
2. Looking over the fence from Lot 31, DP 861686, and
3. Looking with binoculars from the railway easement to the north east of the property.

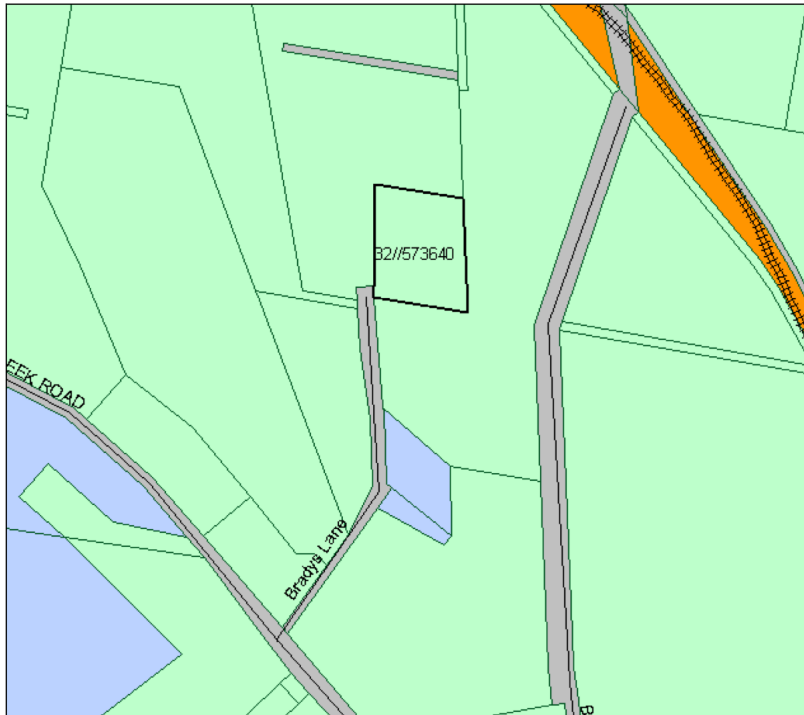
The whole property has been cleared of most trees with only a few small ones remaining. The paddock appears to have been cultivated in the past and at the time of inspection had been heavily grazed, leaving very low ground cover and low species diversity.



Primary land use	Agriculture - grazing	
Plant community	Agricultural grassland	
Condition (for conservation)	Poor	
Dominant canopy species	N/A	
Dominant ground layer species	<i>Sclerolaena muricata</i>	
Habitat features	Present?	Comments
Mature trees	No	
Tree regeneration	No	
Tussock grasses	Yes	Very sparse
Flowering plants	No	
Dense (+/-prickly) shrubs	Some	<i>Sclerolaena muricata</i>
Coarse woody debris	No	
Tree hollows	No	
Leaf litter	No	
Rocks	No	
Soil cracks	Yes	
Free water	Yes	Dam
Loose bark	No	
Other features	No	
Wildlife Connectivity Value	Low	
Overall Environmental Value	Low	
Threatened species using the habitat	Habitat used	Impact of land use intensification
Spotted Harrier	Open paddocks	negligible
Little Eagle	Open paddocks	Negligible
Rainbow Bee-eater	Open paddocks	Negligible

Lot 32, DP 573640

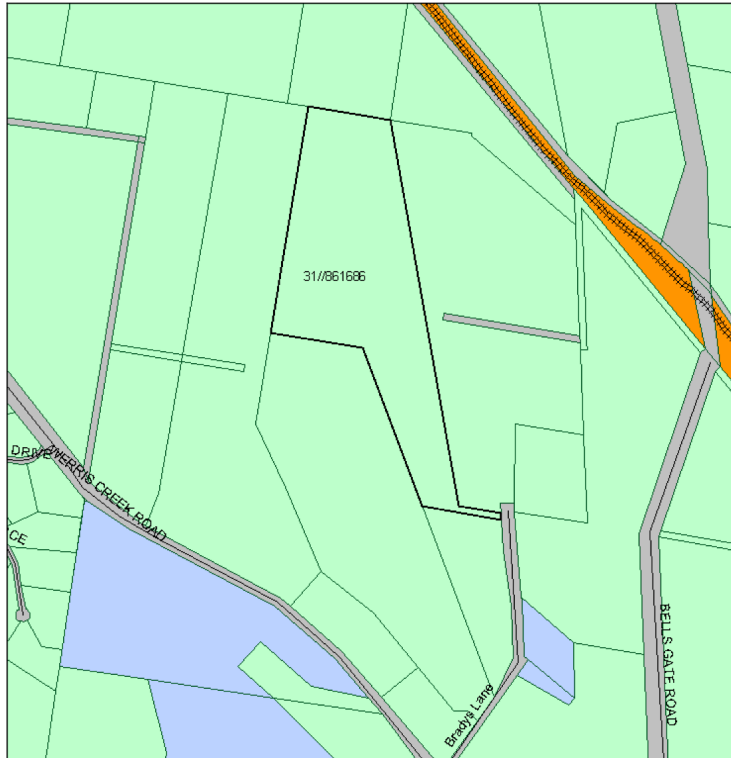
This property was inspected by looking over the fence from the adjacent property (Lot 4, DP 627363). It is a small block, primarily used for residential purposes.



Primary land use	Residential	
Plant community	Garden,	
Condition (for conservation)	Poor	
Dominant canopy species	n/a	
Dominant ground layer species	n/a	
Habitat features	Present?	Comments
Mature trees	No	Small trees
Tree regeneration	No	
Tussock grasses	No	
Flowering plants	Some	
Dense (+/-prickly) shrubs	No	
Coarse woody debris	No	
Tree hollows	No	
Leaf litter	No	
Rocks	No	
Soil cracks	Yes	
Free water	No	
Loose bark	No	
Other features	Some shrubs	
Wildlife Connectivity Value	Low	
Overall Environmental value	Low	
Threatened species using the habitat	Habitat used	Impact of land use intensification
Spotted Harrier	Open paddocks	Negligible
Little Eagle	Open paddocks	Negligible
Rainbow Bee-eater	Open paddocks	Negligible

Lot 31, DP 861686

This property was inspected by driving around and through the paddock with the permission of the landholders (Mr PJ and Mrs L Robinson). I also carried out a plot survey in the paddock. The paddock is currently grazed by cattle.



Primary land use	Agriculture – grazing (horses and cattle)	
Plant community	White Box Grassy Woodland – derived native grassland	
Condition (for conservation)	Moderate	
Dominant canopy species	<i>Eucalyptus albens</i>	
Dominant ground layer species	<i>Austrostipa aristiglumis</i>	
Habitat features	Present?	Comments
Mature trees	Yes	8
Tree regeneration	No	
Tussock grasses	Yes	
Flowering plants	Yes	Small and few
Dense (+/-prickly) shrubs	No	
Coarse woody debris	No	
Tree hollows	No	
Leaf litter	No	
Rocks	No	
Soil cracks	Yes	
Free water	Yes	Dam
Loose bark	No	
Other features		
Wildlife Connectivity Value	Low	
Overall Environmental value	Low	
Threatened species using the habitat	Habitat used	Impact of land use intensification
Spotted Harrier	Open paddocks	Negligible
Little Eagle	Open paddocks	Negligible
Rainbow Bee-eater	Open paddocks	Negligible
Regent Honeyeater	Flowering trees	Negligible
Little Lorikeet	Flowering trees	Negligible

Black-chinned Honeyeater	Flowering trees	Negligible
Swift Parrot	Flowering trees	Negligible
Diamond Firetail	Grasses if seeding	Negligible

The vegetation community of the site fits the definition under the NSW TSC Act of *White Box – Yellow Box – Blakely’s Red Gum Woodland*, a critically endangered community. While the site is highly disturbed and has very few trees compared to the TSR reference site, the ground layer is still dominated by native tussock grasses. The site could still be regenerated to return to a better state. The community is in State 3 as described in Rawlings et al (2010). Further intensification of the land may result in further degradation of the community, through the addition of exotic grasses and fertiliser. If the site is subdivided or developed further as a result of the rezoning, some offsets will be necessary to mitigate the impact on the Threatened Ecological Community.

Land use intensification of this property would not result in any increased impact on any threatened species likely to use the habitat.

It is possible that a change of land use to rural residential, would result in a reduction of the grazing pressure, leading to an improvement in the condition of the site.



Figure 5: Cattle grazing in pasture dominated by Plains Grass (*Austrostipa aristiglumis*).

Lot 32, DP 861686

This property forms a contiguous holding with the previous Lot 31. It was inspected by driving and walking through the paddock with the permission of the landholders (Mr PJ and Mrs L Robinson). The property is in two parts with a the house and sheds in one and an open paddock in the next. The paddocks are currently grazed by horses.



Primary land use	Residential Agriculture – grazing (horses)	
Plant community	White Box Grassy Woodland – derived native grassland	
Condition (for conservation)	Moderate	
Dominant canopy species	<i>Eucalyptus albens</i>	
Dominant ground layer species	<i>Austrostipa aristiglumis</i>	
Habitat features	Present?	Comments
Mature trees	Yes	Big trees near house
Tree regeneration	No	
Tussock grasses	Yes	
Flowering plants	Yes	Trees
Dense (+/-prickly) shrubs	No	
Coarse woody debris	Some	
Tree hollows	Yes	Significant
Leaf litter	No	

Rocks	No	
Soil cracks	Yes	
Free water	No	
Loose bark	Yes	
Other features		
Wildlife Connectivity Value	Moderate	
Overall Environmental value	Moderate	
Threatened species using the habitat	Habitat used	Impact of land use intensification
Spotted Harrier	Open paddocks	Negligible
Little Eagle	Open paddocks	Negligible
Rainbow Bee-eater	Open paddocks	Negligible
Square-tailed Kite	Woodland	Negligible
Regent Honeyeater	Flowering trees	Negligible
Little Lorikeet	Flowering trees, tree hollows	Negligible
Black-chinned Honeyeater	Flowering trees	Negligible
Swift Parrot	Flowering trees	Negligible
Diamond Firetail	Grasses if seeding	Negligible
Large-eared Pied Bat	Woodland for hunting	Negligible
Pale-headed Snake	Hollows	Negligible
Turquoise Parrot	Hollows	Negligible
Squirrel Glider	Hollows	Negligible
Koala	Eucalyptus albens	Negligible
Yellow-tailed Sheath-tailed Bat	Tree hollows	Negligible

The vegetation community of the site fits the definition under the NSW TSC Act of *White Box – Yellow Box – Blakely's Red Gum Woodland*, a critically endangered community. While the site is highly disturbed compared to the TSR reference site, the ground layer is still dominated by native tussock grasses and there are mature White Box trees. The site could still be regenerated to return to a better state. The community is in State 3 as described in Rawlings et al (2010). Further intensification of the land may result in further degradation of the community, through the addition of exotic grasses and

fertiliser or the removal of trees. If the site is subdivided or developed further as a result of the rezoning, some offsets will be necessary to mitigate the impact on the Threatened Ecological Community. Building envelopes may need to be designated to ensure the impact of development is not spread.

All mature trees with hollows should be maintained on site as a condition of any subdivision. Land use intensification of this property will not be likely to result in any increased impact on any threatened species likely to use the habitat.

It is possible that a change of land use to rural residential, would result in a reduction of the grazing pressure, leading to an improvement in the condition of the site.

Lot 21, DP 818902

This property was inspected by walking across the whole site with the permission of the land owner (Mr B Gunning).



Primary land use	Agriculture – grazing (cattle)	
Plant community	White Box Grassy Woodland – derived native grassland	
Condition (for conservation)	Moderate	
Dominant canopy species	n/a	
Dominant ground layer species	<i>Austrostipa aristiglumis</i>	
Habitat features	Present?	Comments
Mature trees	No	
Tree regeneration	No	
Tussock grasses	Yes	
Flowering plants	No	
Dense (+/-prickly) shrubs	No	
Coarse woody debris	No	
Tree hollows	No	
Leaf litter	No	
Rocks	No	

Soil cracks	Yes	
Free water	No	
Loose bark	No	
Other features		
Wildlife Connectivity Value	Low	
Overall Environmental value	Low	
Threatened species using the habitat	Habitat used	Impact of land use intensification
Spotted Harrier	Open paddocks	Negligible
Little Eagle	Open paddocks	Negligible
Rainbow Bee-eater	Open paddocks	Negligible
Diamond Firetail	Grasses if seeding	Negligible

The vegetation community of the site fits the definition under the NSW TSC Act of *White Box – Yellow Box – Blakely's Red Gum Woodland*, a critically endangered community. While the site is highly disturbed and has no trees compared to the TSR reference site, the ground layer is still dominated by native tussock grasses. The site could still be regenerated to return to a better state. The community is in State 3 as described in Rawlings et al (2010). Further intensification of the land may result in further degradation of the community, through the addition of exotic grasses and fertiliser. If the site is subdivided or developed further as a result of the rezoning, some offsets will be necessary to mitigate the impact on the Threatened Ecological Community.

Land use intensification of this property would not result in any increased impact on any threatened species likely to use the habitat.

It is possible that a change of land use to rural residential, would result in a reduction of the grazing pressure, leading to an improvement in the condition of the site.



Figure 6: Left foreground shows Lot 21, showing the absence of trees and the dominance of native tussock grasses in parts.

Lot 22, DP 818902

I inspected this property by walking from the gate on Brady's Lane to the far (northern) end by the western side of the gully and returning by the eastern side. I also carried out a plot survey at the northern end of the property. There is an intermittent stream in a deep gully running approximately south to north in this property. There are some small rocks in parts of the gully. These were inspected for any signs of reptiles, as were the logs scattered throughout the paddock.

There are many large White Box Trees with hollows scattered throughout the paddock, especially close to the creek.



Figure 7: Lot 22, showing the creek and creek flats with scattered White Box trees along the banks.



Primary land use	Residential Agriculture – grazing (horses)	
Plant community	White Box Grassy Woodland	
Condition (for conservation)	Moderate	
Dominant canopy species	<i>Eucalyptus albens</i>	
Dominant ground layer species	<i>Austrostipa aristiglumis</i>	
Habitat features	Present?	Comments
Mature trees	Yes	Big trees near creek
Tree regeneration	Yes	Some seedlings
Tussock grasses	Yes	
Flowering plants	Yes	Trees
Dense (+/-prickly) shrubs	No	
Coarse woody debris	Yes	Logs and stumps
Tree hollows	Yes	Significant
Leaf litter	Yes	
Rocks	Yes	

Soil cracks	Yes	
Free water	Yes	Some pools in creek
Loose bark	Yes	
Other features		
Wildlife Connectivity Value	High	
Overall Environmental value	Moderate	
Threatened species using the habitat	Habitat used	Impact of land use intensification
Spotted Harrier	Open paddocks	Negligible
Little Eagle	Open paddocks	Negligible
Rainbow Bee-eater	Open paddocks	Negligible
Square-tailed Kite	Woodland	Negligible
Regent Honeyeater	Flowering trees	Negligible
Little Lorikeet	Flowering trees, tree hollows	Negligible
Black-chinned Honeyeater	Flowering trees	Negligible
Swift Parrot	Flowering trees	Negligible
Diamond Firetail	Grasses if seeding	Negligible
Large-eared Pied Bat	Woodland for hunting	Negligible
Pale-headed Snake	Hollows	Negligible
Turquoise Parrot	Hollows	Negligible
Squirrel Glider	Hollows	Negligible
Koala	Eucalyptus albens	Negligible
Yellow-tailed Sheath-tailed Bat	Tree hollows	Negligible
Grey-crowned Babbler	Trees connected to remnants on WC Rd	Negligible

The vegetation community of the site fits the definition under the NSW TSC Act of *White Box – Yellow Box – Blakely's Red Gum Woodland*, a critically endangered community. While the site is highly disturbed compared to the TSR reference site, the ground layer is still dominated by native tussock grasses and there are mature White Box trees. The site could still be regenerated to return to a better state. The community is in State 3 as

described in Rawlings et al (2010). Further intensification of the land may result in further degradation of the community, through the addition of exotic grasses and fertiliser or the removal of trees. If the site is subdivided or developed further as a result of the rezoning, some offsets will be necessary to mitigate the impact on the Threatened Ecological Community. Building envelopes may need to be designated to ensure the impact of development is not spread.

All mature trees with hollows should be maintained on site as a condition of any subdivision. Land use intensification of this property will not be likely to result in any increased impact on any threatened species likely to use the habitat.

The gully on the property is a tributary of Box Gully, which feeds into Quipolly Creek, part of the Namoi Catchment. Any development in or near this gully will need to consider possible impacts on water quality and quantity.

It is possible that a change of land use to rural residential, would result in a reduction of the grazing pressure, leading to an improvement in the condition of the site.



Figure 8: Lot 22, showing scattered trees and ground layer dominated by native tussock grasses.

Lot 297, DP 751009; Lot 1, DP 1113250 and Lot 11 DP 113850

These three lots were not clearly distinguished on site by fencing and two of them are small linear blocks (closed roads), so they are treated as one property here. I inspected this property, on Bells Gate Rd, by looking over the fence with binoculars from two vantage points. The site is highly degraded (from a conservation point of view) so did not warrant further inspection. There are only a few small trees in two paddocks with a predominantly native grass groundcover. The groundcover was low in parts, due to grazing by horses.



Primary land use	Residential Agriculture – Grazing (horses)
Plant community	White Box Grassy Woodland – derived native grassland
Condition (for conservation)	Poor
Dominant canopy species	n/a
Dominant ground layer species	<i>Austrostipa aristiglumis</i>

Habitat features	Present?	Comments
Mature trees	No	Few small trees
Tree regeneration	No	
Tussock grasses	Yes	Heavily grazed
Flowering plants	Some	
Dense (+/-prickly) shrubs	No	
Coarse woody debris	No	
Tree hollows	No	
Leaf litter	No	
Rocks	No	
Soil cracks	Yes	
Free water	No	
Loose bark	No	
Other features		
Wildlife Connectivity Value	Low	
Overall Environmental Value	Low	
Threatened species using the habitat	Habitat used	Impact of land use intensification
Spotted Harrier	Open paddocks	Negligible
Little Eagle	Open paddocks	Negligible
Rainbow Bee-eater	Open paddocks	Negligible



Figure 9: Lot 297, showing absence of trees and ground layer dominated by native tussock grasses.

Lot 11, DP 878120

This is the largest property inspected as part of this survey. It is located between Bell's Gate Rd and the railway line. It is immediately north of Lot 12, identified in the OzArk report as being of high conservation value.

I was unable to contact the land owner prior to the survey, so was unable to walk or drive into the property. I inspected the property with binoculars from several vantage points on Bell's Gate Rd.

The property has many mature White Box trees, well spaced to form a woodland. The understorey has been cleared, cultivated and sown to wheat, most likely in the last 5 years. There are still some very small remnants of the grassy understorey around the base of the trees and in the corners of the paddocks. There are many hollows in the remaining trees and this forms a significant resource for hollow-dependent fauna in the region.



Primary land use	Agriculture - farming	
Plant community	White Box Grassy Woodland	
Condition (for conservation)	Moderate	
Dominant canopy species	<i>Eucalyptus albens</i>	
Dominant ground layer species	<i>Austrostipa aristiglumis</i>	
Habitat features	Present?	Comments
Mature trees	Yes	Many, significant

Tree regeneration	No	
Tussock grasses	No	
Flowering plants	Yes	White Box
Dense (+/-prickly) shrubs	No	
Coarse woody debris	No	
Tree hollows	Yes	Many, significant
Leaf litter	No	
Rocks	No	
Soil cracks	Yes	
Free water	No	
Loose bark	Yes	
Other features		
Wildlife connectivity value	High	
Overall Environmental Value	Moderate	
Threatened species using the habitat	Habitat used	Impact of land use intensification
Spotted Harrier	Open paddocks	Negligible
Little Eagle	Open paddocks	Negligible
Rainbow Bee-eater	Open paddocks	Negligible
Square-tailed Kite	Woodland	Negligible
Regent Honeyeater	Flowering trees	Negligible
Little Lorikeet	Flowering trees, tree hollows	Negligible
Black-chinned Honeyeater	Flowering trees	Negligible
Swift Parrot	Flowering trees	Negligible
Diamond Firetail	Grasses if seeding	Negligible
Large-eared Pied Bat	Woodland for hunting	Negligible
Pale-headed Snake	Hollows	Negligible
Turquoise Parrot	Hollows	Negligible

The vegetation community of the site fits the definition under the NSW TSC Act of *White Box – Yellow Box – Blakely’s Red Gum Woodland*, a critically endangered community. While the site is highly disturbed compared to the TSR reference site, there are mature White Box trees. The site could still be regenerated to return to a better state. The community is in State 3 as described in Rawlings et al (2010). Further intensification of the land may result in further degradation of the community, through the removal of the trees. If the site is subdivided or developed further as a result of the rezoning, some offsets will be necessary to mitigate the impact on the Threatened Ecological Community. Building envelopes may need to be designated to ensure the impact of development is not spread.

All mature trees with hollows should be maintained on site as a condition of any subdivision. If this condition is enforced, land use intensification of this property will not be likely to result in any increased impact on any threatened species likely to use the habitat.

It is possible that a change of land use to rural residential, would result in a reduction of the farming, leading to regeneration of the grassy ground layer and improvement in the condition of the site.



Figure 10: Lot 11 viewed from Bell's Gate Rd, showing scattered paddock trees and ground layer cultivated for cropping



Figure 11: Lot 11 with crop stubble and scattered paddock trees. Note small patch of retained grassy ground layer in top left.



Figure 12: Derived native grassland beside Bell's Gate Rd.

Roadsides in Brady's Lane and Bell's Gate Rd

The roadside vegetation in these two roads is *White Box – Yellow Box – Blakey's Red Gum Woodland*, with a healthy and diverse ground layer of tussock grasses and forbs and in some areas, an overstorey of White Box trees. The roadsides are the only areas surveyed that come close to the structure and diversity of the TSR site, albeit in narrow linear strips. Bell's Gate Rd is the wider of the two and supports a healthy strip of derived native grassland, the trees having been removed to protect the power lines.

These linear strips form important sources of seed for natural regeneration. Many of the grassland species have seeds that are dispersed by wind or animals over long distances. As such they are important for the ongoing conservation of White Box Grassy

Woodlands in the area.

Liverpool Plains Shire Council should consider an assessment of roadsides and producing a roadside management plan as part of any future redevelopment.

Discussion and recommendations

Liverpool Plains Shire Council is considering changing the zoning under the current Local Environment Plan (LEP) (see Fig 13) from Environmental Living (E4), Environmental Management (E3) and large lot Rural Residential (R5) to more intensive land uses.

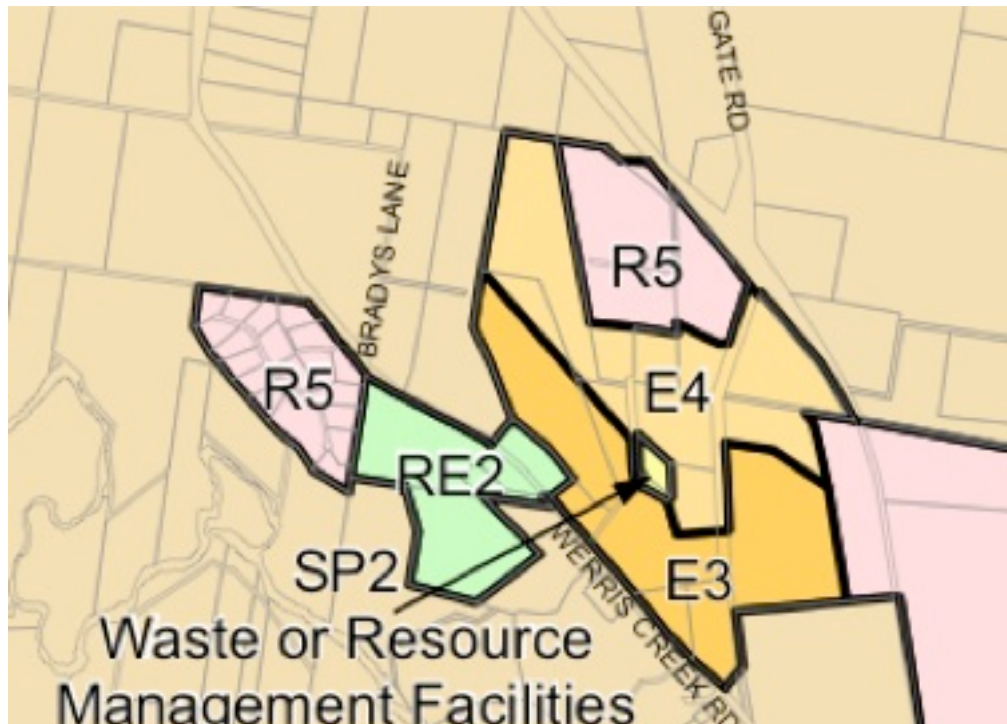


Figure 13: Zoning at North Quirindi under the current LEP

Based on the assessments carried out, each lot has been classified as having a particular environmental value (Table 3).

Table 3: Environmental values of properties

Property	Environmental value
Lot 31 DP 861686	Low
Lot 32 DP 861686	Moderate
Lot 4 DP 627363	Low
Lot 1 DP 1113250	Low
Lot 297 DP 751009	Low
Lot 11 DP 113850	Low
Lot 22 DP 818902	Moderate
Lot 21 DP 818902	Low

Lot 32 DP 573640	Low
Lot 11 DP 878120	Moderate
Lot 12 DP 878120*	Moderate
Lot 317 DP 751009*	Moderate
Lot 339 DP 751009*	Moderate
Lot 7001 DP 94219	Very High

*identified from the OzArk report

The threats to the environmental values of the properties, particularly the threatened ecological community, from activities allowed (with and without consent) under the current zoning are:

- Removal of the tussock grass-dominated ground layer of vegetation through herbicide application or cultivation for crops or pasture establishment.
- Application of fertiliser to increase nutrients in the grassy ground layer of vegetation, resulting in a change from native to exotic grasses.
- Sowing of exotic grasses and legumes, leading to a replacement of the native tussock grasses and forbs with exotic annual or perennial grasses and legumes.
- Loss of diversity of species in the ground layer vegetation through constant grazing.
- Prevention of natural regeneration of trees through constant grazing.
- Removal of logs and dead trees, resulting in a loss of habitat for some species, including threatened fauna species.
- Selective removal of living trees (exemptions allowed under the Native Vegetation Conservation Act, 2003) for routine agricultural activities.

All of these threats arise from the practice of agriculture; either grazing or farming. The LEP has no control over how agriculture is practiced, merely permitting it (with or without consent) or not permitting it. In the current LPSC LEP, “extensive agriculture” is allowed in Zones E3 and E4 without consent, and in Zone R5 with consent.

If, as a result of the rezoning, land currently used for agriculture is developed for rural residential blocks, the following threats may apply to the environmental values:

- Loss of the native tussock grass vegetation layer by the establishment of lawns and gardens, and by the footprint of houses, sheds and other infrastructure.
- Intensification of grazing, particularly by horses. This may result in death of trees from ringbarking by horses.
- Removal of logs and dead trees, resulting in a loss of habitat for some species, including threatened fauna species.
- Continuation of other extensive agriculture practices listed above.

These threats will be increased as lot sizes get smaller. Given that extensive agriculture and smaller lot sizes pose the greatest threats to the maintenance of the identified environmental values of the properties, the LPSC can only control these threats through:

1. Defining appropriate lot sizes to match the environmental values,
2. Making a Development Control Plan for the management and protection of trees on certain lots under Clause 5.9 of the LEP.
3. Inserting a local provision in the LEP to protect terrestrial biodiversity.

Impact of minimum lot sizes

Lot size is an appropriate tool to manage potential impacts on the Endangered Ecological Community, particularly the grassy ground layer. While it offers no control over the intensity of grazing, it can reduce the impact from spreading infrastructure such as sheds, tracks, yards, gardens and buildings. For areas with low environmental values, a minimum Lot size of 2ha is appropriate.

Each of the sites identified as having moderate environmental values are so classed because of the presence of trees or ground layer, or both, associated with *White Box – Yellow Box – Blakely's Red Gum Woodlands*. As this community is a critically endangered ecological community all measures to reduce the impact of development must be taken. Therefore a minimum Lot size of 10ha is recommended for these Lots.

Use of a Development Control Plan

The mature White Box trees in some lots are significant contributors to the environmental values of the properties and could be protected in the Development Control Plan (DCP), with reference to Clause 5.9 of the LEP. Based on this assessment, and the OzArk Assessment, the following properties should be included under the DCP:

- Lot 32 DP 861686 ,
- Lot 22 DP 818902,
- Lot 11 DP 878120,
- Lot 12 DP 878120,
- Lot 317 DP 751009,
- Lot 339 DP 751009.

Impact of zoning

The real impact on environmental values of changing land from one zone to another is likely to be negligible, providing the proposed minimum lot sizes are put in place. However, the objectives of each zone create an expectation that the land will be managed in a certain way and identifies the different values of the land. Table 4 compares the objectives listed for R5 and E3 land.

Table 4: Objectives for Zones R5, E4 and E3 in LPSC LEP

Zone	Objective
E3	To protect, manage and restore areas with special ecological, scientific,

	cultural or aesthetic values.
E3	To provide for a limited range of development that does not have an adverse effect on those values.
E4	To provide for low-impact residential development in areas with special ecological, scientific or aesthetic values.
E4	To ensure that residential development does not have an adverse effect on those values.
R5	To provide residential housing in a rural setting while preserving, and minimising impacts on, environmentally sensitive locations and scenic quality.
R5	To ensure that large residential lots do not hinder the proper and orderly development of urban areas in the future.
R5	To ensure that development in the area does not unreasonably increase the demand for public services or public facilities.
R5	To minimise conflict between land uses within this zone and land uses within adjoining zones.

Zone E3 specifically recognises the management and restoration of environmental values and excludes some land uses that will have a detrimental impact on those values. Zones E3 and E4 specifically allows extensive agriculture without consent as a permitted land use, even though extensive agriculture poses a significant threat to these environmental values.

Zone R5 aims to minimise the impact on “environmentally sensitive locations” and prohibits a wide range of land uses that may have a detrimental impact. It also allows extensive agriculture only with consent, so provides a greater level of control over the most significant threat to the environmental values. Zone R5 also allows environmental protection works without consent, while in Zones E3 and E4 this activity requires consent.

Neither land zoned R5, E4 nor E3 is exempt from the Native Vegetation Conservation Act (2003) under Schedule 1, Part 3, Clause 14a and b.

In my opinion, Zone R5 provides a greater degree of protection of the environmental values than does Zone E3 and E4, under currently allowed activities. Given that extensive agriculture is currently the greatest threat to environmental values, Council will be unlikely to change zoning to exclude this land use, without triggering the *Land Acquisition (Just Terms Compensation) Act 1991*.

While some land (identified as having moderate environmental values) requires consideration of these values, it does not necessarily warrant management or restoration. For these sites Zone E4 would be more appropriate.

Therefore, given that all of the properties surveyed are currently practicing extensive agriculture, and this land use cannot be changed by rezoning without compensation to current land holders, the best zoning would be:

- R5 for land described as having ‘low environmental values’ in Table 4, and
- E4 for land described as having ‘moderate environmental values’.

Use of Local Provisions in the LEP

An alternative method to protect the environmental values of this land would be to create a Biodiversity layer in the LEP and include a standard set of clauses, widely used in other Councils, as Local Provisions. This would require the land identified as having significant terrestrial biodiversity values to be mapped as an additional LEP layer (prefix BIO). The clause is likely to be useful in other circumstances, given the frequency of occurrence of the critically endangered *White Box-Yellow Box-Blakely's Red Gum Woodland* ecological community in the Liverpool Plains Shire. The following standard clauses can be used:

7.x Terrestrial biodiversity

(1) The objective of this clause is to maintain terrestrial biodiversity, by:

- (a) protecting native fauna, flora, and ecological communities*
- (b) protecting the ecological processes necessary for their continued existence, and*
- (c) encouraging the conservation and recovery of native fauna and flora and their habitats and ecological communities.*

(2) This clause applies to land:

- (a) identified as "Biodiversity—habitat corridor" or "Biodiversity—significant vegetation" on the Terrestrial Biodiversity Map, or*
- (b) situated within 40m of the bank (measured horizontally from the top of the bank) of a natural waterbody.*

(3) Before determining a development application for development on land to which this clause applies, the consent authority must consider:

- (a) whether the development is likely to have:*
 - (i) any adverse impact on the condition, ecological value and significance of the fauna, flora and ecological communities on the land, and*
 - (ii) any adverse impact on the importance of the vegetation on the land to the habitat and survival of native fauna, and*
 - (iii) any potential to fragment, disturb or diminish the biodiversity structure, function and composition of the land, and*
 - (iv) any adverse impact on the habitat elements providing connectivity on the land, and*
- (b) any appropriate measures proposed to avoid, minimise or mitigate the impacts of the development.*

(4) Development consent must not be granted to development on land to which this clause applies unless the consent authority is satisfied that:

- (a) the development is designed, sited and will be managed to avoid any significant adverse environmental impact, or*
- (b) if that impact cannot be reasonably avoided by adopting feasible alternatives—the development is designed, sited and will be managed to minimise that impact, or*
- (c) if that impact cannot be minimised—the development will be managed to mitigate that impact.*

(5) For the purpose of this clause:

bank means the limit of the bed of a natural waterbody.

bed, of a natural waterbody, means the whole of the soil of the channel in which the waterbody flows, including the portion that is alternatively covered and left bare with an increase or diminution in the supply of water and that is adequate to contain the waterbody at its average or mean stage without reference to extraordinary freshets in the time of flood or to extreme droughts.

While initially applied to the land of moderate, high or very high environmental value (Table 3) it could be expanded for any new rezoning proposals. Given that Liverpool Plains local government area is in a region with significant areas of endangered ecological communities (including the *White Box – Yellow Box – Blakely's Red Gum Woodland*), this clause may serve to protect these assets from inappropriate development impacts.

Use of suasive incentives

In addition to the regulatory instruments available to Council to manage and protect the environmental values of these sites, there is the option to use suasive incentives to encourage positive environmental behaviour. These include the provision of written materials (brochures and pamphlets), education and access to expert advice to help landholders understand the significance of the *White Box – Yellow Box – Blakely's Red Gum Woodland* and manage it appropriately.

There are a number of resources available including a fact sheet (Carr, 2012) available through the North West Local Land Services; a book (Rawlings et al, 2010) and detailed information available through the Commonwealth Environment Department's website (<http://www.environment.gov.au/cgi-bin/sprat/public/publicshowcommunity.pl?id=43>).

There is often funding available to help land owners manage or restore Threatened Ecological Communities through Local Land Services, other NSW Government Departments and the Commonwealth Government.

Summary and Recommendations

1. Significant areas of the land assessed in this report support the critically endangered ecological community *White Box – Yellow Box – Blakely's Red Gum Woodland*, as defined under the NSW TSC Act. Only the TSR site and parts of the roadsides support the community as defined under the Commonwealth EPBC Act. Regardless of how Council proceeds with rezoning this land, any future proposals for subdivision or other development will need to consider the impact on this ecological community. It is important to note that even land where the trees have been removed and a grassy ground layer remains, fits the definition of the ecological community.
2. Some of the land assessed in this study have habitat elements likely to be used by a range of threatened fauna species. The critical habitat feature of these lands is the presence of mature flowering trees (mostly *Eucalyptus albens*) with hollows.
3. In order to better protect these significant trees, LPSC should make a Development Control Plan (with reference to Clause 5.9 of the LEP) that specifies the retention and protection of trees that meet the following criteria:

- a. Trees of the species *Eucalyptus albens* Benth. or *Angophora floribunda* (Smith) Sweet, and
 - b. With a diameter at breast height (1.3m) exceeding 50cm, and
 - c. Located within the following properties:
 - i. Lot 32, DP 861686; or
 - ii. Lot 22, DP 818902; or
 - iii. Lot 11, DP 878120; or
 - iv. Lot 12, DP 878120; or
 - v. Lot 317, DP 751009; or
 - vi. Lot 7001, DP 94219.
4. Agricultural activities are the main threat to the environmental values of the properties, but neither zoning nor lot size has any influence on this practice.
 5. For land identified as having low environmental value, Lot size should not be smaller than 2ha. For land identified as having moderate environmental value, Lot size should not be smaller than 10ha.
 6. The zoning chosen for each block needs to reflect the presence and condition of the critically endangered ecological community *White Box – Yellow Box – Blakely’s Red Gum Woodland*. All of the properties identified as having moderate environmental values (Table 3) should be zoned E4, while other properties should be zoned R5. In reality, the other recommendations made here are more likely to offer the appropriate level of protection for this ecological community.
 7. LPSC should consider adding a Terrestrial Biodiversity layer and associated Local Provisions Clause to the LEP to protect land with significant environmental values (identified as ‘moderate’ or ‘very high’ in Table 3).
 8. Several educational resources are available to help land owners manage *White Box – Yellow Box – Blakely’s Red Gum Woodland*. LPSC should assist land owners to gain access to these resources as part of any change in zoning, subdivision or development.

References

- Benson J. S., Richards P. G., Waller S. & Allen C. B. (2010) New South Wales Vegetation classification and Assessment: Part 3 Plant communities of the 457 NSW Brigalow Belt South, Nandewar and west New England Bioregions and update of NSW Western Plains and South-western Slopes plant communities, Version 3 of the NSWVCA database. *Cunninghamia* 11, 457-579.
- Carr, D. (2012) Box Gum Grassy Woodland – Threatened Ecological Communities Fact Sheet. Border Rivers Gwydir Catchment Management Authority, Inverell.
- Harden, G (ed.) (1991) *Flora of New South Wales*. University of New South Wales Press, Sydney, NSW.
- Oliver I., O'Keefe P., Ede A. & Koen T. (2010) Operations manual to support the Model for Practical Partnerships in Resource Condition Monitoring, Evaluation and Reporting. (ed O. o. E. a. Heritage). Office of Environment and Heritage.
- OzArk Environmental and Heritage Management Pty Ltd (2012) Ecological Constraints and Values Assessment: 24 land parcels identified for rezoning and investigations for future residential or rural residential purposes in Quirindi and Werris Creek. Unpublished report to Liverpool Plains Shire Council.
- Rawlings K., Freudenberger D. & Carr, D. (2010) A guide to managing Box Gum Grassy Woodlands. Commonwealth of Australia, Caring for Our Country, Canberra, ACT.
- Simpson, K. and Day, N. (1999) *Field guide to the birds of Australia*, 6th Edn. Viking (Penguin), Victoria.

Appendix 1: Species and abundance in TSR reference site

Location: 31° 28' 52.6", 150° 40' 21.7". 455m a.s.l

White Box grassy woodland of the Nandewar and Brigalow Belt South bioregion.

Some disturbance in the form of tree clearing under power lines and vehicle tracks through the reserve.

Species	Common name	Abundance
Trees		
<i>Eucalyptus albens</i>	White Box	Dom
<i>Callitris glaucophylla</i>	White Cypress Pine	U
<i>Brachychiton populneus</i>	Kurrajong	1
Shrubs		
<i>Olearia elliptica</i>	Sticky Daisy Bush	U
<i>Jasminum suavisimum</i>	Native Jasmine	U
<i>Acacia decora</i>	Western Silver Wattle	U
<i>*Olea europaea subsp cuspidata</i>	African Olive	U
<i>Dodonaea viscosa subsp angustifolia</i>	Hop Bush	R
<i>Notelaea microcarpa</i>	Native Olive	U
Grasses		
<i>Austrostipa aristiglumis</i>	Plains Grass	Dom
<i>*Sorghum halepense</i>	Johnson's Grass	U
<i>Aristida leptopoda</i>	White spear grass	U
<i>Austrodanthonia bipartita</i>	Wallaby Grass	U
<i>Austrostipa scabra</i>	Rough Speargrass	U
<i>Bothriochloa biloba</i>	Tall Red Grass	U
<i>Bothriochloa macra</i>	Red Grass	C
<i>Chloris truncata</i>	Windmill Grass	U
<i>Chloris ventricosa</i>	Tall Windmill Grass	U
<i>Cynodon dactylon</i>	Couch	U

<i>Dichanthium sericeum</i>	Qld Bluegrass	C
<i>Digitaria divaricatissima</i>	Spreading Umbrella Grass	C
<i>Eragrostis sp.</i>	Love grass	U
<i>Eriochloa pseudoacrotricha</i>	Early Spring Grass	U
<i>Eulalia aurea</i>	Silky Brown Top	R
<i>Panicum decompositum</i>	Native Millet	C
<i>Poa sieberiana</i>	Snow Grass	U
<i>Themeda australis</i>	Kangaroo Grass	R
<i>Themeda avenacea</i>	Tall Oat Grass	C
Sedges		
<i>Carex inversa</i>	Knob Sedge	U
<i>Cyperus bifax</i>	Downs Nutgrass	U
Forbs, ferns and sub-shrubs		
* <i>Bidens subalternans</i>	Cobblers pegs	U
* <i>Hypericum perforatum</i>	St John's Wort	R
* <i>Plantago debilis</i>	Plantain	U
<i>Arthropodium minus</i>	Vanilla Lily	R
<i>Asperula conferta</i>	Woodruff	C
<i>Brachyscome sp</i>	Daisy	R
<i>Calotis cuneifolia</i>	Burr Daisy	U
<i>Calotis lappulacea</i>	Yellow Burr Daisy	U
<i>Cheilanthes sieberi</i>	Rock Fern	U
<i>Chrysocephalum apiculatum</i>	Billy Buttons	C
<i>Cymbonotus lawsonianus</i>	Bear's Ear	U
<i>Desmodium varians</i>	Tick Trefoil	U
<i>Dianella longifolia</i>	Blue Flax Lily	U
<i>Dichondra repens</i>	Kidney Weed	C
<i>Einadia nutans</i>		C

<i>Eremophila debilis</i>	Aemulla	U
<i>Geranium solanderi</i>	Native Geranium	U
<i>Glycine clandestina</i>		U
<i>Glycine latifolia</i>		R
<i>Lomandra filiformis</i>		R
<i>Lomandra multiflora</i>	Many-headed Mat Rush	U
<i>Maireana microphylla</i>	Eastern Cottonbush	R
<i>Mentha satureioides</i>	Native Pennyroyal	U
<i>Oxalis perennans</i>	Perennial Oxalis	U
<i>Podolepis sp</i>	Copper Wire Daisy	R
<i>Rostellularia adscendens</i>	Pink Tongues	R
<i>Sida trichopoda</i>	Hairy Sida	U
<i>Vittadinia muelleri</i>	Fuzzweed	C
<i>Wahlenbergia sp</i>	Native Bluebell	C

* indicates a non-native species



Figure 14: : The vegetation in the TSR has very high environmental values

Appendix 2: Plant species occurring on private land in the North Quirindi area

Many species on private land could not be identified because most of the plant had been grazed, or because of the time of year of the survey. * indicates an exotic species.

Species	Common name
Trees and shrubs	
<i>Eucalyptus albens</i>	White Box
<i>Angophora floribunda</i>	Rough-barked Apple
<i>Alectryon oleifolius</i>	Boonery
<i>Callitris glaucophylla</i>	White Cypress Pine
<i>Acacia decora</i>	Western Silver Wattle
<i>Lycium ferocissimum</i> *	African Box Thorn
<i>Jasminum suavissimum</i>	Native Jasmine
Grasses and sedges	
<i>Aristida leptopoda</i>	White Spear Grass
<i>Austrodanthonia bipartita</i>	A Wallaby Grass
<i>Austrostipa aristiglumis</i>	Plains Grass
<i>Bothriochloa sp</i>	Red Grass
<i>Carex inversa</i>	Knob Sedge
<i>Chloris truncata</i>	Windmill Grass
<i>Cynodon dactylon</i>	Couch
<i>Dichanthium sericeum</i>	Qld Blue Grass
<i>Eragrostis leptostachya</i>	Paddock Lovegrass
<i>Urochloa panicoides</i> *	Liverseed Grass
Forbs and other species	
<i>Asperula conferta</i>	Woodruff
<i>Chrysocephalum apiculatum</i>	Billy Buttons
<i>Cirsium vulgare</i> *	Spear Thistle
<i>Cymbonotus lawsonianus</i>	Bear's Ear
<i>Dichondra repens</i>	Kidney Weed

<i>Einadia nutans</i>	Climbing saltbush
<i>Einadia polygonoides</i>	
<i>Eremophila debilis</i>	Aemulla
<i>Geranium solanderi</i>	Native Geranium
<i>Leiocarpa tomentosa</i>	Woolly Plover Daisy
<i>Maireana microphylla</i>	Eastern Cottonbush
<i>Opuntia stricta</i> *	Prickly Pear
<i>Oxalis perennans</i>	Perennial Oxalis
<i>Pratia concolor</i>	Poison Pratia
<i>Rumex brownii</i>	Dock
<i>Rapistrum rugosum</i> *	Turnip Weed
<i>Salsola australis</i>	
<i>Salvia verbenaca</i> *	Wild Sage
<i>Schkuhria pinnata</i> *	Dwarf Marigold
<i>Sclerolaena muricata</i>	Black Roly Poly
<i>Sida trichopoda</i>	Hairy Sida
<i>Silybum maireanum</i> *	Variegated Thistle
<i>Solanum esuriale</i>	Quena
<i>Tribulus terrestris</i> *	Caltrop
<i>Urtica incisa</i>	Stinging Nettle
<i>Vittadinia muelleri</i>	Fuzzweed
<i>Wahlenbergia stricta</i>	Native Bluebell
<i>Xanthium spinosum</i> *	Bathurst Burr

Appendix 3: Fauna observed during field assessment (20-21 May 2015)

Observations made at all sites on private and public land.

Species	Common Name
Birds	
<i>Platycercus eximius</i>	Eastern Rosella
<i>Gymnorhina tibicen</i>	Australian Magpie
<i>Manorina melanocephala</i>	Noisy Miner
<i>Psephotus haematonotus</i>	Red-rumped Parrot
<i>Glossopsitta concinna</i>	Musk Lorikeet
<i>Corvus coronoides</i>	Australian Raven
<i>Eolophus roseicapilla</i>	Galah
<i>Ocyphaps lophotes</i>	Crested Pigeon
<i>Cacatua galerita</i>	Sulphur-crested Cockatoo
<i>Grallina cyanoleuca</i>	Mudlark
<i>Cracticus nigrogularis</i>	Pied Butcher Bird
<i>Sturnus vulgaris</i> *	Common Starling
Mammals	
<i>Macropus giganteus</i>	Eastern Grey Kangaroo