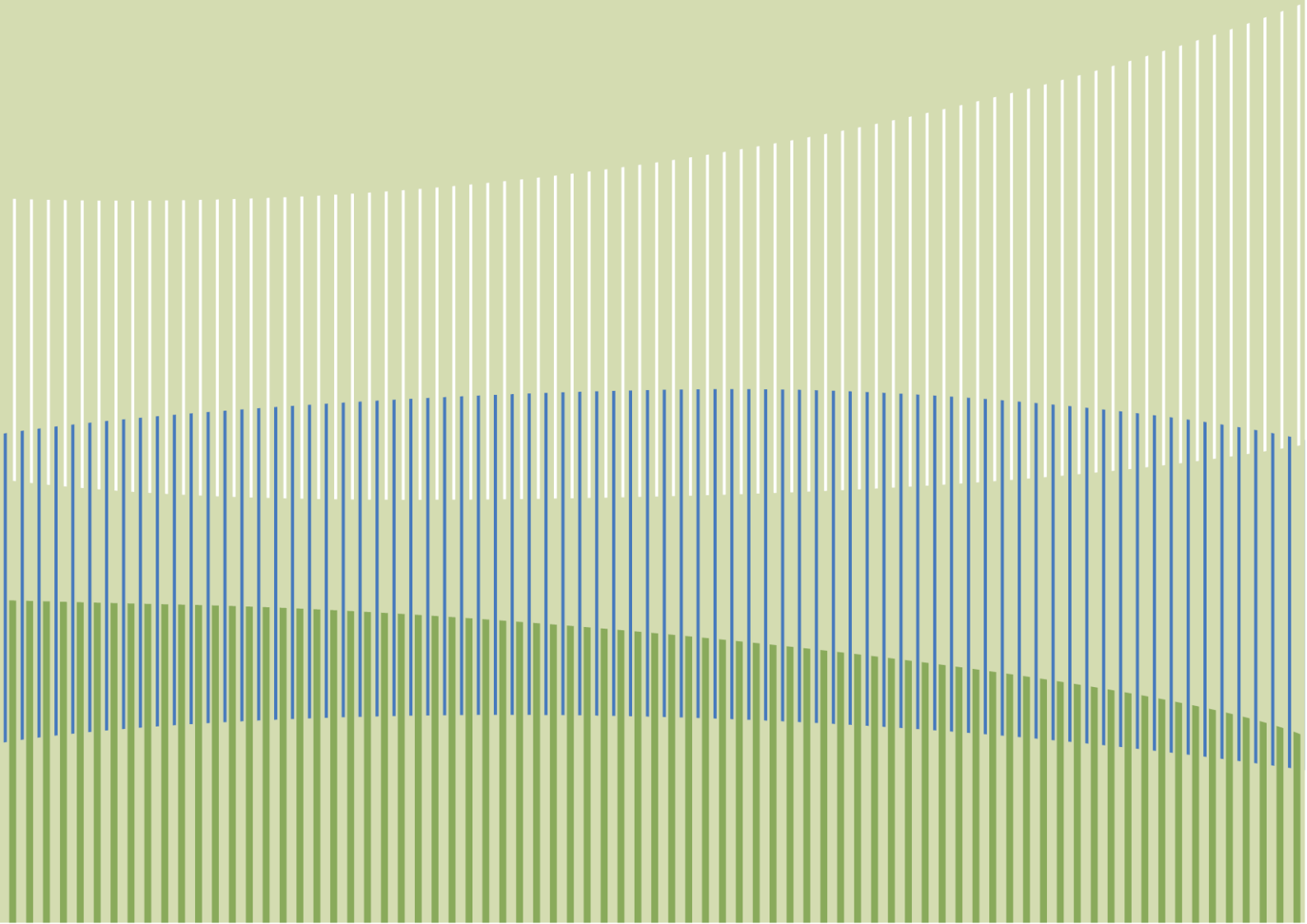


Local Biodiversity Strategy

Appendices



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Appendix A: Summary of natural areas by Precinct

Table 1: Precinct statistics of vegetated natural areas

PRECINCT ID	PRECINCT NAME	PRECINCT CATEGORY	Vegetated natural areas (ha)	Public (DEC) Conservation Estate (ha)	DEC managed State Forest (ha)	Other DEC managed lands (ha)	Local Natural Areas (ha)	POS proposed in ODPs (ha)	Regional Open Space (ha)	Vegetated CCW wetlands (ha)
1	Nambeelup Industrial Estate	A	496.6	10.8			485.8	119.6	0.1	112.8
5	Stakehill DSA 264	A	36.9				36.9			
7	Ravenswood Residential Conceptual Plan	A	22.4				22.4			1.1
19	Furnissdale future urban	A	243.7				243.7	112.4	16.9	134.2
21	Furnissdale Mixed Use Pinjarra Road	A	4.8				4.8			
23	Ravenswood Draft Concept Plan	A	2.4				2.4			
25	South Yunderup	A	44.1				44.1		15.6	17.2
28	Keralup Master Plan	A	395.4				395.4			45.0
30	Nirimba/West Pinjarra proposed urban	A	149.8	0.2			149.6		7.2	30.1
31	Greenlands Rd Light Industrial	A	20.6				20.6			1.2
32	West Pinjarra Light Industrial	A	37.8	13.9			23.9			23.0
33	Ravenswood Future Urban	A	139.9				139.9			57.3
34	North Pinjarra Future Urban	A	45.4				45.4		0.7	14.4
35	Pinjarra Townsite	A	161.6	14.1			147.5		64.0	40.2

PRECINCT ID	PRECINCT NAME	PRECINCT CATEGORY	Vegetated natural areas (ha)	Public (DEC) Conservation Estate (ha)	DEC managed State Forest (ha)	Other DEC managed lands (ha)	Local Natural Areas (ha)	POS proposed in ODPs (ha)	Regional Open Space (ha)	Vegetated CCW wetlands (ha)
41	South Nambeelup Future Urban	A	76.8				76.8			3.4
4	Point Grey	B	128.4				128.4		61.4	34.2
14	North Dandalup Town Future Urban	B	0.1				0.1			
15	Ravenswood, Lots 9005, 9006 & 9007 Pinjarra Rd	B	6.8				6.8			
16	Ravenswood, Lot 22 Old Mandurah Rd	B	9.3				9.3		3.3	1.9
17	Nambeelup Industrial PRS industrial zoned	B	14.7				14.7	4.3		
18	Furnissdale Urban zoned –west	B	18.2				18.2			5.4
24	Austin Cove	B	38.4				38.4		0.3	22.2
2	Golden Lakes View Rural Residential	C	199.0				199.0	108.3		13.1
8	Fairbridge DSA 209	C	4.4				4.4			2.5
9	North Dandalup Long Term Potential Rural Residential	C	64.7				64.7			13.3
10	North Dandalup River Rural Residential	C	73.8				73.8			32.2
13	Lakes Road Special Use Zone	C	112.7				112.7			
27	Nambeelup DSA 236	C	22.9				22.9	0.1		
11	Dandalup Springs Rural Residential	D	0.6				0.6			
12	Lakes Road Rural Residential	D	2.8				2.8			

PRECINCT ID	PRECINCT NAME	PRECINCT CATEGORY	Vegetated natural areas (ha)	Public (DEC) Conservation Estate (ha)	DEC managed State Forest (ha)	Other DEC managed lands (ha)	Local Natural Areas (ha)	POS proposed in ODPs (ha)	Regional Open Space (ha)	Vegetated CCW wetlands (ha)
22	Serpentine Lakes Rural Residential	D	881.6	251.5			630.1	0.1	440.1	338.3
42	DSA 239 Blue Ranges	D	38.1				38.1			
26	South Nambeelup	E	94.1				94.1	24.5		7.7
29	Nambeelup Rural North of Lakes Road	E	664.9				664.9			39.8
36	Harvey Estuary –Nirimba Rural	E	2903.0	1389.0			1514.1		2219.6	1224.6
37	Northwest Coolup Rural	E	298.2				298.2			12.8
38	South West Coolup Rural	E	1316.3	109.3			1206.9		149.1	222.0
39	North Dandalup Rural	E	82.0				82.0			14.3
40	South Nambeelup Rural	E	561.1				561.1	0.1		135.6
43	Hills Landscape RPS North	E	1659.3	57.8	3.2		1598.3		57.8	27.5
44	Hills Landscape RPS South	E	1956.0	17.1	2.9	0.3	1935.6		5.0	144.0
45	State Forest North	E	54546.5	117.4	53903.5		525.5		176.7	925.9
46	State Forest South	E	21343.1	2386.0	17573.6	26.5	1357.1			
3	Keysbrook Sands	F	120.8				120.8			0.8
6	Alcoa Land Holdings	F	1620.0				1620.0			112.4
0	Outside Precincts		1427.1	591.5	50.2		785.4		1191.6	1185.8
TOTAL (ha)			92086.8	4958.6	71533.4	26.8	15568.0	369.2	4413.8	5102.8

Appendix B: Conservation Rated Flora with known occurrences in the Shire of Murray

Table 2: Conservation Rated Flora with known occurrences in the Shire of Murray (NatureMap, 2012)

Species Name	Common Name	EBPC Act Listing	Wildlife Conservation Act Code
<i>Acacia benthamii</i>			P2
<i>Acacia horridula</i>			P3
<i>Acacia lasiocarpa</i> var. <i>bracteolata</i> long peduncle variant (G.J. Keighery 5026)			P1
<i>Acacia oncinophylla</i> subsp. <i>oncinophylla</i>			P3
<i>Acacia oncinophylla</i> subsp. <i>patulifolia</i>			P3
<i>Acacia semitrullata</i>			P4
<i>Anthocercis gracilis</i>	Slender Tailflower	Vulnerable	Rare or likely to become extinct
<i>Aponogeton hexatepalu</i>	Stalked Water Ribbons		P4
<i>Blennospora doliiformis</i>			P3
<i>Boronia capitata</i> subsp. <i>gracilis</i>			P3
<i>Boronia tenui</i>	Blue Boronia		P4
<i>Caladenia huegelii</i>	Grand Spider Orchid	Endangered	Rare or likely to become extinct
<i>Caladenia speciosa</i>			P4
<i>Calothamnus graniticus</i> subsp. <i>leptophyllus</i>			P4
<i>Calothamnus rupestris</i>	Mouse Ears		P4
<i>Centrolepis caespitosa</i>		Endangered	P4
<i>Chamaescilla gibsonii</i>			P3
<i>Chorizema ulotropis</i>			P4
<i>Conostylis pauciflora</i> subsp. <i>pauciflora</i>			P4
<i>Craspedia argillicola</i>			P2
<i>Cyathochaeta teretifolia</i>			P3
<i>Dillwynia dillwynioides</i>			P3
<i>Diuris drummondii</i>	Tall Donkey Orchid		Rare or likely to become extinct

Species Name	Common Name	EBPC Act Listing	Wildlife Conservation Act Code
<i>Diuris micrantha</i>		Vulnerable	Rare or likely to become extinct
<i>Diuris purdiei</i>	Purdie's Donkey Orchid	Endangered	Rare or likely to become extinct
<i>Drakaea elastica</i>	Glossy-leaved Hammer Orchid	Endangered	Rare or likely to become extinct
<i>Drakaea micrantha</i>			Rare or likely to become extinct
<i>Eucalyptus rudis</i> subsp. <i>cratyantha</i>			P4
<i>Gastrolobium</i> sp. <i>Harvey</i> (G.J. Keighery 16821)			P2
<i>Grevillea bipinnatifida</i> subsp. <i>pagna</i>			P1
<i>Grevillea manglesii</i> subsp. <i>dissectifolia</i>			P3
<i>Grevillea manglesii</i> subsp. <i>ornithopoda</i>			P2
<i>Hakea oldfieldii</i>			P3
<i>Hemigenia microphylla</i>			P3
<i>Hemigenia rigida</i>			P1
<i>Jacksonia gracillima</i>			P3
<i>Jacksonia sericea</i>	Waldjumi		P4
<i>Johnsonia pubescens</i> subsp. <i>cygnorum</i>			P2
<i>Lasiopetalum membranaceum</i>		Endangered	P3
<i>Meionectes tenuifolia</i>			P3
<i>Microtis quadrata</i>			P4
<i>Myriophyllum echinatum</i>			P3
<i>Ornduffia submersa</i>			P4
<i>Parsonsia diaphanophleba</i>			P4
<i>Phyllangium palustre</i>			P2
<i>Pimelea rara</i>	Summer Pimelea		P4
<i>Ptilotus sericostachyus</i> subsp. <i>roseus</i>			P1
<i>Rumex drummondii</i>			P4
<i>Schoenus benthamii</i>			P3
<i>Schoenus capillifolius</i>			P3
<i>Schoenus natans</i>	Floating Bog-rush		P4

Species Name	Common Name	EBPC Act Listing	Wildlife Conservation Act Code
<i>Schoenus pennisetis</i>			P1
<i>Schoenus sp. Waroona (G.J. Keighery 12235)</i>			P3
<i>Senecio leucoglossus</i>			P4
<i>Sphaerolobium calcicola</i>			P3
<i>Stylidium ireneae</i>			P4
<i>Stylidium longitubum</i>	Jumping Jacks		P3
<i>Synaphea odocoileops</i>			P1
<i>Synaphea sp. Fairbridge Farm (D. Papenfus 696)</i>		Critically Endangered	Rare or likely to become extinct
<i>Synaphea sp. Pinjarra (R. Davis 6578)</i>		Critically Endangered	Rare or likely to become extinct
<i>Synaphea sp. Pinjarra Plain (A.S. George 17182)</i>			P1
<i>Synaphea stenoloba</i>		Endangered	Rare or likely to become extinct
<i>Tetralia australiensis</i>			Rare or likely to become extinct
<i>Tetralia phoenix</i>			P2
<i>Tetralia pilifera</i>			P3
<i>Thysanotus anceps</i>			P3
<i>Tripterococcus paniculatus</i>			P4
<i>Trithuria australis</i>			P4
<i>Verticordia plumosa var. ananeotes</i>			Rare or likely to become extinct

Conservation codes: Rare or likely to become extinct = (T-Threatened Flora - Schedule 1); P1 = Priority 1, P2 = Priority 2, P3 = Priority 3 (Poorly known taxa); P4 = Rare, near threatened and other taxa in need of monitoring.

Appendix C: Threatened and priority listed fauna

Table 3: List of Conservation Significant Fauna based NatureMap search Shire of Murray (Naturemap, 2013)

Species Name	Common Name	EBPC Act Listing	Wildlife Conservation Act Code
Birds			
<i>Ardeotis australis</i>	Australian Bustard	-	P4
<i>Atrichornis clamosus</i>	Noisy Scrub-bird	Vulnerable	Rare or likely to become extinct
<i>Botaurus poiciloptilus</i>	Australasian Bittern	Endangered	Rare or likely to become extinct
<i>Calyptorhynchus banksii naso</i>	Forest Red-tailed Black-Cockatoo	Vulnerable	Rare or likely to become extinct
<i>Calyptorhynchus baudinii</i>	Baudin's Black-Cockatoo	Vulnerable	Rare or likely to become extinct
<i>Calyptorhynchus latirostris</i>	Carnaby's Black-Cockatoo	Endangered	Rare or likely to become extinct
<i>Falco peregrinus subsp. macropus</i>	Peregrine Falcon	-	Specially Protected Fauna
<i>Leipoa ocellata</i>	Malleefowl	Vulnerable	Rare or likely to become extinct
<i>Numenius madagascariensis</i>	Eastern Curlew	-	P4
<i>Rostratula benghalensis australis</i>	Painted Snipe	Vulnerable; CAMBA	Rare or likely to become extinct
<i>Sternula nereis nereis</i>	Fairy Tern (Australian)	Vulnerable; JAMBA	Rare or likely to become extinct
<i>Tyto novaehollandiae subsp. novaehollandiae</i>	Masked Owl	-	P3
Invertebrates			
<i>Glacidorbis occidentalis</i>	Freshwater snail	-	P2
<i>Idiosoma nigrum</i>	Shield-back Trapdoor Spider	-	Rare or likely to become extinct
<i>Neopasiphe simplicior</i>	Bee	-	Rare or likely to become extinct
<i>Austromerope poultoni</i>	Scorpionfly	-	P2
<i>Synemon gratiosa</i>	Graceful Sun Moth	Endangered	Rare or likely to become extinct
Mammals			
<i>Bettongia penicillata ogilbyi</i>	Woylie	Endangered	Rare or likely to become extinct
<i>Dasyurus geoffroii</i>	Chuditch	Vulnerable	Rare or likely to become extinct
<i>Falsistrellus mackenziei</i>	Western False Pipistrelle	-	P4
<i>Hydromys chrysogaster</i>	Water-rat	-	P4
<i>Isodon obesulus subsp. fusciventer</i>	Quenda	-	P5

Species Name	Common Name	EBPC Act Listing	Wildlife Conservation Act Code
<i>Macropus irma</i>	Western Brush Wallaby	-	P4
<i>Myrmecobius fasciatus</i>	Numbat	-	Rare or likely to become extinct
<i>Phascogale calura</i>	Red-tailed Phascogale	Endangered	Rare or likely to become extinct
<i>Phascogale tapoatafa</i> ssp. (WAM M434)	Brush-tailed Phascogale	-	Rare or likely to become extinct
<i>Pseudocheirus occidentalis</i>	Western Ringtail Possum	Vulnerable	Rare or likely to become extinct
<i>Setonix brachyurus</i>	Quokka	Vulnerable	Rare or likely to become extinct
Reptiles			
<i>Caretta caretta</i>	Loggerhead Turtle	Endangered	Rare or likely to become extinct
<i>Chelonia mydas</i>	Green Turtle	Vulnerable	Rare or likely to become extinct
<i>Ctenotus delli</i>	Skink	-	P4
<i>Dermochelys coriacea</i>	Leatherback Turtle	Endangered	Rare or likely to become extinct
<i>Morelia spilota</i> subsp. <i>imbricata</i>	Carpet Python	-	Specially Protected Fauna

Note: This list does not include migratory species which may inhabit the study area.

Conservation codes: Rare or likely to become extinct = (T-Threatened Flora - Schedule 1); P1 = Priority 1, P2 = Priority 2, P3 = Priority 3 (Poorly known taxa); P4 = Rare, near threatened and other taxa in need of monitoring.

Appendix D: TECs known to occur in the Shire of Murray

Table 4: TEC's known to occur in the Shire of Murray (Molloy *et al*, 2007)

Elongate Fluvial Delta System	Elongate Fluvial Delta System - Peel-Harvey inlet
SCP07	Herb rich saline shrublands in clay pans
SCP08	Herb rich shrublands in clay pans
SCP09	Dense shrublands on clay flats
SCP10a	Shrublands on dry clay flats
SCP15	Forests and woodlands of deep seasonal wetlands of the Swan Coastal Plain
SCP20b	<i>Banksia attenuata</i> and/or <i>Eucalyptus marginata</i> woodlands of the eastern side of the Swan Coastal Plain
SCP3a	<i>Corymbia calophylla</i> - <i>Kingia australis</i> woodlands on heavy soils, Swan Coastal Plain
SCP3b	<i>Corymbia calophylla</i> - <i>Eucalyptus marginata</i> woodlands on sandy clay soils of the southern Swan Coastal Plain

Appendix E: Technical notes and assumptions attached to Precinct Protection Targets

1. The Precinct-by-Precinct approach to establish transparent targets is designed to allow the integration of natural area protection into the Shire's land use planning processes. However, Precinct protection targets should be used cautiously when undertaking detailed planning in each Precinct.
2. The targets assume that the mapped vegetated LNAs are in Good condition, or for vegetation complexes retained at less than 10%, are able to be reasonably restored.
3. The targets do not include areas of unvegetated wetland, even where unvegetated wetlands are part of a CCW or REW wetland with vegetated parts. These areas of unvegetated wetland are high priorities for protection where they form part of CCW or vegetated REW.
4. Targets for each Precinct assume all DEC conservation estate will remain protected, and all PRS ROS that is not DEC conservation yet will be protected will be protected in the future.
5. For Category A Precincts (urban/light industrial, ODP not approved), the following assumptions apply to the setting of protection targets:
 - i. all vegetation in POS proposed in draft ODPs will be protected;
 - ii. all CCW wetlands will be protected as per State Government policy;
 - iii. All LNAs of Priority One vegetation complexes will be protected;
 - iv. Generally all Swan Bioplan Sites will be protected;
 - v. Generally, all vegetated portions of REW wetlands will be protected;
 - vi. Generally, all vegetation meeting the PBP criteria for riparian vegetation and associated with natural watercourses (e.g. rivers and creeks) will be protected.
6. For Category B Precincts (urban/light industrial zoned lands where an ODP has been approved, or some other approval has been given, the proposed protection is based on the approved ODP or plan, and protection of all ROS.
7. For Category C Precincts (rural residential, ODP not approved) the following assumptions apply to the setting of protection targets:
 - i. all vegetation in POS proposed in draft ODPs will be protected;
 - ii. all CCW wetlands will be protected;
 - iii. All LNAs of Priority One vegetation complexes will be protected;

- iv. Generally all Swan Bioplan Sites will be protected;
 - v. Generally, all riparian vegetation associated with natural watercourses (e.g. rivers and creeks) will be protected.
 - vi. Generally, all vegetated REW wetlands will be protected;
8. For category E Precincts, (Rural/ no change) it is assumed that all vegetation will be retained, Protection targets for these Precincts are based on protecting all vegetation in ROS, and only nominal additional amounts of protection, based on:
- i. A nominal protection target of 10% of LNA (outside of ROS) has been set for Category E Precincts WEST of South West Highway;
 - ii. A nominal protection target of 5% of LNA (outside of ROS) has been set for Category E Precincts EAST of South West Highway.

It is important to note that all Precinct targets are subject to the confirmation of ecological values through on-site survey by experts and detailed on-site planning. The targets are designed to assist the Shire to establish benchmarks for natural area protection and ensure a balance between development and conservation that will achieve the Strategy's objectives and conserve the diversity of species and habitats currently found in the Shire.

Appendix F: Urban and Light Industrial Areas (Categories A & B)

1. Nambeelup, Stakehill and Keralup (Precincts 1, 5, 14, 17 & 28)

The north western part of the Shire includes the localities of Nambeelup, Stakehill and Keralup. Large parts of these localities are proposed for urban or industrial land use, except for large rural residential areas and public conservation reserves that buffer the Serpentine River System.

Significant natural features of these localities are the Serpentine River, Nambeelup Brook and large areas of vegetation associated with watercourses or less productive Bassendean sandplain areas.

Around the Serpentine River most of the vegetated natural areas are in reserves vested with the DEC or in rural and rural residential properties. This riverine vegetation forms part of the Yoongarillup and Herdsman complexes. No other occurrences of these complexes occur within the Shire. Key features are good stands of *Eucalyptus gomphocephala* (Tuarts) and several Declared Rare Flora, including *Drakaea elastic* (Glossy-leaved Hammer Orchid), (Shire of Murray, 2012).

Away from the River the vegetation gives way to the Bassendean Central and South Vegetation Complex, and to the east, the Southern River complex. These complexes include large areas of Banksia woodland and wetland. Both of these complexes occur at less than 30% of their original extent across the region and area a priority for protection. Most of this vegetation is in private ownership.

Most, if not all of the vegetation in this part of the Shire is mapped as potential feeding habitat for the Carnaby's Black Cockatoo (DEC, 2011b).

Key conservation aims for these Precincts are designed to conserve biodiversity, protect the Serpentine River and Nambeelup Brook and avoid the potential environmental impacts of planned development:

1. Protect or retain all vegetation within 200 m of the high-water mark of the Serpentine River, and other associated vegetation where possible;
2. Protect or retain all stands of *Eucalyptus gomphocephala* (Tuart);
3. Protect at least 50% of occurrences of Bassendean C/S and Southern River complexes on Urban or industrial zoned lands, and protect or retain all occurrences on rural and rural residential zones; Highest priority is to be given to

- occurrences in Good or better condition and those serving an ecological corridor function;
4. Protect locations of DRF and ensure new occurrences are identified at the earliest possible planning stage;
 5. Protect and rehabilitate a significant foreshore corridor along Nambeelup Brook;

1.1 Nambeelup Industrial Estate (Precincts 1 & 17)

Precinct 1 includes the Nambeelup Industrial Estate, Murrayfield Airfield, the Nambeelup Brook foreshore, and an area of land zoned Industrial in the PRS (Figure 1). The Precinct includes significant vegetated and cleared areas.

A draft District Structure Plan covers Precinct 1 and shows areas for light industrial use, roads and public open space. The DSP leaves large areas within the DSP unplanned, including large areas of vegetation and land abutting the Serpentine River. Protection targets for Precinct 1 reflect the DSP and the protection of additional areas which are likely to have significant biodiversity, wetland and ecosystem service functions (e.g. flood mitigation). Protection targets for Precinct 17 reflect the protection of a number of small isolated LNAs. (A number of LNAs in Precinct 17 are not officially mapped).

The proposed LNA protection target for Precinct 1 is 346.9 ha of the 496.6 ha of vegetated natural areas in the Precinct. Proposed for protection in Precinct 1 is based on protection of:

- All ROS (0.12 ha);
- All proposed POS from Nambeelup Industrial Estate draft DSP (109.0 ha);
- All other CCW wetlands (95.1 ha); and
- All other Swan Bioplan Sites (142.7 ha).

There are already 10.8 ha of vegetated NA in the DEC conservation estate in Precinct 1.

The proposed protection target for Precinct 17 is 9.8 ha of the 14.71 ha of vegetated natural areas in the Precinct. Protected for protection in Precinct 17 is:

- All proposed POS (4.3 ha); and
- All Swan Bioplan (5.5 ha).

Note that there a small area(s) of unmapped vegetated natural area in the Precinct.

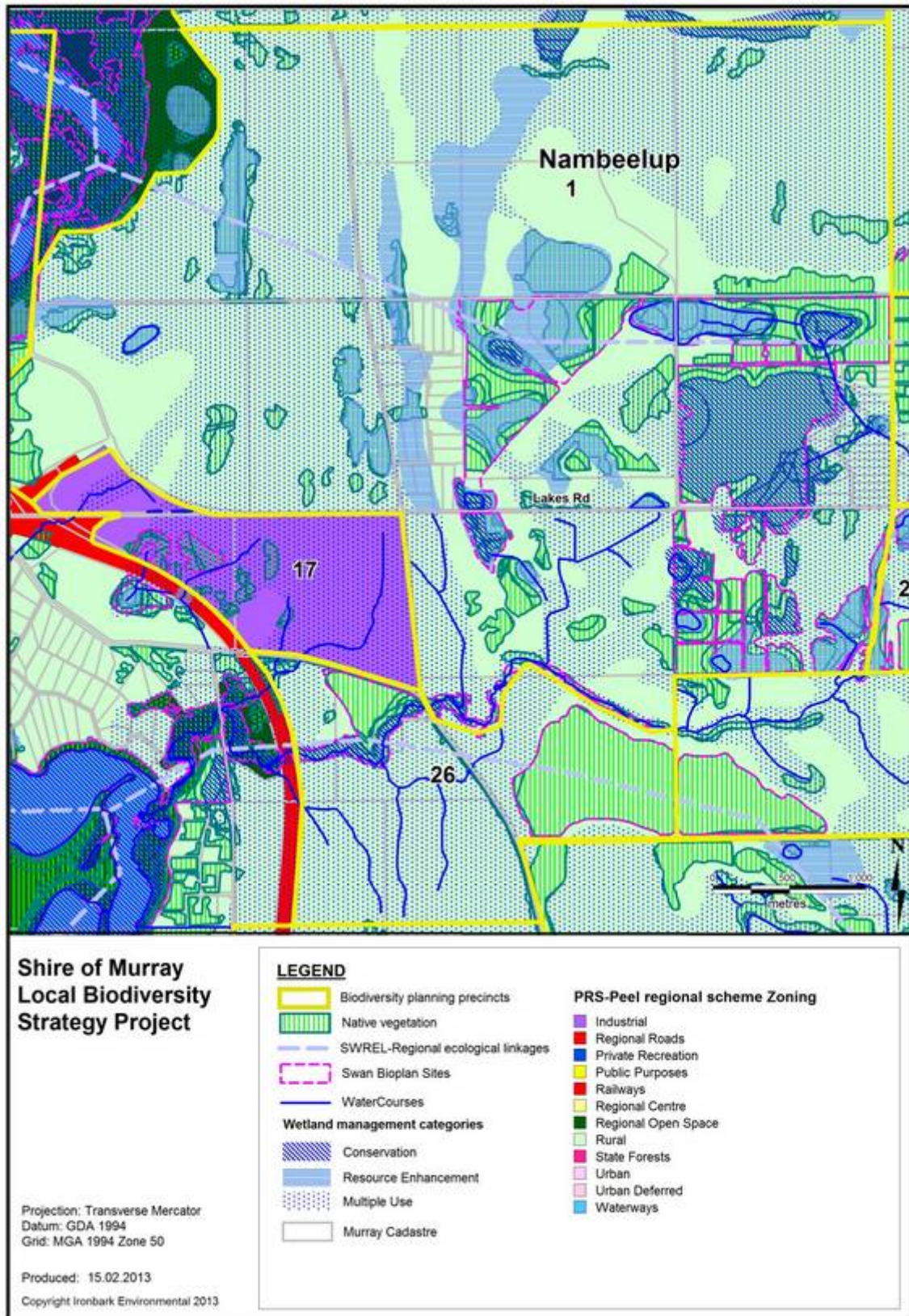


Figure 1: Precincts 1 and 17- Nambeelup Industrial Estate

1.2 Stakehill DSA 264 (Precinct 5)

This Precinct is a well vegetated lot, zoned Urban in the Peel Region Scheme and Rural in the Shire's local planning scheme. There is 36.88 ha of vegetated NA in the 69.9 ha Precinct, including known occurrences of Declared Rare Flora (Figure 2).

It is proposed to protect a 24.6 ha vegetated portion of the 36.9 ha of bushland on the site. The proposed target is based on protecting the central area of bushland on the site which has low perimeter to area ratio and includes bushland likely to be in Good or better condition.

1.3 Keralup Master Plan (Precinct 28)

Precinct 28 is part of a large State Government landholding, designated as an Urban Investigation Area (2011 – 2020) in the State Government's planning for the future of Perth and Peel (Department of Planning, 2010).

The 1644 ha site includes 395.4 ha of mapped native vegetation and large expanses of wetland (Figure 3). All vegetated natural areas in the Keralup Precinct are mapped as part of the Bassendean Central and South Vegetation Complex.

The proposed protection target for Precinct 28 is 248.5 ha of the 395.4 ha (63%) of vegetated natural areas in the Precinct. Proposed for protection in Precinct 28 is based on protection of:

- All CCW wetlands (45.0 ha);
- All other Swan Bioplan Sites (90.3 ha) – presumed all are to be protected;
- All riparian 25.4 ha (Serpentine Rive riparian); and
- All vegetated REW wetlands (87.8 ha).

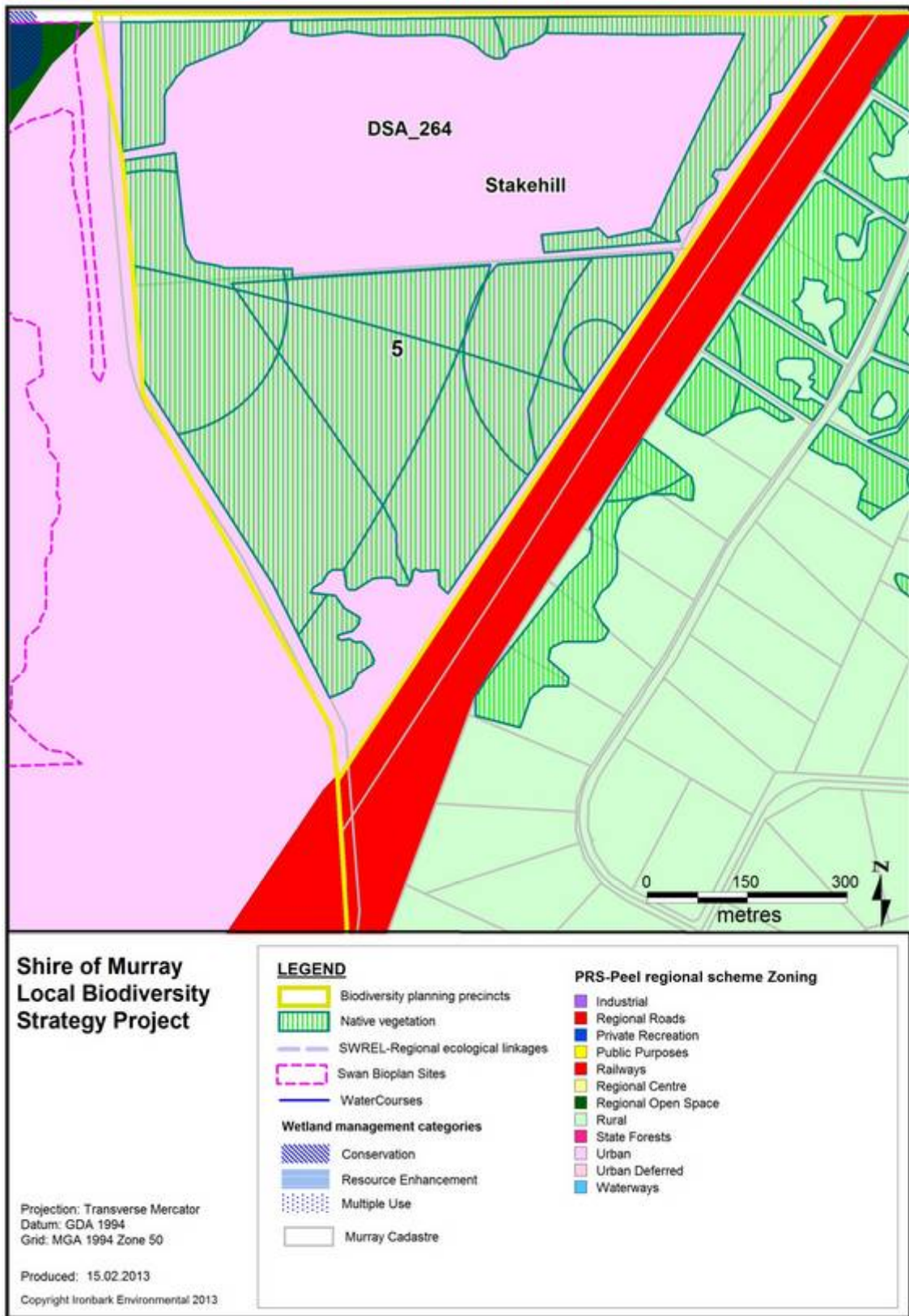


Figure 2: Precinct 5 – DSA 264 Stakehill

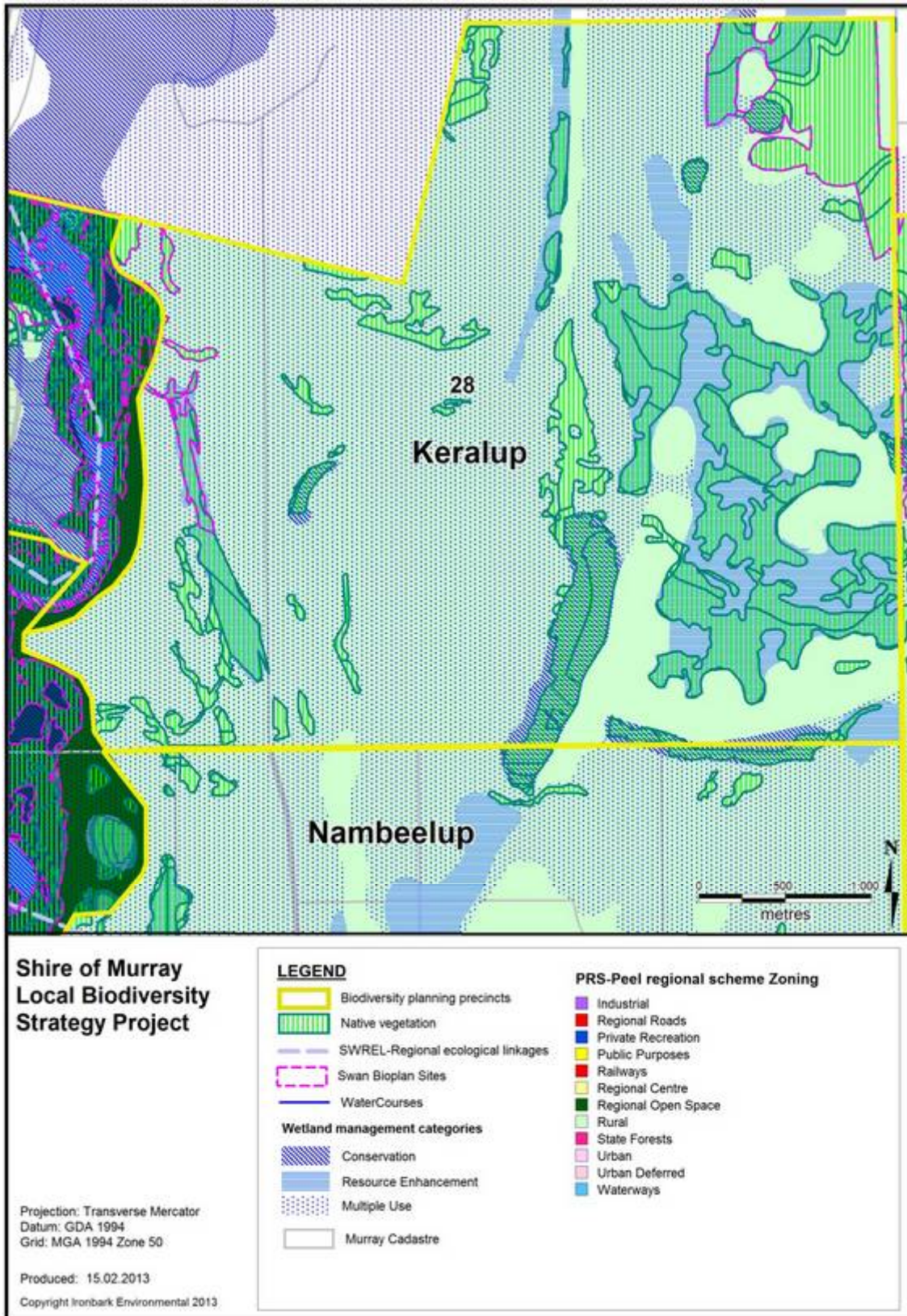


Figure 3: Precinct 28 – Keralup Master Plan area

2. Furnissdale, North Yunderup & South Yunderup (Precincts 18, 19, 20 & 21)

The Furnissdale/North Yunderup Precincts border the City of Mandurah and are generally bounded by Serpentine River, Pinjarra Road, Wilgie Creek and Tonkin Drive (Figure 4). The current main land use is rural residential, however the site is identified for urban development (Department of Planning, 2010). Land ownership across the Precincts is fragmented.

The Precinct contains substantial areas of vegetated LNA, many of which are likely to be assessed as of Good or better condition. A number of occurrences of threatened ecological communities and Declared Rare Flora are known to occur in Furnissdale/North Yunderup, and more occurrences are likely to be found with detailed ecological assessment as part of long-term planning.

2.1 Furnissdale Urban zoned –west (Precinct 18)

Precinct 18 is the PRS Urban zoned area adjacent to the Serpentine River near the Peel Inlet, (Figure 5). The Precinct is included in the draft Furnissdale Structure Plan, shown as Urban, with two small areas for Open Space – Recreation.

Precinct 18 includes 18.2 ha of vegetated LNA, of which 4.1 ha is approved to be cleared. Of the balance (14.1 ha), all is identified as potentially regionally significant in Swan Bioplan. A CCW is almost totally within the Swan Bioplan site (5.4 ha of the CCW is mapped as vegetated NA).

It is proposed that a natural area of 11.2 ha be protected as part of detailed structure planning and subdivisional design for the site. The area of 11.2 ha will protect:

- a) All remaining portions of the Swan Bioplan site;
- b) All CCW (vegetated and non-vegetated); and
- c) All remaining vegetated areas within 50 m of the CCW (the CCW minimum buffer).

A small portion of non-vegetated CCW is included within the 11.2 ha, but no non-vegetated buffer areas to the CCW have been protected. DEC usually required that non-vegetated portions of buffers to CCW wetlands be protected and revegetated.

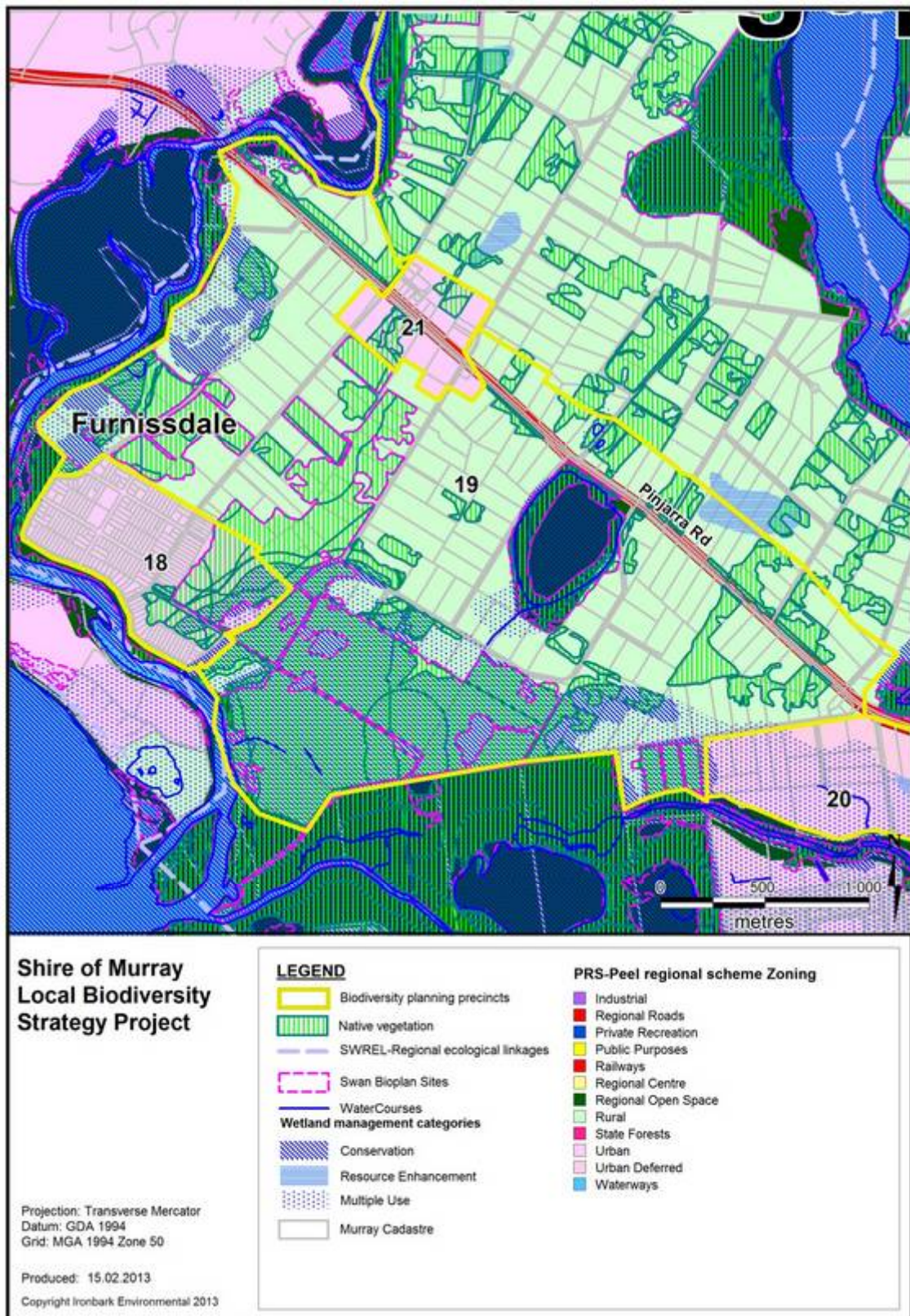


Figure 4: Precincts in the Furnissdale/Yunderup area

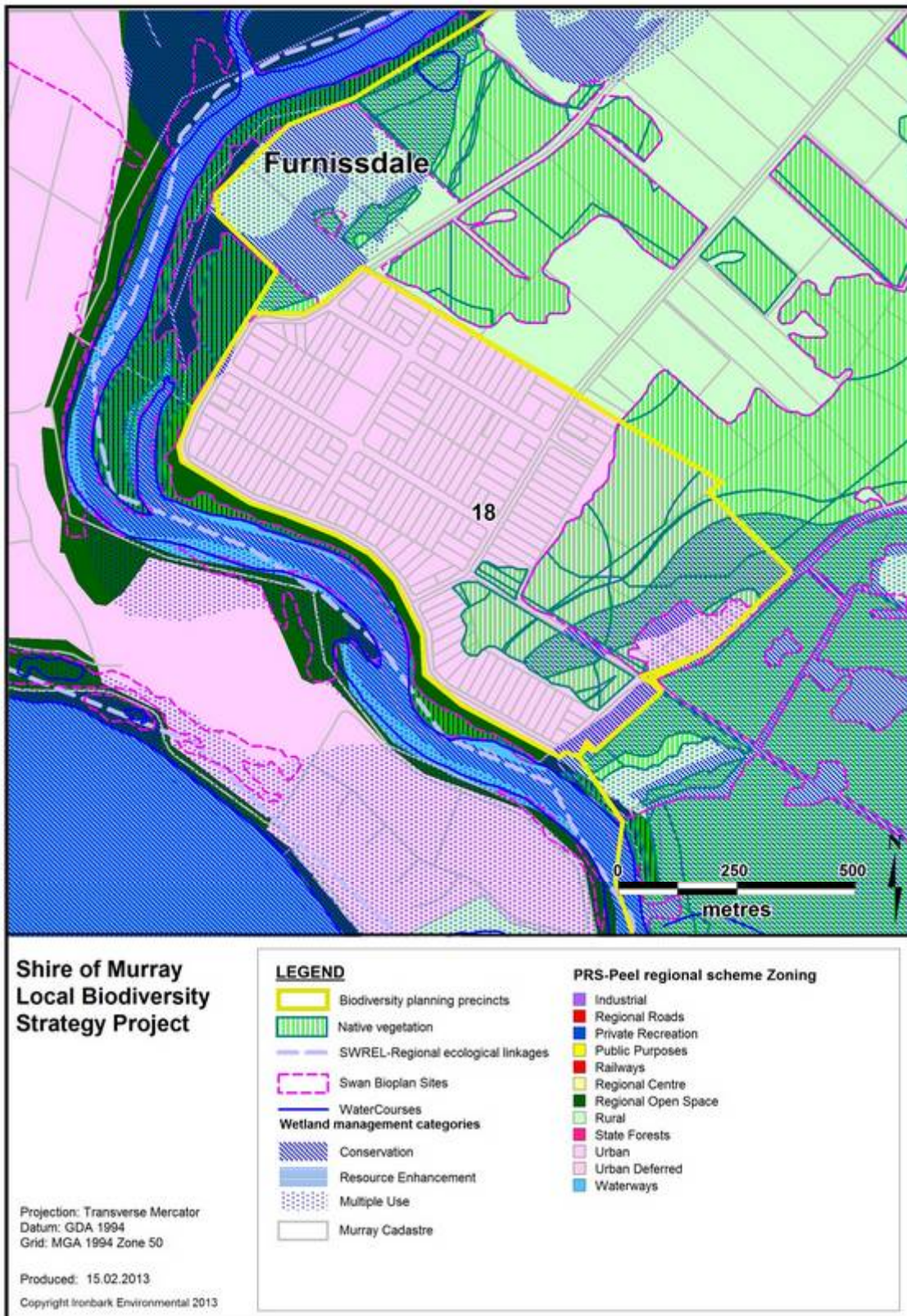


Figure 5: Precinct 18 – Furnissdale Urban zoned –west

2.2. Furnissdale future urban (Precinct 19)

Precinct 19 is the future urban land, currently zoned rural and special rural (local Planning scheme), within Furnissdale (Figure 6). It is generally bounded by Pinjarra Road, Serpentine River and Murray River.

The Precinct is 619.4 ha and contains 243.7 ha of vegetated LNA. The vegetation is mapped as Bassendean Central and South (156.4 ha) and Vasse (87.3 ha) Vegetation complexes.

The Precinct is included within the draft Furnissdale Structure Plan. This district structure plan identifies a number of proposed areas of open space for conservation.

The proposed protection target for Precinct 19 is 194.6 ha of the 243.7 ha (80%) of vegetated natural areas in the Precinct. Proposed for protection in Precinct 19 is:

- All ROS (16.9 ha);
- All POS proposed in the draft Furnissdale Structure Plan (100.2 ha);
- Additional areas of CCW wetlands (38.7 ha);
- All other Swan Bioplan Sites (37.9 ha) – presumed all are to be protected;
- All other riparian (0.4 ha); and
- All significant flora and Tuarts (0.5 ha).

2.3 North Yunderup (Precinct 20)

Precinct 20 is 88.3 ha between Wilgie Creek and Pinjarra Road. It supports a large REW wetland with no mapped vegetation. The protection of the REW wetland in the Draft Furnissdale Structure Plan is proposed (Department of Planning, 2012).

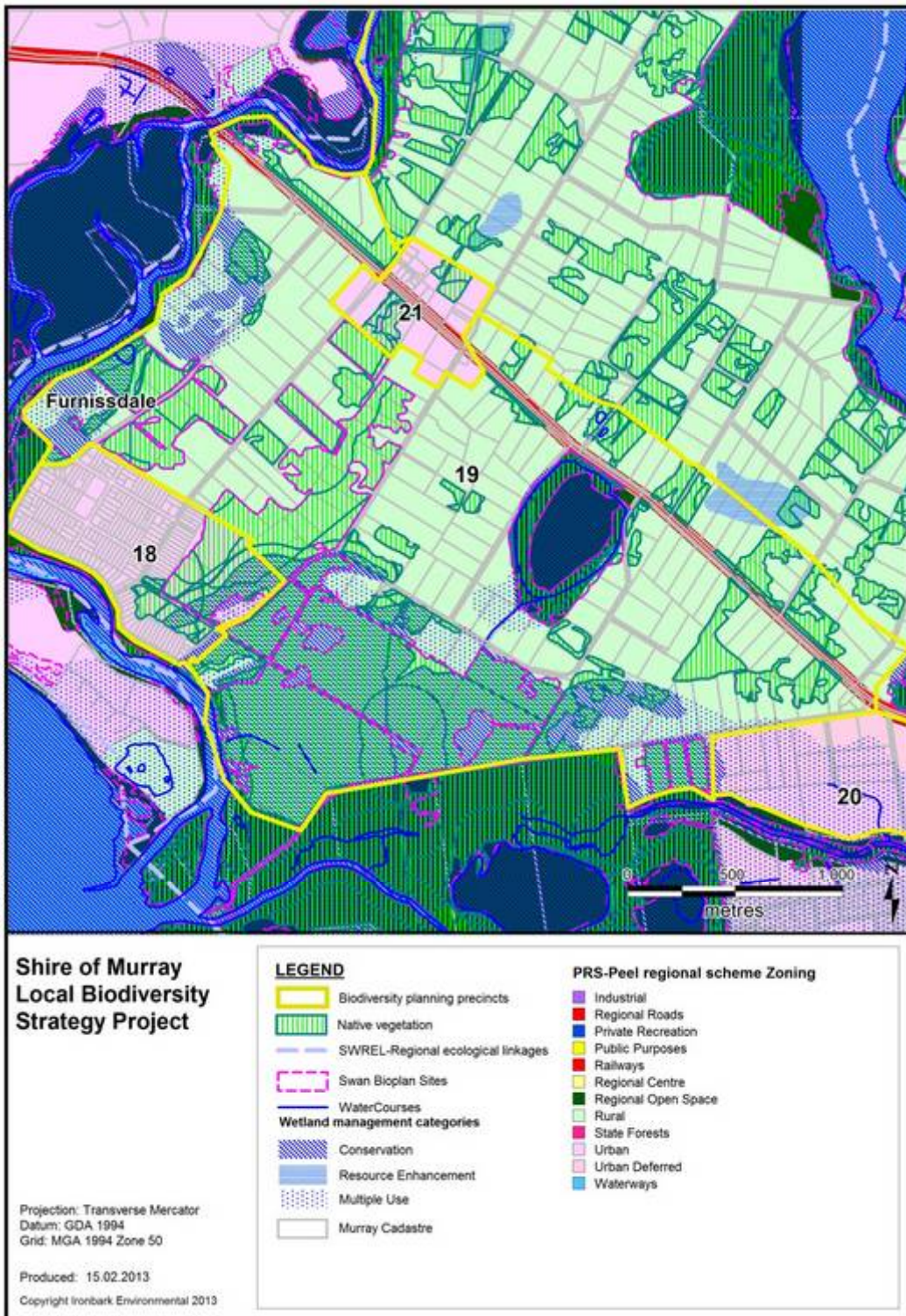


Figure 6: Precinct 19 – Furnissdale, currently zoned rural and special rural in the Local Planning Scheme, with urban planned for the future.

2.4 Furnissdale Mixed Use Pinjarra Road (Precinct 21)

This area is identified as a Mixed Use/ Service Commercial area within the Draft Furnissdale Structure Plan (Figure 6). Detailed structure planning has not yet occurred.

The Precinct includes 4.8 ha of mapped LNA, all of which would be very difficult to protect in the long-term. However, planning in the Precincts can support biodiversity by:

- Ensuring that adequate buffers and interfaces between adjacent protected bushland are provided (e.g. a proposed conservation open space directly to the south of Precinct 21);
- Maximising retention of large trees within Precinct 21 as part of streetscapes and road reserves; and
- Ensuring all stormwater is managed onsite and no direct discharge is permitted to protected bushland or wetlands.

2.5 South Yunderup (Precinct 25)

The South Yunderup Precinct is 322 ha and supports 44.1 ha of vegetated LNA, including vegetation mapped as part of the Bassendean Central and South (7.8 ha) and Vasse (36.3 ha) Vegetation Complexes. The Precinct predominantly used for rural residential, and includes some larger lots. The planned future use of the Precinct is urban (Figure 7).

The protection target for this Precinct, 28.9 ha, is based on protecting:

- All ROS (15.6 ha);
- All other CCW wetlands (7.2 ha);
- A 3.1 ha Swan Bioplan site over a tributary of the Murray River (off Thomasfield Place); and
- 3.0 Swan Bioplan site (on Yunderup Rd, near the South Yunderup Oval).

Retention of other LNA's in the Precinct should be maximised, especially where they are adjacent to protected LNA, or have other important values, such as CBC feeding habitat and large trees.

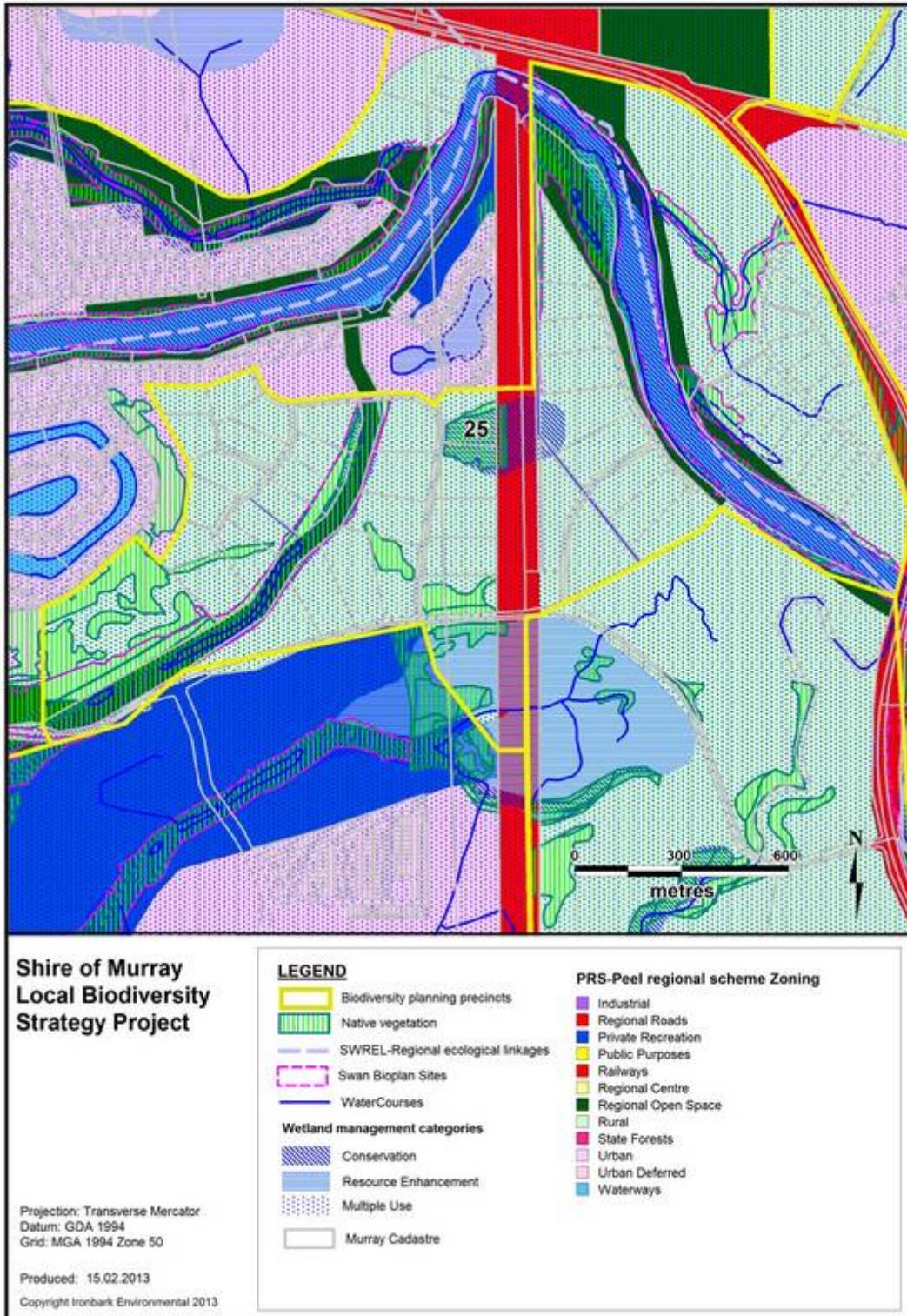


Figure 7: Precinct 25 – South Yunderup

3. South Nambeelup proposed urban (Precinct 41)

There are 76.81 ha of vegetated LNA in this area of 772.1 ha (10%). No ROS or DEC estate exists within this Precinct. All zoned PRS rural. All vegetated is of the Bassendean Central and South Vegetation Complex.

Known biodiversity features are:

- 3.4 ha of vegetated CCW;
- 14.7 ha of riparian vegetation (including 5.0 of vegetated CCW and vegetated REW);
- 9.6 ha of vegetated REW wetlands;
- Un-vegetated portions of REW wetlands.

The proposed protection target is 22.7 ha (Figure 8).

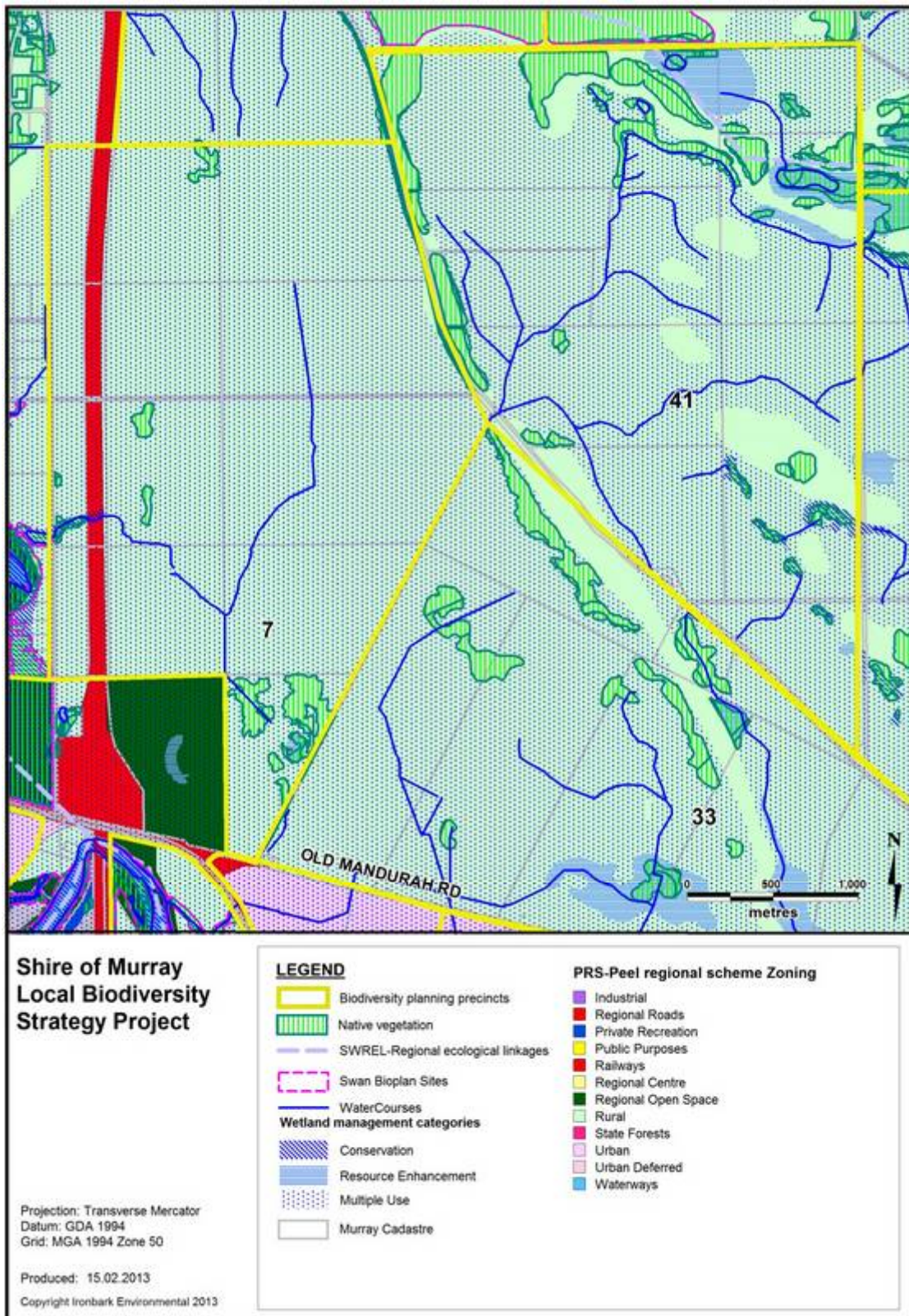


Figure 8: Precinct 7, South Nambelup proposed urban and adjacent is Precinct 41, Ravenswood Residential Conceptual Plan

4. Ravenswood Precincts (7, 15, 16, 23 & 33)

4.1 Ravenswood Residential Conceptual Plan (Precinct 7)

Precinct 7 is a large area of cleared palusplain, with only 22.4 ha of vegetated LNAs on the Precinct (Figure 8). All of the Precinct's remaining vegetation is of the Bassendean Central and South Vegetation Complex and all but 1.9 ha of the 22.4 ha of vegetated LNA is wetland. 1.1 ha is CCW, 0.9 ha is REW and 18.6 ha are MUW.

Given that the Precinct has been so heavily cleared, a priority is to protect at least 75% of the area of vegetated LNA (including all CCWs and REWs), and plan for revegetation to rebuild regional ecological linkages.

4.2 Ravenswood, Lots 9005, 9006 & 9007 Pinjarra Rd (Precinct 15)

The approved urban ODP for this site does not plan or allow for the protection of any of the 6.8 ha of mapped vegetation on the site (Figure 9). Most of this vegetation is included on a proposed school site and a 0.69 ha proposed public open space. Some of the mapped vegetation may be retained within the future open space and school site, but protection opportunities are severely limited. The Precinct contains no vegetated LNA in ROS, CCW, or Swan Bioplan sites.

4.3 Ravenswood, Lot 22 Old Mandurah Rd (Precinct 16)

This Precinct is a 66.1 ha site on the eastern side of the Ravenswood residential area (Figure 9). It supports 9.3 ha of vegetated LNA, including 3.3 ha of vegetated ROS, and additional 1.9 ha of CCW and Swan Bioplan which covers an additional 1.8 ha of vegetation.

An approved ODP covers Lot 22 in the Precinct, but the portions of the Precinct with vegetated LNA are not covered by an approved ODP.

Given the significance of CCWs and Swan Bioplan, it is recommended that the CCW and Swan Bioplan site should be protected in full, in addition to the ROS site. This equates to a total protected area of 7.6 ha.

4.4 Ravenswood Draft Concept Plan (Precinct 23)

This Precinct supports 2.3 ha of mapped LNA of the Bassendean Central and South Vegetation Complex. An existing structure plan over this site shows a public open space

area over portion of the vegetated LNA, and it is estimated that about 1.0 ha of bushland may be able to be retained within the subdivision. This is subject to verification at the detailed subdivision design stage (Figure 9).

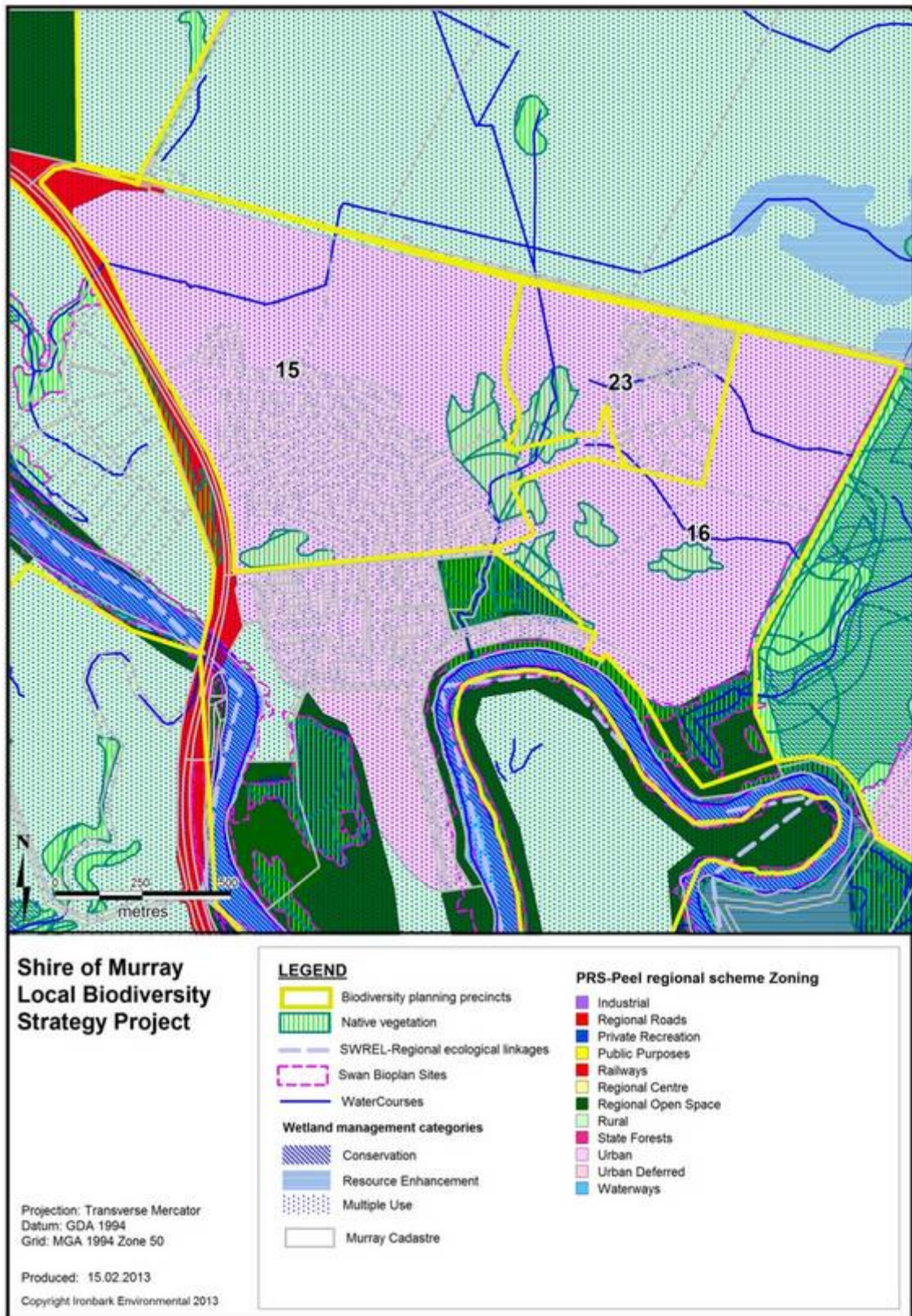


Figure 9: Ravenswood Precincts 15, 16 and 23

4.5 Ravenswood Future Urban (Precinct 33)

This 1162.9 ha area supports 139.9 ha of vegetated LNA (12%), of which 134.1 ha is Bassendean Central and South Vegetation Complex and 5.8 ha is Swan Vegetation Complex (Figure 10).

The key biodiversity features of the area's natural areas are:

- A large natural area of 57.3 ha, which is CCW and a Swan Bioplan Site, and linked to the Murray River;
- An additional 16.5 ha of Swan Bioplan Sites;
- 13.3 ha of riparian vegetation; and
- 17.0 ha of REW wetlands, including 7.1 ha of vegetated REW.

The protection target, 94.2 ha is based on protecting all of these features. 45.7 ha would be likely cleared. The 94.2 ha does not include the protection of non-vegetated parts of REW wetlands. This is also a priority.

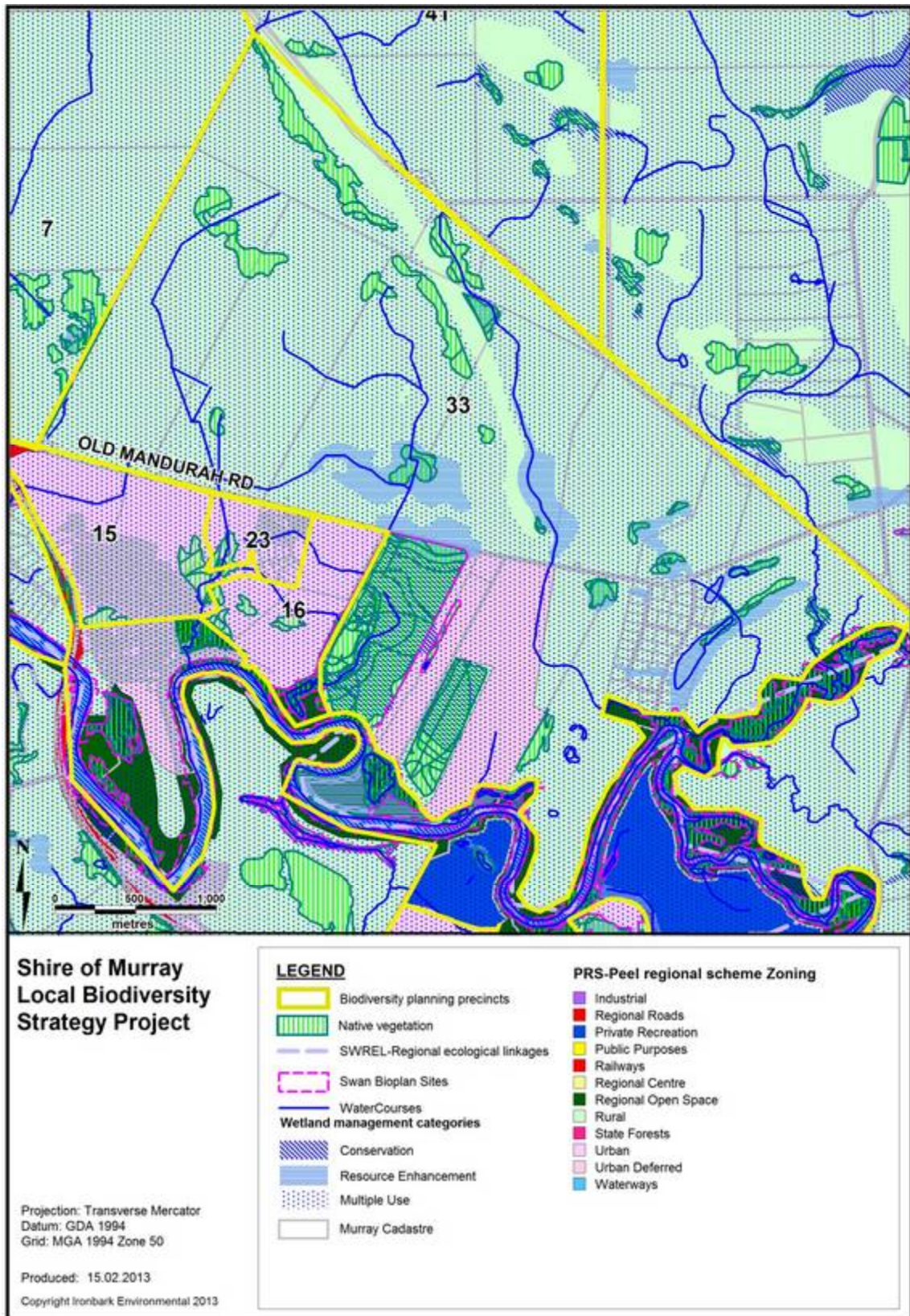


Figure 10: Precinct 33 Ravenswood Future Urban

5. West Pinjarra Precincts (30, 31, 32, 34, 35)

5.1 Nirimba/West Pinjarra proposed urban (Precinct 30)

Precinct 30 is a 2542.8 ha area of flat, largely seasonally waterlogged and inundated land which has been significantly cleared of native vegetation and drained (Figure 11). The Precinct straddles the Forrest Highway and abuts the Peel Inlet. Only 149 ha of vegetation remain in the Precinct (5.8%). All but 6.3 ha of the Precinct's remaining vegetation are Priority Vegetation complexes. The Precinct has been earmarked for possible future urban use (Chappell Lambert & Everett, 2008).

The key biodiversity features in the Precinct are:

- Buchanan's Drain and its associated riparian vegetation (CCW), approximately 28.2 ha of CCW;
- There are also 26.8 ha of Swan Bioplan Sites in the Precinct associated with the Murray River and Austin Bay Nature reserve;
- A further 30.7 ha meets the PBP riparian vegetation criterion (P5_3);
- REW wetlands (11.3 ha) outside of Swan Bioplan Sites (or 21.7 ha REW in total);
- There are no known occurrences of TEC within the Precinct; however, TECs are recorded to the immediate east and west of the Precinct and new occurrences may be found with ecological survey; and
- The Precinct abuts the Austin Bay Nature Reserve, and development which supports ecological links to this reserve is critical.

Development of the Precinct for urban is severely constrained by the seasonally waterlogged nature of the site, and its proximity to the Peel-Harvey Estuary. Water and nutrient management issues are critical to the sustainability of any proposed development.

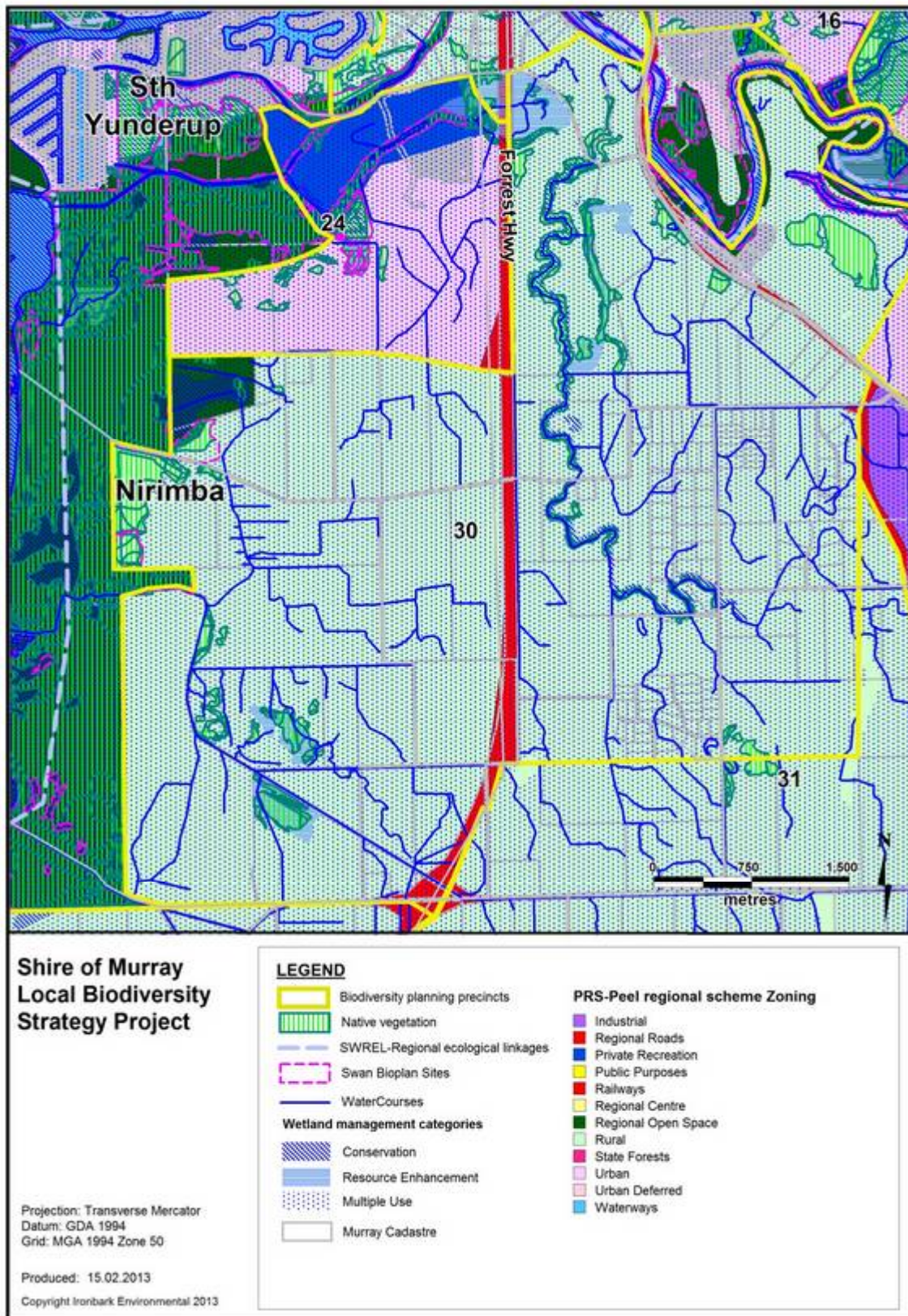


Figure 11: Precinct 30 – Nirimba/West Pinjarra proposed urban

The proposed protection target for Precinct 30 is 143.3 ha of the 149.6 ha. Proposed for protection in Precinct 30 is:

- All ROS (7.0 ha);
- All other CCW wetlands (28.2 ha); (Total CCW: 30.1 ha);
- All other Swan Bioplan Sites (26.8 ha ha);
- All DRF and TEC (0.2 ha of DRF and 30.1 ha of buffer to TEC habitat)
- All other riparian (19.7 ha);
- All REW wetlands (6.7 ha); and
- Other locations of Priority One vegetation complexes (24.6 ha).

All of the above natural areas to achieve the above proposed target should protect all remaining occurrences of priority one vegetation complexes: Vasse, Swan, Guildford and Cannington.

The protection of almost all remaining vegetated LNA in the Precinct is regarded as critical, not only for biodiversity conservation, but for the association of most of the vegetation with wetlands and waterways and its nutrient and water management functions.

5.2 Greenlands Rd Light Industrial (Precinct 31)

Precinct 31 is an 1147.3 ha area between Pinjarra and the Forrest Highway (Figure 12). The area supports 20.6 ha (1.7%) of vegetated LNA, and non-vegetated REW and MUW. The area is flat, seasonally waterlogged and has been extensively drained. All vegetation in the area is mapped as part of the Guildford Vegetation Complex.

The known biodiversity values of the 20.6 ha of vegetation are:

- 1.2 ha of CCW
- 4.0 ha of TEC or TEC buffer;
- 3.8 ha of riparian vegetation (2.6 ha of which is not included above); and
- 20.6 ha of Priority One vegetation complex (12.8 ha which is not included above).

Given these values, and the level of clearing below 5%, it is recommended that all of the remaining 20.6 ha be protected. Further, given the extent of clearing, and the need to revegetate watercourses for water quality improvement, stabilisation and wildlife movement, it is important that all structure planning includes planning for the creation of living streams and wildlife corridors.

5.2 West Pinjarra Industrial area – existing and proposed (Precinct 32)

This 220.9 ha area supports 37.8 ha of vegetated natural areas, of which 13.9 ha is included within the DEC conservation estate (Figure 12). Of the 23.9 ha of vegetated LNA, 15.9 ha is ROS. All remaining vegetated LNA is mapped as Bassendean Central and South vegetation Complex.

The remaining LNA (8.0 ha), 7.3 ha is a Swan Bioplan sites supporting 7.0 ha is TEC or TEC buffer).

Given that all remaining LNA in the area is ROS or TEC/Swan Bioplan site, the proposed protection target is to protect all of the remaining LNA in the Precinct.

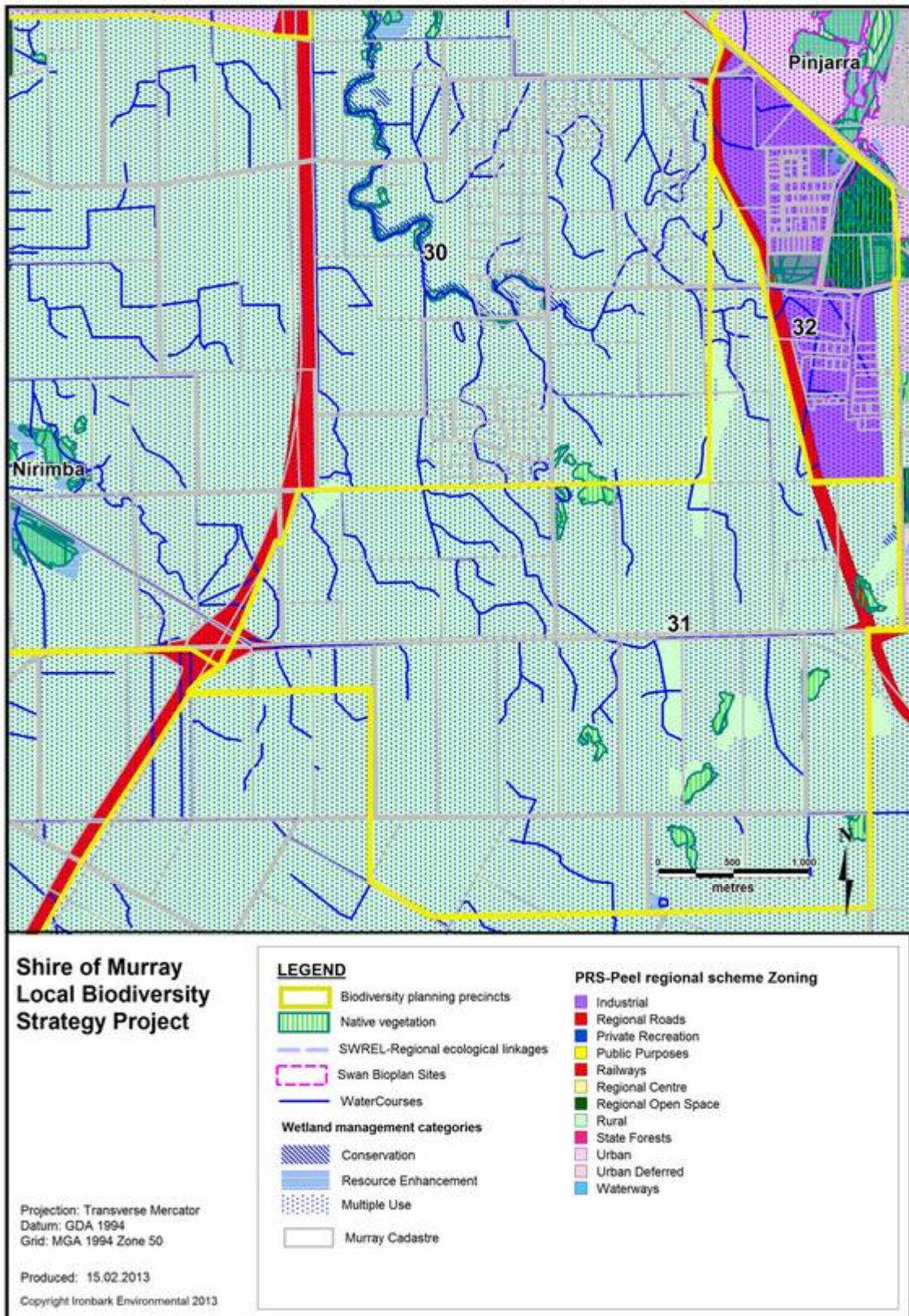


Figure 12: West Pinjarra Light Industrial areas (Precincts 31 & 32)

5.4 North Pinjarra Future Urban (Precinct 34)

This 1106.4 ha area supports 45.4 ha of vegetated LNA, of the Guildford and Swan Vegetation Complexes (4%). The remaining natural areas are generally small and associated with riparian habitats directly linked to the Murray River. Most of the CCW wetlands in the area contain both vegetated and non-vegetated portions and protection of the entire CCW wetland landform and a buffer will be important.

It is proposed that all of the vegetated LNAs in the Precinct on the grounds that all are either CCW or riparian vegetation, and mapped as Guildford or Swan Vegetation Complex.

5.5 Pinjarra townsite plus proposed urban (Precinct 35)

This 873.6 ha area currently supports 161.5 ha, of which 21.0 ha has been approved to be cleared and 14.1 ha is within the DEC conservation estate. This leaves 126.4 ha of LNA of the Bassendean C/S, Swan and Guildford Vegetation Complexes. 48.9 ha of the remaining LNA are within ROS reservations and 6.15 ha are within Waterways Reservations.

The remaining 71.4 ha of LNA

- 4.6 ha is CCW and within Swan Bioplan sites;
- 0.75 ha is other CCW;
- 52.2 ha is other Swan Bioplan sites, 23.3 ha which also meets the Riparian Criteria;
- A further 3.8 ha meets riparian criteria;
- A further 6.5 ha is vegetated REW; and
- 0.3 ha is priority 1 vegetation complex.

Given that all of the above biodiversity values are protected by legislation, government policy, or are protectable in other local government areas, it is recommended that the LNA protection target for the Precinct is 123.8 ha, of which 55.1 ha is PRS ROS and Waterways.

Under this target, all but 2.7 ha of the LNA currently in the Precinct would be protected.

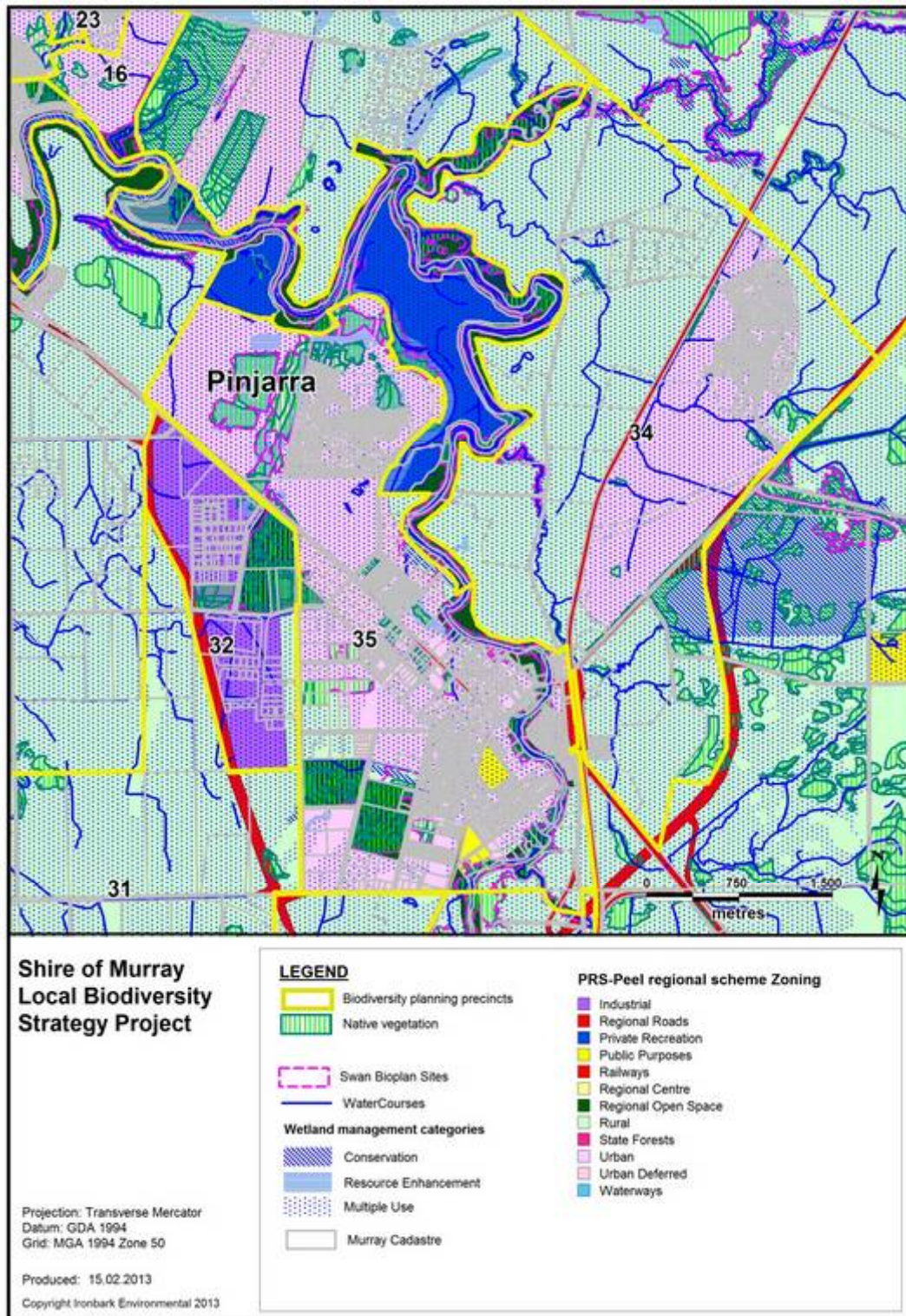


Figure 13: Precinct 34

6. Austin Cove (Precinct 24)

Austin Cove is a 393 ha area adjacent to the Peel Inlet which supports 38.4 ha of vegetated LNA, including 22.2 ha of CCW and a number of other vegetated and unvegetated wetlands (Figure 14). Land in the Precinct is zoned Urban and Private Recreation (golf course).

The main biodiversity conservation features in the Precinct are CCW, which supports a threatened ecological community, Herb rich saline shrublands in clay pans (TEC SCP07), and a REW immediately to the south of the CCW. These and other features in the Precinct have been identified as Swan Bioplan Sites.

The CCW occurs on both land zoned Urban and Private Recreation.

Urban development of the site is approved through the Austin Bay Outline Development Plan. This shows all of the Urban zoned portion of the CCW and REW to be retained in public open space. This protects an area of vegetated LNA and REW of 10.9 ha (including 10.0 of vegetated LNA).

23.8 ha of vegetated LNA occurs on the land zoned Private Recreation. All of this vegetation should be retained, and where possible, protected in negotiation as part of detailed design of site. Over 17 ha of the Vegetated LNA within the Private Recreation Zone are a Swan Bioplan Site, and mostly CCW.

Most of the balance of the vegetation in the Precinct (4.6 ha) is likely to be cleared as part of urban development, but efforts should be made to retain trees and other significant vegetation where possible.

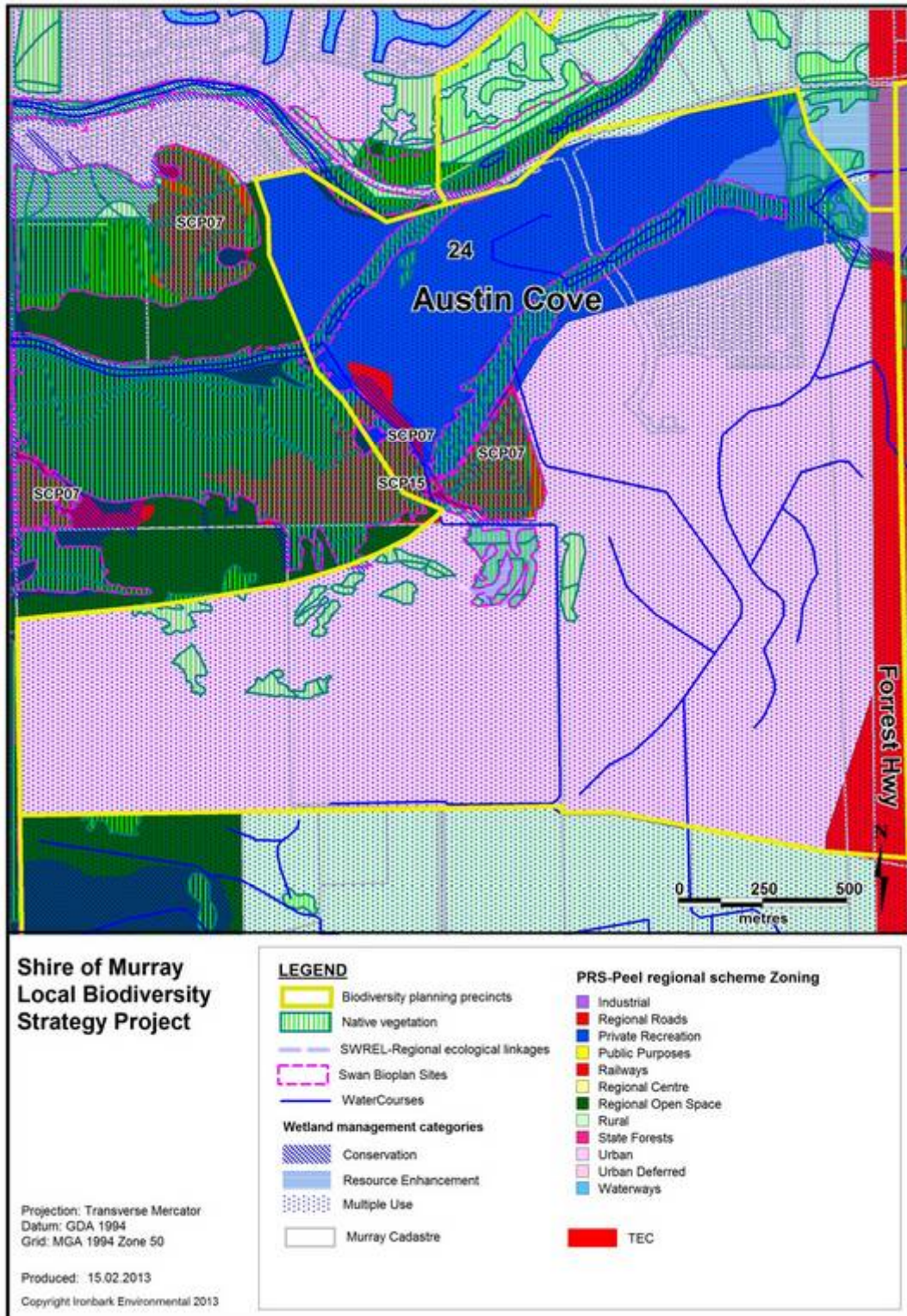


Figure 14: Precinct 24 – Austin Cove

7. Point Grey (Precinct 4)

The Point Grey Precinct is made up of the proposed Point Grey urban and marina development and the adjacent ROS (Figure 15). The Structure plan for the urban development is approved, and so opportunities to protect natural areas outside of approved POS and ROS are limited.

The proposed protection target for Precinct 4 is 82.8 ha of the 128.4 ha (64%) of vegetated natural areas in the Precinct. Proposed for protection in Precinct 4 is:

- All ROS (61.4 ha);
- 21.4 ha of the LNA that is within the ROS and POS proposed as part of the structure plan, including:
 - 16.4 ha (or 75%) of the LNA in the ROS/POS identified in the structure plan and currently zoned PRS Rural Zone (this includes Estuarine vegetation, and the proposed marina site. It is assumed that 25% of the vegetation in this area will be directly lost by the marina development); and
 - 5.0 ha (or 10%) of all LNA in the proposed POS in the draft structure plan.

Much of the Urban Zone vegetation often meets the criteria for TEC, regional ecological linkage and Swan Bioplan.

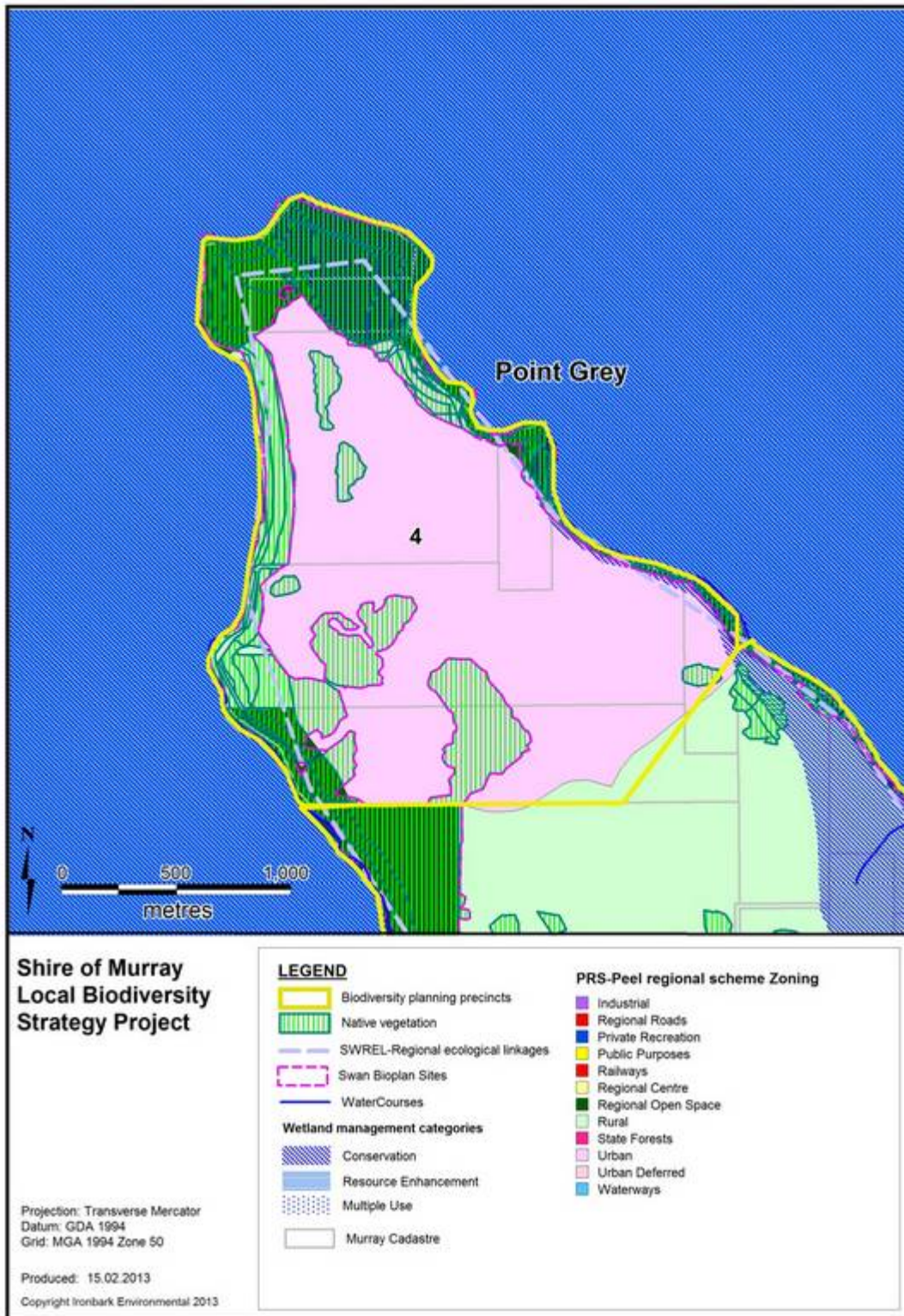


Figure 15: Precinct 4 – Point Grey

Appendix G: Rural Residential Precincts (Categories C & D)

1. Nambeelup and North Dandalup rural residential (Precincts 2, 13 & 27)

1.1 Golden Lakes View Rural Residential (Precinct 2)

The proposed protection target for Precinct 2 is 153.9 ha of the 199.0 ha (77%) of vegetated natural areas in the Precinct (Figure 16). Proposed for protection in Precinct 2 is:

- All POSP (108.3 ha);
- All other CCW wetlands (0.1 ha);
- All other Swan Bioplan Sites (28.2 ha) – presumed all are to be protected;
- All riparian (15.0 ha); and
- All REW wetlands (2.3 ha).

The achievement of this protection target requires the protection of all of the above LNA in Conservation POS or conservation covenanted areas.

1.2 Nambeelup DSA 236 (Precinct 27)

Precinct 27 is proposed for rural residential use within the Nambeelup North Dandalup Local Rural Strategy. It includes a large stretch of the Nambeelup Brook and 22.9 ha of LNA within the 51.6 ha Precinct.

The proposed protection target for Precinct 27 is 19.7 ha of the 22.9 ha (93%) of vegetated natural areas in the Precinct (Figure 17). A large portion of the vegetated LNA in the Precinct is part of a REW wetland, the riparian zone to Nambeelup Brook. To continue the riparian reserve created to the north, all of the riparian vegetation in Precinct 27 should be protected. Proposed for protection in Precinct 27 is:

- Vegetated REW wetlands associated with the Nambeelup Brook (8.8 ha);
- Swan Bioplan upland vegetation associated with the Brook and REW wetland (4.1 ha); and
- A 6.8 ha vegetated LNA separate to the Brook and identified in Swan Bioplan.

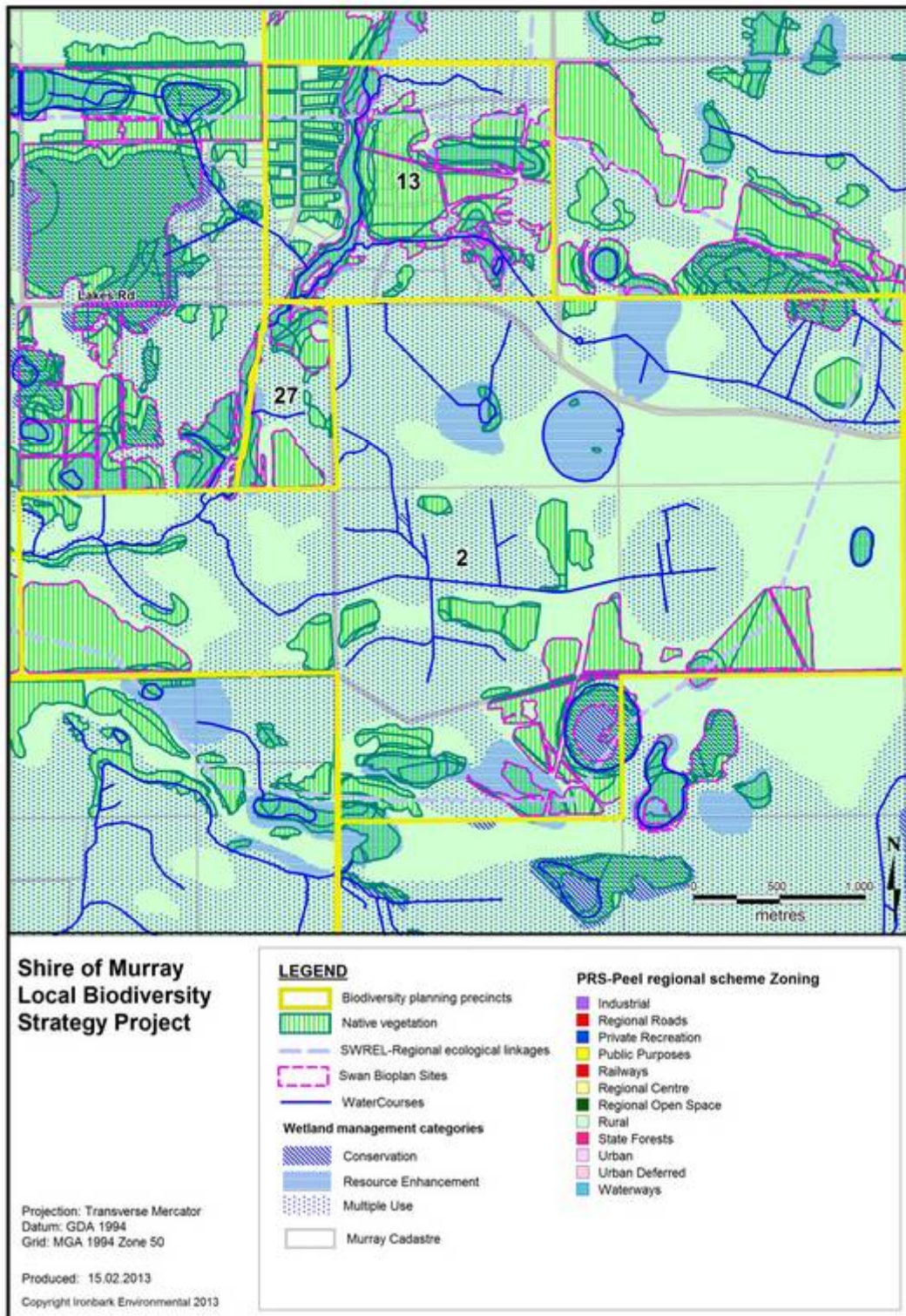


Figure 16: Precinct 2

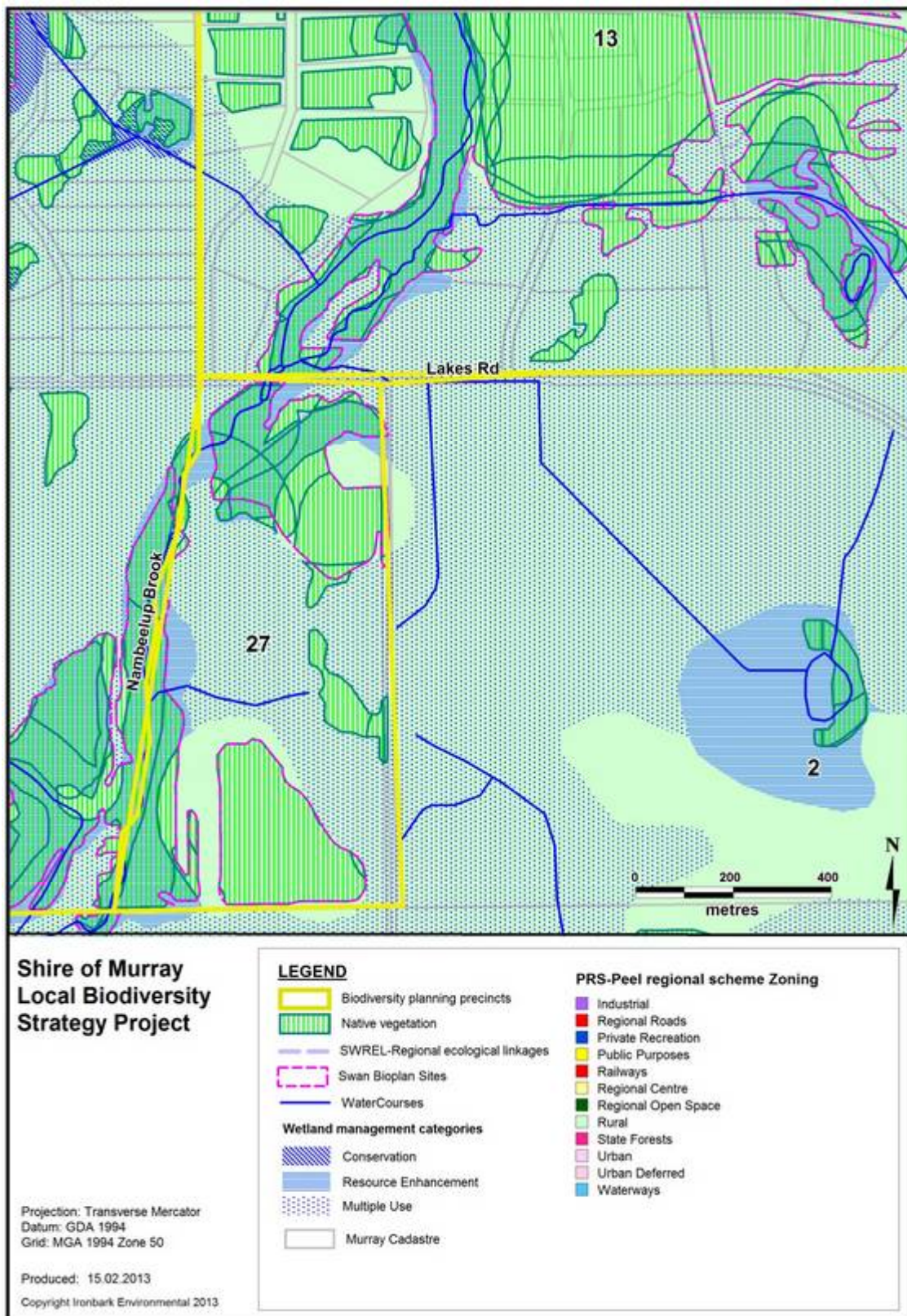


Figure 17: Precinct 27

1.3 Lakes Road Special Use Zone – Home Business (Precinct 13)

Precinct 13 is zoned Special use, part of the site for Home Business and the balance for Kennels. The Precinct is 229.1 ha and supports 112.7 ha of vegetated LNA, including vegetated and un-vegetated REW wetlands (Figure 18). 102.5 ha of the Precincts vegetation is mapped as Bassendean Central and South Vegetation Complex, 10.2 ha Southern River Vegetation Complex. 85.4 ha of the Precincts vegetation has been identified as a Swan Bioplan site.

An approved ODP and subdivisions have been largely implemented over the site. This has resulted in all REW wetlands, and approximately 39.8 ha of vegetated LNA being included in public reserves. The public reserves have been created within the Shire of Murray local planning scheme, designated for the purpose of Recreation. The purpose of these reserves should be changed to Recreation and conservation.

The protection of vegetation within private lots is not feasible, and most of this vegetation has been included as a retention target. It is estimated that 20% of the vegetation outside of the reserves has been/ will be cleared to construct the remaining lots, roads, firebreaks etc. The retention target is 58.3 ha and the likely clearing is 14.6 ha.

The proposed protection target for Precinct 13 is 94.6 ha of the 112.7 ha (84%) of vegetated natural areas in the Precinct. Proposed for protection in Precinct 13 is:

- All other Swan Bioplan Sites (85.4 ha) – presumed all are to be protected; and
- All riparian (9.2 ha).

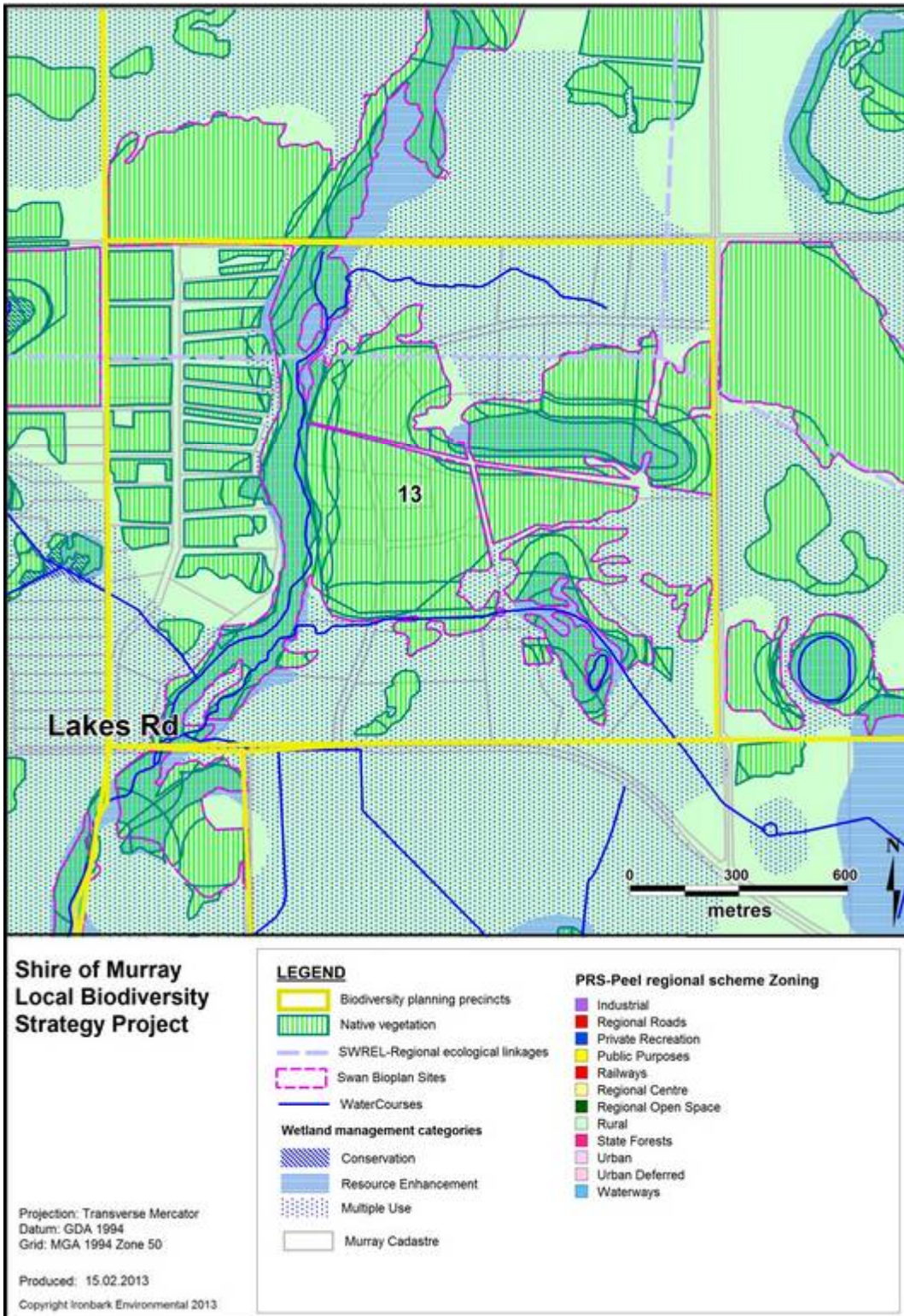


Figure 18: Precinct 13 – zoned Special use, part of the site for Home Business and the balance for Kennels

2. North Dandalup rural residential (Precincts 9, 10, 11, 12, 42)

2.1 North Dandalup Long Term Potential Rural Residential (Precinct 9)

This area is proposed, in the long-term, for rural residential development. Subdivision of the site to rural residential is subject to the extraction of minerals on land to the north of the Precinct (Figure 19).

Precinct 9 supports 64.7 ha of vegetated natural areas, all LNA and all representative of the Guildford Complex. About 30% of the Precinct by area is already subdivided for rural residential and these rural residential lots include about 60% of the Precincts LNA. There are two main areas of LNA on land which is yet to be subdivided.

The LNAs in the Precincts have a number of recognized biodiversity and other environmental values. 22.5 ha of the 64.7 ha are identified as a Swan Bioplan site, and of this 9.3 ha is CCW (there are a total of 13.3 ha of CCW in the Precinct). A further 8.1 ha meets the PBP criteria for riparian vegetation and a further 3.3 ha is REW.

It is proposed that an indicative target is set for this Precinct, given the likely long-term nature of land use change. An indicative protection target of 37.9 ha is proposed, based on the protection of all CCW, Swan Bioplan Sites, riparian vegetation and REW. The balance of 26.8 ha in the Precinct, all Guildford Vegetation Complex should, in the least, be retained (Retention Target). Ideally, all LNA in the Precinct should be protected, but this may be very difficult given part of the site is already subdivided to RR uses, the long-term nature of development and the distribution of LNA across the site.

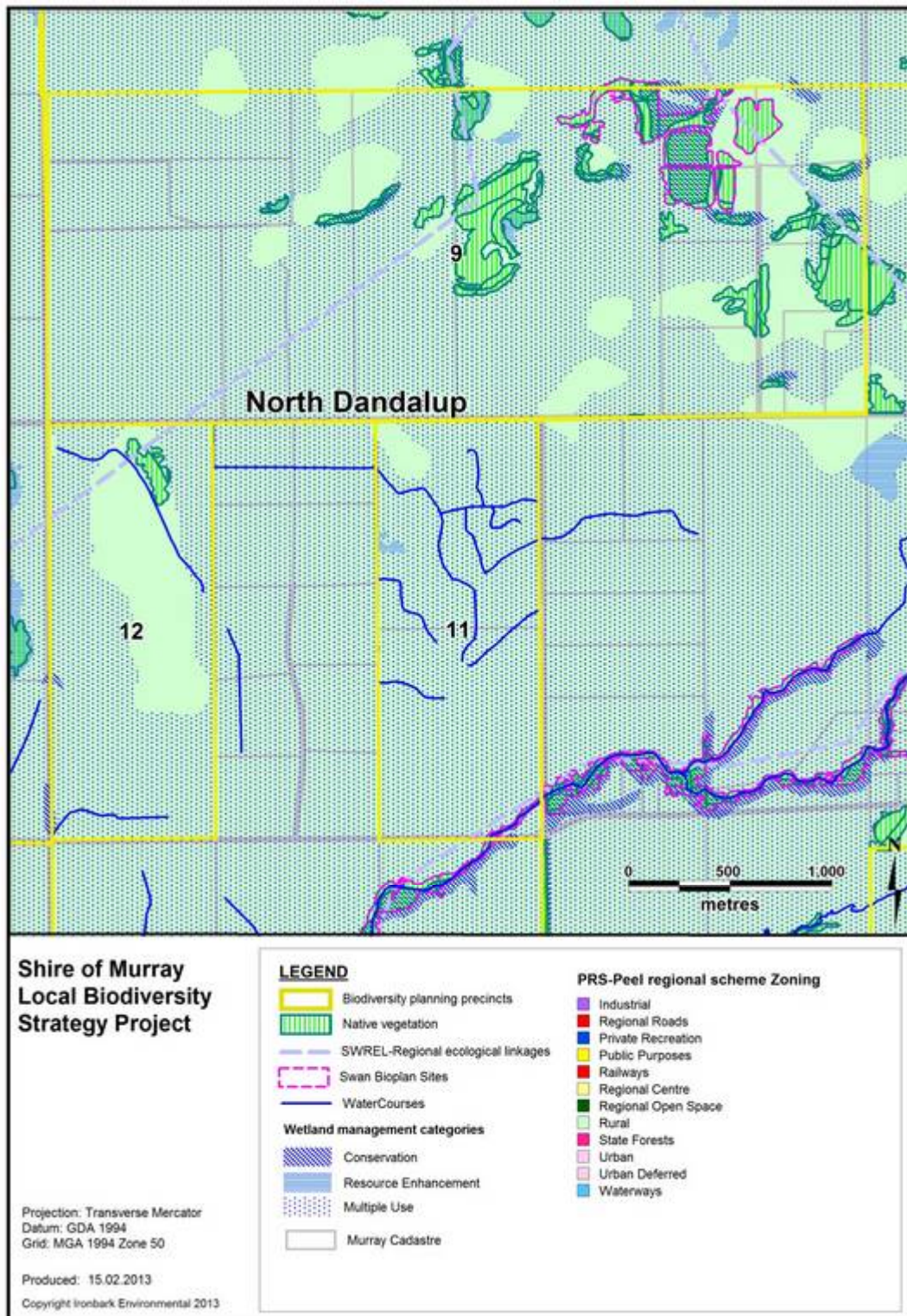


Figure 19: Precinct 9

2.2 North Dandalup River Rural Residential (Precinct 10)

This Precinct is a large currently rural area to the west of the North Dandalup townsite and is proposed for RR1 as part of the Nambeelup North Dandalup Local Rural Strategy¹. The Precinct supports a large stretch (4.1 km) of the North Dandalup River, and associated native vegetation. This is an important waterway and regional ecological linkage and is a priority for protection.

The Precinct contains 73.8 ha of vegetated LNA, of which 44.8 ha is directly associated with the North Dandalup River or a direct tributary, and meets the PBP riparian vegetation criterion (P5_3), (Figure 20). Most of this, (32.2 ha) is CCW. 52.9 ha of the Precinct's vegetation is within Swan Bioplan Sites. All of the vegetation in the Precinct is mapped as part of the Guildford Vegetation Complex (70.6 ha) or Southern River Vegetation Complex (3.2 ha).

Whilst the highest priority for protection in the Precinct is the vegetation which is riparian and associated with North Dandalup River and identified as Swan Bioplan, there is a strong case also for protection for all Guildford vegetation in the Precinct, and all other vegetation in the Precinct (Southern River Vegetation Complex).

In summary, the proposed protection target for Precinct 10 is:

- All CCW wetlands (32.2 ha), including those associated with the North Dandalup River;
- All other Swan Bioplan Sites (22.8 ha);
- All other riparian areas (1.5 ha); and
- All other LNA of the Guildford Vegetation Complex (16.7 ha).

To meet these objectives, all of the LNA remaining in the Precinct needs to be protected.

1 A small part of the Precinct has already been subdivided for rural residential uses and does not contain any mapped LNA.

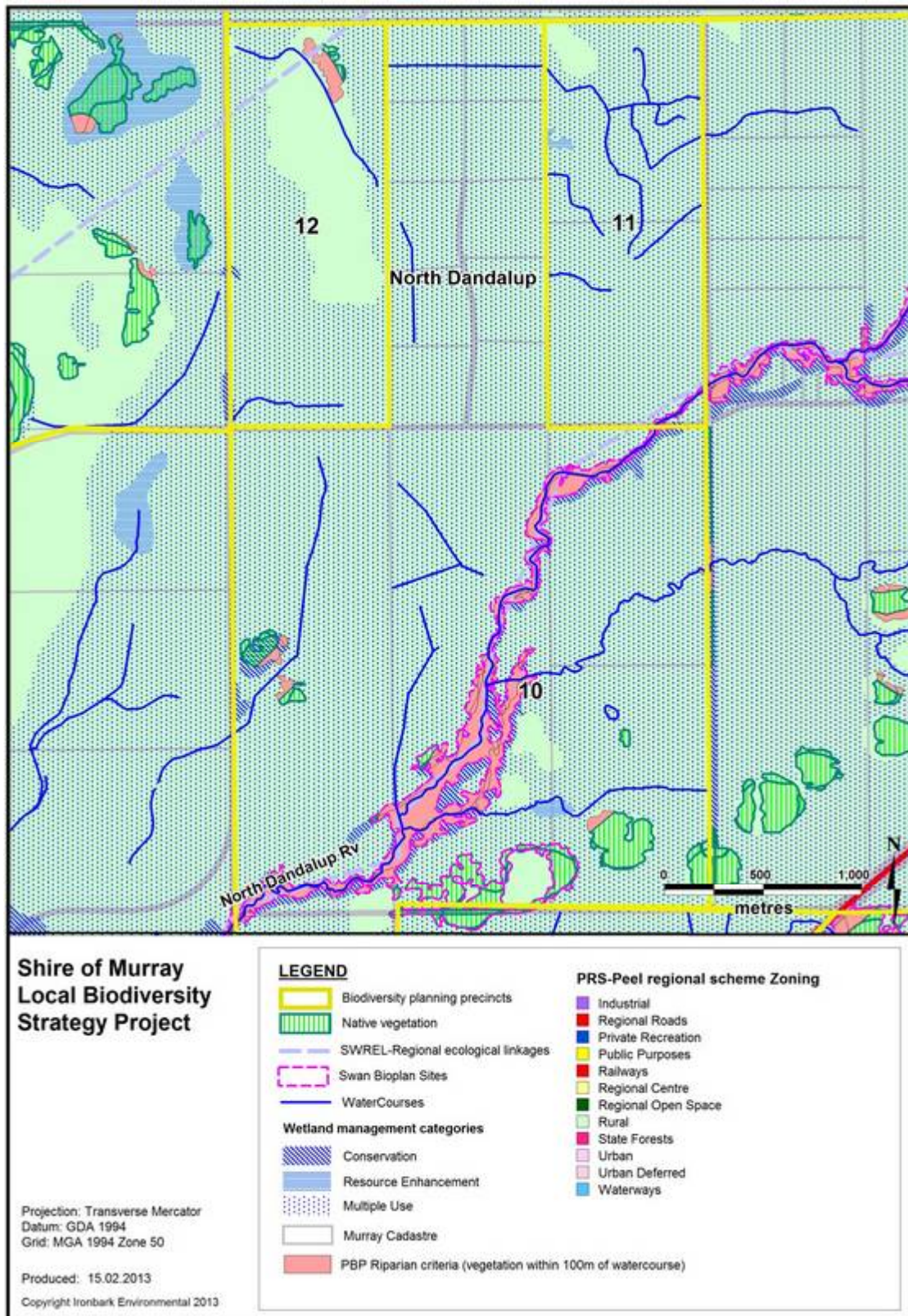


Figure 20: Precinct 10 – Riparian criteria met (Perth Biodiversity Project) within 100 metres of North Dandalup River.

2.3 Dandalup Springs Rural Residential - approved (Precinct 11)

0.6 ha of mapped LNA is in this rural residential subdivision, all riparian vegetation on the North Dandalup River (Figure 20).

All of this vegetation, including a buffer to the River is to be included in a reserve for Recreation. It is recommended that this reserve also be designated for the purpose of conservation, in addition to recreation.

2.4 Lakes Road Rural Residential – approved (Precinct 12)

2.3 ha of the 2.8 ha are riparian and all is Guildford Vegetation Complex and mapped as potential Carnaby's feeding habitat. The Precinct has been rezoned for RR, but no subdivision guide plan has been approved.

Given the small size of the remaining LNA it is not considered feasible to protect this 2.8 ha area of vegetation (Figure 20). However, its retention should be planned into the subdivision, and all of the area should be included on one lot, outside of a designated building envelope.

2.5 Blue Ranges DSA 239 (Precinct 42)

Approved subdivision which proposes to include all mapped LNA in private lots. All vegetation is Guildford Vegetation Complex. 31.0 of the 38.1 ha of LNA in area is Swan Bioplan.

It is assumed that 25% of the vegetation will be cleared or directly degraded from the subdivision (roads, firebreaks, building envelopes and private access). This equates to 9.5 ha of clearing or degradation, and 28.6 ha of retention. Retention of all other vegetation is to be maximised.

2.6 Serpentine Lakes Rural Residential (Precinct 22)

Precinct 22 includes most of the rural residential lands west of the Serpentine River and Forrest Highway. Most of the Precinct has been subdivided to rural residential, with seven parcels of land, as identified in the Nambeelup North Dandalup Local Rural Strategy, yet to be subdivided to rural residential.

The proposed protection target for Precinct 22 is 457.2 ha of the 881.6 ha of vegetated local natural areas in the Precinct (Figure 21). This protection target is made up of 251.5 ha in the DEC conservation estate and an additional 205.7 ha of ROS.

The balance of vegetation within the Precinct, 424.4 ha is proposed for retention. Vegetated LNA which makes up this 424.4 ha includes:

- All other CCW wetlands (34.1 ha);
- All other Swan Bioplan Sites (62.3 ha) – presumed all are to be protected;
- All DRF (6.8 ha);
- All riparian 4.9 ha (Serpentine Rive riparian);
- All Tuarts (3.2 ha);
- All habitat for significant fauna (0.1 ha); and
- All REW wetlands (6.7 ha).

Any land proposed for rezoning or subdivision in this Precinct should protect all of the above biodiversity features, with sufficient vegetated buffers to ensure long-term ecological viability.

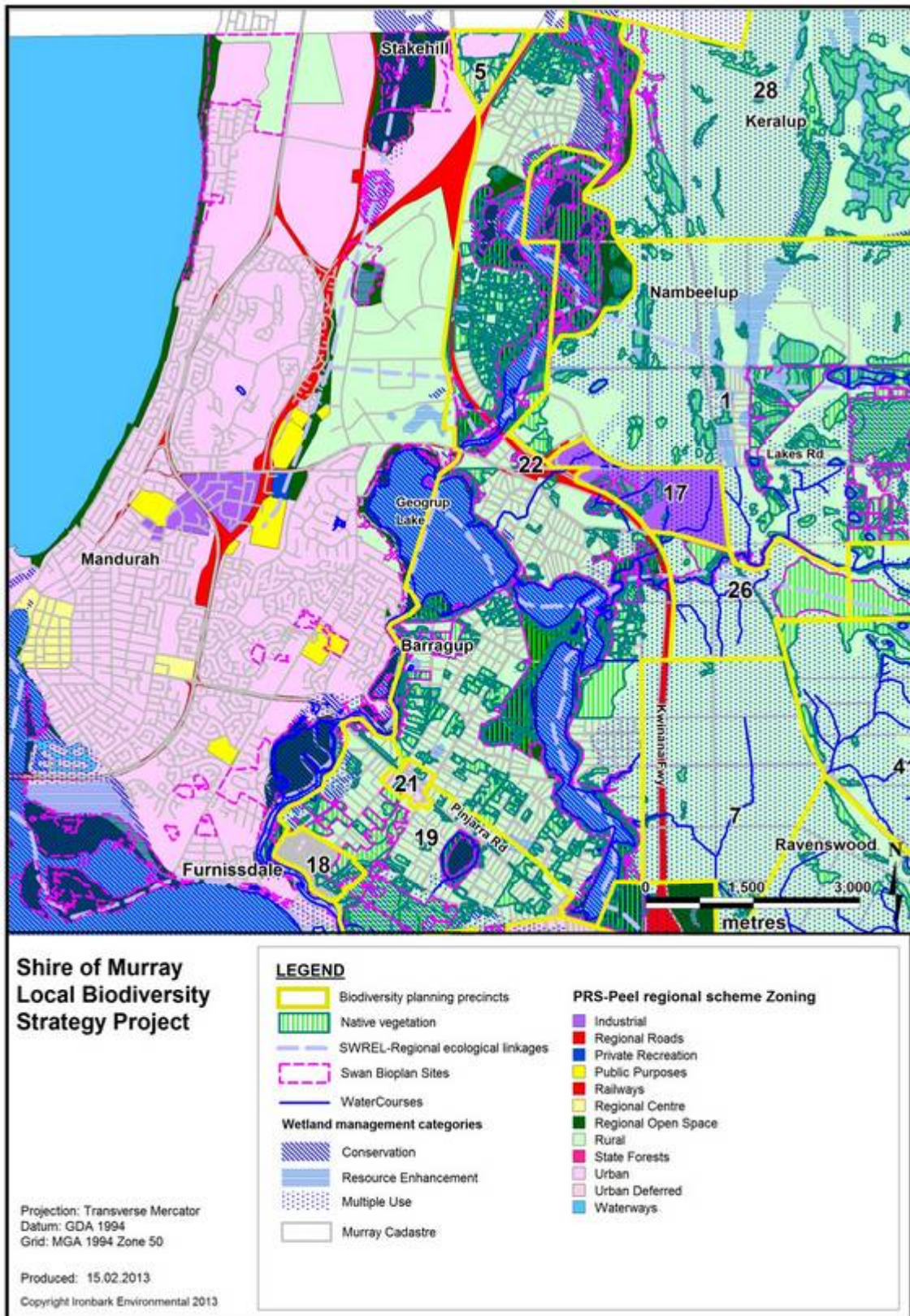


Figure 21: Precinct 22 - Serpentine River, Goegrup Lake and surrounding rural residential areas

Appendix H: Rural Coastal Plain (Category E Precincts)

1. Rural North (Precincts 26, 29, 39 and 40)

Planning and future development potential for these Precincts is managed through the Nambeelup-North Dandalup Local Rural Strategy. Current planning initiatives include the Southern Palusplain Study (Shire of Murray, 2012).

1.1 South Nambeelup (Precinct 26)

Precinct 26 is rural zoned land situated south of the proposed Nambeelup Industrial Estate (Figure 22). The 322.6 ha Precinct supports, 94.1 ha of vegetated LNA, all mapped as Bassendean Central and South Vegetation Complex.

The Precinct protection Target for Precinct 26 is 24.5 ha, all of which is proposed POS in the Draft Nambeelup Industrial Estate District Structure Plan and is included within a Swan Bioplan site.

Given that land within the Precinct is not proposed for rezoning, the remainder of vegetation in the Precinct is targeted for retention, including 63.68 ha of Swan Bioplan vegetation.

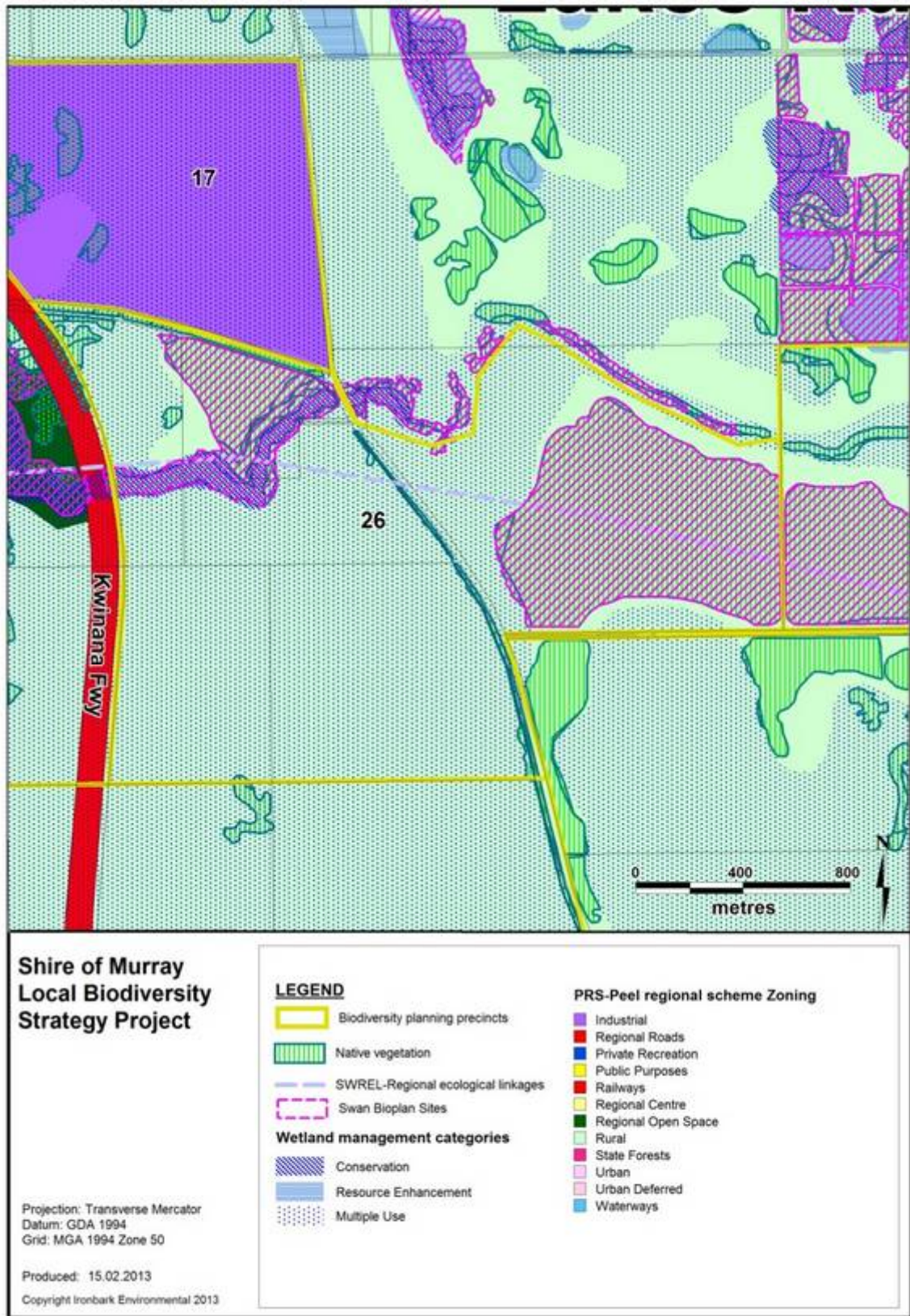


Figure 22: Precinct 26 – Rural zoned land, south of the proposed Nambelup Industrial Estate

1.2 Nambeelup Rural North of Lakes Road (Precinct 29)

664.9 ha of vegetated LNA occurs in this 2921.4 ha Precinct, all mapped as part of the Bassendean C/S and Southern River Vegetation Complexes. The land is zoned Rural (Figure 23). Given that no rezoning is proposed, a 100% retention target is proposed.

Should the Council create any incentives for private land conservation, an indicative target of 10% of the highest conservation assets should be protected. In the Precinct, the highest conservation assets include:

- 39.8 ha of CCW, of which 27.7 ha are also Swan Bioplan Sites;
- 364.4 ha of Swan Bioplan sites in Precinct 29, of which 41.4 ha also meets the riparian criteria;
- A further 74.1 ha of vegetated LNA meets the riparian criteria;
- 30.1 ha of vegetated REW wetlands;
- 14.3 ha of Guildford Vegetation Complexes; and
- There are no recorded occurrences of DRF or TECs, most likely due to insufficient surveys.

An indicative protection target of 49.5 ha for the Precinct is considered feasible should the Council support a private lands conservation strategy.

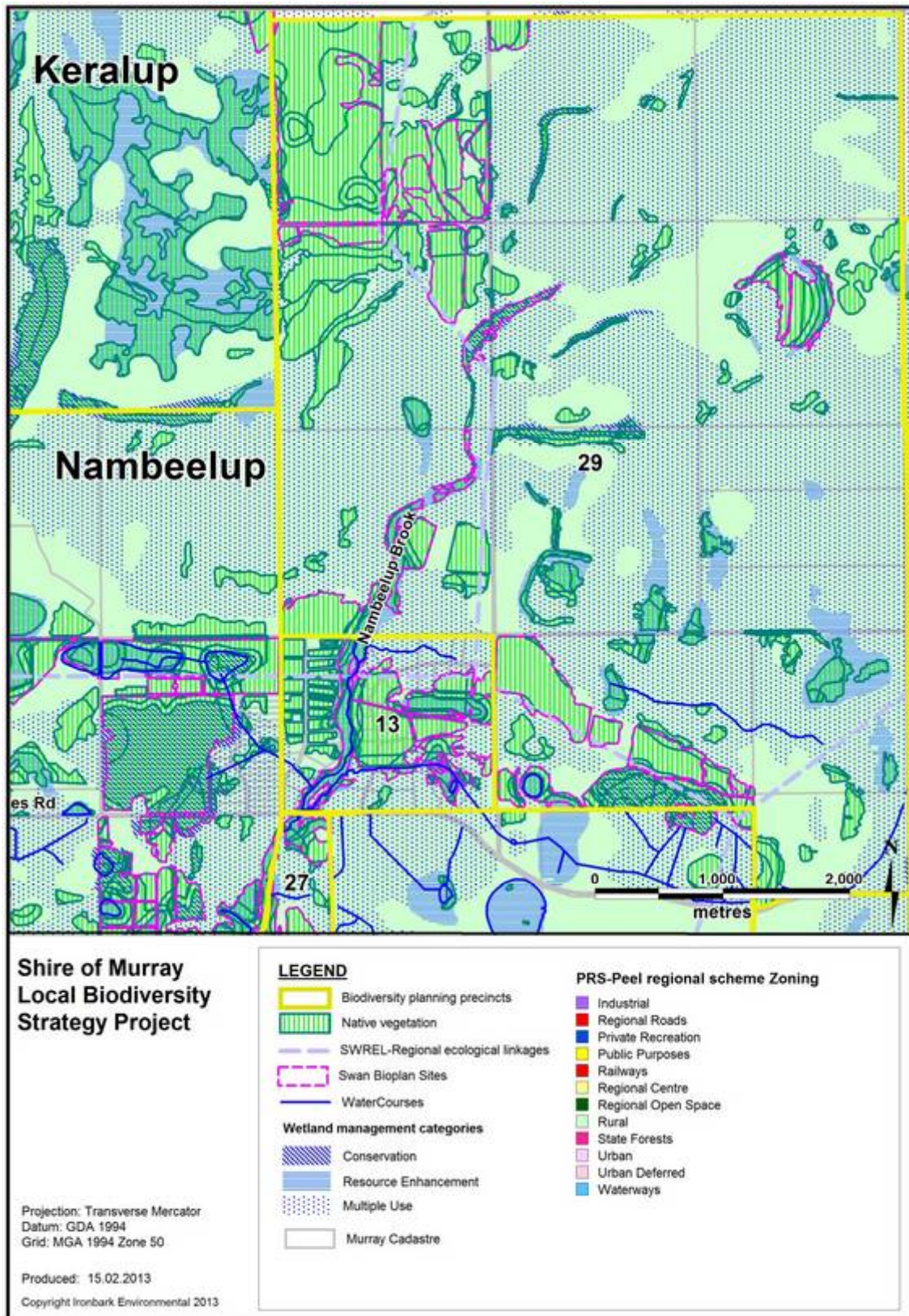


Figure 23: Precinct 29 – Nambeelup Rural North of Lakes Road

1.3 North Dandalup Rural (Precinct 39)

This area of 1905.2 ha supports 82.0 ha of vegetated LNA (4%) and is situated to the west of South West Highway and north of the North Dandalup townsite (Figure 24). Most of the land is zoned rural. All LNA is mapped as Guildford or Forrestfield Vegetation Complex, both being Priority One Vegetation Complexes.

All LNAs share one or more of the following biodiversity values:

- 14.3 ha of vegetated CCW wetlands;
- 27.0 ha Swan Bioplan Sites (including 9.2 ha of CCW);
- 35.2 ha of riparian vegetation (including 6.5 not CCW or Swan Bioplan); and
- All 82.0 ha is Priority One vegetation complex, including 41.5 ha which is not CCW, Swan Bioplan or riparian vegetation).

Based on an indicative 10% protection target for high biodiversity assets, the protection target is 8.2 ha. All vegetation is to be retained.

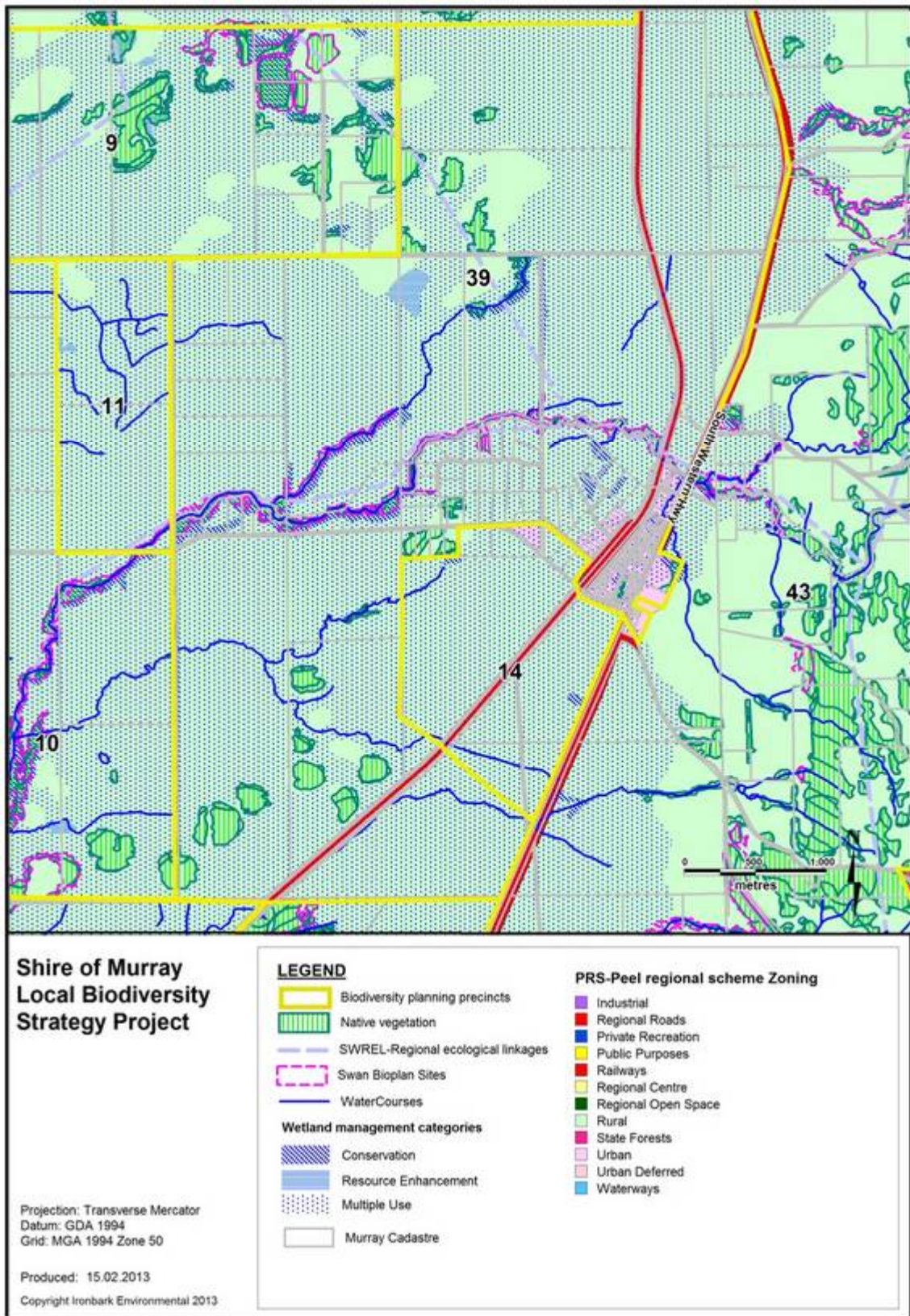


Figure 24: Precinct 39 North Dandalup rural area

1.4 South Nambelup Rural (Precinct 40)

All 561.1 ha of vegetated natural areas are LNA in this 4303.3 ha Precinct (13%), (Figure 25).

Known values of the area's LNA's are:

- 135.6 ha of vegetated CCW;
- 333.2 ha of Swan Bioplan Sites (including 76.9 ha CCW);
- 14.7 ha of DRF vegetated habitat (all within Swan Bioplan sites);
- 160.6 ha of riparian vegetation (33.59 ha outside of CCW and Swan Bioplan sites);
- 11.4 ha of vegetated REW(including 9.7 ha outside of Riparian or Swan Bioplan sites); and
- 309.4 ha of Priority One complexes (Guildford and Swan), including 86.2 ha outside of CCW, Swan Bioplan, riparian, and REW wetlands).

Based on an indicative 10% protection target for high biodiversity assets, the protection target is 52.1 ha. All vegetation is to be retained.

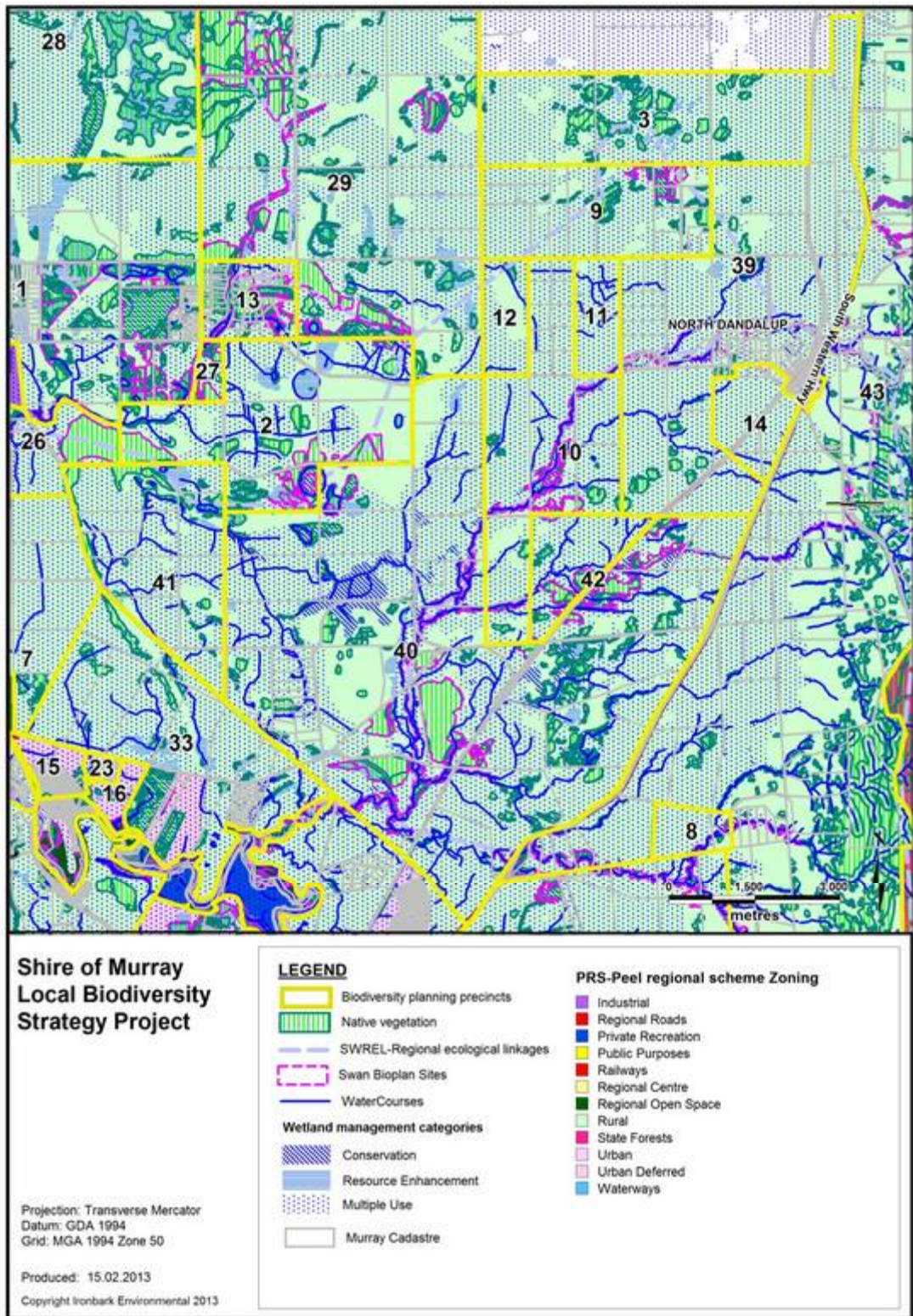


Figure 25: Precinct 40 – Rural west of South West Hwy, between Pinjarra and North Dandalup

2. Rural South (Precincts 36, 37 and 38)

2.1 Harvey Estuary –Nirimba rural (Precinct 36)

Precinct 36 is 9705.9 ha and is situated between the Peel-Harvey Estuary and the Forrest Highway (Figure 26). 30% of the Precinct is vegetated natural area, with most of this being CCW adjacent to the Estuary and within DEC conservation Estate.

286.0 ha of LNA is ROS or Waterway reservation within the PRS and should be protected at some time in the future.

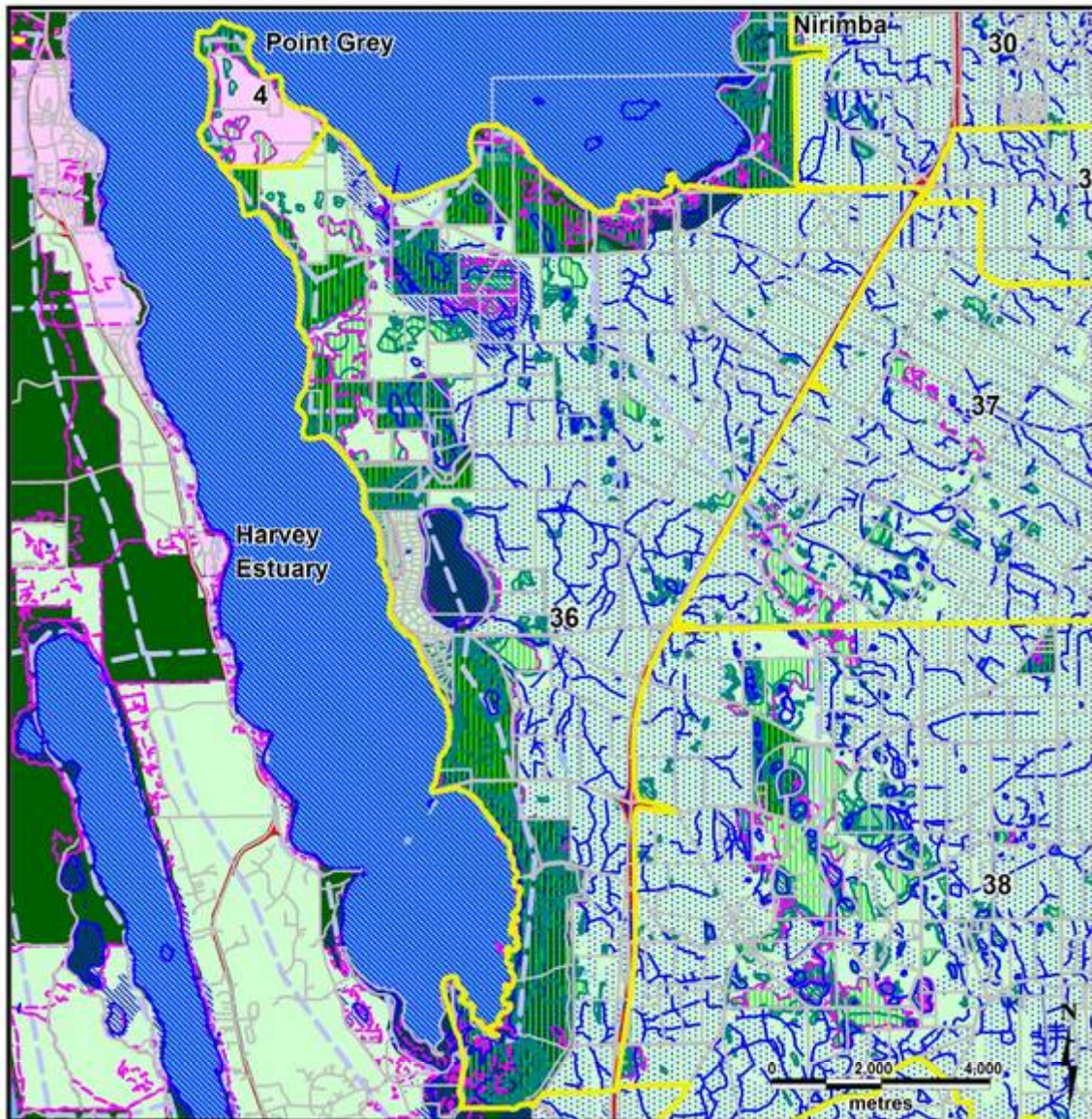
The balance of vegetation in the area is zoned rural with no planned prospects for rezoning. Of this rural zoned vegetated LNA:

- 112.4 HA is CCW;
- 393.7 ha is within Swan Bioplan sites (including 88.3 ha of CCW);
- 130 ha meets the PBP riparian criteria (23.5 ha not Bioplan or CCW);
- 310.8 ha is Cannington or Vasse Vegetation Complex (of which 41.5 ha is not CCW, Bioplan, or riparian); and
- 27.9 ha is REW (including 6.7 ha which is not CCW, Bioplan, riparian, Cannington or Vasse Vegetation Complex.

These LNAs are regarded as the highest known conservation assets and should be protected where a scheme amendment, subdivision or development directly impacting the LNA is proposed.

Should the Council create any incentives for private land conservation, an indicative target of 10% of the highest conservation assets should be protected.

Based on the known values, an indicative protection target of 77.6 ha for the Precinct is considered feasible should the Council support a private lands conservation strategy. This indicative protection target is additional to protection of all of the 286.0 ha of vegetated LNA that is within ROS.



**Shire of Murray
Local Biodiversity
Strategy Project**

Projection: Transverse Mercator
 Datum: GDA 1994
 Grid: MGA 1994 Zone 50
 Produced: 15.02.2013
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LEGEND

- Biodiversity planning precincts
- Native vegetation
- SWREL-Regional ecological linkages
- Swan Bioplan Sites
- WaterCourses
- Wetland management categories**
- Conservation
- Resource Enhancement
- Multiple Use
- Murray Cadastre

PRS-Peel regional scheme Zoning

- Industrial
- Regional Roads
- Private Recreation
- Public Purposes
- Railways
- Regional Centre
- Regional Open Space
- Rural
- State Forests
- Urban
- Urban Deferred
- Waterways

Figure 26: Precinct 36 rural zoned area situated between the Harvey Estuary and Forrest Hwy

2.2 West Coolup Rural (Precincts 37 and 38)

Precincts 37 (North West, Figure 27), and 38 (South West, Figure 28) are substantially cleared and drained rural lands, predominantly used for beef grazing. The Precincts form the study area for the Southern Palusplain Precinct Study area, a study to address a number of land use planning issues relating to this broad area within the Shire (Shire of Murray, 2012).

Precinct 37 has been 95% cleared. The Precinct is 5856.4 ha and supports 298.2 ha of LNA. There is no DEC conservation Estate, and no ROS. All land is PRS zone Rural.

Given the amount of clearing that has occurred in the area, there should be a presumption against clearing in the catchment.

Of the remaining 298.2 ha of vegetation in the area, the following values are known:

- 12.75 ha are CCW;
- 141.4 are within Swan Bioplan Sites (of which 8.52 ha are CCWs);
- 295.4 meets the TEC criteria (of which 149.8 ha is not CCW or Swan Bioplan); and
- 57.6 ha meet the PBP riparian vegetation criterion (P5_3).

An indicative protection target of 10% of the remaining vegetated LNA is proposed.

Precinct 38 includes 109.3 ha of DEC conservation estate and 1206.9 ha of vegetated LNA. In total vegetated natural areas cover 12% of the Precinct. 39.7 ha of the vegetated LNA is ROS.

Of the balance of LNA (1167.2 ha), much is concentrated to the east of the Forrest Highway around Old Bunbury Road. This may have the potentials to be a focus for private land conservation incentives, with the cooperation of landholders.

The known biodiversity values of the LNAs in the area are:

- 159.4 ha are CCW;
- 735.3 are within Swan Bioplan Sites (including 111.8 ha CCW);
- 18.1 ha meets the DRF criteria;(all within Swan Bioplan sites);
- 1128.1 ha meet the TEC criteria (This is result of very big buffers to the TECs in and around Precinct 38); and
- 358.5 ha are priority One complexes (Cannington, Guildford and Serpentine River Vegetation Complexes).

Given the values of the remaining vegetated LNA, all vegetation should be retained, and indicative protection target of 10% of remaining LAN be set.

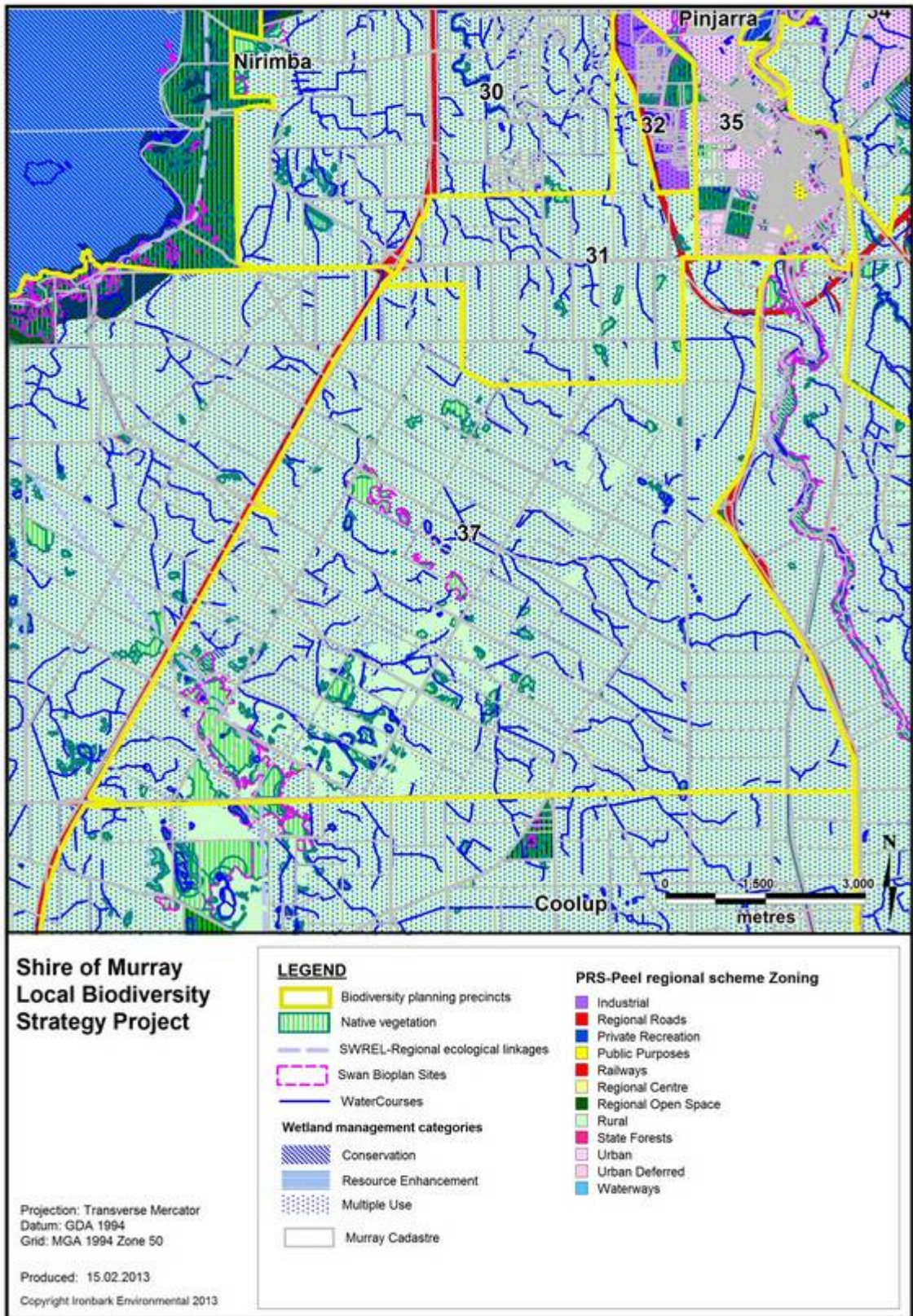
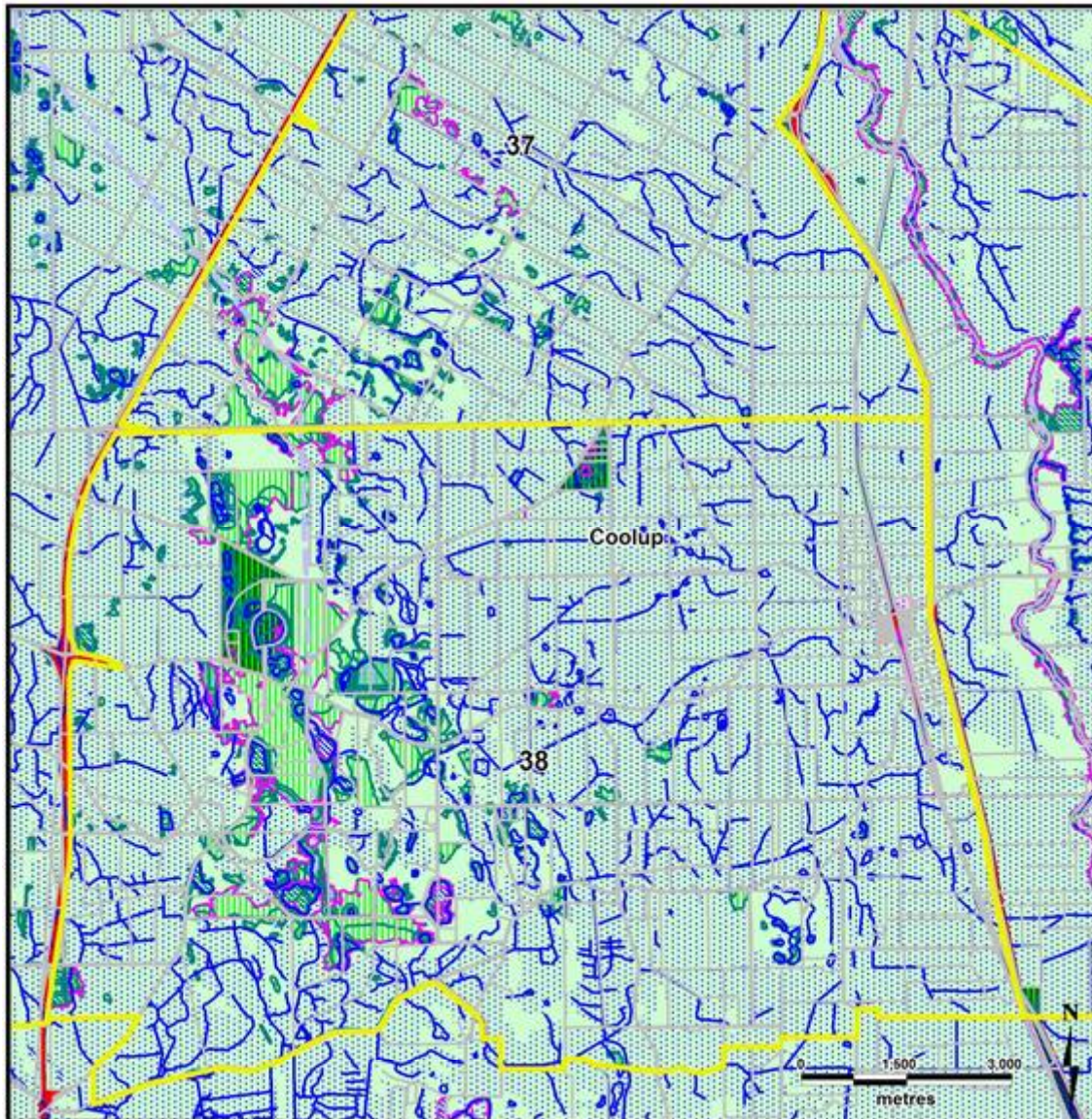


Figure 27: Precincts 37 form part of the Southern Palusplain Precinct Study area



Shire of Murray Local Biodiversity Strategy Project

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Grid: MGA 1994 Zone 50

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LEGEND

- Biodiversity planning precincts
- Native vegetation
- SWREL-Regional ecological linkages
- Swan Bioplan Sites
- WaterCourses
- Wetland management categories**
- Conservation
- Resource Enhancement
- Multiple Use
- Murray Cadastre

PRS-Peel regional scheme Zoning

- Industrial
- Regional Roads
- Private Recreation
- Public Purposes
- Railways
- Regional Centre
- Regional Open Space
- Rural
- State Forests
- Urban
- Urban Deferred
- Waterways

Figure 28: Precincts 38 form part of the Southern Palusplain Precinct Study area

Appendix I: Hills, State Forest and Mining Precincts (Precinct Categories E & F)

1. Hills Landscape Rural areas (Precincts 43 & 44)

Precincts 43 and 44 are aligned to sub-Precincts 1A, 1B and 3 of the Hills Landscape Rural Planning Strategy (HLRPS). The HLRPS generally sets objectives for planning and development in these Precincts which are compatible with retention of natural areas (Shire of Murray & DoP, 2012).

Precincts 43 and 44 together support 3615.3 ha of vegetation, of which most (3533.9 ha) is LNA. The balances are all areas of DEC conservation estate, DEC State Forest and DEC miscellaneous reserves.

A small amount of LNA in Precincts 43 and 44 (less than 6 ha) is included in ROS.

1.1 Hill Landscape RPS North (Precinct 43)

In Precinct 43 (HLRPS Precinct 1A), 1076.9 ha of the 1659.2 ha of LNA is of the Darling Scarp Vegetation Complex, and a small amount (139.5 ha) is of Priority 1 vegetation complexes (Swan, Guildford or Forrestfield). 719.2 ha meet the PBP riparian corridor criteria (Figure 29).

The HLRPS generally supports planning and development which will retain this vegetation, and sets the following objectives:

1. Protect the regionally and locally significant scenic qualities of the Darling Scarp.
2. Avoid increased fire risk to life and property through inappropriately located or designed land use, subdivision and development.
3. Protect priority agricultural land from land uses and development that may lead to its alienation or diminished productivity.

These objectives also apply to the eastern portion of Precinct 44 (see below). No additional rural residential subdivisions are identified in the HLRPS in Precinct 43.

Whilst the HLRPS does not address the protection of vegetation in conservation zones, covenants or reserves, the Shire should keep the option open of considering subdivision for conservation in the future and the protection of vegetation where a development proposal poses a risk to existing LNA. A nominal protection target of 5% of the LNA in the Precinct is recommended for the purpose of target setting.

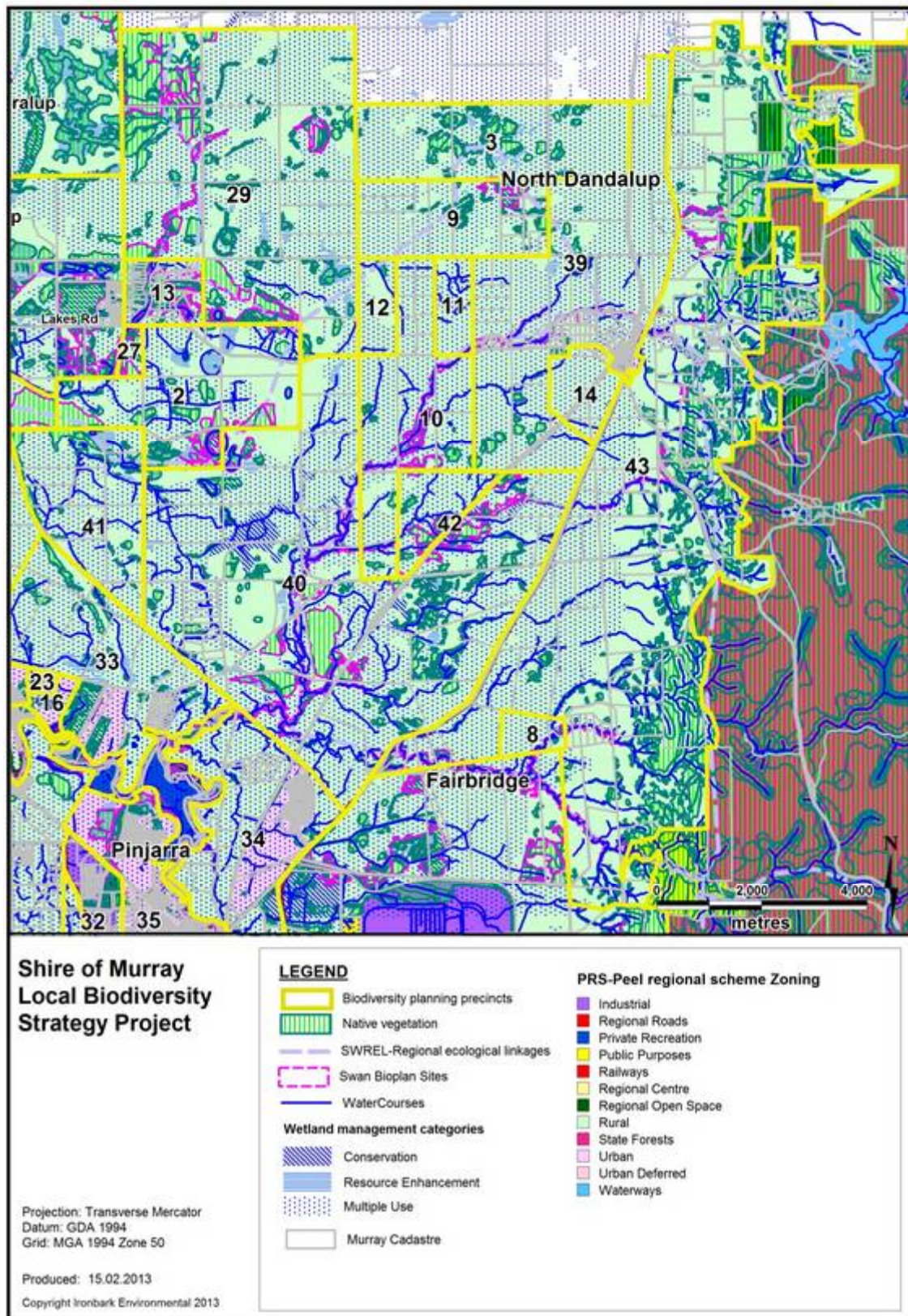


Figure 29: Hill Landscape RPS North

1.2 Hill Landscape RPS South (Precinct 44)

Precinct 44 aligns with HLRPS Precincts 1B (scarp and foothills) and 3 (Priority Agriculture Area).

Precinct 44 supports 1956.0 ha of vegetation of which 1935.6 is LNA. Most of this vegetation occurs in the eastern portion of the Precinct and is part of the Darling Scarp Vegetation Complex (409.1 ha), Helena 1 (100.6 ha), Murray 1 and Dwellingup 1 Vegetation Complexes (Figure 30).

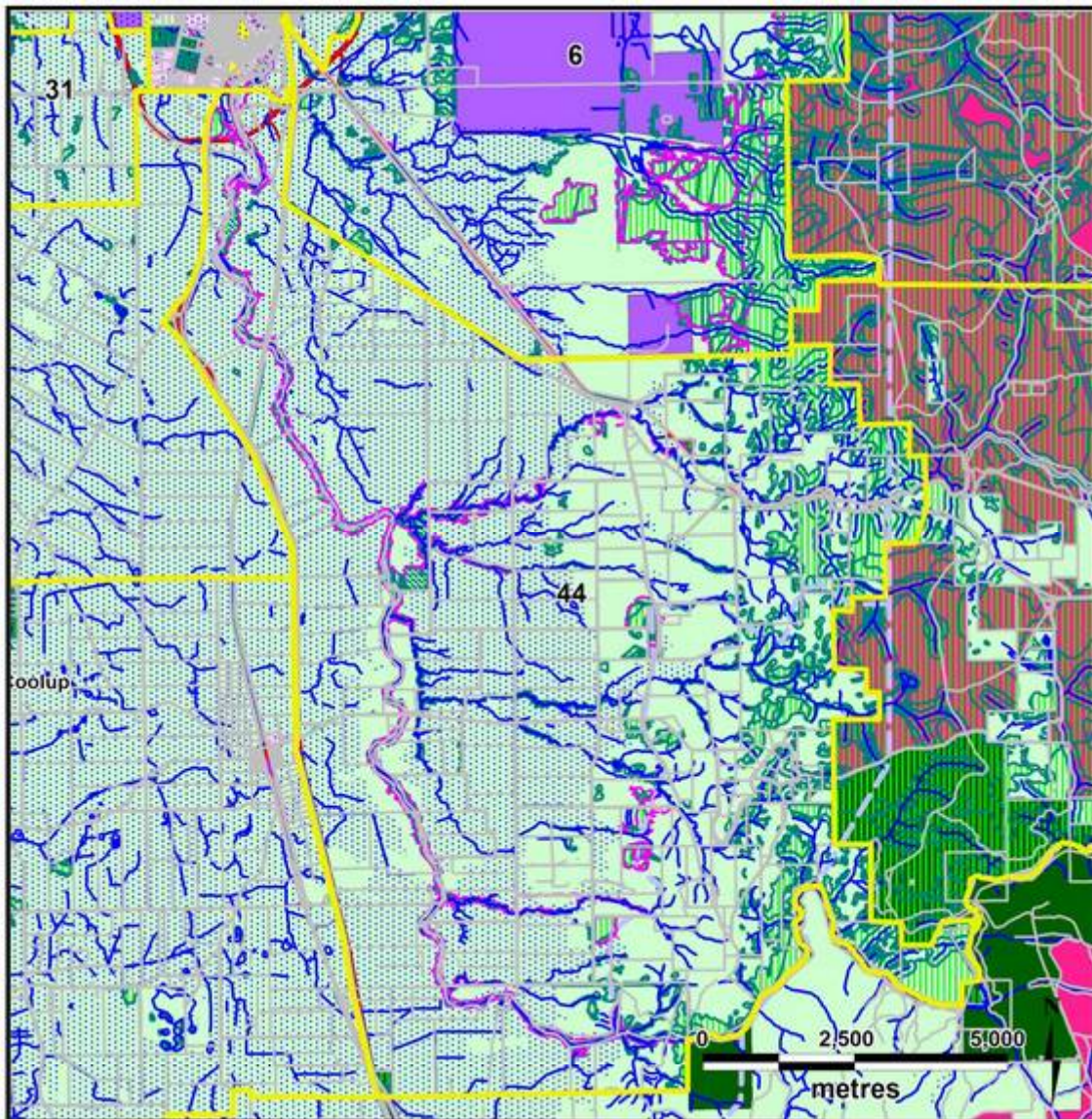
All of the vegetation in the western portion of the Precinct (HLRPS Precinct 3 Priority Agriculture Area) is Forrestfield, Guildford and Swan (Priority 1 complexes). Of this, most of the Swan vegetation Complex forms the riparian vegetation on the Murray River, with most of the Guildford vegetation connected to the Murray River (Swan complex occurrences).

Of the 1935.6 ha of LNA in Precinct 44, 438.1 ha is PRS Waterways (433.2 ha) or ROS (4.9 ha) regional reserve. Most of this is associated with the Murray River.

The HLRPS generally supports planning and development which will retain this vegetation and is focused on the protection of agricultural land for uses, subdivision and development that may lead to its alienation or diminished productivity (Department of Planning and Shire of Murray, 2012). Within this objective of agricultural protection, the HLRPS states all development proposals “must minimise clearing, and retain threatened ecological communities and threatened species within viable natural areas. Vegetation, flora and fauna surveys prepared in accordance with EPA Guidance Statements 51 and 56 should be submitted to the Shire....”.

Given, that the vegetation complexes in HLRPS Precinct 3 are all Priority One complexes, including the Swan Vegetation Complex associated with the Murray River, the Shire should have policy which goes beyond preventing clearing, and encourage protection of significant vegetation within the Priority Agricultural Area as part of future perennial horticultural enterprises.

For the purposes of this, a nominal protection target of 5% of the LNA in the Precinct is recommended as part of the Shire’s future biodiversity planning. This equates to protection of 97.6 ha of LNA.



**Shire of Murray
Local Biodiversity
Strategy Project**

Projection: Transverse Mercator
Datum: GDA 1994
Grid: MGA 1994 Zone 50

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LEGEND		PRS-Peel regional scheme Zoning	
	Biodiversity planning precincts		Industrial
	Native vegetation		Regional Roads
	SWREL-Regional ecological linkages		Private Recreation
	Swan Bioplan Sites		Public Purposes
	WaterCourses		Railways
Wetland management categories			Regional Centre
	Conservation		Regional Open Space
	Resource Enhancement		Rural
	Multiple Use		State Forests
	Murray Cadastre		Urban
			Urban Deferred
			Waterways

Figure 30: Precinct 44

2. Mining areas (Precincts 3 & 6)

2.1 Keysbrook Mineral Sand Mining area (Precinct 3)

This Precinct of 927 ha includes 120.8 ha of LNA. The level of protection and retention of LNA has been determined through the existing approvals for mineral sand mining over the site.

The proposed Precinct protection Target has been set at 64.7 ha, based on the area identified in the Matilda Zircon Conceptual Rehabilitation Plan as 'Conservation Offset Area' (MBS Environmental, 2011). 48.2 ha of vegetation are likely to be cleared as part of the approved mining activity.

2.2 Alcoa landholdings (Precinct 6)

Precinct 6 is associated with the Alcoa Alumina refinery and Alcoa's surrounding rural landholdings. Planning and development in the Precinct is guided by the Hills Landscape Rural Planning Strategy (Shire of Murray & DoP, 2012) and Alcoa's Long Term Residue Management Strategy Pinjarra (Alcoa, 2011).

The general approach to biodiversity conservation in Alcoa's Pinjarra Refinery landholdings is to encourage retention of natural areas, and where possible, achieve protection of significant natural areas. There are currently 1620.0 ha of vegetated natural areas in the Precinct, all LNA.

The Alcoa Precinct is shown in Figure 31. Land use and planning in the Precinct is guided by the Residue Management Strategy. Under this plan, Alcoa has approval for expansion of its facilities, including residue holding facilities, which will require the clearing of some natural areas.

Of the remaining vegetation, the proposed retention target is 1167.3 ha and the proposed protection target for Precinct 6 is 88.8 ha. These targets are indicative, and are dependent on negotiations with Alcoa. The proposed protection target is based on the protection of all CCW in the Precinct which is outside of current or proposed expansion plans (as defined in the Long Term Residue Management Strategy) and which has been identified as Swan Bioplan sites.

In setting this target, it has been assumed that 377.0 ha of the 1620.0 ha are likely to be cleared, (or is already approved to be cleared). Most of this loss is due to current or proposed expansion of the refinery. As part of the 377.00 ha it is presumed that the

13.7 ha of vegetated LNA in Primary Regional Road Reserves and Railway Reserves will also be cleared.

Of all existing vegetated natural areas in Precinct 6: (proposed for clearing or not):

- 113.2 ha of CCW, of which 91.5 ha is of Guildford Complex vegetation and included within Swan Bioplan sites;
- 696.9 ha in Swan Bioplan Sites; and
- 826.5 ha of vegetation belonging to the Guildford or Forrestfield Vegetation Complexes.

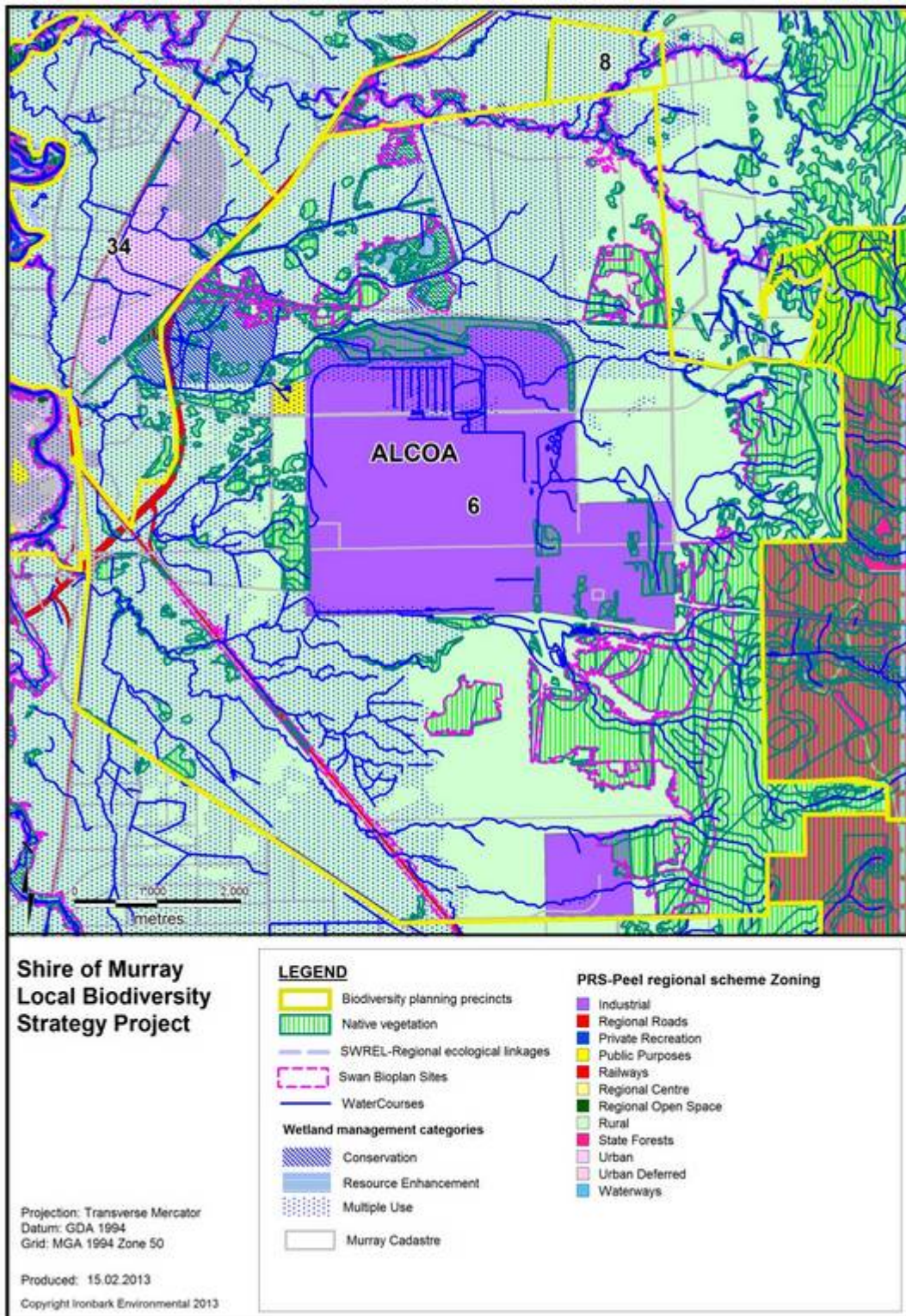


Figure 31: Precinct 6 – Alcoa Alumina refinery and Alcoa’s surrounding rural landholdings

3. State Forest Precincts including Dwellingup Townsite (Precincts 45 & 46)

The State Forest Precincts support 75,889.6 ha of vegetation, of which 1883.1 ha is LNA. Most of the vegetation in these Precincts is State Forest or other regional reserves.

Of the 1883.1 ha of LNA, 1281.8 is zoned Rural or Urban. Of this urban and rural zoned land, 171.7 ha occurs within the Dwellingup Townsite land use categories of Intensive Agricultural Zone, rural residential or urban and may be subject to more intensive development. These land use categories are defined within the Dwellingup Structure Plan (Land inSights, 2011). Dwellingup Structure Plan, Shire of Murray, November 2011).

The priority action for LNA in Precincts 45 and 46 is retention of all natural areas, and protection of all natural areas where development is under consideration which meet the Specific biodiversity criteria. Indicative protection targets are not considered appropriate for Precincts 45 and 46 given the existing level of retention and protection of vegetation and vegetation complexes in the Darling Plateau, and the lower level of development pressure relative to the Swan Coastal Plain and Hills landscape Precincts.

Appendix J: Local Reserves in the Shire of Murray

Table 5: Local reserves in the Shire of Murray with bushland

Reserve No.	Veg_Area (ha)	Reserve Area (ha)	Veg Complex
NA	23.7	NA	Bassendean Complex-Central And - South
NA	34.9	NA	Bassendean Complex-Central And - South
R1453	2.0	2.0	Swan Complex
R15228	2.6	56.9	Dwellingup - D1
R15844	1.0	7.0	Forrestfield Complex
R16899	0.2	0.9	Darling Scarp Complex
R18676	2.7	4.0	Dwellingup - D1
R18759	8.2	8.3	Dwellingup - D1; Yarragil 1 - Yg1
R20215	88.1	100.9	Bassendean Complex-Central And - South; Vasse Complex
R20433	0.9	2.8	Forrestfield Complex
R20585	8.2	8.2	Guildford Complex
R21041	13.7	13.8	Darling Scarp Complex
R21099	3.0	47.3	Bassendean Complex-Central And - South
R23015	4.8	4.9	Vasse Complex
R23016	4.0	4.1	Bassendean Complex-Central And - South; Vasse Complex
R23642	4.3	4.3	Helena 1 - He1
R23798	0.8	2.2	Swan Complex
R25077	0.5	1.5	Swan Complex
R25503	5.9	6.5	Bassendean Complex-Central And - South
R25634	19.4	22.2	Murray 1 - My1; Yarragil 1 - Yg1; Dwellingup - D1
R25635	3.9	6.2	Yarragil 1 - Yg1; Dwellingup - D1
R25662	0.1	0.1	Guildford Complex
R26242	0.7	1.1	Dwellingup - D1
R26735	3.7	11.1	Bassendean Complex-Central And - South; Vasse Complex
R27704	2.9	10.4	Vasse Complex
R29033	2.1	2.1	Guildford Complex
R29516	0.6	1.0	Swan Complex
R30342	4.3	10.3	Bassendean Complex-Central And - South; Swan Complex
R30371	1.4	5.8	Dwellingup - D1
R31032	1.2	2.1	Bassendean Complex-Central And - South; Swan Complex
R31463	0.4	0.5	Bassendean Complex-Central And - South
R31568	1.1	1.7	Swan Complex
R31654	6.2	7.2	Southern River Complex
R31656	0.3	2.2	Bassendean Complex-Central And - South
R31922	20.9	24.0	Cannington Complex
R31951	0.4	0.7	Guildford Complex; Swan Complex
R31962	0.1	0.2	Bassendean Complex-Central And - South

Reserve No.	Veg_Area (ha)	Reserve Area (ha)	Veg Complex
R32876	0.7	1.7	Bassendean Complex-Central And - South
R32989	2.0	2.3	Dwellingup - D1
R33039	2.9	3.1	Southern River Complex
R33281	3.6	4.9	Guildford Complex; Swan Complex
R33446	2.0	3.9	Swan Complex; Guildford Complex
R33768	0.7	0.7	Vasse Complex
R34033	20.0	20.9	Bassendean Complex-Central And - South
R34148	0.5	0.6	Swan Complex; Bassendean Complex-Central And - South
R34465	0.7	1.7	Vasse Complex
R35077	13.0	28.0	Bassendean Complex-Central And - South
R35478	0.1	0.3	Herdsmen Complex
R35786	0.7	2.4	Bassendean Complex-Central And - South
R3585	23.2	23.9	Murray 1 - My1
R36202	13.7	13.8	Herdsmen Complex
R37191	0.1	0.6	Swan Complex
R37757	0.5	0.7	Swan Complex
R37994	0.6	1.3	Vasse Complex; Bassendean Complex-Central And - South
R38251	0.1	2.5	Bassendean Complex-Central And - South; Herdsmen Complex; Swan Complex
R39259	0.1	0.2	Dwellingup - D1
R39985	0.1	0.1	Vasse Complex
R40295	1.4	2.0	Vasse Complex
R40339	3.0	6.3	Bassendean Complex-Central And - South
R40591	1.8	1.8	Guildford Complex; Bassendean Complex-Central And - South
R40736	0.7	4.1	Vasse Complex
R40830	0.1	0.7	Bassendean Complex-Central And - South
R42867	4.2	4.3	Swan Complex
R44435	2.7	3.9	Bassendean Complex-Central And - South
R44436	1.0	1.0	Bassendean Complex-Central And - South
R44445	1.3	3.6	Swan Complex
R44749	0.5	1.1	Dwellingup - D1
R45108	0.9	2.0	Guildford Complex
R45205	2.7	3.6	Vasse Complex
R45206	1.0	1.0	Vasse Complex
R45471	1.9	2.7	Guildford Complex
R45616	1.8	5.1	Bassendean Complex-Central And - South; Swan Complex
R45790	0.5	4.4	Swan Complex
R45827	18.2	36.1	Guildford Complex; Swan Complex
R46846	0.2	0.3	Bassendean Complex-Central And - South
R48196	0.6	1.2	Swan Complex
R48253	1.0	2.4	Vasse Complex; Bassendean Complex-Central And - South
R48433	0.6	1.7	Guildford Complex
R48899	0.1	0.4	Vasse Complex

Reserve No.	Veg_Area (ha)	Reserve Area (ha)	Veg Complex
R48905	0.1	1.2	Bassendean Complex-Central And - South
R48943	2.8	4.1	Bassendean Complex-Central And - South; Guildford Complex
R50023	0.3	2.4	Forrestfield Complex
R50025	9.1	10.1	Vasse Complex
R50159	0.1	0.3	Vasse Complex
R5170	1.9	17.2	Bassendean Complex-Central And - South
R5623	1.4	1.4	Vasse Complex
R5625	0.2	1.0	Vasse Complex
R6038	31.5	34.7	Guildford Complex
R6131	1.4	1.6	Bassendean Complex-Central And - South
R6132	2.5	2.7	Bassendean Complex-Central And - South
R6542	0.5	0.5	Guildford Complex
R8756	32.1	33.2	Murray 1 - My1; Yarragil 1 - Yg1; Dwellingup - D1
TOTAL	494.7	1129.5	