



APPENDIX B
ENVIRONMENTAL ASSESSMENT AND
MANAGEMENT STRATEGY

ENVIRONMENTAL ASSESSMENT & MANAGEMENT STRATEGY

**LOTS 52 & 2979, ILLAREEN RD,
SHIRE OF KATANNING**



Prepared for

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on behalf of

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1.0 INTRODUCTION

1.1 Purpose of Report, Location, and Planning Requirements

This report has been commissioned by Elberton Property on behalf of the owners of Lots 52 & 2979, Illareen Road, Katanning. The purpose is to provide planners Taylor Burrell Barnett with an *Environmental Assessment and Management Strategy* to assist preparation of a Structure Plan as a basis for subdivision of the land.

The Department of Planning and the Western Australian Planning Commission have released a *Structure Plan Framework* (WAPC 2015) to outline the manner and form in which a Structure Plan is to be prepared to meet the requirements of the *Planning and Development (Local Planning Schemes) Regulations 2015*. Among other things, the Structure Plan Framework explains that local government (Shire of Katanning) and the WAPC need to consider whether proposed lots are capable of being developed for their intended use and an *Environmental Assessment and Management Strategy* is listed as one of the technical studies to be undertaken to provide supporting information and assist decision making.

Together, adjacent Lots 52 & 2979 off Illareen Road form a 210.76 ha farming property known as 'Broadway'. The property is centred approximately 3 km south-west of the Katanning CBD just south of the Kojonup – Katanning Road. Illareen Road forms its western boundary, and Prosser Street its eastern boundary.

The property is currently zoned 'Special Rural' under the Katanning Local Planning Scheme No 4 (endorsed November 2013). As shown in Figure 1 the Local Planning Strategy (Shire of Katanning 2013) identifies the property as part of Development Investigation Area No 10 where the purpose is "*to consolidate and redevelop existing rural residential areas*". In this context it is noted that land adjacent to the Broadway property, on the eastern side of Prosser Street, is an existing established rural residential area with a minimum lot size of 2 ha.

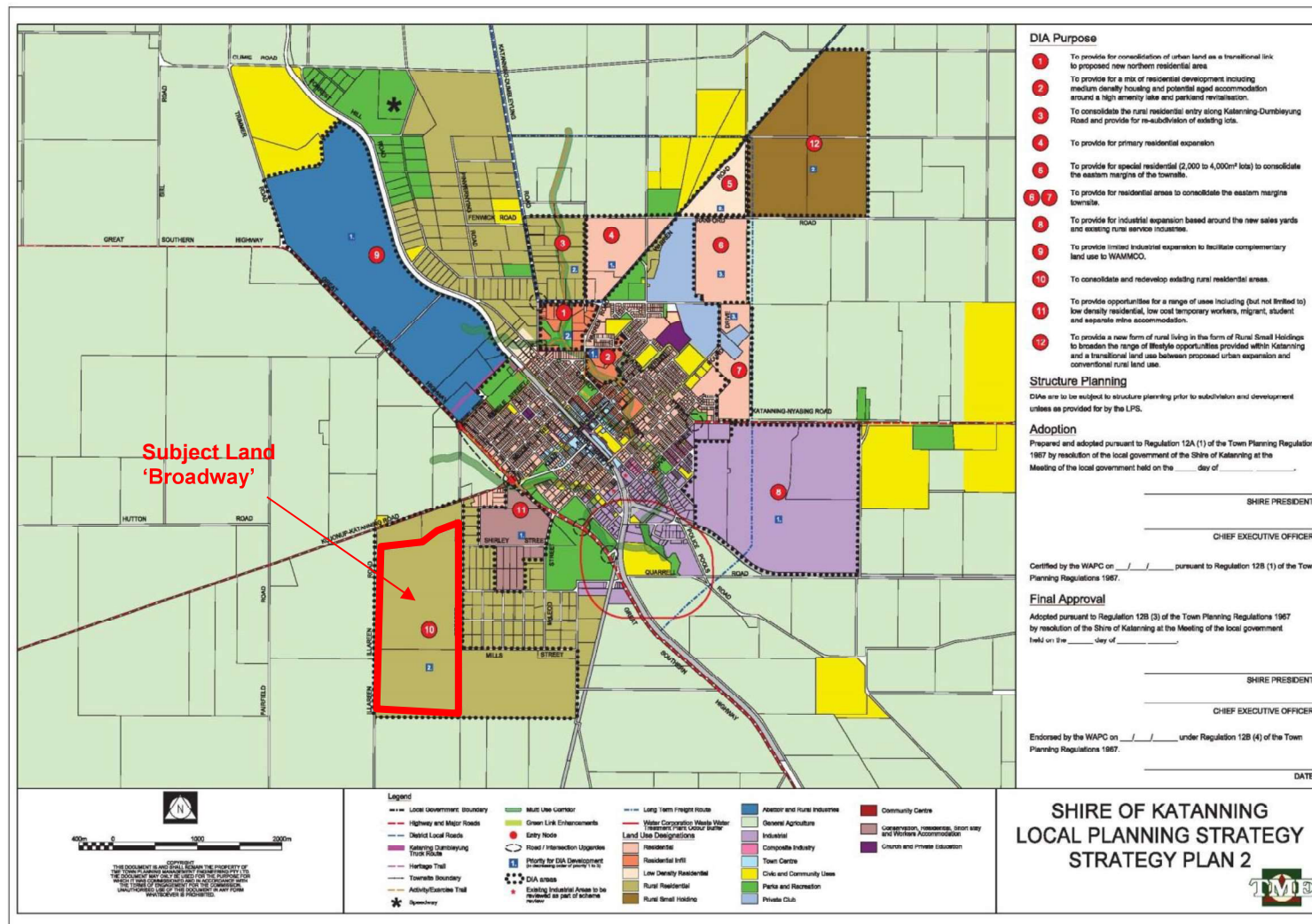


FIGURE 1: LOCATION PLAN

Source: Adapted from Shire of Katanning Local Planning Strategy – Plan 2 (prepared by TME Planning Consultants 2013).

1.2 Scope, and Local Environmental Considerations

A Structure Plan is “to provide information relevant to the site and commensurate with the scale of planning being undertaken” (WAPC 2015). The scope of an accompanying Environmental Assessment and Management Strategy is therefore determined by the need for information on site conditions and constraints, as well as on the relevant environmental matters identified in the Local Planning Strategy and Planning Scheme.

The Local Planning Strategy (Shire of Katanning 2013) identifies the following key issues to be addressed for Development Investigation Area No 10;

- Land Capability
- Drainage and creek-line management
- Low lying area with potential drainage issues
- Proximity to highway and waste-water treatment ponds.

Under the existing endorsed Town Planning Scheme (TPS No 4) specific environmental management requirements relevant to the ‘Special Rural’ zoning of subject land include;

- restrictions on vegetation clearing,
- setback distances for on-site effluent disposal from watercourses and dams,
- effluent disposal systems to be designed to address potential problems associated with high water-tables and low nutrient retention ability of sands.

Under draft Local Planning Scheme No 5 (Shire of Katanning 2016) opportunities for a range of limited rural and related ancillary pursuits are proposed for rural residential (formerly special rural) lots. This will depend however on those pursuits being consistent with the amenity and landscape attributes of the locality. Off-site impacts such as nutrient loss, drainage and/or potential conflicts with adjoining land uses also need to be avoided. Draft Local Planning Scheme No 5 also proposes areas be set aside for the retention of vegetation or other distinguishing features of the land.

Taken together, the environmental issues outlined above have determined the scope of matters addressed in this report.

2.0 ENVIRONMENTAL CONDITIONS

2.1 LANDFORMS AND SOILS

2.1.1 Geology, Geomorphology and Topography

Geological conditions determine the nature of the surface soils that provide a medium on-site effluent disposal associated with un-sewered rural residential development. The nature of the regolith (soils and underlying rock) also influences the risk of any pollution to surface or groundwater resources.

The geology of Katanning and its environs has been mapped at 1:250,000 scale by the Geological Survey of Western Australia (Dumbleyung Sheet SI/50-07 - Chin and Brakel 1986). It shows the subject land is underlain by Archaean biotite granite (Age) of the Yilgarn Block with an overlay, in its northern portion, of more recently formed Quaternary colluvial material and minor alluvial deposits (Qc).

In broad geomorphic terms the subject land occurs within the eastern portion of the *zone of rejuvenated drainage*, near its transition into the *zone of ancient drainage* further inland (Mulchay 1967). The local topography is gently undulating with surface elevation ranging from 306 m AHD in the south eastern corner of the property, up to 328 m AHD along a broad east – west aligned crest approximately within its centre.

The geology and geomorphology generally indicate the soils formed from the weathering of these predominantly ancient rocks are likely to duplex types (sand or loam overlying clayey subsoil) with slow subsoil permeability. Furthermore, valley floors and drainage lines are likely to be salt affected, increasingly so moving eastwards and further inland.

2.1.2 Soil Landscape Mapping and Agricultural Capability

A broad perspective of the landform and soils within this portion of the Shire of Katanning is provided by soil-landscape mapping (Percy 2004) undertaken by the Department of Agriculture and Food (DAFWA).

Figure 2 shows the area west of Katanning as mainly part of the Carrolup System described as gently undulating rises, low hills and some narrow alluvial plains.

More specifically, the subject land is part of the Carrolup 2 subsystem (Ca2). This is described as *lower to upper slopes and hillcrests with mainly grey deep sandy duplex soils and lesser areas of grey shallow sandy duplex soils, red shallow loamy and sandy duplex soils*. Immediately to the north, the property is bordered by the Carrolup 5 subsystem (Ca5) representing *narrow valley flats with saline wet soils and minor areas of grey deep sandy duplex soils*.

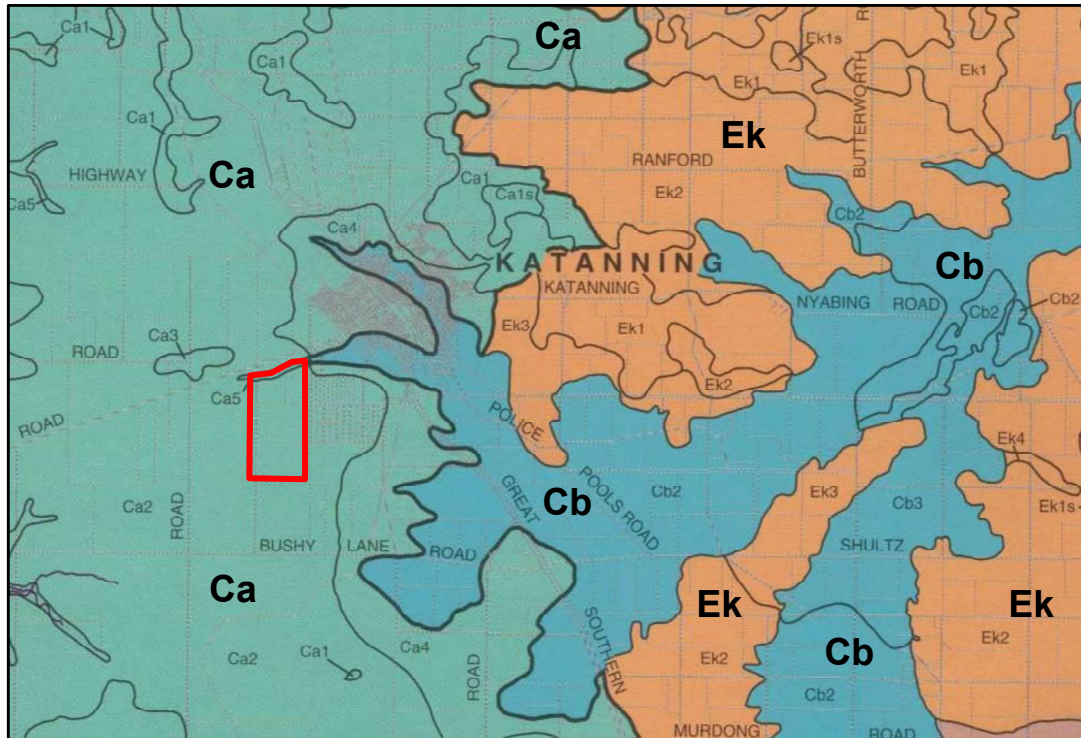


FIGURE 2: SOIL LANDSCAPE MAPPING. Source: Percy (2004)

Zone of Ancient Drainage

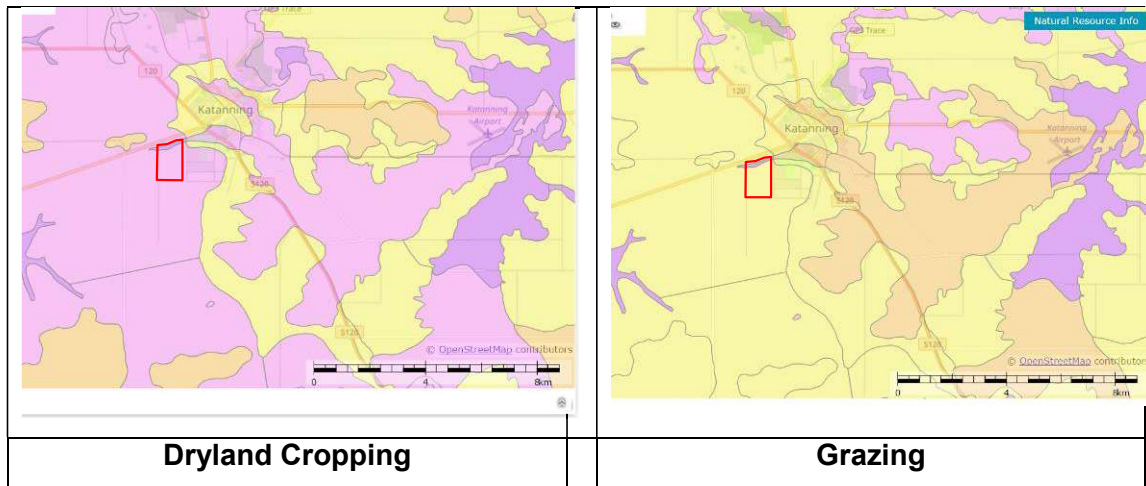
- Ek East Katanning System** - Gently undulating to undulating rises, in the South-western Zone of Ancient Drainage. Sandy gravels, grey sandy duplex soils and alkaline grey sandy duplex, often with hardsetting surfaces.
- Cb Cobline System** - Broad valley floors, with few lakes, in the South western Zone of Ancient Drainage. Saline wet soils, alkaline grey shallow duplex soils and grey deep sandy duplex soils.

Zone of Rejuvenated Drainage

- Ca Carrolup System** - Undulating rises and low hills, with grey sandy duplex (deep and shallow) and shallow loamy duplex soils.
 - Ca2 Grey sandy duplex soils on slopes, hill crests and less commonly minor drainage lines, within the Carrolup system.*
 - Ca5 Drainage lines and valley flats which are 100 – 300 m wide with mainly saline wet soils.*

The DAFWA assessment of agricultural land use capability for these broad soil-landscape mapping units is shown in Figure 3 and Table 1 below. The assessments are for dryland cropping and grazing which represent the dominant forms of agricultural land use around Katanning. They indicate the land is generally of moderate agricultural quality for grazing purposes, but of lesser quality for cropping.

FIGURE 3: BROADSCALE AGRICULTURAL CAPABILITY



Source: DAFWA Soil landscape mapping unit database (accessed via SLIP)

TABLE 1: BROAD-SCALE LAND CAPABILITY INTERPRETATIONS

Soil - Landscape Map Unit	Dryland Cropping	Grazing
Ca2	C1	B1
Ca5	C2	C2

Land capability classes used for map representation

- A1 >70% of the area is Class 1 or 2.
- A2 50-70% of the area is Class 1 or 2.
- B1 >70% of the area is Class 1, 2 or 3.
- B2 50-70% of the area is Class 1, 2 or 3.
- C1 50-70% of the area is Class 4 or 5.
- C2 >70% of the area is Class 4 or 5.

Capability Classes: 1 = Very high; 2 = High; 3 = Fair; 4 = Low; 5 = Very low.

2.1.3 Land Management Units

While the DAFWA soil-landscape mapping and capability interpretations outlined in section 2.1.2 assist planning at a 'whole of Shire' level, these broad-scale mapping units are quite heterogeneous and hence more detailed survey and mapping is required for planning and assessment of specific property development proposals.

In comparison with the DAFWA soil landscape mapping units, land management units (LMUs) are more detailed and relatively homogeneous areas of landform and soils. LMUs are described, but not mapped, within the report of DAFWA's soil-landscape mapping (Percy 2004).

Land Management Units (LMUs) within the subject land have been delineated and described by this consultant in general accordance with the DAFWA *Land Evaluation Standards for Land Resource Mapping* (van Gool et al 2005).

Using the soil-landscape mapping as an initial framework, and with the aid of recent aerial photography and 2 m interval contour mapping, landform and soil conditions were examined during a field survey on May 5. This survey was designed to supplement earlier mapping produced by this consultant as part of a Limited Rural Strategy for Katanning (Busselton Survey Office 1993). The recent soil observations were made from hand auger borings at twelve sites, with soils classified according to the WA Soil Group nomenclature (Schoknecht and Pathan 2013) and sites located using a Garmin 64s GPS.

The resulting property-specific LMU mapping is shown in Figure 4 and illustrated by accompanying photographs. Field survey results are available from Land Assessment Pty Ltd and generic descriptions of the soil groups are provided in Attachment A. Description of soil profiles and depth to groundwater conditions (from excavated pits) may be required at a later stage to address Department of Health requirements relating on-site effluent disposal systems, but planning guidelines (WAPC 2015) indicate they are not needed at Structure Plan stage.

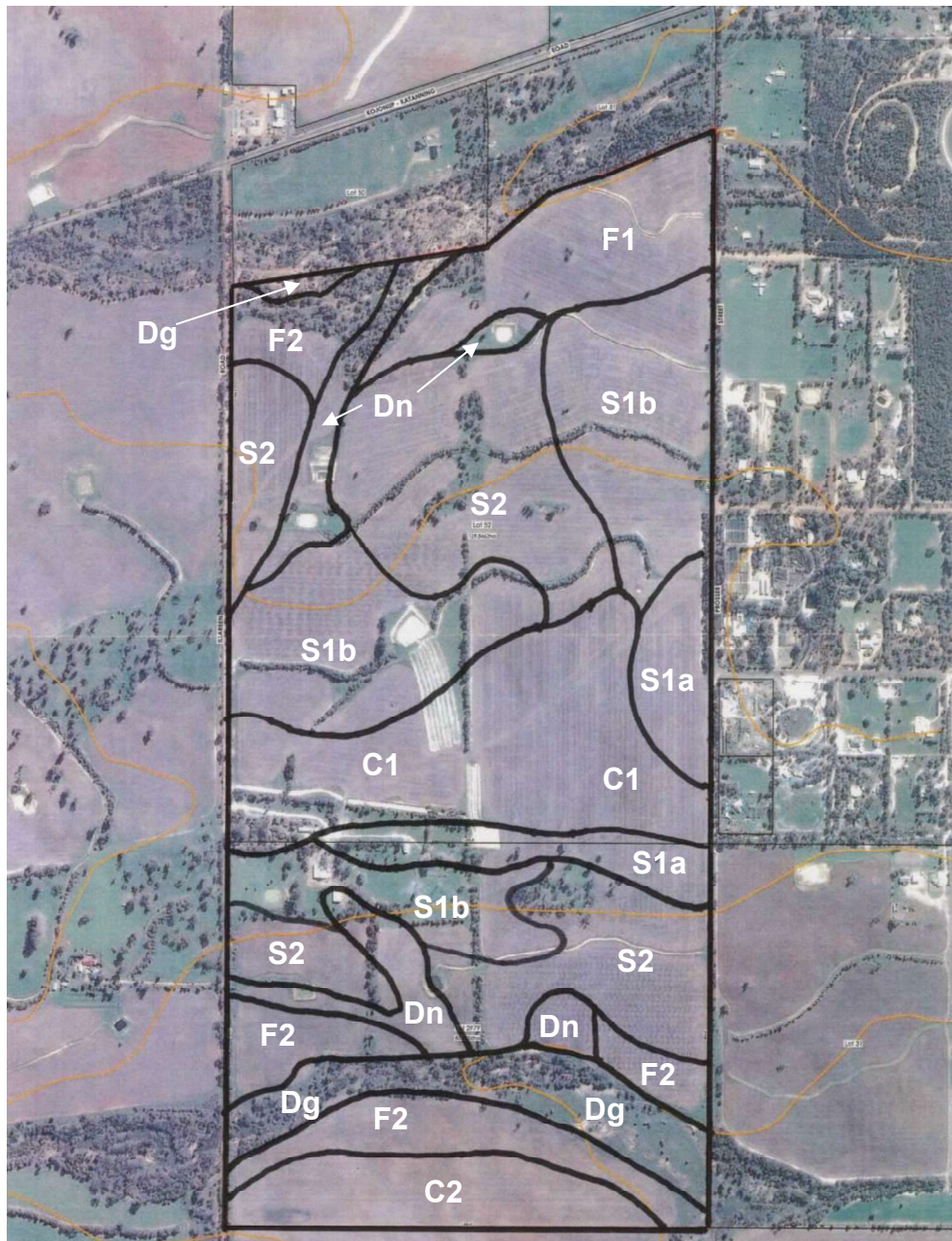


FIGURE 4: LAND MANAGEMENT UNITS*

Crests (0 – 2% gradient)	
C1 Shallow sandy duplex soils.	C2 Shallow loamy duplex soils.
Slopes (2 – 5% gradient)	
S1a Shallow sandy duplex soils.	S1b Deep sandy duplex soils.
S2 Shallow loamy duplex soils	
Footslopes (1 – 2% gradient)	
F1 Sandy duplex soils.	F2 Shallow loamy duplex soils
Drainage pathways	
Dn Non incised drainage pathway or seepage areas.	Dg Gullied (incised) drainage pathway.

* Shallow duplex soils are classified as either shallow (clay at less than 30 cm depth) or deep (clay at greater than 30 cm depth). Sandy duplexes have predominantly grey coloured topsoil, while loamy duplexes have predominantly red or yellow/brown topsoil.



Photo 1. C1 – Upland crest within southern part of Lot 52 - with grey shallow sandy duplex soil. ‘Fair’ capability rural-residential land.



Photo 2. C2 – Upland crest within southern part of Lot 2979 - with shallow loamy duplex soil. ‘Fair’ capability rural-residential land.



Photo 3. S1a - Gentle slopes (2 – 5 % gradient) with grey shallow sandy duplex soil. ‘Fair’ capability rural-residential land.



Photo 4. S1b Gentle slopes (2 – 5 % gradient) with mainly grey deep sandy duplex soil. ‘High’ capability rural-residential land.



Photo 5. S2 – Gentle slopes (2 – 5 % gradient) with red or yellow/brown shallow loamy duplex soil. ‘Fair’ capability rural-residential land.



Photo 6. F1 –Footslope (1 -2 % gradient) in north eastern portion of Lot 52 with yellow brown deep sandy duplex soil. ‘Fair – low’ capability rural-residential land.



Photo 7. F2 - Footslope (1 - 2 % gradient) within north western portion of Lot 52 with yellow brown shallow loamy duplex soil. ‘Fair – low’ capability rural-residential land.



Photo 8. F2 - Footslope (1 - 2 % gradient) within south eastern portion of Lot 2979 with yellow brown shallow loamy duplex soil. ‘Fair – low’ capability rural-residential land.



Photo 9. Dn – Non-incised drainage pathway with imperfect to poorly drained duplex soils - in northern portion of Lot 52. ‘Low’ capability rural-residential land.



Photo 10. Dg – Incised drainage pathway with saline soils and minimal riparian vegetation - in south eastern portion of Lot 2979. ‘Very low’ capability land.



Photo 11. Dg – Incised drainage pathway with saline soils and better riparian vegetation - in south western portion of Lot 2979. ‘Very low’ capability land.



Photo 12. Dam within unit Dn in central northern portion of Lot 52. Setbacks (30 m) required for on-site effluent disposal systems from such surface waterbodies.



Photo 13. There are a number of ‘grade banks’ such as this within Lot 52. They serve to intercept and divert surface runoff to dams. Spoil has been placed on the downhill side and planting with a variety of eucalypt species provides paddock windbreaks.



Photo 14. This ‘roaded catchment’ extending from crest unit C1 to upper slopes unit S1b is a water harvesting structure designed to increase the amount of surface runoff from the catchment above the largest dam near the central portion of Lot 52.



Photo 15. A boundary strip of planted vegetation of mixed species (some local, some introduced) currently provides a buffer between farming within Lot 52 and existing rural-residential lots on the eastern side of Prosser Street.



Photo 16. Outside of planted banks and boundary strips, areas of remnant vegetation are limited to drainage lines or scattered stands of eucalypts with understorey grazing - such as these in north eastern portion of Lot 2979.

2.1.4 Rural-Residential Capability

'Land capability' is a term used to express the ability of land to support a proposed use with minimal risk of degradation to its soil and water resources. Capability assessment is based on an analysis of land resources data and its comparison with physical requirements of the proposed form of land use (rural-residential). The general land capability assessment method developed by the Department of Agriculture (Wells and King 1989, van Gool et al 2005) forms the basis for the assessment of the subject land in this report.

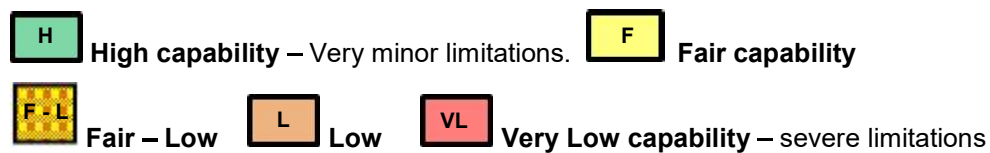
Under the assessment method, the ability of site conditions to meet the requirements of a specific form of land use is expressed in terms of a five class rating system from 'very high' capability (class one) to 'very low' capability (class five). Land of very high capability is considered to have very few inherent physical land use limitations and minimal associated risk of land degradation. Very low capability land however is severely constrained by the inherent soil or landform conditions and there is a high risk of land or water degradation associated with the proposed land use. As a result, the need for land management inputs increases proportionally from 'very high' through to 'very low' capability land.

Given the nature of the terrain and its current use for farming (predominantly livestock grazing), the introduction of a greater number of houses, each with an on-site effluent disposal system, is the most significant change to result from the proposed rural residential development. The focus of the capability assessment has therefore been on addressing the risk of pollution or nutrient loss to waterbodies, and the ability of soil conditions (particularly subsoil permeability) to provide an appropriate medium for on-site domestic effluent disposal.

Figure 5, in combination with Table 2, shows the capability assessment for rural residential development. Figure 6 shows additional constraints or 'considerations' for the proposed development including watercourses, and dams, earthworks and tree plantings associated with existing water management and erosion control initiatives within the property. Setback distances apply in relation to positioning of on-site effluent disposal systems near watercourses and dams. The setbacks noted on Figure 6 are in accordance with the currently operative Draft Country Sewerage Policy (Gov't of WA 1999) and the latest consultation draft of the proposed new Government Sewerage Policy (Department of Health 2016 a,b).



FIGURE 5: LAND CAPABILITY (refer to Table 2 for nature of limitations)



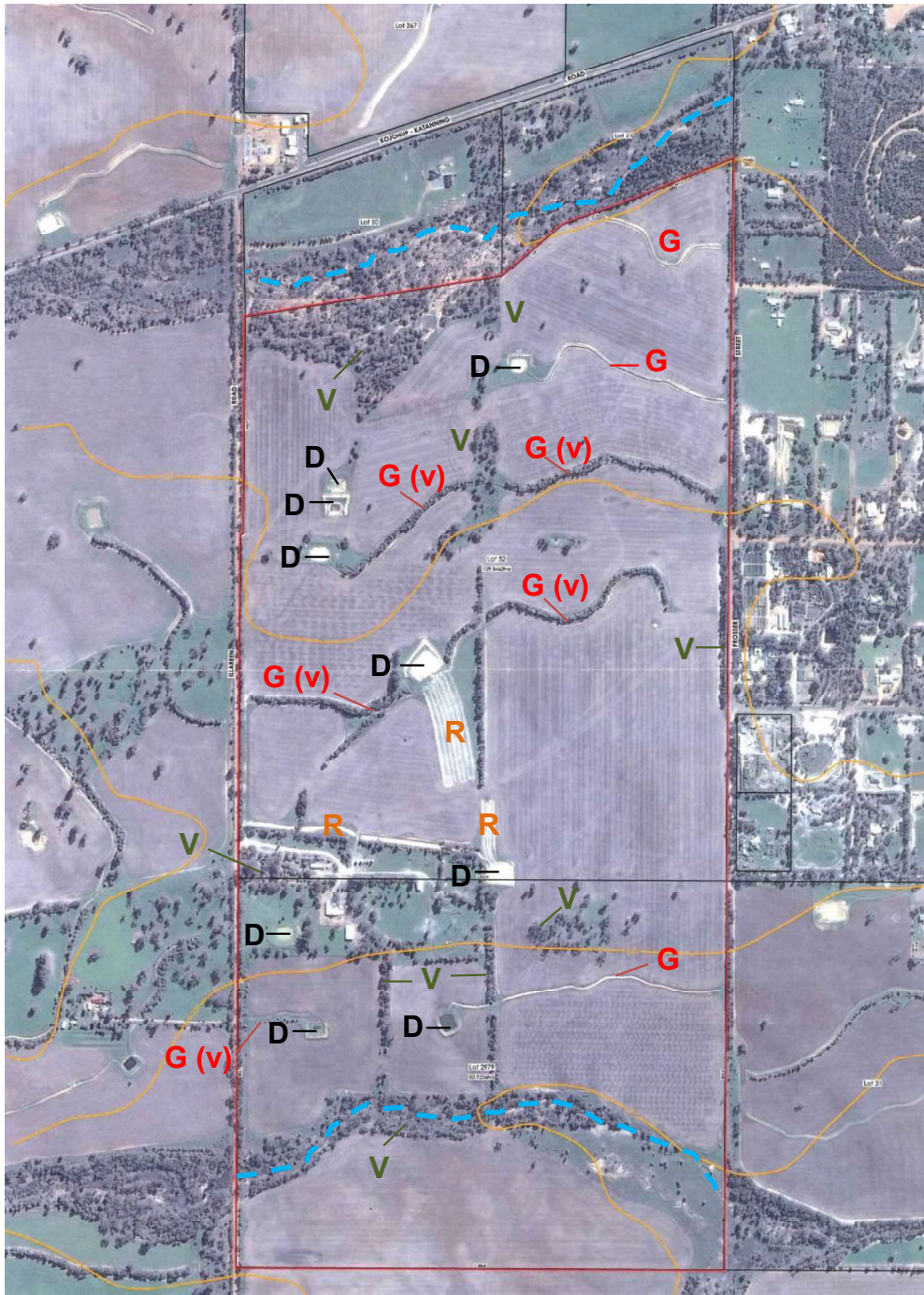


FIGURE 6: OTHER ENVIRONMENTAL CONSIDERATIONS

--- Watercourse - Seasonally flowing tributary of Katanning Creek

- D** – Dam
- G** – Grade Bank
- G(v)** - Grade Bank (vegetated)
- R** – Roded catchment
- V** – Vegetation (remnants and plantings)

TABLE 2. LAND CAPABILITY AND PLANNING CONSIDERATIONS – for Rural-Residential Development

LMU* (Landform)	SOIL	LAND CAPABILITY**	COMMENTS
C – Crests (< 2 % gradient)			
C1	Grey shallow sandy duplex	Fair	Moderate limitations relating to shallow clayey subsoil with slow permeability / absorption ability. On-site effluent disposal systems will require use of partially inverted leach drains (a common need within wheatbelt landscapes). Moderately well drained with moderate nutrient retention ability and minimal erosion risk. Suitable for livestock grazing as a rural pursuit
C2	Yellow brown shallow loamy duplex	Fair	Moderate limitations relating to shallow clayey subsoil with slow permeability / absorption ability. On-site effluent disposal systems will require use of partially inverted leach drains (a common need within wheatbelt landscapes). Moderately well drained with good nutrient retention ability and minimal erosion risk. Suitable for livestock grazing as a rural pursuit
S - Slopes (2 – 5 % gradient)			
S1a	Grey shallow sandy duplex	Fair	Moderate limitations relating to shallow clayey subsoil with slow permeability / absorption ability. Other comments as per unit C1 although more susceptible to soil erosion if surface runoff unchecked. Suitable for livestock grazing as a rural pursuit.
S1b	Grey or yellow brown deep sandy duplex.	High	No significant limitations. Elevated and generally well drained with greater depth to clay and sufficiently remote from drainage lines, although partially inverted leach drains may be still be required (a common need within wheatbelt landscapes). Generally good nutrient retention ability. Suitable for livestock grazing as a rural pursuit
S2	Yellow brown or red shallow loamy duplex	Fair	Moderate limitations relating to shallow clayey subsoil with slow permeability / absorption ability. Other comments as per unit C2 although more susceptible to soil erosion if surface runoff unchecked. Suitable for livestock grazing as a rural pursuit
F – Footslopes (1 – 2% gradient)			
F1	Yellow brown deep sandy duplex	Fair - Low	Moderate to significant limitations. Low-lying area with imperfectly drained soils that receive runoff and groundwater seepage from adjacent higher terrain. Can be susceptible to waterlogging and areas in proximity to adjacent drainage line units require consideration of a 30 m minimum* setback for on-site effluent disposal systems. (* for predicted soil PRI > 5). Suitable for livestock grazing as a rural pursuit subject to fencing off any adjacent riparian vegetation.

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LMU* (Landform)	SOIL	LAND CAPABILITY**	COMMENTS
			Further investigation of soil conditions and winter depth to groundwater recommended to be undertaken at a later stage of planning to address evolving policy requirements** for on-site effluent disposal. (** new Government Sewerage Policy - Department of Health 2016 a,b)
F2	Yellow brown shallow loamy duplex	Fair - Low	<p>Moderate to significant limitations. Low-lying area as per unit F1 although likely slower subsoil permeability / absorption ability. Suitable for livestock grazing as a rural pursuit</p> <p>Further investigation of soil conditions and winter depth to groundwater recommended to be undertaken at a later stage of planning to address evolving policy requirements** for on-site effluent disposal. (** new Government Sewerage Policy - Department of Health 2016 a,b)</p>
D – Drainage pathways			
Dn	Grey shallow sandy duplex soils	Low	Significant limitations relating to drainage / pollution risk to this minor drainage pathway (only episodic surface flow) or lower-slope seepage area. Predominantly a low-lying area where it is recommended to avoid in relation to positioning building envelopes and on-site effluent disposal systems. Can be susceptible to salinity.
Dg	Saline and wet sandy duplex soils	Very Low	<p>Severe limitations relating to drainage / pollution risk to watercourses, susceptibility to flooding and presence of remnant riparian vegetation. Low-lying area that is prohibitive for building envelopes.</p> <p>Application of setbacks for on-site effluent disposal systems within adjacent units is required (30 m minimum measured from edge of fringing riparian vegetation in this unit). Fencing should be maintained to prevent access by any livestock permitted as a rural pursuit on adjacent units.</p>
Dams and banks	Not applicable	Not applicable	<p>Setbacks (30 m) for on-site effluent disposal systems from dams recommended to avoid potential nutrient inputs to waterbody.</p> <p>Retain dams and the integrity of grade banks where possible as an asset for future water management particularly for landholders with livestock grazing as a rural pursuit. These structures form part of drainage system for stormwater management and where vegetated act as wind breaks and contribute to rural amenity.</p>

* Refer Figure 4 ** Refer Figure 5

2.1.4 Acid Sulfate Soils

Acid Sulfate Soils (ASS) are naturally occurring soils and sediments that are either acidic or have the potential to become acidic when exposed to air. These soils are predominantly found in coastal or estuarine areas and have the capacity to generate acidity due to the presence of iron sulfides (mainly pyrite) found in permanently waterlogged, frequently anoxic and submerged soil layers.

The National Acid Sulfate Soils database is accessed on-line via the Australian Soil Resource Information System (ASRIS) (www.asris.csiro.au). This database broadly identifies the area just west of Katanning as “Low probability” in relation to the risk of encountering acid sulfate soil conditions. More detailed mapping is currently not available at a state level.

Land developmental projects involving dewatering, dredging or excavation have the potential to expose ASS to oxidation locally. Not forsaking the low probability of risk, the proposed development within Lots 52 and 2797 should not involve any dewatering, and very minimal excavation (associated with road construction, house foundations, and installation of septic tank leach drains).

2.1.5 Visual Landscape Impact

The subject land is not visible from major travel routes, including the Kojonup – Katanning Road, due to intervening vegetative cover or topography.

Visual landscape impacts of the proposed development would therefore be limited to viewpoints along the lesser rural roads (Illareen Road to the west, and Prosser Street to the east). Prosser Street borders, and provides access to, an existing rural-residential area which supports substantially more trees than nearby rural-zoned farming properties.

2.2 BIODIVERSITY AND NATURAL AREA ASSETS

2.2.1 Vegetation

Broad-scale mapping by Beard (1980) shows of the original native vegetation of the property as being part of the Broomehill vegetation system within a botanical subdivision of the Avon Botanical District. Broomehill system is described as:

- located within an almost entirely cleared area of flat to gently undulating plain with winter-wet soils,
- dominated by blue mallet (*E gardneri*) and Wandoo (*E wandoo*) but also with some Brown mallet (*E astringens*) on lateritic areas, and York gum (*E loxophleba*) in more dissected areas, and
- occasionally including Yate (*E occidentalis*) and Red Morrel (*E longicornis*).

A total of 7.2 % of the original 62,528 ha extent of Broomehill System remains intact (Shepherd et al 2002) with many areas having been almost totally cleared to enable agricultural production.

The extent of native vegetation within the 'Broadway' property is shown in Figure 6. Comparison of 1992 aerial imagery (associated with the Katanning Limited Rural Strategy by Busselton Survey Office) with this contemporary image, shows extensive vegetative regrowth in and around drainage lines (unit Dg). Outside of these, the scattered areas of natural remnants are in generally poor condition resulting from understorey grazing. Significant plantings have however occurred in association with the establishment of grade banks for surface water control, and also along paddock boundary fences for windbreaks and landcare purposes.

2.2.2 Significant Flora and Fauna

A search of the Department of Parks and Wildlife data-base (NatureMap – Attachment B) indicates there are no Threatened Ecological Communities (TECs) or Priority Ecological Communities (PECs) within the 'Broadway' property.

There are records of four flora species, eight birds, and two other fauna species of conservation significance occurring within a 5 radius of the subject land (Table 3). The likelihood of their habitat (if present) being significantly affected by subdivision

and development of the land is considered remote. This is because the largest vegetated areas are associated with drainage lines that are already fenced and prohibitive for building, can be expected to remain so. Other 'upland' vegetated areas are either also fenced, or unlikely to provide habitat due to understorey grazing.

TABLE 3: SPECIES OF CONSERVATION SIGNIFICANCE WITHIN 5 km RADIUS

Species	Conservation Code*
Flowering plants, shrubs and herbs	
<i>Tribonanthes purpurea</i> (Granite Pink)	T
<i>Banksia acanthopoda</i>	P2
<i>Verticordia brevifolia</i> subsp. <i>brevifolia</i>	P3
<i>Acacia grisea</i>	P4
Birds	
<i>Actitis hypoleucos</i> (Common Sandpiper)	IA
<i>Merops ornatus</i> (Rainbow Bee-eater)	IA
<i>Plegadis falcinellus</i> (Glossy Ibis)	IA
<i>Ninox connivens</i> subsp. <i>connivens</i> (Barking Owl)	P2
<i>Falco peregrinus</i> (Peregrine Falcon)	S
<i>Phascogale calura</i> (Red-tailed Phascogale, Kenngoor)	S
<i>Calyptorhynchus banksii</i> subsp. <i>naso</i> (Forest Red-tailed Black-Cockatoo)	T
<i>Calyptorhynchus latirostris</i> (Carnaby's Cockatoo (short-billed black-cockatoo).	T
Other Fauna	
<i>Bettongia penicillata</i> subsp. <i>ogilbyi</i> (Woylie, Brush-tailed Bettong)	T
<i>Onychogalea lunata</i> (Crescent Nailtail Wallaby, Wurrung).	X

* Conservation Codes

T - Rare or likely to become extinct

X - Presumed extinct

IA - Protected under international agreement

S - Other specially protected fauna

P1 – P5 - Priority 1 to Priority 5 respectively.

2.3 SURFACE WATER AND GROUNDWATER

2.3.1 Catchment Management and Surface Water

The 'Broadway' property occurs within the upper part of the Blackwood Catchment (Management Zone 5 - De Silva et al 2000) within eastern most portion of the Zone of Rejuvenated Drainage.

At a more local level, the property occurs within the catchment area to Katanning Creek which flows eastwards into the Coblinine River which eventually flows into Lake Dumbleyung (Lewis 1992).

There is a broad east – west aligned crest in approximately the centre of the property around a kilometre south of the Kojonup – Katanning Road, and surface drainage is to the north and south of this upland area towards two un-named seasonally active tributaries of Katanning Creek. The northern tributary occurs just outside the Lot 52 portion of the property, however part of the southern tributary is encompassed within the property (Lot 2979 portion) approximately 1.5 km to the south of Kojonup – Katanning Road.

Both tributaries flow only seasonally and into separate pools within Katanning Creek about 4 – 7 km eastwards. Vegetation within and adjacent to both tributaries indicates they are salt affected and therefore they offer no potential for extraction of water for livestock or domestic purposes.

Topographic mapping (Katanning 1:50,000 sheet) shows neither of these tributary watercourses extend more than 2.5 km upstream from the 'Broadway' property. Accordingly their catchment areas are small, and the extent of any flood event is likely to be minimal and contained within the boundaries of the encompassing land management unit (unit Dg) as shown in Figure 4.

2.3.2 Groundwater

The 'Broadway' property does not occur within a proclaimed or proposed groundwater protection area and there are no records for groundwater bores within the property.

At a broad-scale level, weathered and fractured granitoid and gneissic basement rock aquifers occupy the greater part of Blackwood Catchment Management Zone 5

(De Silva et al 2000). Surficial and palaeochannel aquifers are generally constrained to broad flats in the lower landscape areas (at < 280 m AHD) further westwards than the subject land.

In the more upper landscape elevations (> 330 m AHD) De Silva et al report depth to water level varies between 0.6 and 24 m, with salinities ranging from 90 to 10,000 mg/L. The subject land at 306 - 328 m AHD is just below the upland areas however water level trends have not been reported for Catchment Management Zone 5 or the adjacent more easterly zone 6 (De Silva et al 2000).

In light of the above, there is insufficient information on which to predict depth to groundwater beneath the property other than to say that in low-lying areas local perching of water above subsoil clays is likely to influence the performance of leach drains. It is sufficient however to conclude that the area has no significant potential for irrigated rural pursuits due to likely poor water quality.

3.0 ENVIRONMENTAL PLANNING MATTERS - CONCLUSIONS

This section specifically addresses the environmental considerations outlined in the Shire's Draft Local Planning Strategy as being relevant to gaining Council's support for a rural-residential development proposal.

3.1 Land Capability

Figure 5 shows that approximately 72 % of the 'Broadway' property is land of fair or better capability to support un-sewered rural residential development. It is therefore physically well suited to such development subject to subdivision design taking into account the smaller portions of lesser capability.

The capability assessment method focuses on landform and soil conditions in relation to the primary change in land use change associated with subdivision and rural residential development. That is, the introduction of multiple dwellings along with a requirement for individual landowners to provide water and install approved on-site sewage treatment and effluent disposal systems.

In the absence of a scheme water supply, domestic water needs are expected to be provided by harvesting roof-top rainwater runoff and tank storage. This is a practical and common measure undertaken in most rural-residential areas. Likewise with on-site sewage management and effluent disposal where conventional septic tanks are most common and leach drains are sized according to the absorption ability of the receiving soil environment.

Under Draft Local Planning Scheme No 5 (Shire of Katanning 2016) the use of alternative treatment unit effluent disposal systems, may be required in the following situations:

- (a) Where soil conditions are not conducive to the retention of nutrients;
- (b) In low lying areas; and
- (c) In areas where there is a known high groundwater level.

In relation to the 'Broadway' property there are no areas of deep bleached sands. However, the grey sandy topsoils of some duplex soils are not conducive to nutrient retention, although the underlying clayey subsoils are retentive.

The low lying areas of the property are the footslope units F1, F2 and lower portions of unit Dn as shown in Figure 5. Groundwater levels within these areas have not been determined but are considered likely to high, and may warrant further investigation if;

- lot sizes at the smaller end of the rural residential spectrum are to be considered here, and /or
- the Shire is aware of any effluent disposal problems within nearby areas of similar landscape position.

Land use limitations associated with the 'fair capability' land shown in Figure 5 are relatively minor and easily addressed. They include the necessity for partially inverted leach drains for on-site effluent disposal (i.e. leach drains contained within free draining sandy soil fill material brought onto the site) associated with the use of septic tank systems in areas of duplex soil (sand or loam over slowly permeable clay) despite the gently sloping terrain being moderately well drained.

The same land use limitations occur within the 'fair to low' and 'low capability' areas but are progressively more significant due to the lower-lying position within the landscape where winter water-table (perching over clay subsoil) is exacerbated by receipt of drainage run-off from adjacent slopes. Soil waterlogging can be expected for longer periods and leach drains / sand pads need to be more elevated. Alternatively, alternative treatment units might be used for sewage management as their disposal areas have a lesser depth to impermeable layer (clay / watertable) requirement than leach drains.

The 'fair to low' and 'low capability' areas also occur closer to drainage lines and therefore un-sewered rural residential development presents a greater risk of addition of pollutants or nutrients to natural watercourses during winter wet conditions unless on-site effluent disposal systems function effectively and drainage is carefully controlled. Larger than minimum lot sizes in the 'fair to low' and 'low capability' areas provide greater flexibility for control of drainage and positioning and sizing of effluent disposal systems away from drainage pathways.

Larger lots also provide more opportunity for ancillary rural pursuits such as livestock grazing which is more suited to the lower lying terrain where there is generally greater longevity for pastures and less risk of soil erosion. The existing town planning scheme (Shire of Katanning 1998) provides controls on livestock numbers in special rural / rural residential areas and appropriate measures to address any degradation of land arising from poor management.

The 'very low capability' areas are confined to the watercourses and their associated flats and riparian vegetation. Such land is understandably prohibitive in terms of being directly affected by positioning of buildings and sewage management systems due to the risk of localised flooding, pollution, and conservation values associated with flora / fauna habitat and landscape aesthetics.

3.2 Creek-lines and Protection of Riparian Vegetation

The Local Planning Strategy (Shire of Katanning 2013) indicates Council's support for protecting the natural environment, and under its draft Local Planning Strategy (2016) development is required to prevent disruption to the natural drainage system.

For the 'Broadway' property, the natural drainage systems are shown as unit Dg within Figure 5. Protection of creeklines and riparian vegetation requires the application of setbacks (30 m for effluent disposal systems) and fencing to exclude livestock. Creation of a foreshore reserve as part of the Structure Plan's 'open space' component should also be considered, although it is understood the Shire's preference is for the creek line to be kept in individual lots with the use of easements to ensure protection.

Riparian vegetation associated with the drainage line in the southern portion of the Broadway property (Lot 2979 – see Photo 10) is incomplete, and replanting of appropriately salt, and waterlogging, tolerant native species is recommended.

At a later stage of the planning process, road infrastructure drainage systems will need to be designed and constructed in accordance with the 'Stormwater Management Manual for Western Australia' (Department of Water 2007) and 'Better Urban Water Management' guidelines (Western Australian Planning Commission 2008). In doing so, there will be a presumption against any additional stormwater runoff from these areas entering the watercourse within land unit Dg.

3.3 Landscape Character and Other Vegetation Protection

Protection of rural character and visual amenity is an important planning consideration, particularly in relation to views from major tourism travel routes. The subject land is located to the west of Great Southern Highway and south of the Kojonup – Katanning Road. Development within the property will not be visible from either of those travel routes.

Notwithstanding this lack of exposure from traffic routes, protection of the remaining tree and shrub cover within the property (including windbreaks and bank plantings) will serve to retain aesthetic values, particularly within upper parts of the landscape.

Under existing Town Planning Scheme No 4 (Shire of Katanning 1998) and in relation to landscape matters in Special Rural / Rural residential areas, the following provisions apply;

- *“in order to conserve the rural environment or features of natural beauty all trees shall be retained unless their removal is authorized by the Council”* and
- *“in order to enhance the rural amenity of the land in areas the Council considers deficient in tree cover it may require as a condition of any planning approval the planting of such trees and/or groups of trees and species as specified by the Council”*.

Furthermore, and specific to the subject land;

- *“At the time of application for planning approval for a dwelling the owner will be required to plant and maintain for a period of two years 50 trees capable of growing to at least 3 metres in height”* and
- *“Dwellings and all ancillary buildings shall be constructed of non-reflective material be constructed of non-reflective material (with the exception of glazed areas) and shall comprise either timber, stone, rammed earth, brick or steel construction and shall be of colour(s) and textures which are essentially natural and earthy. All such materials shall be to the satisfaction of the Council and shall be compatible with the rural character of the locality.*

In light of the above no further measures are considered necessary for the protection of landscape character.

3.4 Low-lying Areas and Drainage

Outside of land unit Dg, it is considered there is minimal risk of flooding of the low lying areas (units F1 and F2 in Figure 5) due to the small upstream catchment area.

As discussed in section 3.1, under Draft Local Planning Scheme No 5 (Shire of Katanning 2016) the use of alternative treatment unit effluent disposal systems, may be required in low lying areas and further investigation of groundwater levels may be warranted if;

- lot sizes at the smaller end of the rural residential spectrum are to be considered here, and /or
- the Shire is aware of any effluent disposal problems within nearby areas of similar landscape position.

If such investigations are to be undertaken, they are expected to be part of either a 'local water management strategy' or an 'urban water management plan' prepared and progressed in concert with the land planning process (Western Australian Planning Commission 2008).

In relation to surface drainage matters, the fate of the existing dams and water control earthworks within the property (See Figure 6) also needs to be considered. Dams can provide a drinking water source for livestock, a fire-fighting water supply, and are usually regarded as a landscape asset within rural residential area. However for a reliable supply, the integrity of catchment areas (including grade banks which divert water towards those storages) needs to be maintained where possible. This can provide a subdivision design challenge, but can assist landscaping and possible future block values where property boundaries align with existing vegetated banks or vegetation plantings around existing farm paddocks.

3.5 Amenity and Nearby Land Uses

The subject land is bordered to the east and north by an existing rural residential area. Land to the west and south contains existing broad-acre farming properties.

As indicated in section 2.1.2, land in the subject property and much of the surrounding area is of 'moderate' agricultural quality for grazing purposes, and somewhat lesser quality for cropping. It is therefore likely that in remaining

agricultural land to the west and south of the proposed development, livestock grazing will continue as the predominant farming activity. Any future intensive forms of agriculture (such as vineyards) which could otherwise require buffers from the proposed rural-residential development of the 'Broadway' property, are unlikely given the generally limited availability and poor quality of water resources.

As shown in Figure 1 the subject land is in excess of 1 km from the outer part of the designated odour buffer from the Water Corporation's Waste Water Treatment Plant.

Given the above, it is concluded there would be no significant detrimental impact of the proposed development to the amenity of the area and nearby land uses.

3.6 Mechanisms for protection of environmental values and features

The principal environmental values of the property are associated with the natural watercourses within its southern portion, and just beyond its northern portion. Vegetation within and adjacent to these watercourse areas can be protected from the impact of grazing livestock by maintaining fencing, and from the possible addition of nutrients / pollutants from domestic sewage management systems by adherence to required setbacks or the use of alternative treatment units.

Other environmental values include the scattered areas of remnant vegetation on higher terrain away from the watercourse, although this is in generally poor condition (except for bird habitat) due to understorey grazing. Existing earthworks and dams for surface water management should also be regarded as environmental assets and retained as far as possible. Where accompanied by vegetation plantings, the grade banks have landscape value and help to intercept groundwater flows which might otherwise contribute to salinization of low-lying areas.

Mechanisms to ensure protection of the environmental values are largely already contained within Town Planning Scheme No 4 or draft Local Planning Scheme No 5. They can however also be affected through variation in the size and design of lots within the proposed development.

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ATTACHMENT A

WA Soil Groups – Generic Descriptions

(Schoknecht and Pathan 2013)

Yellow/brown shallow loamy duplex

Soil Group 508

Yellow/brown loam over clay at <30 cm

Characteristics

- Yellow or brown topsoil
- Neutral pH subsoil common, although rarely acid or alkaline
- Firm to hard setting surface

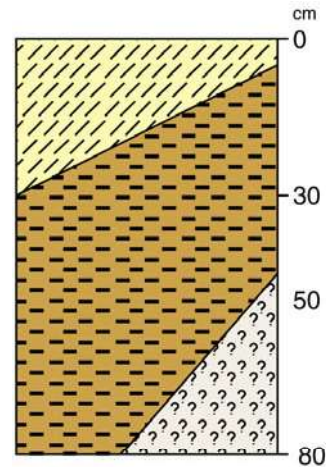
Local names

- Mallee duplex

Typical Australian Soil Classification (ASC)

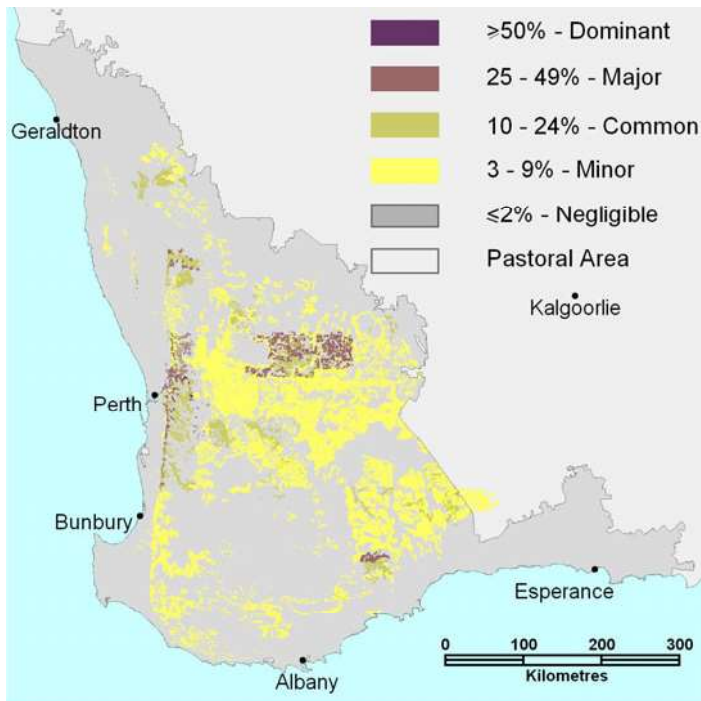
(dominant ASC in italics)

- *Yellow or Brown Chromosol*
- Yellow or Brown Sodosol



Main occurrences in Western Australia

- Widespread throughout the South-west and parts of the Kimberley
- Scattered in the wheatbelt



Distribution map of Yellow/brown shallow loamy duplex in the South-west of WA



Yellow/brown shallow loamy duplex (Donnybrook)

Red shallow loamy duplex

Soil Group 507

Red loam over non-calcareous clay at <30 cm

Characteristics

- Red within top 30 cm
- Neutral pH subsoil
- Firm to hard setting surface

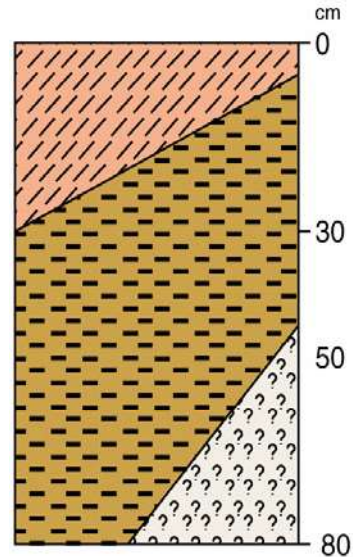
Local names

- Jam soil
- York gum soil
- Chapman valley loam
- Avon valley loam
- Red soil

Typical Australian Soil Classification (ASC)

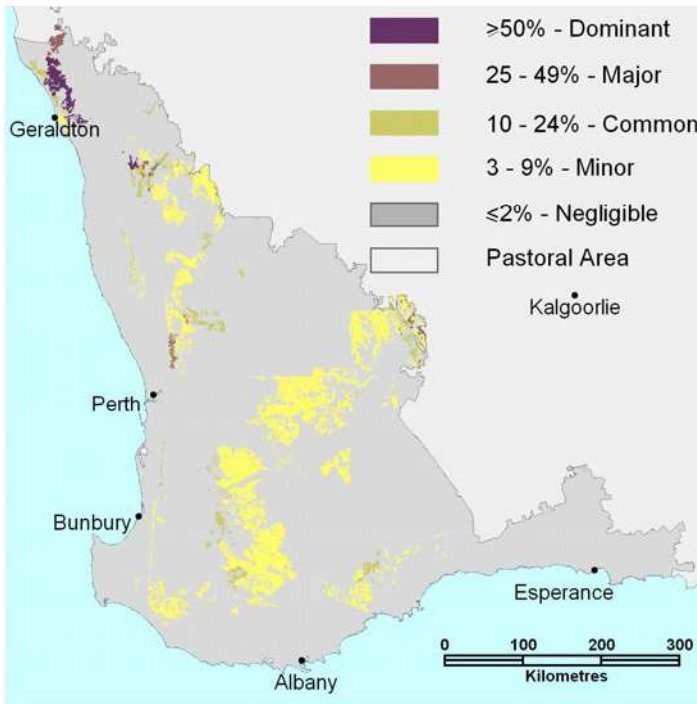
(dominant ASC in italics)

- *Red Chromosol*
- Red Sodosol
- Red Dermosol



Main occurrences in Western Australia

- Widespread, but rarely common, in areas of rejuvenated drainage on granite, between Moora and Bridgetown
- Scattered throughout the wheatbelt



Distribution map of Red shallow loamy duplex in the South-west of WA



Red shallow loamy duplex (Three Springs)

Yellow/brown deep sandy duplex

Soil Group 407

Yellow/brown sand over sandy clay loam to clay at 30-80 cm

Characteristics

- Surface layers mainly yellow or brown
- May have a paler subsurface and various colours in subsoil
- Neutral subsoil pH common, but may be acid to alkaline
- Ironstone gravel sometimes present, especially on top of clay

Local names

- Mallee broombush soil
- Blue mallee soil

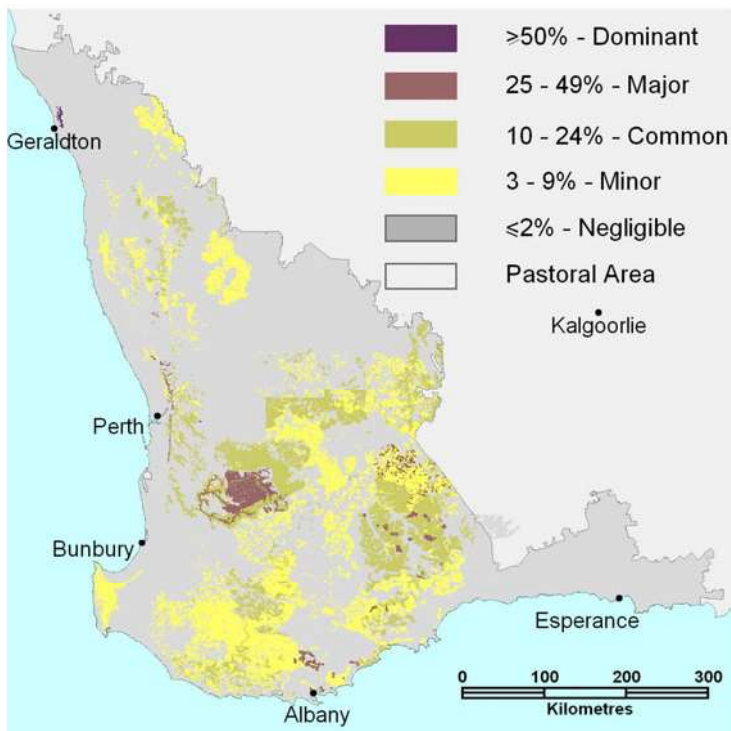
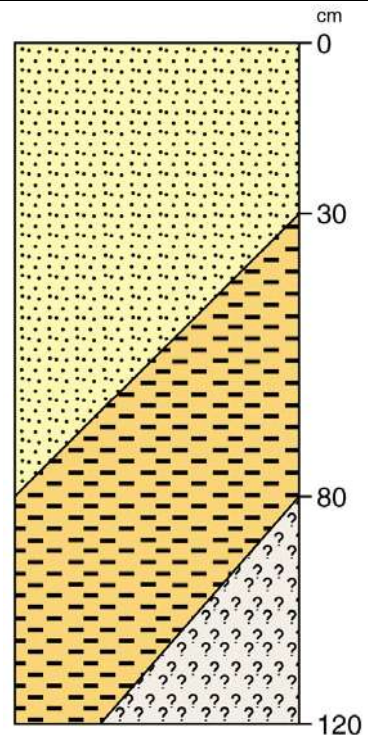
Typical Australian Soil Classification (ASC)

(dominant ASC in italics)

- *Yellow or Brown Chromosol*
- Yellow or Brown Sodosol

Main occurrences in Western Australia

- Occurs throughout the South-west, but rarely common



Distribution map of Yellow/brown deep sandy duplex in the South-west of WA



Yellow/brown deep sandy duplex (Donnybrook)

Grey shallow sandy duplex

Soil Group 404

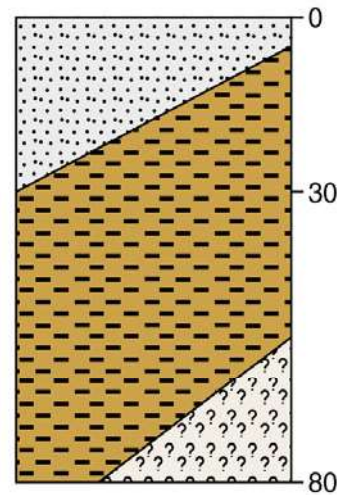
Grey sand over non-alkaline sandy clay loam to clay at <30 cm

Characteristics

- Grey surface layers
- Various colours in subsoil, and mottling is common
- Neutral to acid pH subsoil
- Ironstone gravel common, especially above clay
- Often in old drainage lines

Local names

- Duplex soil
- White gum soil
- Spongeolite soil
- Grey clay



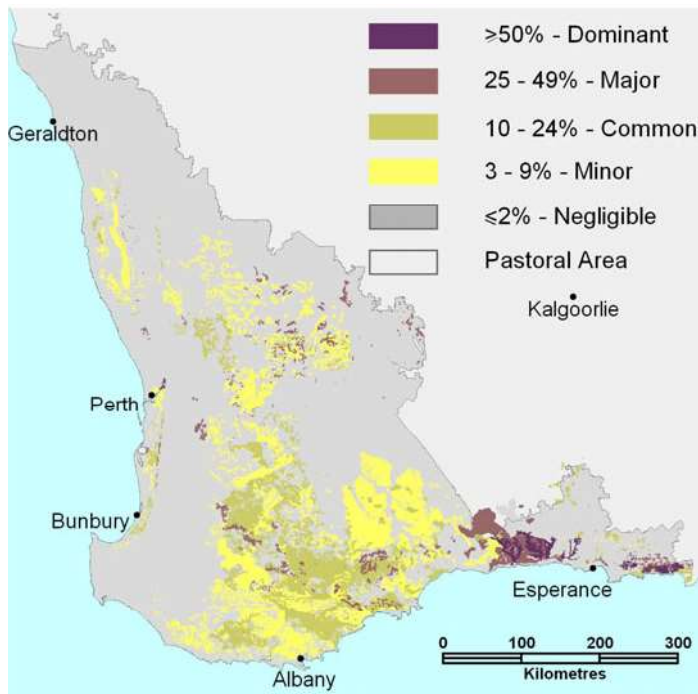
Typical Australian Soil Classification (ASC)

(dominant ASC in italics)

- *Grey, Yellow or Brown Sodosol*
- *Grey, Yellow or Brown Chromosol*

Main occurrences in Western Australia

- Widespread in the South-west throughout the Zone of Rejuvenated Drainage from Moora south to Katanning and east to Jerramungup and Esperance
- Scattered in other parts of the South-west



Distribution map of Grey shallow sandy duplex in the South-west of WA



Grey shallow sandy duplex (Swan Coastal Plain)

Grey deep sandy duplex

Soil Group 403

Grey sand over non-alkaline sandy clay loam to clay at 30-80 cm

Characteristics

- Grey topsoil colour common
- Often with bleached grey subsurface and various colours in subsoil (mottling common)
- Neutral to acid pH subsoil
- Ironstone gravel often present, especially on top of clay

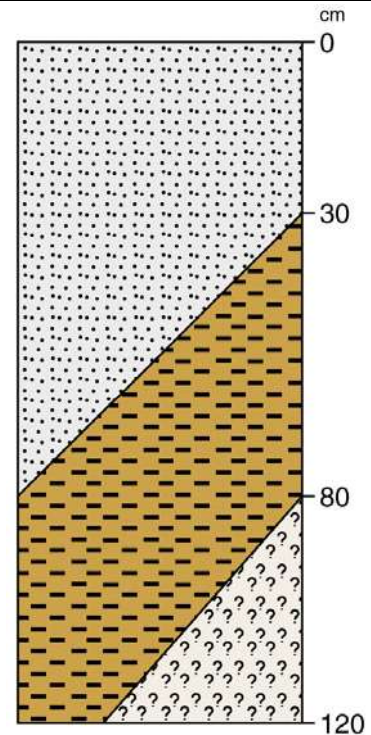
Local names

- Esperance sandplain
- Swamp road gravel
- Fleming sand
- Fleming gravelly sand
- Sheoak soil
- Sand over clay
- Sandy duplex

Typical Australian Soil Classification (ASC)

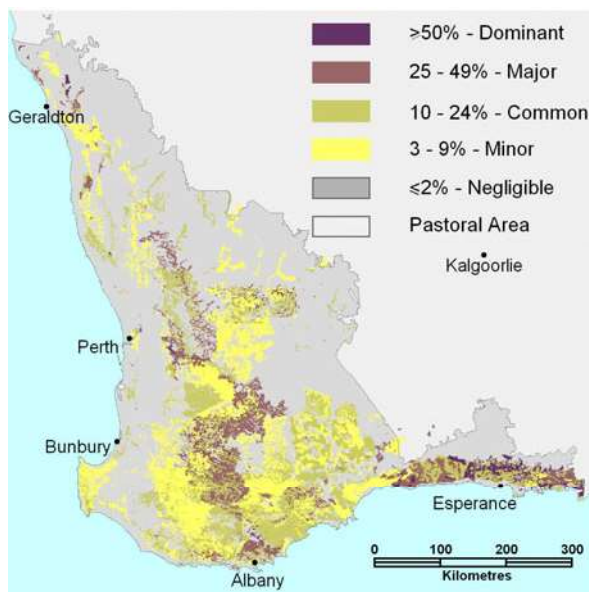
(dominant ASC in italics)

- *Grey, Yellow or Brown Sodosol*
- *Grey, Yellow or Brown Chromosol*



Main occurrences in Western Australia

- Common in the South-west, especially in the Esperance sandplain and west to the Fitzgerald and Great Southern areas
- Widespread and scattered in other areas such as the Swan Coastal Plain and the West Midlands



Distribution map of Grey deep sandy duplex in the South-west of WA



Grey deep sandy duplex (Geraldton)

Semi-wet soil

Soil Group 103

Non-saline soils waterlogged to 30-80 cm for a major part of the year

Characteristics

- Lower part of profile (30-80 cm) saturated for the major part of the year
- Often with dark grey, brown or black topsoil
- Sands, loams and clays
- Acid to neutral pH
- Variable subsoil, may contain bog iron
- Common in plains with elevated fresh water tables

Local names

- Mungite soil
- Coolup sand
- Boyanup loam

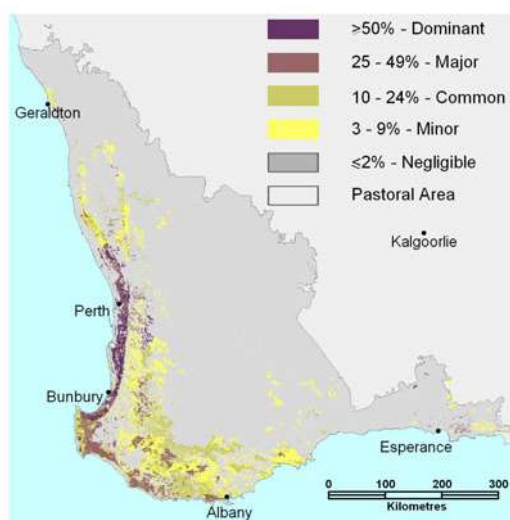
Typical Australian Soil Classification (ASC)

(dominant ASC in italics)

- *Redoxic or Oxyaquic Hydrosol*
- *Aquic or Semiaquic Podosol*
- Kandosol
- Rudosol
- Sodosol
- Tenosol

Main occurrences in Western Australia

- Seasonally wet areas in the South-west, including extensive areas of seasonally wet duplex soils on the coastal areas of the South-west of WA
- Especially the Swan Coastal Plain, North Coastal Plain and Scott River Plain on the south coast, Margaret River Plateau, southern Darling Plateau
- Scattered in other areas in depressions and valley floors



Distribution map of Semi-wet soil
in the South-west of WA



Semi-wet soil
(South coast)

Land use considerations

- Waterlogging and seasonal inundation moderately limit land use options
- Artificial drainage may sometimes be an option
- Often have good summer moisture for perennial pastures, summer cropping

Saline wet soil

Soil Group 101

Seasonally waterlogged soils subject to secondary salinity

Characteristics

- Seasonally wet to within 80 cm for a major part of the year
- Sands, loams and clays
- Affected by moderate to extreme secondary salinity
- Commonly over clay or pan

Local names

- Salt
- Salt land

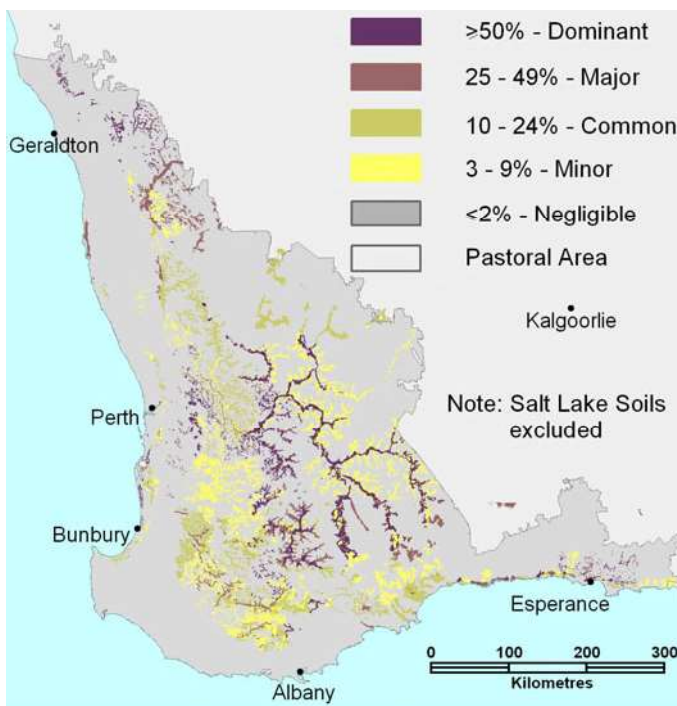
Typical Australian Soil Classification (ASC)

(dominant ASC in italics)

- *Salic Hydrosol*

Main occurrences in Western Australia

- Areas of secondary salinity in the wheatbelt of the South-west



Distribution map of Saline wet soil
in the South-west of WA



Saline wet soil
(Pingrup)

Land use considerations

- Waterlogging and high salinity severely limits growth of most plants, except halophytes
- These soils are frequently degraded by sheet, rill and wind erosion and may be devoid of vegetation

ATTACHMENT B

NatureMap – Search Results

NatureMap Species Report

Created By Martin Wells on 01/05/2017

Current Names Only Yes
Core Datasets Only Yes
Method 'By Circle'
Centre 117° 32' 05" E, 33° 42' 42" S
Buffer 5km

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
1.	3200 <i>Acacia acuminata</i> (Jam, Mangard)			
2.	16116 <i>Acacia chamaeleon</i>			
3.	3357 <i>Acacia grisea</i>		P4	
4.	15484 <i>Acacia sphacelata</i> subsp. <i>sphacelata</i>			
5.	15717 <i>Acacia varia</i> var. <i>crassinervis</i>			
6.	24260 <i>Acanthiza apicalis</i> (Broad-tailed Thornbill, Inland Thornbill)			
7.	24261 <i>Acanthiza chrysorrhoa</i> (Yellow-rumped Thornbill)			
8.	24262 <i>Acanthiza inornata</i> (Western Thornbill)			
9.	24560 <i>Acanthorhynchus superciliosus</i> (Western Spinebill)			
10.	<i>Acariformes</i> sp.			
11.	25535 <i>Accipiter cirrocephalus</i> (Collared Sparrowhawk)			
12.	24281 <i>Accipiter cirrocephalus</i> subsp. <i>cirrocephalus</i> (Collared Sparrowhawk)			
13.	25536 <i>Accipiter fasciatus</i> (Brown Goshawk)			
14.	41323 <i>Actitis hypoleucos</i> (Common Sandpiper)		IA	
15.	2926 <i>Adonis microcarpa</i> (Pheasant's Eye)	Y		
16.	25544 <i>Aegotheles cristatus</i> (Australian Owlet-nightjar)			
17.	24301 <i>Aegotheles cristatus</i> subsp. <i>cristatus</i> (Australian Owlet-nightjar)			
18.	<i>Aeshnidae</i> sp.			
19.	2653 <i>Alternanthera pungens</i> (Khaki Weed)	Y		
20.	2383 <i>Amyema preissii</i> (Wireleaf Mistletoe)			
21.	<i>Aname mainae</i>			
22.	24312 <i>Anas gracilis</i> (Grey Teal)			
23.	24315 <i>Anas rhynchotis</i> (Australasian Shoveler)			
24.	24316 <i>Anas superciliosa</i> (Pacific Black Duck)			
25.	<i>Anisops thienemanni</i>			
26.	24561 <i>Anthochaera carunculata</i> (Red Wattlebird)			
27.	24562 <i>Anthochaera lunulata</i> (Western Little Wattlebird)			
28.	24599 <i>Anthus australis</i> subsp. <i>australis</i> (Australian Pipit)			
29.	24285 <i>Aquila audax</i> (Wedge-tailed Eagle)			
30.	<i>Argiope trifasciata</i>			
31.	25566 <i>Artamus cinereus</i> (Black-faced Woodswallow)			
32.	24353 <i>Artamus cyanopterus</i> (Dusky Woodswallow)			
33.	24356 <i>Artamus personatus</i> (Masked Woodswallow)			
34.	<i>Artonopsis exposita</i>			
35.	<i>Asterella drummondii</i>			
36.	<i>Atherinosoma wallacei</i>			
37.	2471 <i>Atriplex prostrata</i> (Hastate Orache)	Y		
38.	<i>Austracantha minax</i>			
39.	<i>Austrochiltonia subtenuis</i>			
40.	<i>Austrolestes annulosus</i>			
41.	24318 <i>Aythya australis</i> (Hardhead)			
42.	32687 <i>Banksia acanthopoda</i>		P2	
43.	32142 <i>Banksia proteoides</i> (King Dryandra)			
44.	<i>Barnardius zonarius</i>			
45.	15037 <i>Bartsia trixago</i>	Y		
46.	741 <i>Baumea articulata</i> (Jointed Rush)			
47.	<i>Bdelloidea med-large</i> contracted of RJS (SAP)			
48.	5385 <i>Beaufortia incana</i> (Grey-leaved Beaufortia)			
49.	<i>Bennelongia australis</i>			
50.	<i>Berosus macumbensis</i>			
51.	24162 <i>Bettongia penicillata</i> subsp. <i>ogilbyi</i> (Woylie, Brush-tailed Bettong)		T	
52.	<i>Bidessini</i> sp.			
53.	25798 <i>Billardiera fusiformis</i> (Australian Bluebell)			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
54.	3160 <i>Billardiera lehmanniana</i> (Kurup)			
55.	24319 <i>Biziura lobata</i> (Musk Duck)			
56.	749 <i>Bolboschoenus caldwellii</i> (Marsh Club-rush)			
57.	18426 <i>Bossiaea halophila</i>			
58.	<i>Brachionus angularis</i>			
59.	<i>Brachionus calyciflorus</i>			
60.	<i>Brachionus quadridentatus</i>			
61.	<i>Brachionus urceolaris</i> s.l.			
62.	24359 <i>Burhinus grallarius</i> (Bush Stone-curlew)			
63.	25716 <i>Cacatua sanguinea</i> (Little Corella)			
64.	42307 <i>Cacomantis pallidus</i> (Pallid Cuckoo)			
65.	11165 <i>Caladenia falcata</i>			
66.	17980 <i>Caladenia hiemalis</i>			
67.	15354 <i>Caladenia hirta</i> subsp. <i>hirta</i>			
68.	15398 <i>Caladenia xantha</i>			
69.	<i>Calanoida</i> sp.			
70.	24731 <i>Calyptorhynchus banksii</i> subsp. <i>naso</i> (Forest Red-tailed Black-Cockatoo)		T	
71.	24734 <i>Calyptorhynchus latirostris</i> (Carnaby's Cockatoo (short-billed black-cockatoo), Carnaby's Cockatoo)		T	
72.	5465 <i>Calytrix leschenaultii</i>			
73.	<i>Candonocypris novaehollandiae</i>			
74.	<i>Ceinidae</i> sp.			
75.	<i>Cephalodella catellina</i>			
76.	<i>Ceratopogonidae</i> sp.			
77.	24086 <i>Cercartetus concinnus</i> (Western Pygmy-possum, <i>Mundarda</i>)			
78.	24186 <i>Chalinolobus gouldii</i> (Gould's Wattle Bat)			
79.	18156 <i>Chamaecytisus palmensis</i> (Tagasaste)	Y		
80.	24377 <i>Charadrius ruficapillus</i> (Red-capped Plover)			
81.	3169 <i>Cheiranthra preissiana</i>			
82.	43380 <i>Chelodina colliei</i> (South-western Snake-necked Turtle)			
83.	24321 <i>Chenonetta jubata</i> (Australian Wood Duck, Wood Duck)			
84.	<i>Chironominae</i> sp.			
85.	<i>Chironomus</i> aff. <i>alternans</i> (V24) (CB)			
86.	<i>Chironomus tepperi</i>			
87.	24980 <i>Christinus marmoratus</i> (Marbled Gecko)			
88.	<i>Chroicocephalus novaehollandiae</i>			
89.	47155 <i>Chrysocephalus semipapposum</i> subsp. <i>occidentale</i>			
90.	<i>Cladopelma curtivalva</i>			
91.	<i>Coenagrionidae</i> sp.			
92.	25675 <i>Colluricincla harmonica</i> (Grey Shrike-thrush)			
93.	24399 <i>Columba livia</i> (Domestic Pigeon)	Y		
94.	<i>Colurella adriatica</i>			
95.	25568 <i>Coracina novaehollandiae</i> (Black-faced Cuckoo-shrike)			
96.	<i>Corduliidae</i> sp.			
97.	25592 <i>Corvus coronoides</i> (Australian Raven)			
98.	7947 <i>Cotula turbinata</i> (Funnel Weed)	Y		
99.	24671 <i>Coturnix pectoralis</i> (Stubble Quail)			
100.	25595 <i>Cracticus tibicen</i> (Australian Magpie)			
101.	24422 <i>Cracticus tibicen</i> subsp. <i>dorsalis</i> (White-backed Magpie)			
102.	25596 <i>Cracticus torquatus</i> (Grey Butcherbird)			
103.	25401 <i>Crinia pseudinsignifera</i> (Bleating Froglet)			
104.	4809 <i>Cryptandra pungens</i>			
105.	24322 <i>Cygnus atratus</i> (Black Swan)			
106.	30901 <i>Dacelo novaeguineae</i> (Laughing Kookaburra)	Y		
107.	13156 <i>Dampiera haematotricha</i> subsp. <i>dura</i>			
108.	7471 <i>Dampiera sacculata</i> (Pouched Dampiera)			
109.	<i>Daphnia carinata</i>			
110.	25673 <i>Daphoenositta chrysoptera</i> (Varied Sittella)			
111.	3797 <i>Daviesia cardiophylla</i>			
112.	25607 <i>Dicaeum hirundinaceum</i> (Mistletoebird)			
113.	<i>Dicrotendipes conjunctus</i>			
114.	311 <i>Digitaria ciliaris</i> (Summer Grass)	Y		
115.	19256 <i>Drosera intricata</i>			
116.	11853 <i>Drosera menziesii</i> subsp. <i>menziesii</i>			
117.	33480 <i>Dysphania pumilio</i> (Clammy Goosefoot)			
118.	<i>Dytiscidae</i> sp.			
119.	25096 <i>Egernia kingii</i> (King's Skink)			
120.	<i>Egretta novaehollandiae</i>			
121.	<i>Elanus axillaris</i>			
122.	24290 <i>Elanus caeruleus</i> subsp. <i>axillaris</i> (Australian Black-shouldered Kite)			

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123.	47937 <i>Euseyornis melanops</i> (Black-fronted Dotterel)			
124.	<i>Enchytraeidae</i> sp.			
125.	<i>Eolophus roseicapillus</i>			
126.	24651 <i>Eopsaltria australis</i> subsp. <i>griseogularis</i> (Western Yellow Robin)			
127.	<i>Ephydriidae</i> sp.			
128.	<i>Ephydriidae</i> sp. 3 (SAP)			
129.	<i>Ephydriidae</i> sp. 6 (SAP)			
130.	5643 <i>Eucalyptus falcata</i> (Silver Mallet, Dulyumuk)			
131.	5763 <i>Eucalyptus rudis</i> (Flooded Gum, Kulurda)			
132.	12906 <i>Eucalyptus wandoo</i> subsp. <i>wandoo</i>			
133.	29940 <i>Euphorbia maculata</i>	Y		
134.	25622 <i>Falco cenchroides</i> (Australian Kestrel, Nankeen Kestrel)			
135.	25623 <i>Falco longipennis</i> (Australian Hobby)			
136.	24474 <i>Falco longipennis</i> subsp. <i>longipennis</i> (Australian Hobby)			
137.	25624 <i>Falco peregrinus</i> (Peregrine Falcon)		S	
138.	25727 <i>Fulica atra</i> (Eurasian Coot)			
139.	24761 <i>Fulica atra</i> subsp. <i>australis</i> (Eurasian Coot)			
140.	25730 <i>Gallirallus philippensis</i> (Buff-banded Rail)			
141.	<i>Gambusia affinis</i>			
142.	3895 <i>Gastrolobium calycinum</i> (York Road Poison)			
143.	3929 <i>Gastrolobium tricuspdatum</i>			
144.	3930 <i>Gastrolobium trilobum</i> (Bullock Poison)			
145.	25530 <i>Gerygone fusca</i> (Western Gerygone)			
146.	47962 <i>Glyciphila melanops</i> (Tawny-crowned Honeyeater)			
147.	3943 <i>Glycyrrhiza acanthocarpa</i> (Native Liquorice)			
148.	24443 <i>Grallina cyanoleuca</i> (Magpie-lark)			
149.	2175 <i>Hakea lissocarpha</i> (Honey Bush)			
150.	2179 <i>Hakea marginata</i>			
151.	2197 <i>Hakea prostrata</i> (Harsh Hakea)			
152.	2216 <i>Hakea varia</i> (Variable-leaved Hakea)			
153.	25408 <i>Heleioporus albopunctatus</i> (Western Spotted Frog)			
154.	<i>Hemianax papuensis</i>			
155.	<i>Hemicordulia tau</i>			
156.	6856 <i>Hemigenia incana</i> (Silky Hemigenia)			
157.	<i>Heterocypris vatia</i>			
158.	25734 <i>Himantopus himantopus</i> (Black-winged Stilt)			
159.	24491 <i>Hirundo neoxena</i> (Welcome Swallow)			
160.	<i>Hydrophilidae</i> sp.			
161.	20454 <i>Juncus acutus</i> subsp. <i>acutus</i>	Y		
162.	1180 <i>Juncus capitatus</i> (Capitate Rush)	Y		
163.	1188 <i>Juncus pallidus</i> (Pale Rush)			
164.	1194 <i>Juncus radula</i>			
165.	<i>Keratella australis</i>			
166.	12008 <i>Kickxia elatine</i> subsp. <i>crinita</i>	Y		
167.	<i>Kiefferulus intertinctus</i>			
168.	<i>Lampona cylindrata</i>			
169.	2811 <i>Lampranthus glaucus</i>	Y		
170.	<i>Lancetes lanceolatus</i>			
171.	<i>Lecane bulla</i>			
172.	19111 <i>Lechenaultia formosa</i> subsp. <i>Wheatbelt</i> (R.J. Cranfield 4718)			
173.	<i>Lepadella</i> sp.			
174.	3018 <i>Lepidium africanum</i> (Rubble Peppergrass)	Y		
175.	19983 <i>Lepidium draba</i>	Y		
176.	<i>Leptoceridae</i> sp.			
177.	5847 <i>Leptospermum erubescens</i> (Roadside Teatree)			
178.	25131 <i>Lerista distinguenda</i>			
179.	<i>Lestidae</i> sp.			
180.	6373 <i>Leucopogon concinnus</i>			
181.	25661 <i>Lichmera indistincta</i> (Brown Honeyeater)			
182.	<i>Limnesia</i> sp.			
183.	25388 <i>Litoria moorei</i> (Motorbike Frog)			
184.	8564 <i>Lotus subbiflorus</i>	Y		
185.	<i>Macrothrix cf. rosea</i> (SAP)			
186.	24326 <i>Malacorhynchus membranaceus</i> (Pink-eared Duck)			
187.	24583 <i>Manorina flavigula</i> (Yellow-throated Miner)			
188.	25758 <i>Megalurus gramineus</i> (Little Grassbird)			
189.	5952 <i>Melaleuca preissiana</i> (Moonah)			
190.	5956 <i>Melaleuca pungens</i>			
191.	5959 <i>Melaleuca raphiophylla</i> (Swamp Paperbark)			
192.	25663 <i>Melithreptus brevirostris</i> (Brown-headed Honeyeater)			

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193.	24586 <i>Melithreptus brevirostris</i> subsp. <i>leucogenys</i> (Brown-headed Honeyeater)			
194.	24587 <i>Melithreptus chloropsis</i> (Western White-naped Honeyeater)			
195.	24736 <i>Melopsittacus undulatus</i> (Budgerigar)			
196.	24598 <i>Merops ornatus</i> (Rainbow Bee-eater)		IA	
197.	<i>Mesocyclops brooksi</i>			
198.	<i>Microcarbo melanoleucos</i>			
199.	<i>Miconecta robusta</i>			
200.	<i>Missulena granulosa</i>			
201.	<i>Missulena hoggi</i>			
202.	<i>Moina australiensis</i>			
203.	<i>Monohelea</i> sp. 1 (SAP)			
204.	25610 <i>Myiagra inquieta</i> (Restless Flycatcher)			
205.	<i>Necterosoma</i> sp.			
206.	<i>Nematoda</i> sp.			
207.	24738 <i>Neophema elegans</i> (Elegant Parrot)			
208.	24819 <i>Ninox connivens</i> subsp. <i>connivens</i> (Barking Owl (southwest pop P2), Barking Owl)		P2	
209.	25252 <i>Notechis scutatus</i> (Tiger Snake)			
210.	<i>Notholca salina</i>			
211.	1381 <i>Nothoscordum gracile</i>	Y		
212.	<i>Notonectidae</i> sp.			
213.	24194 <i>Nyctophilus geoffroyi</i> (Lesser Long-eared Bat)			
214.	24407 <i>Ocyphaps lophotes</i> (Crested Pigeon)			
215.	14292 <i>Oenothera stricta</i> subsp. <i>stricta</i>	Y		
216.	<i>Oligochaeta</i> sp.			
217.	24137 <i>Onychogalea lunata</i> (Crescent Naitail Wallaby, Wurrung)		X	
218.	44779 <i>Opuntia ficus-indica</i>	Y		
219.	<i>Orthocladinae</i> sp.			
220.	24085 <i>Oryctolagus cuniculus</i> (Rabbit)	Y		
221.	4358 <i>Oxalis purpurea</i> (Largeflower Wood Sorrel)	Y		
222.	25680 <i>Pachycephala rufiventris</i> (Rufous Whistler)			
223.	502 <i>Panicum capillare</i> (Witchgrass)	Y		
224.	2966 <i>Papaver somniferum</i> (Opium Poppy)	Y		
225.	25681 <i>Pardalotus punctatus</i> (Spotted Pardalote)			
226.	25682 <i>Pardalotus striatus</i> (Striated Pardalote)			
227.	24630 <i>Pardalotus striatus</i> subsp. <i>westraliensis</i> (Striated Pardalote)			
228.	2270 <i>Persoonia quinquenervis</i>			
229.	48061 <i>Petrochelidon nigricans</i> (Tree Martin)			
230.	48066 <i>Petroica boodang</i> (Scarlet Robin)			
231.	24659 <i>Petroica goodenovii</i> (Red-capped Robin)			
232.	2302 <i>Petrophile media</i>			
233.	2309 <i>Petrophile serruriae</i>			
234.	24409 <i>Phaps chalcoptera</i> (Common Bronzewing)			
235.	24098 <i>Phascogale calura</i> (Red-tailed Phascogale, Kenngoos)		S	
236.	48071 <i>Phylidonyris niger</i> (White-cheeked Honeyeater)			
237.	24596 <i>Phylidonyris novaehollandiae</i> (New Holland Honeyeater)			
238.	<i>Physa acuta</i>			
239.	<i>Physidae</i> sp.			
240.	24841 <i>Platalea flavipes</i> (Yellow-billed Spoonbill)			
241.	25720 <i>Platycercus icterotis</i> (Western Rosella)			
242.	24745 <i>Platycercus icterotis</i> subsp. <i>icterotis</i> (Western Rosella)			
243.	24747 <i>Platycercus spurius</i> (Red-capped Parrot)			
244.	6257 <i>Platysace maxwellii</i> (Karno)			
245.	24843 <i>Plegadis falcinellus</i> (Glossy Ibis)		IA	
246.	25703 <i>Podargus strigoides</i> (Tawny Frogmouth)			
247.	25704 <i>Podiceps cristatus</i> (Great Crested Grebe)			
248.	24680 <i>Podiceps cristatus</i> subsp. <i>australis</i> (Great Crested Grebe)			
249.	24681 <i>Poliocephalus poliocephalus</i> (Hoary-headed Grebe)			
250.	<i>Polypedilum nubifer</i>			
251.	25722 <i>Polytelis anthopeplus</i> (Regent Parrot)			
252.	30854 <i>Polytelis anthopeplus</i> subsp. <i>westralis</i> (Regent Parrot)			
253.	24683 <i>Pomatostomus superciliosus</i> (White-browed Babbler)			
254.	<i>Potamotheirus bavaricus</i>			
255.	16688 <i>Prasophyllum gracile</i>			
256.	<i>Procladius paludicola</i>			
257.	25259 <i>Pseudonaja affinis</i> subsp. <i>affinis</i> (Dugite)			
258.	<i>Psychodidae</i> sp.			
259.	<i>Pterodroma macroptera</i> subsp. <i>macroptera</i>			
260.	2716 <i>Ptilotus declinatus</i> (Curved Mulla Mulla)			
261.	24711 <i>Puffinus assimilis</i> subsp. <i>assimilis</i> (Little Shearwater)			
262.	<i>Purpureicephalus spurius</i>			

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263.	25008 <i>Pygopus lepidopodus</i> (Common Scaly Foot)			
264.	<i>Pyralidae</i> sp.			
265.	3061 <i>Raphanus raphanistrum</i> (Wild Radish)	Y		
266.	24245 <i>Rattus rattus</i> (Black Rat)	Y		
267.	<i>Rhantus</i> sp.			
268.	48096 <i>Rhipidura albiscapa</i> (Grey Fantail)			
269.	25614 <i>Rhipidura leucophrys</i> (Willie Wagtail)			
270.	44608 <i>Rosulabryum billardieri</i>			
271.	2433 <i>Rumex crispus</i> (Curled Dock)	Y		
272.	115 <i>Ruppia megacarpa</i>			
273.	3192 <i>Sanguisorba minor</i> (Sheep's Burnet)	Y		
274.	<i>Sarscyridopsis aculeata</i>			
275.	7638 <i>Scaevola pulvinaris</i> (Cushion Fanflower)			
276.	8207 <i>Senecio glossanthus</i> (Slender Groundsel)			
277.	608 <i>Setaria italica</i> (Italian Millet)	Y		
278.	25266 <i>Simoselaps bertholdi</i> (Jan's Banded Snake)			
279.	<i>Simuliidae</i> sp.			
280.	30948 <i>Smicromis brevirostris</i> (Weebill)			
281.	24108 <i>Sminthopsis crassicaudata</i> (Fat-tailed Dunnart)			
282.	7005 <i>Solanum elaeagnifolium</i> (White Horse Nettle, Silverleaf Nightshade)	Y		
283.	7033 <i>Solanum rostratum</i> (Buffalo Burr)	Y		
284.	7039 <i>Solanum triflorum</i> (Threeflower Nightshade)	Y		
285.	2912 <i>Spergula arvensis</i> (Corn Spurry)	Y		
286.	20537 <i>Stachystemon virgatus</i>			
287.	24645 <i>Stagonopleura oculata</i> (Red-eared Firetail)			
288.	25597 <i>Strepera versicolor</i> (Grey Currawong)			
289.	25590 <i>Streptopelia senegalensis</i> (Laughing Turtle-Dove)	Y		
290.	25705 <i>Tachybaptus novaehollandiae</i> (Australasian Grebe, Black-throated Grebe)			
291.	24331 <i>Tadorna tadornoides</i> (Australian Shelduck, Mountain Duck)			
292.	<i>Tamopsis perthensis</i>			
293.	<i>Tanypodinae</i> sp.			
294.	<i>Tanytarsus fuscithorax/semibarbitarsus</i>			
295.	673 <i>Themeda triandra</i>			
296.	5086 <i>Thomasia macrocalyx</i>			
297.	25207 <i>Tiliqua rugosa</i> subsp. <i>rugosa</i>			
298.	45835 <i>Tilletia bromi</i>			
299.	<i>Tipulidae</i> type A (SAP)			
300.	42351 <i>Todiramphus pyrrophygius</i> (Red-backed Kingfisher)			
301.	1484 <i>Tribonanthes purpurea</i> (Granite Pink)		T	
302.	24158 <i>Trichosurus vulpecula</i> subsp. <i>vulpecula</i> (Common Brushtail Possum)			
303.	4295 <i>Trifolium dubium</i> (Suckling Clover)	Y		
304.	<i>Triplectides australis</i>			
305.	<i>Trombidioidea</i> sp.			
306.	<i>Turbellaria</i> sp.			
307.	48147 <i>Turnix varius</i> (Painted Button-quail)			
308.	24852 <i>Tyto alba</i> subsp. <i>delicatula</i> (Barn Owl)			
309.	45850 <i>Urocystis bolivarii</i>			
310.	8256 <i>Ursinia speciosa</i>	Y		
311.	45896 <i>Ustilago bromivora</i>			
312.	14708 <i>Verticordia brevifolia</i> subsp. <i>brevifolia</i>		P3	
313.	6103 <i>Verticordia ovalifolia</i>			
314.	24206 <i>Vespadelus regulus</i> (Southern Forest Bat)			
315.	<i>Xanthagrion erythroneurum</i>			
316.	25765 <i>Zosterops lateralis</i> (Grey-breasted White-eye, Silveryeye)			

Conservation Codes

T - Rare or likely to become extinct
X - Presumed extinct
IA - Protected under international agreement
S - Other specially protected fauna
1 - Priority 1
2 - Priority 2
3 - Priority 3
4 - Priority 4
5 - Priority 5

¹ For NatureMap's purposes, species flagged as endemic are those whose records are wholly contained within the search area. Note that only those records complying with the search criterion are included in the calculation. For example, if you limit records to those from a specific datasource, only records from that datasource are used to determine if a species is restricted to the query area.