Department of Environment and Conservation

Clearing Permit Decision Report

1. Application details

1.1. Permit application details

Permit application No.: 2211/1
Permit type: Area Permit

1.2. Proponent details

Proponent's name: **MR Edward Johannes Schwagermann**

1.3. Property details

Property: LOT 733 ON PLAN 52012 (MUCKENBURRA 6503)
LOT 733 ON PLAN 52012 (MUCKENBURRA 6503)
Local Government Area: Shire Of Gingin
Colloquial name:

1.4. Application

Clearing Area (ha)	No. Trees	Method of Clearing	For the purpose of:
17		Mechanical Removal	Horticulture

2. Site Information

2.1. Existing environment and information

2.1.1. Description of the native vegetation under application

Vegetation Description	Clearing Description	Vegetation Condition	Comment
Beard vegetation association: 1014- Mosaic: Low woodland; banksia/ Shrublands; tea-tree and thicket. (SAC Bio datasets 05/03/2008; Shepherd, 2006)	The three areas under application (total area of 17hectares) are located within Lot 733, a 45.31ha property (Zoned rural). The clearing is to establish a horticultural area, aquaculture, a dam and a private dwelling.	Excellent: Vegetation structure intact; disturbance affecting individual species, weeds non-aggressive (Keighery 1994)	The condition of the native vegetation under application was sourced from the Site Inspection (2008).
Heddle Vegetation Complex: Bassendean Complex - North: Vegetation ranges from a low open forest and low open woodland of Banksia species-E. todtiana to low woodland of Melaleuca species and sedgelands which occupy the moister sites. (Heddle et al, 1980)	The vegetation under application is described as low Banksia woodland with a dense shrub layer and a dense herb layer (Site inspection, 2008). The vegetation includes Banksia attenuata, Banksia menziesii, Banksia illicifolia, Eucalyptus todtiana, Leucopogon sp, Stirlingia sp, Xanthorrhoea preissii, Dasypogon sp, Adenanthos sp, Verticordia sp, Desmocladus sp and Hibbertia sp. There is some minimal disturbance from vehicle tracks with no weeds observed. The soils were pale grey sands.		

3. Assessment of application against clearing principles

(a) Native vegetation should not be cleared if it comprises a high level of biological diversity.

Comments

Proposal is at variance to this Principle

A site inspection (2008) of the areas under application identified the vegetation as low Banksia woodland with a dense shrub layer and a dense herb layer, in an excellent condition. In addition, there is minimal disturbance from vehicle tracks with no weed species present over the majority of the site (Site Inspection, 2008).

The vegetation under application may provide habitat for ground dwelling fauna such as the Western Brush

Wallaby and Chuditch, and feeding habitat for Carnaby's Black-Cockatoo (Calyptorhynchus latirostris).

Given the low level of disturbance and the excellent condition of the vegetation under application it is considered likely that the areas under application comprise a high level of biological diversity. Therefore, the clearing as proposed would be at variance to this Principle.

Methodology Reference:
- Site Inspection (2008)

(b) Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia.

Comments

Proposal may be at variance to this Principle

There are two fauna species conservation significance recorded within the local area (10km radius) being Western Brush Wallaby (Macropus irma) (Priority 4) and Chuditch (Dasyurus geoffroii) (Vulnerable), located approximately 9.0km south-west and 9.7km north-east of the areas under application.

DEC Fauna Habitat Notes (2007) indicate that Chuditch occupy large home ranges, is highly mobile and appears able to utilise bush remnants and corridors and that Western Brush Wallaby occur in areas of forest and woodlands supporting a dense shrub layer.

The Black-Cockatoo is known to feed on a large variety of plants including Proteaceous species (e.g. banksia, dryandra and grevillea), marri nuts (Corymbia calophylla), jarrah (Eucalyptus marginata), tuart (Eucalyptus gomphocephala) and a range of introduced species, (Birds Australia WA, 2006).

A site inspection (2008) of the areas under application identified the vegetation as low Banksia woodland with a dense shrub layer and a dense herb layer, in an excellent condition. The vegetation under application may provide habitat for ground dwelling fauna including Chuditch and Western Brush Wallaby, and would provide feeding habitat for Carnaby's Black-Cockatoo (Calyptorhynchus latirostris).

Given the occurrence of approximately 17ha of native vegetation, being Banksia woodland and in excellent condition, and the connectivity to the surrounding vegetation and conservation areas it is considered that the vegetation under application comprises significant habitat for fauna indigenous to Western Australia and is therefore, considered to may be at variance to this Principle.

Methodology References:
- Birds Australia WA (2007)
- DEC Fauna Habitat Notes.xls February (2007)
- Site Inspection (2008)

GIS Database:
- SAC Bio Datasets 17032008

(c) Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, rare flora.

Comments

Proposal may be at variance to this Principle

There are two known records of one species of Declared Rare Flora (DRF) in the local area (8km radius), being Drakaea elastica located approximately 4.9km and 7.8km south-west of the areas under application.

The DRF, D. elastica flowers in Oct-Nov, with a green leaf being obvious in August; is usually found in 'white or grey sand in low-lying situations adjoining winter-wet swamps' and is often found in association with thickets of Kunzea glabrescens (Western Australian Herbarium 1998-). DEC Conservation Officers (2007) advised that 'D. elastica is predominantly found in Banksia woodland, particularly under thickets of Kunzea glabrescens above winter-wet areas'.

The vegetation under application is described as Banksia woodland on pale grey sands (Site inspection, 2008). Furthermore, there is a seasonally waterlogged Conservation Category wetland (dampland) located within Lot 733. This wetland covers an area of approximately 0.6ha and is located approximately 26m east at the closest point to the areas under application. In addition, there is a seasonally inundated Resource Enhancement wetland (sumpland), located within Lot 733. This wetland covers an area of approximately 3.9ha and is located approximately 11m west at the closest point to the areas under application.

D. elastica occurs on the same soils and within the same vegetation complexes as the areas under application; therefore, the 16.8ha of native vegetation under application may provide suitable habitat for this species.

There are seven species of Priority flora recorded within the local area, which are:
- Grevillea evanescens,
- Anigozanthos humilis sp. Badgingarra,
- Leschenaultia magnifica,
- Verticordia lindleyi subsp. lindleyi,

- Isotropis cuneifolia subsp. glabra,
- Blennospora doleiformis, and
- Schoenus natans

The closest record Priority flora is Verticordia lindleyi subsp. lindleyi (Priority 4) located approximately 1.2km north-east of the areas under application. All of the species in the local area occur on the same soils and within the same vegetation complexes as the areas under application.

Given the occurrence of DRF, Drakaea elastica and Priority flora within the same vegetation complexes and on the same soils as those under application, it is considered that the vegetation to be cleared may include suitable habitat for the DRF Drakaea elastica and the Priority Flora.

Furthermore, given there are two wetlands located in close proximity to the areas under application and that Drakaea elastica occurs in fringing wet area approximately 0-50m from wetlands, it is considered that the vegetation to be cleared may include suitable habitat for the DRF Drakaea elastica. Therefore, the clearing as proposed is may be at variance to this Principle.

Methodology

References:
- DEC (2007)
- Western Australian Herbarium (1998-)

GIS Databases:
- Geomorphic Wetlands (Mgt Categories), Swan Coastal Plain - DEC
- Heddle Vegetation Complexes
- Pre-European Vegetation
- SAC Bio Datasets 18032008
- Soils, Statewide

(d) Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of a threatened ecological community.

Comments

Proposal is not likely to be at variance to this Principle

There is one known occurrence of Threatened Ecological Communities (TECs) located within the local area (5km radius). This recorded TEC is located approximately 2.8km south of the areas under application and has been identified as being Community type 7 - Herb rich saline shrublands in claypans.

The vegetation under application is described as Banksia woodland with a dense shrub layer and a dense herb layer on pale grey sands (Site inspection, 2008). The vegetation includes Banksia attenuata, Banksia menziesii, Banksia illicifolia, Eucalyptus todtiana, Leucopogon sp, Stirlingia sp, Xanthorrhoea preissii, Dasypogon sp, Adenanthos sp, Verticordia sp, Desmocladus sp and Hibbertia sp. (Site Inspection, 2008).

Given the vegetation under application is identified as low Banksia woodland on pale grey sands with no claypans identified during the site inspection, the vegetation applied to be cleared is unlikely to comprise or is necessary for the maintenance of a Threatened Ecological Community. Therefore the clearing as proposed is not likely to be at variance to this Principle.

Methodology

Reference:
- Site Inspection (2008)

GIS Database:
- SAC Bio Datasets 170308

(e) Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared.

Comments

Proposal is not likely to be at variance to this Principle

The vegetation within the area under application is identified as a component of Beard vegetation type 1014, and Heddle Bassendean Complex North, of which there is 52.9% and 72.0% of Pre-European extent remaining respectively (Shepherd, 2006; EPA, 2006). Further, the Beard vegetation type and the Heddle vegetation complex are well represented in secure tenure (52.5% and 27.5%) (Shepherd, 2006; EPA, 2006). In addition, vegetation mapping of the local area (5km radius) shows approximately 41% remnant vegetation to be remaining.

The State Government is committed to the National Objectives and Targets for Biodiversity Conservation which includes a target that prevents the clearance of ecological communities with an extent below 30% of that present Pre-European settlement (Commonwealth of Australia, 2001). The Beard vegetation type and Heddle complex are above the recommended minimum of 30% representation.

Given there is 52.9% and 72.0% of Pre-European extent remaining of the Beard and Heddle vegetation associations; the vegetation applied to be cleared is not considered significant as a remnant of native vegetation. Therefore, the clearing as proposed is considered not likely to be at variance to this Principle.

	Pre-European (ha)	Current extent (ha)	Remaining (%)	In secure tenure (%)
IBRA Bioregion*				
Swan Coastal Plain^	1,501,456	571,758	38.1	
Shire of Gingin**	315,560	177,688	56.3	
Local area (5km radius)	7,850	~3,270	~41.0	
Beard vegetation type				
1014*	41,066	21,730	52.9	52.5
Heddle vegetation complex***				
Bassendean Complex North	74,147	53,384	72.0	27.5

* (Shepherd, 2006)
** (Shepherd et al, 2001)
*** (EPA, 2006)
^ Area within Intensive Land Use Zone

Methodology

References:
- Commonwealth of Australia (2001)
- EPA (2006)
- Shepherd et al (2001)
- Shepherd (2006)

GIS Databases:
- Heddle Vegetation Complexes
- Pre-European Vegetation
- Interim Biogeographic Regionalisation of Australia
- NLWRA, Current Extent of Native Vegetation
- SAC Bio datasets 05032008

(f) Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland.

Comments

Proposal is at variance to this Principle

There is a seasonally waterlogged Conservation Category wetland (dampland) located within Lot 733. This wetland covers an area of approximately 0.6ha and is located approximately 26m east at the closest point to the areas under application. CCWs are recognised as wetlands with high ecological values and are the highest priority wetlands for protection. There should be no further loss or degradation of CCWs and their protection also requires the retention of an adequate buffer (Government of Western Australia, 1997).

In addition, there is a seasonally inundated Resource Enhancement wetland (sumpland), located within Lot 733. This wetland covers an area of approximately 3.9ha and is located approximately 11m west at the closest point to the areas under application. REWs are priority wetlands which may have been partially modified but still support substantial ecological attributes and functions. The ultimate objective for these wetlands is for management, restoration and protection towards improving their conservation value. These wetlands have the potential to be restored to conservation category (Government of Western Australia, 1997). Furthermore, Lot 733 is surrounded by a five wetlands (200m radius) including a CCW located approximately 30m west, a REW (also identified as an EPP lake) located approximately 50m south, a CCW located approximately 70m south and a CCW (also identified as an EPP lake) located approximately 115m north .

Although the wetlands have been excluded from the areas under application the clearing is proposed within the critical zone of influence (within 50m of mapped wetlands), which may adversely impact the ecological processes and functions within the wetlands (Hill et al, 1996). Therefore, the vegetation under application is considered to be growing in association with a wetland.

Methodology

References:
- Government of Western Australia (1997)
- Hill et al (1996)

GIS Databases:
- EPP, Lakes
- Geomorphic Wetlands (Mgt Categories), Swan Coastal Plain - DEC
- Hydrogology, linear

(g) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.

Comments

Proposal is at variance to this Principle

The landscape of the areas under application and surrounds can be described as subdued dune-swale terrain (Northcote et al, 1960). The chief soils are leached sands on the low dunes and small areas of other sandy soils (Northcote et al, 1960). These soils are known to have a low Phosphorus Retention Index (PRI), and it is considered that the proposed clearing of deep-rooted perennial vegetation is likely to result in increased nutrient loss from the soil profile (McPharlin et al, 1990).

Soils within the applied area are part of the Bassendean Dune System, which are described as well drained deep pale sands (DAFWA, 2008). These soils have a high to very high risk of wind erosion and phosphorus export (DAFWA, 2008; State of Western Australia 2005). The high erosion potential is due to the sandy nature of the topsoil and without appropriate ground cover, windbreaks or adequate dust suppression on exposed surfaces the proposal would be likely to cause land degradation.

Given the sandy soils present within the areas under application, it is considered that the proposed clearing of approximately 17ha of native vegetation is likely to cause appreciable land degradation in the form of wind erosion and increased nutrient loss from the soil profile. Therefore, it is considered that clearing as proposed is likely to cause appreciable land degradation.

The Acid Sulphate Soil (ASS) risk mapping indicates the areas under application are mapped as having a Class 2 risk. This classification is defined as having a moderate to low risk of shallow (<3m depth) of ASS or potential ASS. Therefore, given that the areas under application have been identified as having a moderate to low risk of potential acid sulphate soils, the disturbance of these areas may result in appreciable land degradation through acidity.

Methodology

References:
- DAFWA (2008)
- McPharlin et al (1990)
- Northcote et al (1960)
- State of Western Australia (2005)

GIS Database:
- Soils, Statewide

(h) Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area.

Comments

Proposal may be at variance to this Principle

There are two conservation reserves within the local area (5km radius), being State Forest 65 (Gnangara-Moore River State Forest) located 3.8km south-west and Yeal Nature Reserve (also identified as a System 6 Conservation Reserve) located 4.4km south-east of the areas under application. In addition, there is a System 6 Conservation Reserve (Lake Muckenburra, also identified as an EPP lake), 2.1km south-east of the area under application, that is currently recognised as a Shire Reserve (land uses of Recreation and Government Requirements).

Aerial photography of the local area indicates connectivity between the vegetation under application and the surrounding conservation areas, with the vegetation providing ecological linkages to the nearby conservation areas. A site inspection (2008) of the areas under application identified the vegetation as low Banksia woodland with a dense shrub layer and a dense herb layer, in an excellent condition. This vegetation is considered likely to support fauna utilising these conservation areas and maintain fauna movement and migration across the local landscape.

Given the occurrence of 17ha of native vegetation in excellent condition and the connectivity to the nearby conservation areas, it is considered likely that the clearing as proposed may have a direct impact on the environmental values of nearby conservation areas through restricting fauna movement.

Methodology

Reference:
- Site Inspection (2008)

GIS databases:
- Cadastre
- DEC Managed Lands and Waters
- EPP, Lakes
- Gingin 50cm Orthomosaic - Landgate06
- System 6 Conservation Reserves

(i) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water.

Comments

Proposal is at variance to this Principle

There is a seasonally waterlogged Conservation Category wetland (dampland) located within Lot 733. This wetland covers an area of approximately 0.6ha and is located approximately 26m east at the closest point to the areas under application. CCWs are recognised as wetlands with high ecological values and are the highest priority wetlands for protection. There should be no further loss or degradation of CCWs and their protection also requires the retention of an adequate buffer (Government of Western Australia, 1997).

In addition, there is a seasonally inundated Resource Enhancement wetland (sumpland), located within Lot 733. This wetland covers an area of approximately 3.9ha and is located approximately 11m west at the closest point to the areas under application. REWs are priority wetlands which may have been partially modified but still support substantial ecological attributes and functions. The ultimate objective for these wetlands is for management, restoration and protection towards improving their conservation value. These wetlands have the potential to be restored to conservation category (Government of Western Australia, 1997). Furthermore, Lot 733 is surrounded by a five wetlands (200m radius) including a CCW located approximately 30m west, a REW (also identified as an EPP lake) located approximately 50m south, a CCW located approximately 70m south and a CCW (also identified as an EPP lake) located approximately 115m north .

The minimum recommended buffer distance for wetlands is 50m and this is designed to protect wetlands from potential deleterious impacts while helping safeguard and maintain ecological processes and functions within the wetland and, whenever possible, in the buffer (WRC, 2001). The areas under application include approximately 0.6ha of native vegetation, adjacent to the Resource Enhancement Wetland that is within the 50m buffer and the vegetation and approximately 0.2ha of native vegetation, adjacent to the Conservation Category Wetland that is within the 50m buffer with the vegetation considered to be in excellent condition. The clearing of this vegetation is likely to impact the water quality of the adjacent REW and CCW.

Gingin Brook is located approximately 2.1km north and Quin Brook is located approximately 2.4km south-west of the areas under application. DAFWA (2008) advised that the soils within the applied area are part of the Bassendean Dune System, which are described as well drained deep pale sands. These soils have a high risk of phosphorus loss, which may result in contamination of groundwater (DAFWA, 2008).

The areas under application are not located in a Public Drinking Water Source Area, but are located 620m south-west of an EPP Area (Gnangara Mound). The areas under application are identified as having predominantly no salinity risk with approximately 2ha identified as having a moderate to high salinity risk.

Given, some of the vegetation under application is within the recommended wetland buffer and that there is a high risk of phosphorous loss, it is considered likely that the clearing proposed would deteriorate the quality of surface water and ground water, impacting the nearby wetlands, and Gingin Brook and Quin Brook.

Methodology

References:
- DAFWA (2008)
- Site Inpection (2008)
- WRC (2001)

GIS Databases:
- EPP, Areas
- EPP, Lakes
- Geomorphic Wetlands (Mgt Categories), Swan Coastal Plain
- Hydrography, linear
- Public Drinking Water Source Areas (PDWSAs)
- Salinity Risk LM 25m - DOLA 00

(j) Native vegetation should not be cleared if clearing the vegetation is likely to cause, or exacerbate, the incidence or intensity of flooding.

Comments

Proposal is not likely to be at variance to this Principle

There is a seasonally inundated wetland (sumpland), which is classified as a Resource Enhancement Wetland (REW) located within Lot 733. This wetland covers an area of approximately 3.9ha and is located approximately 11m west at the closest point to the areas under application. In addition, there is a seasonally waterlogged wetland (dampland), which is classified as a Conservation Category Wetland (REW) located within Lot 733. This wetland covers an area of approximately 0.6ha and is located approximately 26m east at the closest point to the areas under application. Given the areas under application are not within the REW or CCW, it is considered that the clearing as proposed (17ha) is not likely to cause or increase the incidence or intensity of localised flooding.

Methodology

GIS Database:
- Geomorphic Wetlands (Mgt Categories), Swan Coastal Plain DEC

Planning instrument, Native Title, Previous EPA decision or other matter.

Comments

A submission (2008) for the proposed clearing of the areas under application was received. The submission considered land degradation issues including moisture availability and phosphate eutrophication risk. These issues were considered as part of the assessment. The vegetation proposed to be cleared varies from thinly scattered vegetation on failed pasture land to high conservation corridor linking vegetation. The submission stated that the vegetation proposed to be cleared within the corridor is an important buffer from nearby agricultural activities and should remain intact; the vegetation plays an important role for fauna and flora; and that there should be no further clearing of Banksia woodland for agricultural use.

The Acid Sulphate Soil (ASS) risk mapping indicates the areas under application are mapped as having a Class 2 risk. This classification is defined as having a moderate to low risk of shallow (<3m depth) of ASS or potential ASS. Therefore, given that the areas under application have been identified as having a moderate to low risk of potential acid sulphate soils, the disturbance of these areas may result in appreciable land degradation through acidity.

Wetlands Program (DEC, 2008) advised that the proposed horticultural activity has the potential to significantly impact the values of nearby wetlands by:
- ground water abstraction, which will reduce groundwater levels and may stress groundwater dependent vegetation and associated ecosystems
- an increased transport of nutrients and pollutants, which has the potential to reduce vegetation condition; impacting fauna habitat; impacting water quality; eutrophication and algal blooms and fauna mortality.
Furthermore the clearing may reduce the wetland values through erosion, edge effects and weed invasion.

DAFWA (2008) advised that there is a potential of contamination of the groundwater due to the high risk of phosphorous loss from the site. Therefore, the fertiliser applications and irrigation practices associated with horticulture require careful management.

Given the transmissive nature of the soils within the proposed area (Northcote et al, 1960), it is considered that a minimum 200 metres buffer to any identified Resource Enhancement or Conservation Category Wetland should be maintained to protect wetlands from nutrient inputs (Water and Rivers Commission, 2001). As the proposed horticultural area is in closer proximity to the wetland areas than that recommended, the proposed land use may negatively impact on the wetland areas.

The area under application is within the Proclaimed Groundwater Area of Gingin. Therefore any abstraction of groundwater would require a licence. As the proposed purpose of the clearing is for irrigated horticulture a groundwater licence is required.

The Shire of Gingin (2008) advised that the Council does not support the clearing proposal as a development application for irrigated horticulture has not been submitted to the Shire. In addition, development approval for a dam and private dwelling is outstanding.

There is no other RIWI Act Licence, Works Approval or EP Act Licence that affects the area under application.

Lot 733 on Plan 52012 is zoned Rural under the local Town Planning Scheme.

The applicant has indicated, to mitigate soil wind erosion that a vegetated buffer will be retained between each of the proposed cleared areas.

The applicant has been provided with the opportunity to address the issues raised above and during the report. To date no response addressing these issues has been received by the Department from the applicant.

Methodology

References:
- DAFWA (2008)
- DEC (2008)
- Northcote et al (1960)
- Shire of Gingin (2008)
- Submission (2008)
- Water and Rivers Commission (2001)

GIS databases:
- Acid Sulphate Soil risk map, Swan Coastal Plain DEC
- RIWI Act, Groundwater Areas - DOW
- RIWI Act, Surface Water Areas - DOW
- Town Planning Scheme Zones

4. Assessor's comments

Comment

The assessable criteria have been addressed and the clearing as proposed is at variance to Principles (a), (f), (g) and (i); and may be at

variance to Principles (b), (c) and (h).

5. References

Commonwealth of Australia (2001) National Targets and Objectives for Biodiversity Conservation 2001-2005, AGPS, Canberra.

DEC (2007) Advice on Drakaea elastica for CPS1852/1 from DEC Coordinator-Threatened Flora, Department of Environment and Conservation (DEC), Western Australia. TRIM Ref DOC26331

DEC (2007) Wetlands Advice: Clearing Permit Application CPS 2252 - Lot 5 and Lot 6 Orange Springs Road, Orange Springs; Wetlands Program; Species and Community Branch; Department of Environment and Conservation. TRIM Ref DOC39221

EPA (2006) Guidance for the Assessment of Environmental Factors -level of assessment of proposals affecting natural areas within the System 6 region and Swan Coastal Plain portion of the System 1 Region. Report by the EPA under the Environmental Protection Act 1986. No 10 WA.

Government of Western Australia (1997) Wetlands Conservation Policy for Western Australia, Department of Conservation and Land Management and the Water and Rivers Commission, Perth WA.

Hill, A.L., Semenuik, C. A, Semenuik, V. Del Marco, A. (1996) Wetlands of the Swan Coastal Plain. Volume 2b, Wetland mapping, classification and evaluation. Wetland Atlas. WRC and DEP. Perth WA.

Keighery, B.J. (1994) Bushland Plant Survey: A Guide to Plant Community Survey for the Community. Wildflower Society of WA (Inc). Nedlands, Western Australia.

McPharlin, I., Delroy, N., Jeffrey, B., Dellar, G. and Eales, M. (1990) Phosphorous retention of sandy horticultural soils on the Swan Coastal Plain, W.A. Journal of Agriculture, Volume 31, 1990.

Northcote, K. H. with Beckmann G G, Bettenay E., Churchward H. M., van Dijk D. C., Dimmock G. M., Hubble G. D., Isbell R. F., McArthur W. M., Murtha G. G., Nicolls K. D., Paton T. R., Thompson C. H., Webb A. A. and Wright M. J. (1960-68): 'Atlas of Australian Soils, Sheets 1 to 10, with explanatory data'. CSIRO and Melbourne University Press: Melbourne.

Shepherd, D.P. (2006). Adapted from: Shepherd, D.P., Beeston, G.R., and Hopkins, A.J.M. (2001), Native Vegetation in Western Australia. Technical Report 249. Department of Agriculture Western Australia, South Perth. Includes subsequent updates for 2006 from Vegetation Extent dataset ANZWA1050000124.

Shepherd, D.P., Beeston, G.R. and Hopkins, A.J.M. (2001) Native Vegetation in Western Australia, Extent, Type and Status. Resource Management Technical Report 249. Department of Agriculture, Western Australia.

Shire of Gingin (2008) Direct Interest Submission from the Shire of Gingin. TRIM DOC45133

Site Inspection (2008) Site Inspection Report, Department of Environment and Conservation (DEC), Western Australia. TRIM Ref ED2059

State of Western Australia (2005) Agmaps Land Manager CD Rom.

Submission (2008) Direct Interest Submission. TRIM Ref ED2054

Water and Rivers Commission (2001). Position Statement: Wetlands, Water and Rivers Commission, Perth.

Western Australian Herbarium (1998-). FloraBase - The Western Australian Flora. Department of Environment and Conservation. http://florabase.calm.wa.gov.au/ (Accessed 17/03/2008).

6. Glossary

Term	Meaning
BCS	Biodiversity Coordination Section of DEC
CALM	Department of Conservation and Land Management (now BCS)
DAFWA	Department of Agriculture and Food
DEC	Department of Environment and Conservation
DEP	Department of Environmental Protection (now DEC)
DoE	Department of Environment
DoIR	Department of Industry and Resources
DRF	Declared Rare Flora
EPP	Environmental Protection Policy
GIS	Geographical Information System
ha	Hectare (10,000 square metres)
TEC	Threatened Ecological Community
WRC	Water and Rivers Commission (now DEC)