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Greenway Ecological Analysis

PREPARED FOR THE LAND DEVELOPMENT AGENCY

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Contents

1. Introduction

The Land Development Agency (LDA) commissioned Open Lines Consulting to determine the ecological value of a proposed development site at Greenway in relation to both the:

- *Nature Conservation Act 1980* (Territory legislation); and
- *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) (Commonwealth legislation).

The purpose of the project was to:

1. review existing ecological information for the site;
2. determine which threatened species or threatened ecological communities (if any) could potentially be present; and
3. undertake targeted surveys for those species that had the potential to be present.

A key component of the project was to review the recommendations arising out of a pre-existing flora and fauna assessment report prepared by Booth and Associates (2011) for the site.

1.1 STUDY AREA

The study area is shown in Figure 1. It is approximately 25 ha in size and was divided into four zones by Booth and Associates (2011) to facilitate discussion about the site's ecological values.

The area is bordered on the west by the Tuggeranong town centre, urban development on both the south and east, and Tuggeranong Lake to the north. The southern proportion of Tuggeranong Lake bisects the area.

Most of the study area is comprised of managed urban parkland consisting of exotic grasses and planted native eucalypts. A small patch of remnant native vegetation (approximately 0.54 ha) exists in the south eastern section of the study area (within Zone C).

1.2 LEGISLATIVE CONTEXT

TERRITORY LEGISLATION

Planning and Development Act 2007

Development in the ACT needs to consider the legislative requirements of the *Planning and Development Act 2007*. Schedule 4 of the Act establishes the actions, areas and processes that may trigger the requirement for an Environmental Impact Statement (EIS) to be prepared. The specific issues that have the potential to trigger the requirement for an EIS to be prepared in relation to development at Greenway are:

- the clearing of greater than 0.5 ha of native vegetation; or
- the potential for significant impacts on a threatened species or endangered ecological community as listed under the Nature Conservation Act.

For the above triggers, recent amendments to the Planning and Development Act allow for the conservator of flora and fauna to issue an Environmental Significance Opinion (ESO) if they consider there to be little likelihood of a significant adverse environmental impact. If the conservator issues an ESO then an EIS is not required.

Nature Conservation Act 1980

The *Nature Conservation Act 1980* identifies threatened species and ecological communities protected in the ACT and provides definitions around native vegetation and the clearing of native vegetation.

Under the Nature Conservation Act, 'native vegetation' comprises vegetation indigenous to the area and can include trees, understorey plants, groundcover consisting of any kind of grass or herbaceous vegetation and plants occurring in a wetland or stream. An area is considered to be native vegetation as defined by the Nature Conservation Act if:

- trees or shrubs indigenous to the area have a canopy cover of 10% or greater in any stratum; or
- native plants indigenous to the area comprise 50% or more of the cover of the groundlayer (grasses, small shrubs, forbs, sedges).

In this context, indigenous refers to the original seed stock. Therefore, plants that are a species that originally occurred in the area but were planted from seed collected outside the study site and immediate surrounds, do not for the purposes of the Nature Conservation Act meet the definition of native vegetation.

EPBC ACT

The Commonwealth's *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) provides a national scheme for protecting the environment and conserving biodiversity values.

Approval from the Commonwealth Environment Minister is required under the EPBC Act if an action (which can include a project, development, undertaking or activity) will, or is likely to, have a significant impact on a matter of national environmental significance (MNES). The eight MNES protected under the EPBC Act are:

- world heritage properties;
- national heritage places;
- wetlands of international importance (listed under the Ramsar Convention);
- listed threatened species and ecological communities;
- migratory species protected under international agreements;
- Commonwealth marine areas;
- the Great Barrier Reef Marine Park; and
- nuclear actions (including uranium mines).

The only MNES potentially relevant to development at Greenway is listed threatened species and ecological communities.

1.3 SUMMARY OF APPROVAL RECOMMENDATIONS

RECOMMENDED ACT APPROVALS APPROACH

Open Lines recommends two options for addressing the ACT approval requirements:

1. Should the native vegetation within Zone C be retained within a conservation area, no approvals relating to native vegetation, threatened species or ecological communities would be required.
2. Should the native vegetation within Zone C be proposed for clearing, it is recommended that the LDA seek an ESO for development at Greenway.

RECOMMENDED COMMONWEALTH APPROVALS APPROACH

Given the general lack of MNES values at Greenway, Open Lines does not consider that an EPBC Act referral is required for the proposed development at Greenway. This recommendation is based on the premise that the principles of WSUD are incorporated into the planning and development for the site to protect the artificial population of Murray Cod.

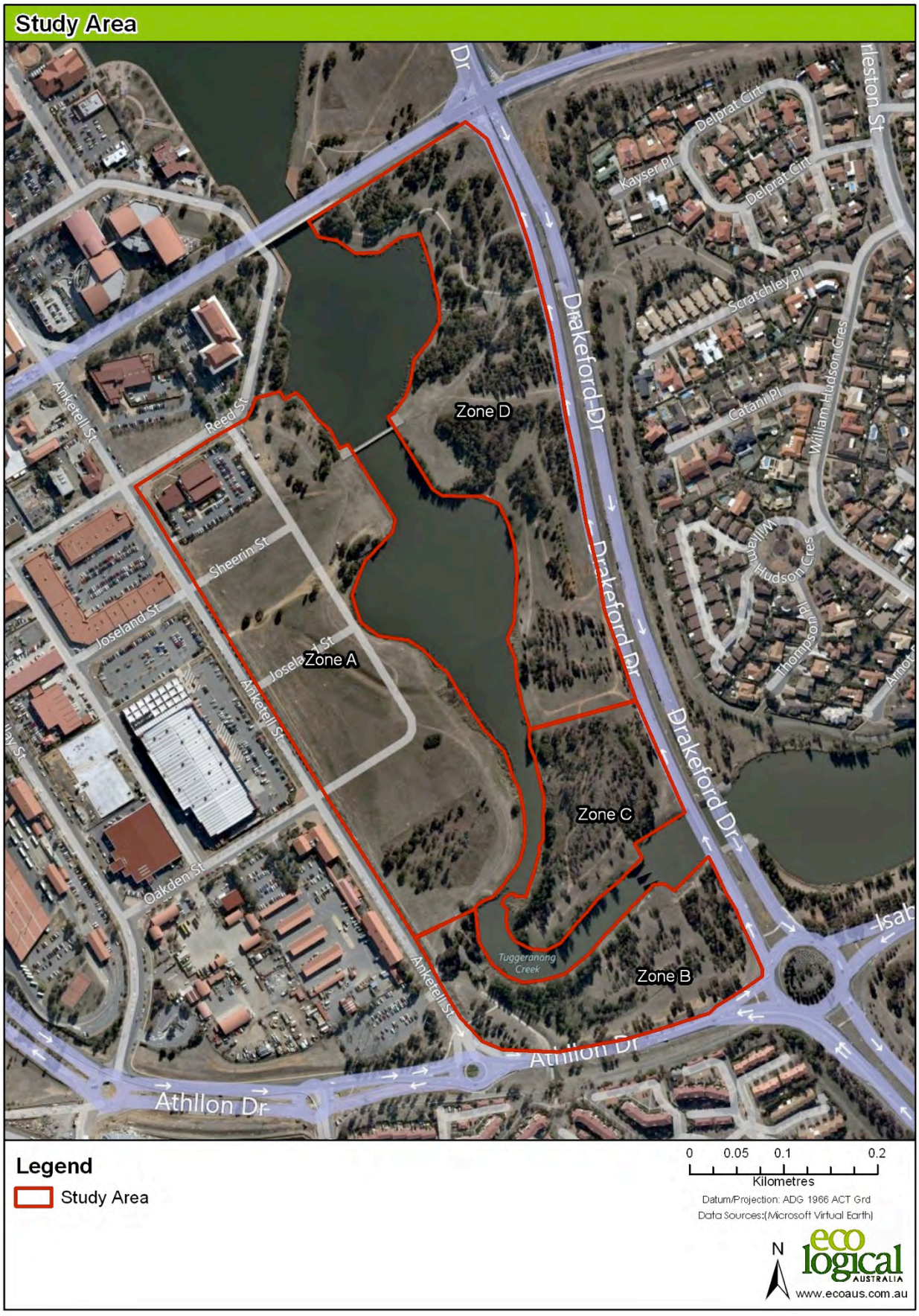

Figure 1: study area

2. Methodology

The methodology for the project included:

- A desktop review of existing information including the Booth and Associates (2011) report.
- A site reconnaissance and targeted field survey for a number of threatened species and ecological communities.
- Analysis of the potential impacts of development at Greenway in relation to the relevant threatened species and ecological communities.

2.1 DESKTOP REVIEW

A review of relevant information was undertaken prior to the commencement of the field survey. This included:

- Greenway Master Plan Flora and Fauna Report (Booth and Associates 2011).
- Mapped GIS layers for Greenway Master Plan Flora and Fauna Report (Booth and Associates 2011).
- SPRAT Profiles for identified Commonwealth Matters of NES.
- EPBC Act policy statements for several threatened species and ecological communities.
- ACT Action Plans for identified ACT listed Threatened Species.

This process reviewed the:

- threatened species to be considered (as recommended by Booth and Associates 2011);
- additional threatened species and ecological communities that may be relevant;
- habitat requirements for these species; and
- potential for the site to support the species within a regional context.

The threatened species and ecological communities that are the focus of this report are listed below. There are no other threatened species or ecological communities that have the potential to occur at Greenway.

Common name	Scientific name	EPBC Act listing status	Nature Conservation Act listing status
Natural Temperate Grassland of the Southern Tablelands of NSW and the Australian Capital Territory	*n/a*	Endangered	Endangered
Button Wrinklewort	*Rutidosis leptorrhynchoides*	Endangered	Endangered
Hoary Sunray	*Leucochrysum albicans var. tricolor*	Endangered	-
Small Purple Pea	*Swainsona recta*	Endangered	Endangered
Tarengo Leek Orchid	*Prasophyllum petilum*	Endangered	Endangered
Austral Toadflax	*Thesium austral*	Vulnerable	-
Hooded Robin	*Melanodryas cucullata cucullata*	-	Vulnerable
Superb Parrot	*Polytelis swainsonii*	Vulnerable	Vulnerable
Swift Parrot	*Lathamus discolour*	Endangered	Endangered
Perunga Grasshopper	*Perunga ochracea*	-	Vulnerable
Golden Sun Moth	*Synemon plana*	Critically Endangered	Endangered
Grassland Earless Dragon	*Tympanocryptis pinguicolla*	Endangered	Endangered
Pink-tailed Worm Lizard	*Aprasia parapulchella*	Vulnerable	Vulnerable
Striped Legless Lizard	*Delma impar*	Vulnerable	Vulnerable
Murray Cod	*Maccullochella peelii*	Vulnerable	-
Silver Perch	*Bidyanus bidyanus*	-	Endangered

2.2 SITE RECONNAISSANCE AND FIELD SURVEY

SITE RECONNAISSANCE

A site reconnaissance of the study area was conducted on the 19th October 2011 and covered the whole of the study area. This process:

- reviewed the site and ecological information that was presented in the Booth and Associates report (2011); and
- examined the site for potential habitat features for threatened species.

TARGETED THREATENED FLORA SURVEY

While it was considered unlikely for any threatened flora to occur within the study area, due to a general lack of suitable habitat (see Section 3), a targeted threatened flora survey was conducted within Zone C (see Figure 2).

A targeted threatened flora survey was conducted on the 19th October 2011 between 1-4 pm on a windless, sunny day reaching 25ºC for:

- Hoary Sunray (*Leucochrysum albicans* var. *Tricolor*);
- Tarengo Leek Orchid (*Prasophyllum petilum*)
- Small Purple Pea (*Swainsona recta*); and
- Austral Toadflax (*Thesium australe*).

An additional targeted flora survey was conducted on the 6th December 2011 between 12:30-1:30pm on a windless, cloudy day reaching 22 ºC for:

- Button Wrinklewort (*Rutidosis leptorrrynchoides*).

Flowering Button Wrinkleworts were observed at the Australian National Botanic Gardens prior to conducting the targeted search for this species.

The targeted survey area (approximately 1.6 ha) provided the only area of potential habitat for these flora species within the study area and included a patch of predominantly native vegetation and areas dominated by exotic grasses. The targeted threatened flora survey was conducted within the known flowering periods for each of the species.

TARGETED THREATENED FAUNA SURVEY

In addition to the flora survey, a targeted survey was also conducted for the Pink-tailed Worm Lizard (*Aprasia parapulchella*) on the 19th October 2011 within a 0.54 ha area of Zone C (see Figure 2). The survey was conducted by two people over a one hour period.

Surface rock and the cavity between rocks are an important habitat component for the Pink-tailed Worm Lizard. Areas with slightly embedded surface rock, especially in the range of 10 x 10 cm to 40 x 40 cm square are considered particularly important.

All partially embedded rocks (up to a total of 40) of suitable size (10-40 cm diameter) were rolled to determine the presence of any individuals. All rocks were returned to their original position to minimise disturbance. The survey was conducted at an appropriate time of year (i.e. spring) in mild weather (25ºC) which is considered to be suitable survey conditions for the species.

BOOTH AND ASSOCIATES SURVEY

Booth and Associates (2011) surveyed the site in May 2011. This work included general traverses of the site and two detailed quadrat surveys in Zone C. The results of these surveys are included in the discussion of relevant species in Section 3.

2.3 THREATENED SPECIES AND ECOLOGICAL COMMUNITY ANALYSIS

Based on the results of the desktop review and the field visit, the potential for threatened species and ecological communities to be present within the study area and the potential for impacts to occur as a result of development at Greenway were analysed. This process involved:

- reviewing the background information for each species and ecological community including likely presence within the region;
- analysing the potential for habitat to occur at the Greenway site;
- incorporating the results of the on-ground surveys undertaken by both Open Lines and Booth and Associates (2011); and
- analysing the potential for impacts to occur as a result of development at Greenway.

The outcomes of this task are presented in Section 3.

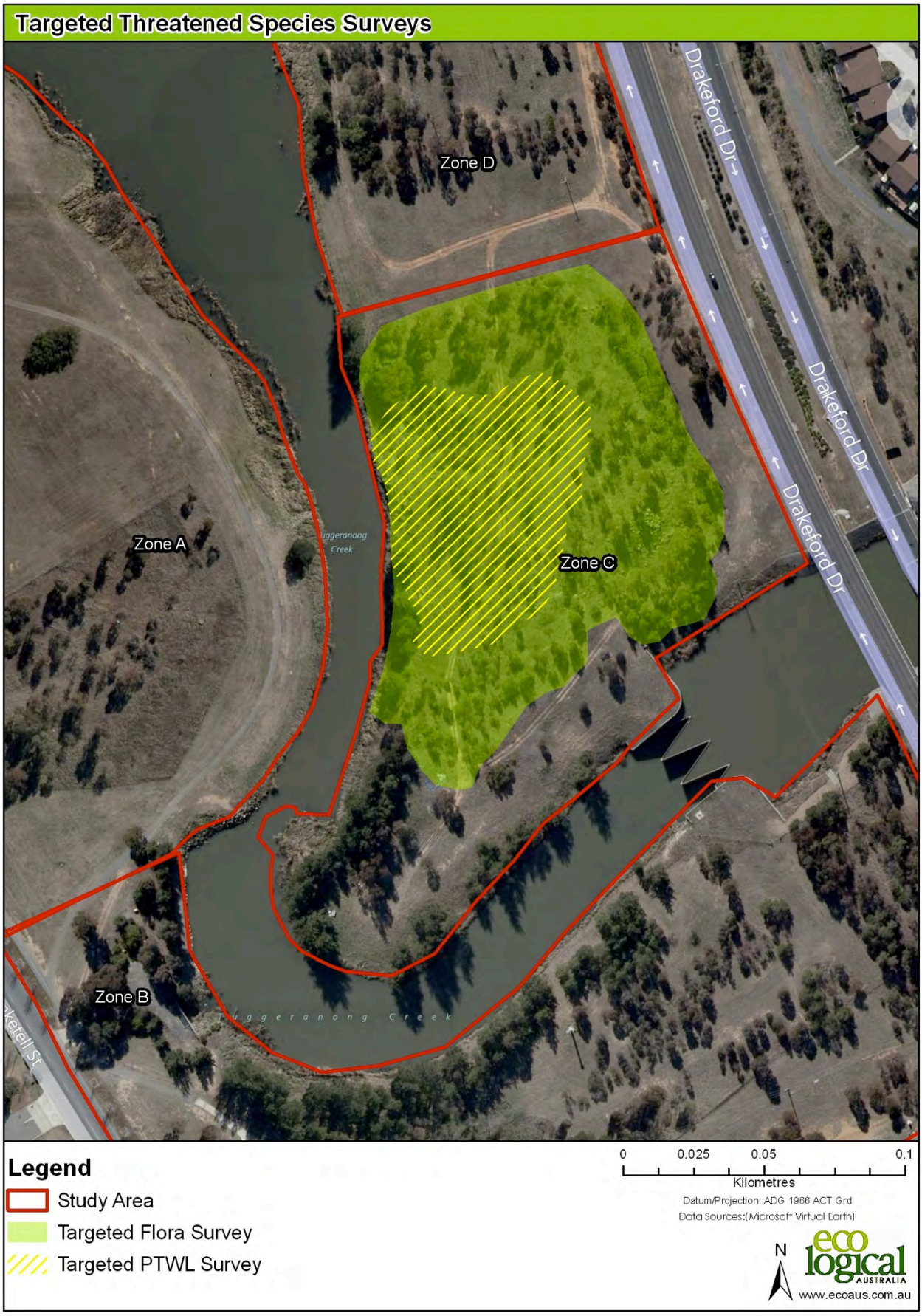

Figure 2: targeted threatened flora and fauna survey

3. Results

3.1 SITE OVERVIEW

The study area has been significantly modified through the development of the lake, town centre and surrounding suburbs. It is predominately an area of urban parkland and used as a place of recreation. The parkland, for most of its length, abuts residential development and incorporates a cycle path around the lake.

The majority of the study area is intensively managed (mown) and contains limited ecological value. No remnant overstorey exists and the current overstorey is comprised of planted native non-indigenous or exotic trees such as river oaks, eucalypts and wattles.

The western section of the study area is entirely parkland / open space and is comprised of Zones A and B. The eastern section is mostly parkland (75%) with a small area on a rocky knoll containing a moderate level of native diversity. The eastern section is comprised of Zones C and D. See Figure 1 for a map of the study area.

- Zone A (10.2 ha): is open space bordering the Tuggeranong township. It receives a high volume of passive recreation and consists of paved tracks and exotic grasses. This zone contains no remnant vegetation and has limited to no ecological value.
- Zone B (2.8 ha): is similar to Zone A with its parkland like features and high volume of passive recreation. It contains no remnant vegetation and has limited to no ecological value.
- Zone C (3.8 ha): is generally less disturbed than the rest of the study area, and contains a higher number of planted overstorey species and thick swards of exotic and native grasses such as *Phalaris aquatica* and Kangaroo Grass (*Themeda australis*). Zone C incorporates some ecological value.
- Zone D (8.1 ha): contains significant areas of open space and areas of revegetation (no remnant overstorey). The ground layer is comprised of exotic grasses. Zone D receives considerable passive recreation use. It contains no remnant vegetation and has limited to no ecological value.

The area of native vegetation within Zone C (0.54 ha) is the only area containing remnant ecological values within the study area. However, similar to the rest of the study area, it contains at least a moderate level of disturbance. The remainder of the study area (Zones A, B and D) is severely disturbed with no remnant ecological features.

Based on discussions with officers in Conservation, Planning and Research (TAMS Directorate), the native plantings in Zones C and D of the study area have local value in terms of habitat connectivity between Tuggeranong Hill and Farrer Ridge and Mt Taylor. These plantings also link with plantings along Drakeford Drive to the south and around Lake Tuggeranong, and then with plantings and remnant vegetation along Athllon Drive and Drakeford Drive and open space to Mt Taylor.

3.2 NATIVE VEGETATION WITHIN ZONE C

The 0.54 ha of remnant vegetation within Zone C meets the definition of 'native vegetation' under the Nature Conservation Act. The species are indigenous to the area and comprise 50% or more of the cover of the groundlayer (grasses, small shrubs, forbs, sedges).

Approximately 0.33 ha of this patch occurs within the proposed development boundary (see Figure 3).

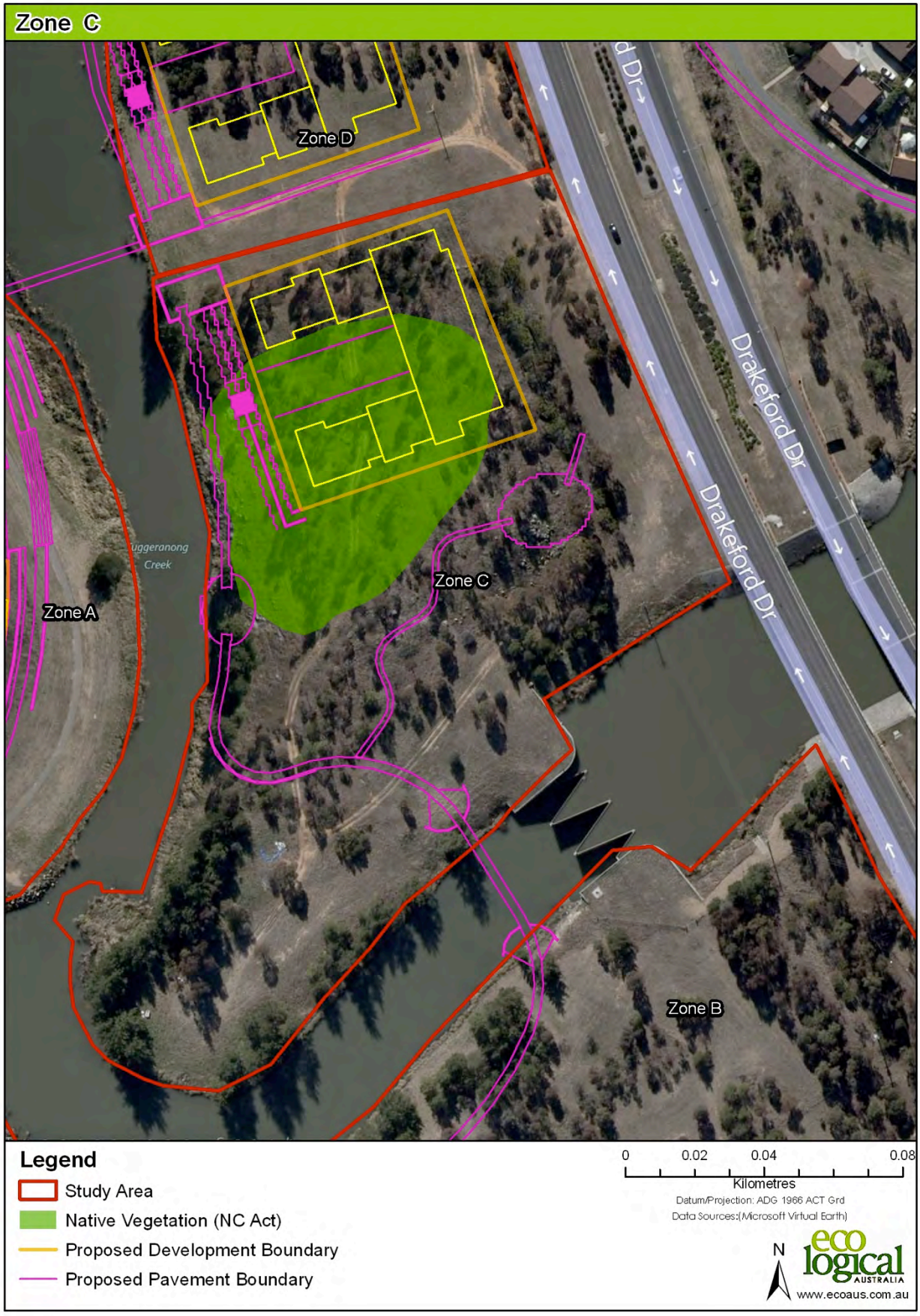

Figure 3: native vegetation within Zone C

3.3 THREATENED ECOLOGICAL COMMUNITIES

NATURAL TEMPERATE GRASSLAND

Natural Temperate Grassland of the Southern Tablelands of NSW and the Australian Capital Territory (NTG) is a grassy ecological community dominated by moderately tall (25–50 cm) to tall (50–100 cm), dense to open tussock grasses in the genera *Austrodanthonia, Austrostipa*, *Bothriochloa*, *Poa* and *Themeda* with up to 70% of species being forbs (SEWPACf). It is listed as endangered under both the EPBC Act and the Nature Conservation Act (SEWPAC 2011f).

The ecological community may be treeless or contain up to 10% cover of trees, shrubs or sedges. It occurs within the geographical region of the Southern Tablelands of NSW and the ACT at altitudes between 560 metres in central and northern parts of its distribution and 1200 metres in the south, in valleys influenced by cold air drainage and in broad plains (Endangered Species Scientific Subcommittee 2000). The community extends southwards from the Abercrombie River to the Victorian Border, from Boorowa and Jindabyne to the west and Goulburn to Braidwood and Bombala to the east (SEWPAC 2011f).

Zone C with its high diversity of remnant native grasses, herbs and forbs provides the only area of potential habitat in the study area for NTG. Kangaroo grass (*Themeda australis*) dominants the groundlayer in this remnant patch.

For NTG to occur, it needs to be determined that the area under consideration previously supported the ecological community (ACT Government 2005). This can be inherently difficult when small patches of remnant vegetation are surrounded by expanses of modified environments, as there is limited reference vegetation to make a judgment of its original classification. However, the positioning of the remnant patch in the landscape and the species present can be used to guide the delineation of its original classification.

Booth and Associates (2011) suggested that the most likely previous vegetation to occur within Zone C would have been Tablelands Dry Shrubby Forest. This conclusion was reached based on the following comments:

- *"Study area attributes including site position within the landscape, climate, elevation, topography, geology and soils revealed that the study area was most likely to comprise a moderately modified Lowland Woodland / Secondary Grassland with the eastern side likely to be Tablelands Dry Shrubby Forest."*
- *"Although the study area includes a grassland community, including many of the same dominant species (*in reference to NTG*), Kangaroo Grass, Wallaby Grass, Spear Grass, it has been assessed as more likely to be a modified secondary grassland due to its key site attributes including position within the landscape."*
- *"The ACT Lowland Woodland Conservation Strategy (ACT Government 2004), would categorise this Zone as Moderately Modified Lowland Woodland Habitat, but based on an overstorey of indigenous revegetation."*
- *"The use of certain species utilised for revegetation across the south east corner of the Study Area (such as Red Box, Long-leaved Box, Argyle Apple) suggests that this conclusion* (Tablelands Dry Shrubby Forest) *has been reached at a prior time."*

In addition to these points, the remnant patch of native vegetation within Zone C contained a moderate diversity of shrubs which are usually sparse or absent in NTG due to influences of cold air drainage (Sharp 1997).

Open Lines supports the conclusions of Booth and Associates (2011) in relation to NTG, and consider that it is unlikely for the ecological community to occur (or have previously occurred) within the study area.

3.4 THREATENED SPECIES

BUTTON WRINKLEWORT (RUTIDOSIS LEPTORRHYNCHOIDES)

The Button Wrinklewort is listed as Endangered under both the EPBC Act and the Nature Conservation Act (SEWPAC 2011g). It is a perennial, multi-stemmed herb, sometimes with narrow basal leaves and with leafy flower stems to 35 cm tall. Flower-heads are bright yellow, slightly domed and button-like, to 2 cm wide. Flower-heads are produced at the ends of the stems in summer, and are surrounded at their bases by a cup of broad, overlapping, smooth bracts with light papery edge. It normally flowers between December to March (OEH 2011).

In the ACT and NSW, it is found in undulating topography 570–780 m above sea level and grows on soils that are usually shallow, stony red-brown clay loams (SEWPAC 2011g). It can exhibit an ability to colonise disturbed areas such as vehicle tracks and areas of soil erosion (OEH 2011).

The Button Wrinklewort occurs:

- in Box-Gum Woodland or secondary grassland derived from Box-Gum Woodland;
- in Natural Temperate Grassland; and
- often in the ecotone between the two ecological communities (SEWPAC 2011g).

The remnant native vegetation in Zone C represents an area of low quality potential habitat for this species. However, the targeted flora surveys for the Button Wrinklewort did not discover any individuals. The survey was undertaken during the flowering period for the species.

Based on the nature of the study area and the results of the targeted survey, it is considered highly unlikely for the study area to support a population of Button Wrinklewort. Impacts to this species as a result of development at Greenway are therefore not expected or considered likely.

HOARY SUNRAY (LEUCOCHRYSUM ALBICANS VAR. TRICOLOR)

The Hoary Sunray is listed as Endangered under the EPBC Act (SEWPAC 2011d). It is a perennial herb with a stout, erect, woody rootstock. The stems grow to between 10-40 cm long. The leaves are between 4-12 cm long and arranged alternately on the stem. The leaves are covered in soft cotton like hairs that are white. The flower heads are solitary and at the ends of long stalks that bear a few small, scattered bracts (TAS DPIWE 2011). In spring and summer it has long-stemmed, bright yellow flowers 25 to 40 mm in diameter (The Royal Botanic Gardens and Domain Trust 2011).

The Hoary Sunray occurs in a wide range of habitats from peaty uplands to stony plains, and has been associated with the Western (Basalt) Plains Natural Temperate Grasslands (OEH 2011). This species is wind dispersed and does not rely on a soil borne seed bank for germination of seedlings. The Hoary Sunray is also known be found on road verges or from areas where soils have previously been disturbed. There is a paucity of point source data and ecological/habitat information for the species.

The native vegetation in Zone C represents an area of low quality potential habitat for this species. However, the targeted search for the Hoary Sunray did not discover any individuals. The survey was undertaken during the flowering period for the species.

Based on the nature of the study area and the results of the survey, it is considered highly unlikely for the study area to support a population of the Hoary Sunray. Impacts to this species as a result of development at Greenway are therefore not expected or considered likely.

SMALL PURPLE PEA (SWAINSONA RECTA)

The Small Purple Pea is listed as Endangered under the EPBC Act and the Nature Conservation Act (SEWPAC 2011h). The species is a slender, erect perennial herb growing to 30 cm tall. The leaves are divided into up to six pairs of 10 mm long, very narrow leaflets, each with a pointed tip. There is also a single leaflet at the end of each divided leaf. It bears one to several sprays of between 10 and 20 purple, pea-shaped flowers, between late September and early December. Flowers are followed by pods up to 10 mm long in summer (OEH 2011).

Before European settlement, the Small Purple-pea occurred in the grassy understorey of woodlands and open-forests dominated by Blakely's Red Gum *Eucalyptus blakelyi*, Yellow Box *E. melliodora*, Candlebark Gum *E. rubida* and Long-leaf Box *E. goniocalyx*. It grows in association with understorey dominants that include Kangaroo Grass *Themeda australis*, poa tussocks *Poa* spp. and spear-grasses *Austrostipa* spp. (OEH 2011).

Small Purple Pea was recorded historically from places such as Carcoar, Culcairn and Wagga Wagga where it is probably now extinct. Over the last 60 years, the range of this species has contracted to two disjunct clusters in NSW, one between Wellington and Mudgee, and the other from Canberra and Queanbeyan south to Williamsdale. Fewer than 4,000 plants now survive in seven populations (ACT Government 1997c).

The largest known population has about 3,400 plants, scattered along 22 km of narrow railway easement in NSW from Tralee (south of Queanbeyan) to south of Williamsdale. The western fence of this part of the railway easement marks the ACT/NSW border. The largest ACT population is on Mount Taylor where 94 plants over 0.03 ha were recorded in 1996. A second population of 12 plants occurs on three undeveloped house blocks in Kambah, and a single plant has been recorded on the edge of Long Gully Road (ACT Government 1997c).

The native vegetation in Zone C represents an area of low quality potential habitat for this species. However, the targeted search for the Small Purple Pea did not discover any individuals. The survey was undertaken during the flowering period for the species.

Based on the nature of the study area and the results of the survey, it is considered highly unlikely for the study area to support a population of the Small Purple Pea. Impacts to this species as a result of development at Greenway are therefore not expected or considered likely.

TARENGO LEEK ORCHID (PRASOPHYLLUM PETILUM)

The Tarengo Leek Orchid is listed as Endangered under the EPBC Act and the Nature Conservation Act (SEWPAC 2011f). This species can be distinguished from the more common onion orchids (*Microtis* spp.) that grow in its habitat by the pinkish-purple base to the leaf. The flower-spike emerges in mid spring to early summer. The flowers are usually a pale whitish-green, but can be pink or pale purple. Plants can be very cryptic when growing in small numbers and within tall grasses (OEH 2011).

The Tarengo Leek Orchid was originally known only from the Hall Cemetery in the ACT. It has since been found at four sites in New South Wales: Captains Flat Cemetery, Ilford Cemetery, Steves Travelling Stock Route (TSR) at Delegate and the Tarengo TSR near Boorowa (ACT Government 2007b; OEH 2011; SEWPAC 2011f).

The Tarengo Leek Orchid occurs on relatively fertile soils in grassy woodland or natural grassland. The three cemetery sites originally contained grassy woodland, dominated by Snow Gum *(Eucalyptus pauciflora)* and Black Gum *(E. aggregata)* at Captains Flat, and Blakely's Red Gum *(E. blakelyi)* and Yellow Box *(E. melliodora)* at Hall and Ilford. Both Tarengo TSR and Steves TSR are natural grasslands. It is likely that this species is only found in high quality grassland and grassy woodland remnants not subject to continuous grazing pressure (SEWPAC 2011f).

The native vegetation in Zone C represents an area of low quality potential habitat for this species. However, the targeted search for the Tarengo Leek Orchid did not discover any individuals. The survey was undertaken during the flowering period for the species.

Based on the nature of the study area and the results of the survey, it is considered highly unlikely for the study area to support a population of the Tarengo Leek Orchid. Impacts to this species as a result of development at Greenway are therefore not expected or considered likely.

AUSTRAL TOADFLAX (THESIUM AUSTRALE)

The Austral Toadflax is listed as Vulnerable under the EPBC Act (SEWPAC 2011j). It is a small, straggling herb to 40 cm tall. Leaves are pale green to yellow-green, somewhat succulent, 1 - 4 cm long and 0.5 - 1.5 mm wide. Flowers are tiny and white, emerging where the leaves meet the stems and appearing in spring-summer. This species is often hidden amongst grasses and herbs (OEH 2011).

Austral Toadflax occurs in grassland or grassy woodland. Often found in damp sites in association with Kangaroo Grass (*Themeda australis*) (OEH 2011). The preferred soil type is a fertile loam derived from basalt although it occasionally occurs on metasediments and granite.

It is widespread throughout the eastern third of NSW but most common on the North Western Slopes, Northern Tablelands and North Coast but generally only found in very small populations (OEH 2011).

The native vegetation in Zone C represents an area of low quality potential habitat for this species. However, the targeted search for the Austral Toadflax did not discover any individuals. The survey was undertaken during the flowering period for the species.

Based on the nature of the study area and the results of the survey, it is considered highly unlikely for the study area to support a population of the Austral Toadflax. Impacts to this species as a result of development at Greenway are therefore not expected or considered likely.

SUPERB PARROT (POLYTELIS SWAINSONII)

The Superb Parrot is listed as vulnerable under both the EPBC Act and the Nature Conservation Act. It occurs in south-eastern Australia, mainly on the inland slopes of the Great Divide and adjacent plains particularly alongside major river systems. It occurs mainly in forests and woodlands dominated by eucalypts such as red gum and box eucalypts (SEWPAC 2011e).

It has been estimated that the total breeding population of Superb Parrots consists of about 6,500 birds. However, this estimate is considered to be of low reliability (SEWPAC 2011e). The population of the Superb Parrot is said to be in decline and has historically (20th Century) undergone extreme fluctuations. It is unclear whether these fluctuations have been in response to natural phenomena, human induced habitat changes or unknown factors.

In NSW, it mostly occurs west of the Great Divide, where it mainly inhabits the Riverina, the South-west Slope and Southern Tableland Regions. The breeding range of the Superb Parrot is restricted to three distinct and geographically separate locations. The first is along the Murray and Edward Rivers; the second is along the Murrumbidgee River; and the third is in a triangle bounded by Molong, Yass and Young. It also bred in the ACT until the late 1960s, although few breeding pairs have been recorded since then (SEWPAC 2011e).

In the ACT, the species is present during the breeding season with most records from the Hall area. During the breeding season it is sparsely distributed between Canberra, Yass, Sutton and Gundaroo (SEWPAC 2011e). Anecdotal information now exists that suggests that the species is increasingly using the Molonglo area in the ACT.

Based on the nature of the site and the information available about the species, it is considered highly unlikely that the Superb Parrot occur within or frequent the study area. The study area occurs outside the usual visiting area for the Canberra region. Minimal to zero potential foraging habitat occurs on site compared to the large areas of Box-Gum Woodland in other parts of the ACT (e.g. north Canberra).

Impacts to this species as a result of development at Greenway are therefore not expected or considered likely.

SWIFT PARROT (LATHAMUS DISCOLOR)

The Swift Parrot is listed as Endangered under both the EPBC Act and the Nature Conservation Act (SEWPAC 2011c). The species breeds in Tasmania between September and January and over-winters on the mainland of Australia between March and October (Higgins 1999).

On the mainland the species inhabits mainly dry open eucalypt forests and woodland where it forages on profuse flowering eucalypts (SEWPAC 2011c). The Swift Parrot's preferred feed trees include winter flowering species such as Swamp Mahogany (*Eucalyptus robusta*), Spotted Gum (*Corymbia maculata*), Red Bloodwood (*C. gummifera*), Mugga Ironbark (*E. sideroxylon*), and White Box (*E. albens*). Commonly used lerp infested trees include Inland Grey Box (*E. microcarpa*), Grey Box (*E. moluccana*) and Blackbutt (*E. pilularis*) (Swift Parrot Recovery Team 2001).

The habitat recorded within the study area is not considered preferable feeding habitat for the Swift Parrot. The overstorey species are all fairly young (circa 1980's) planted native non-indigenous species and do not include any of the listed species above. Additionally, the habitat area containing the overstorey eucalypt species is small, highly disturbed, surrounded by urban development and does not contain any connectivity values (i.e. isolated).

Impacts to this species as a result of development at Greenway are therefore not expected or considered likely.

GOLDEN SUN MOTH (SYNEMON PLANA)

The Golden Sun Moth is listed as Critically Endangered under the EPBC Act and Endangered under Nature Conservation Act (SEWPAC 2011i). The species is a medium-sized, day-flying moth. It occurs in Natural Temperate Grassland and grassy Box-Gum Woodland in which the groundlayer is dominated by wallaby grasses (OEH 2011; SEWPAC 2011i).

These grassland habitats are typically low and open. The bare ground between tussocks is thought to be an important microhabitat feature for the Golden Sun Moth, as it is typically these areas on which the females are observed displaying to attract males. Habitat may contain several wallaby grass species, which are typically associated with other grasses particularly spear-grasses or Kangaroo Grass (SEWPAC 2011i). The flying season for the Golden Sun Moth is variable each year, but occurs approximately between late October and early January (SEWPAC 2011i).

Suitable soils are generally low in phosphorus (below 14 mg/g), slightly acidic, sandy, clay loams (SEWPAC 2011i). All of the known sites are less than 790 m above sea level, although sites of suitable habitat have been identified above this in central and southwest NSW. In NSW and ACT, sites are generally less than 720m above sea level (SEWPAC 2011i).

The Golden Sun Moth was historically distributed across Natural Temperate Grassland in NSW, the ACT, Victoria and South Australia (Clarke & O'Dwyer 2000). Today, the Golden Sun Moth is known from 125 extant sites (post-1990) across its range. Forty-five sites occur in Victoria, 48 sites occur in NSW and 32 sites occur in the ACT (ACT Government 2005b; Clarke & Whyte 2003). In the ACT, seven of the 32 known sites occur either wholly or partially within the ACT nature reserve system (SEWPAC 2011i).

The Golden Sun Moth's NSW populations are found in the area between Queanbeyan, Gunning, Young and Tumut. The species' historical distribution extended from Bathurst (central NSW) through the NSW Southern Tablelands, through to central and western Victoria, to Bordertown in eastern South Australia (OEH 2011).

There is no suitable habitat for the Golden Sun Moth within the study area. The majority of the study area is frequently mown and contains planted overstorey native species. The mown groundlayer as part of the urban parkland sections consists primarily of exotic grasses. The native vegetation in Zone C is not considered suitable given that it does not support high abundances of wallaby grass and spear grasses and has been planted with a range of overstorey species.

Based on the nature of the study area, it is considered highly unlikely for the study area to support a population of the Golden Sun Moth. Impacts to this species as a result of development at Greenway are therefore not expected or considered likely.

GRASSLAND EARLESS DRAGON (TYMPANOCRYPTIS PINGUICOLLA)

The Grassland Earless Dragon is listed as Endangered under both the EPBC Act and the Nature Conservation Act (SEWPAC 2011k). The species is a small dragon, with a maximum adult head and body length of around 7 cm, and a maximum overall length of 16 cm. It has three thin white lines running from the neck, along the body and down the tail. These lines divide an irregular pattern of light and dark brown or reddish cross-bands on the back. This patchy pattern gives it very good camouflage in its grassland habitat. This species has no external ear openings (OEH 2011).

The Grassland Earless Dragon is found in naturally treeless native tussock grassland on black clay, brown clay loams and podzolic soils (Cogger *et al*. 1993; SEWPAC 2011j). It prefers ungrazed or lightly grazed temperate grasslands on gentle slopes dominated by wallaby grasses (*Austrodanthonia*), spear grasses (*Austrostipa*), tussock grasses (*Poa*), and Kangaroo grass (*Themeda australis*). Within grasslands it is known to use a mix of predominantly shorter grasses and taller tussocks. In addition to tussocks, partially embedded surface rocks, and spider and insect holes are used for shelter. These are important micro-habitat

elements within the grassland habitat. Rocks and arthropod holes provide important thermal refuges during temperature extremes (Osborne *et al*. 1993a; Osborne *et al*. 1993b; SEWPAC 2011k).

There are three isolated populations of the Grassland Earless Dragon. These occur in the ACT/NSW Southern Tablelands region, southern Victoria and south-east Queensland (Robertson & Cooper 2000). In NSW, the Grassland Earless Dragon has been recorded from Bathurst, south through the ACT to the Monaro grasslands in the Southern Tablelands (Osborne *et al*. 1993a; Osborne *et al*. 1993b). The species occurs near Cooma and Queanbeyan (SEWPAC 2011k).

Within the ACT, Grassland Earless Dragon populations persist in the Jerrabomberra Valley near Woden, and in the Majura Valley near the Canberra Airport. The species is also known to occur on Commonwealth land controlled by HMAS Harman. Past records suggest that the species was locally common prior to 1970 (SEWPAC 2011k).

There is no suitable habitat (native tussock grassland) for the Grassland Earless Dragon within the study area. The majority of the study area is frequently mown exotic grassland with planted overstorey native non-indigenous species. The mown groundlayer as part of the urban parkland sections consists primarily of exotic grasses. Zone C where it is considered to contain some remnant groundlayer features such as the dense swards of Kangaroo Grass is also disturbed. However, the determining features of the Grassland Earless Dragon habitat do not exist within the study area.

Based on the nature of the study area, it is considered highly unlikely for the study area to support a population of the Grassland Earless Dragon. Impacts to this species as a result of development at Greenway are therefore not expected or considered likely.

PINK-TAILED WORM LIZARD (APRASIA PARAPULCHELLA)

The Pink-tailed Worm Lizard listed as Vulnerable under EPBC Act and the Nature Conservation Act (SEWPAC 2011a). The species is worm-like, with a dark-brown head and nape, gradually merging with the pale grey or grey-brown body. The tail, nearly as long as its body, is pink or reddish-brown towards the tip (OEH 2011).

In general, lizards occur in open grassland habitats that have a substantial cover of small rocks (Osborne & Jones 1995). Lizards also show a preference for sunny aspects, avoiding south facing slopes. The species is only found at sites with good numbers of invertebrates under rocks (Barrer 1992). Most sites occur in relatively open vegetation (SEWPAC 2011a).

Lizards are most commonly found sheltering under small rocks (150 - 600 mm basal area) shallowly embedded in the soil (2 - 5 cm). Some individuals have been found under larger rocks embedded up to 30 cm deep. Individuals may be faithful to the same rock for long periods of time (SEWPAC 2011a). The lizards utilise ant burrows underneath the rocks, possibly retreating deep into burrows in hot, dry weather (Osborne & Jones 1995).

This lizard is known from four sites in eastern Australia: near Canberra in the ACT, Tarcutta and Bathurst in NSW, and near Bendigo in Vic. In the Canberra region the species is widespread but patchily distributed along the Murrimbidgee and Molonglo Rivers and adjacent hill slopes (Osborne & Jones 1995). Major populations in the ACT occur at Mount Taylor, the lower Molonglo River corridor from 250 m upstream of Coppins Crossing to the junction with the Murrimbidgee River, and Woodstock, Stony Creek, Bullen Range and Gingerline reserves in the Murrimbidgee River Corridor (Barrer 1992; Osborne & Jones 1995).

In the ACT lizards are generally found in open grassland communities, particularly where Kangaroo Grass (*Themeda triandra*) occurs (Barrer 1992; Osborne & Jones 1995). Sites often occur on skeletal, infertile soils, and also on darker, deeper, finely grained soils with a porous or sandy fabric (Barrer 1992). Lizards show a preference for more level ground with more suitable rocks (Barrer 1992) such as small flat-based rocks of volcanic origin (Osborne & Jones 1995).

A targeted search for the Pink-tailed Worm Lizard was conducted within Zone C of the study area despite the consideration of very limited to zero potential habitat existing. All rocks of suitable size (10 x 10 cm to 40 x 40 cm square) were rolled within Zone C around the rocky knoll. The number of rocks rolled was <50 (no other suitably sized rocks were observed). No Pink-tailed Worm Lizard was observed during the targeted search.

It is not considered likely that the Pink-tailed Worm Lizard occurs within the confines of the study area due to the lack of potential or suitable habitat and the highly disturbed nature of the study area. The majority of the study area is frequently mown exotic grassland with planted overstorey native non-indigenous species. Zone C where it is considered to contain some remnant groundlayer features such as the dense swards of Kangaroo Grass is also disturbed. However, the determining features of its current habitat such as grassy understorey of woodlands and open forest dominated by aforementioned species do not exist within the study area. Additionally, this species was not recorded during the targeted survey.

Impacts to this species as a result of development at Greenway are therefore not expected or considered likely.

STRIPED LEGLESS LIZARD (DELMA IMPAR)

The Striped Legless Lizard is listed as Vulnerable under both the EPBC Act and the Nature Conservation Act (SEWPAC 2011b). The species differs most obviously from a snake in having external ear openings, small scaly flaps for hind limbs, a long tail and

a broad, undivided tongue. It is pale grey-brown above, with a darker head, and almost white below. The most distinguishing characteristic is a pattern of light and dark parallel lines running along the length of the body, although these may be very pale or even absent in some individuals. This parallel stripe pattern breaks up into a diagonal pattern on the tail. They grow to about 30 cm in length, with up to three-quarters of this being the tail (OEH 2011). The striped legless lizard feeds selectively on surface active and sedentary arthropod prey, especially spiders, butterfly and moth larvae, field crickets and cockroaches (SEWPAC 2011b).

The Striped Legless Lizard is a grassland specialist, being found only in areas of native grassland and nearby grassy woodland and exotic pasture (Smith and Robertson 1999). Until recently, the species was thought to inhabit only native grasslands dominated by species such as *Austrostipa bigeniculata* (Spear Grass) and *Themeda australis* (Kangaroo Grass). In recent years, surveys have revealed sites dominated by exotic grasses such as *Phalaris aquatica, Nassella trichotoma* and *Hypochaeris radicata* (ACT Government 1997a; Smith and Robertson 1999). They have also been found in several secondary grassland sites (i.e. sites which were not historically grassland, but which have been cleared for grazing or agriculture). The presence of a relatively dense and continuous tussock structure, rather than the floristic composition of the grasslands, may be important in influencing the persistence of this species (ACT Government 1997a; Smith and Robertson 1999).

The Striped Legless Lizard is patchily distributed in grasslands of south-eastern NSW, the ACT, north-eastern, central and south-western Victoria, and, possibly, south-eastern South Australia. It is currently known to occur at several locations in the basalt plains to the north and west of Melbourne in Victoria, with isolated records near Yass, Goulburn, Cooma, Batlow and immediately north of the ACT in NSW (SEWPAC 2011b). There are four separate locations in the ACT, in grassland areas of Gungahlin, Majura and Jerrabomberra Valleys, and Yarramundi Reach on the shores of Lake Burly Griffin. Gungahlin appears to be the stronghold of the species in the ACT region (ACT Government 1997a).

It is not considered likely that the Striped Legless Lizard occurs within the confines of the study area due to the lack of potential or suitable habitat and the highly disturbed nature of the study area. The majority of the study area is frequently mown exotic grassland with a planted overstorey of native non-indigenous species. Zone C where it is considered to contain some remnant groundlayer features such as the dense swards of Kangaroo Grass is also disturbed. However, the determining features of potential habitat such as relatively continuous tussock structured grassland do not exist within the study area. Additionally, the study area does not resemble a native grassland, grassy woodland or exotic pasture.

Impacts to this species as a result of development at Greenway are therefore not expected or considered likely.

HOODED ROBIN (MELANODRYAS CUCULLATA)

The Hooded Robin is listed as Vulnerable under the Nature Conservation Act (ACT Government 1999a). The species is a large Australian robin reaching 17 cm in length. The male is strikingly marked in black and white, with a bold black hood extending down a white breast. The back is black with distinct white shoulder and wing-bar (OEH 2011).

The Hooded Robin occupies drier eucalypt forest, woodland and scrub, grasses and low shrubs, as well as cleared paddocks with regrowth or stumps (ACT Government 1999a). In temperate woodlands, the species favours open areas adjoining large woodland blocks, with areas of dead timber and sparse shrub cover (NSW Scientific Committee 2001). Hooded Robin home ranges are relatively large, averaging 18ha for birds from the New England Tableland (NSW Scientific Committee 2001). It uses stumps, posts or fallen timber from which to locate prey on the ground. The Hooded Robin avoids dense forests and urban areas and is not observed in suburban gardens in Canberra. In the ACT region, it is found in woodland, often with scattered Yellow Box *Eucalyptus melliodora* or Blakely's Red Gum *E. blakelyi*, with long grass (ACT Government 1999a).

In the ACT, small groups have been observed in grassy woodlands in the north and in the open areas in valleys in the south Taylor and Canberra Ornithologists Group (ACT Government 1999a). Graham (1995) surveyed sites at Mulligans Flat, Yalgum (on the Kings Highway between Queanbeyan and Bungendore), Gigerline (four kilometres southeast of Tharwa), Malcolmvale (north of Canberra Airport) and Enchanted Hill (east of Theodore), and estimated there were approximately 40 breeding pairs in the ACT at that time . Small numbers were also observed in the Murrumbidgee, Naas, Gudgenby and Paddys River valleys during data collection for the ACT Bird Atlas (1986-89). The current total ACT population is estimated at between 100 and 200 individuals (ACT Government 1999a).

The study area does not provide suitable habitat for the Hooded Robin. The study area is relatively small, is an urban parkland, consists of planted (young) eucalypt species and does not contain the required habitat structure such as sparse shrub cover and fallen timber. The study area is also isolated with no connectivity values to areas of suitable habitat.

Impacts to this species as a result of development at Greenway are therefore not expected or considered likely.

PERUNGA GRASSHOPPER (PERUNGA OCHRACEA)

The Perunga Grasshopper is listed as Vulnerable under the Nature Conservation Act (ACT Government 1999b). It is a short-winged but flightless grasshopper, with adult females ranging from 26-35 mm long and adult males ranging from 15-20 mm long. The colour is variable, often ranging from brown to grey in dry years, to green in wet years (ACT Government 1999b).

The Perunga Grasshopper has been found in Natural Temperate Grassland dominated by Wallaby Grass (*Austrodanthonia* spp.), Spear Grass (*Austrostipa* spp.) or Kangaroo Grass (*Themeda australis*) and in native pasture with forb food plants located in the inter-tussock spaces. Grass tussocks are used also to escape predators. It may also occur in open woodland areas with a grassy understorey, including the endangered Yellow Box–Red Gum Grassy Woodland community (ACT Government 1999b).

Records of the species are from Wagga Wagga, Boorowa, Galong, the ACT and adjacent areas of NSW including Jeir, Murrumbateman and Queanbeyan. ACT locality records include Black Mountain, Gungahlin, Majura Valley, Canberra International Airport, Jerrabomberra Valley, Molonglo valley, the Campbell Park paddocks, Belconnen Naval Station, Hall, Kambah Pool, Mt Stromlo, Reid, Weetangera and Tuggeranong (ACT Government 1999b).

The study area does not provide sufficient grass tussock structure for this species to persist. Zone C as previously stated, does contain some swards of dense native grass (Kangaroo Grass) but this has been moderately disturbed in the past and is limited in size. It is therefore considered highly unlikely that the Perunga Grasshopper occurs within the study area. Additionally, no Perunga Grasshopper was observed in the Booth and Associates 2011 field survey or the threatened species targeted surveys and site reconnaissance associated with this report.

Impacts to this species as a result of development at Greenway are therefore not expected or considered likely.

MURRAY COD (MACCULLOCHELLA PEELII) AND SILVER PERCH (BIDYANUS BIDYANUS)

Murray Cod is listed as Vulnerable under the EPBC Act while Silver Perch is listed as Endangered under the NC Act. Both species are found throughout the Murray Darling Basin in the south-eastern region of Australia and have experienced habitat and range reductions (ACT Government 2003; SEWPACe).

Lake Tuggeranong is an artificial lake which was filled in 1988. The lake was intended for scenic and recreational (swimming, boating and fishing) purposes, but also to serve as an urban stormwater quality control (ACT Government 2011b). The lake is stocked with two species of native fish species (Murray Cod and Golden Perch) by the ACT Government. However, the ACT Parks and Conservation Service only considers Silver Perch to be suitable for stocking at Googong Reservoir (ACT Government 2011a) and the species is therefore not considered likely to be present within Lake Tuggeranong.

In relation to Murray Cod, a large release of fingerlings was undertaken in January 2011. The relevant ACT Government media release (23,000 Fingerlings released into ACT lakes, January 6, 2011) stated that "*a total of 23,000 Murray Cod fingerlings were released into Yerrabi Pond (7,000) and Lake Tuggeranong (16,000) in January 2011, as part of a regular program to improve recreational fishing. The release of fish into Canberra's lakes provides greater opportunities for fishing closer to home, takes pressure off native species in our non-urban rivers and streams better protecting threatened species in the wild, and improves the biodiversity of our lakes*."

While both the lake and the population of Murray Cod are not part of a natural system, maintenance of water quality within Lake Tuggeranong will be important for maintain the species within the area. The incorporation of Water Sensitive Urban Design (WSUD) into the planning and development for Greenway will ensure that water quality is maintained. Based on the implementation of WSUD principles, significant impacts are not considered to be likely for the Murray Cod.

4. Conclusion

Based on the work of both Open Lines (this report) and Booth and Associates (2011), it is clear the site at Greenway provides limited ecological value and does not support the presence of terrestrial threatened species or ecological communities (as listed under the Nature Conservation Act or the EPBC Act). The majority of the site is highly disturbed and managed as an urban parkland (mown grass with areas of planted overstorey).

4.1 ACT APPROVAL CONSIDERATIONS

ACT ECOLOGICAL VALUES

The ecological values relevant to ACT approval considerations that do exist at Greenway are:

- One patch of native vegetation as defined by the Nature Conservation Act within Zone C. This area is approximately 0.54 ha in size and supports a range of native grass and understorey species.
- Landscape level connectivity provided by the tree plantings within Zones C and D.

POTENTIAL SIGNIFICANT IMPACTS

As outlined in Section 1.2, the specific issues that have the potential to trigger the requirement for an EIS to be prepared in relation to development at Greenway are:

- the clearing of greater than 0.5 ha of native vegetation; or
- the potential for significant impacts on a threatened species or endangered ecological community as listed under the Nature Conservation Act.

Based on the current master plan, approximately 0.33 ha of native vegetation is proposed to be cleared within Zone C (see Figure 3). It is possible that additional impacts to the native vegetation may occur as a result of construction activities. In order to ensure that the 0.5 ha trigger is not reached, Open Lines recommends the revision of the development boundary and retention of the native vegetation within a conservation area for Greenway. Should this approach be taken then significant impacts due to the clearing of native vegetation would not occur.

Given that there are no terrestrial threatened species or ecological communities present, significant impacts in relation to those matters are considered unlikely at Greenway.

Finally, significant impacts to landscape connectivity are considered unlikely on the basis that plantings within Zone C and D are either retained or replaced as part of the development.

RECOMMENDED ACT APPROVALS APPROACH

Open Lines recommends two options for addressing the ACT approval requirements:

1. Should the native vegetation within Zone C be retained within a conservation area, no approvals relating to native vegetation, threatened species or ecological communities would be required.
2. Should the native vegetation within Zone C be proposed for clearing, it is recommended that the LDA seek an ESO for development at Greenway.

4.2 COMMONWEALTH APPROVAL CONSIDERATIONS

MNES AT GREENWAY

Booth and Associates (2011) generated an EPBC Protected Matters Search Report that identified the potential MNES within the vicinity of Greenway. They also analysed the potential presence of threatened and migratory species, and threatened ecological communities (see Booth and Associates 2011 - Annexure 8.0 Habitat Impact Assessment). Based on that work and the additional considerations within this report, the only MNES that has potential relevance to development at Greenway is the Murray Cod (listed threatened species). No other MNES are present or likely to be significantly impacted by development at Greenway (see Table 1 below).

Table 1: potential relevance of MNES at Greenway

MNES	Relevance to Greenway	Justification
World heritage	Not relevant	No world heritage properties occur within the vicinity of Greenway
National heritage	Not relevant	No national heritage properties occur within the vicinity of Greenway
Wetlands of international importance	Not relevant	No wetlands of international importance occur within the vicinity of Greenway
Listed threatened species and ecological communities	Potentially relevant	No terrestrial threatened species occur at Greenway No ecological communities occur at Greenway The Murray Cod occurs within Lake Tuggeranong
Migratory species	Not relevant	Greenway does not provide important habitat or support an ecologically significant proportion for any migratory species (see Booth and Associates 2011 - Annexure 8.0 Habitat Impact Assessment)
Commonwealth marine areas	Not relevant	The Commonwealth marine area does not occur within the vicinity of Greenway
Great Barrier Reef Marine Park	Not relevant	The Great Barrier Reef Marine Park does not occur within the vicinity of Greenway
Nuclear actions	Not relevant	The proposed action at Greenway is not a nuclear action

POTENTIAL SIGNIFICANT IMPACTS

As outlined in Section 3, the Murray Cod is stocked within Lake Tuggeranong by the ACT Government for the purposes of promoting recreational fishing. Development has the potential to effect water quality within Lake. However, significant impacts are considered unlikely on the basis that the principles of WSUD are incorporated into the planning and development for the site.

RECOMMENDED COMMONWEALTH APPROVALS APPROACH

Given the general lack of MNES values at Greenway, Open Lines does not consider that an EPBC Act referral is required for the proposed development at Greenway. This recommendation is based on the premise that the principles of WSUD are incorporated into the planning and development for the site to protect the artificial population of Murray Cod.

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