

MINISTER FOR URBAN SERVICES

**PRELIMINARY ASSESSMENT
EVALUATION**

for

**NORTH GUNGAHLIN STRUCTURE PLAN
ACT**

**PROPONENT:
STRUCTURE PLANNING AND DESIGN
PLANNING AND LAND MANAGEMENT GROUP
DEPARTMENT OF URBAN SERVICES**

JANUARY 2003

ACT GOVERNMENT

1. Introduction

In order to meet the requirements of section 121(1) of the *Land (Planning and Environment) Act 1991* (the 'Land Act') the following evaluation has been prepared for the North Gungahlin Structure Plan Preliminary Assessment.

The function of this evaluation is to determine if any of the environmental impacts associated with the proposal are of sufficient significance to warrant further impact assessment.

2. Background

On 14 September 1993 the Territory Plan was gazetted. It incorporated the previous National Capital Development Commission's (NCDC's) original plan for Gungahlin and two previously approved Variations to the Interim Territory Plan for parts of Gungahlin. These Variations covered the suburbs of Amaroo, Casey, Harrison, Ngunnawal and Nicholls (1991) and part of Nicholls including the Gold Creek Tourist Area (1992).

Since that time two major Variations have since been gazetted. These were for:

- Mulligans Flat (Variation 15, 1994) which expanded the Reserve area; and
- Gungahlin Town Centre and Central Area (Variation 53, 1995) which altered the original plan for the Gungahlin Town Centre mainly in response to the discovery of the habitat for the vulnerable Striped Legless Lizard (*Delma impar*) on the original site and the creation of conservation reserves.

The need for modifications to the Territory Plan was demonstrated in these Variations to ensure the protection of environmentally significant sites. Also, the community argued strongly for a new approach to retail provision and urban development generally.

A proposed Variation to the Territory Plan has now been prepared which proposes changes to the boundaries of urban development in Gungahlin's northern suburbs and results in changes to the Urban Open Space and Community Facilities Land Use Policies. Advice was given that a Preliminary Assessment (PA) would be required as the proposal involved the potential removal of more than 0.5ha of remnant native vegetation. This removal is identified as a mandatory trigger under Schedule II of the Territory Plan.

The proposed Variation to the Territory Plan is the result of the review of the planning for North Gungahlin which has incorporated the need to:

- re-examine and revise planning for the northern undeveloped area of Gungahlin;
- draw together and integrate a range of different strategies and government policies into the future planning for Gungahlin;
- take into account significant changes in the basic assumptions underlying previous

planning work including changes to the location of Gungahlin Town Centre and the creation of significant conservation reserves at Mulligans Flat and Mulanggari/Crace; and

- harness current approaches and ideas to the application of sustainable development principles and environmental management, access to public transport, urban design and safety, cultural planning, water cycle management and innovative infrastructure delivery.

Changes to the projected population levels due to the urban village concept for the town centre and Central Area and higher residential densities, provide for lower employment assumptions and to provide wider housing choice yet provide are also valid reasons for the review.

On the 14 June 2001 a Preliminary Assessment (PA) was triggered under Section 113 of the Land Act. The Structure Planning and Design of Planning and Land Management (PALM), Department of Urban Services was nominated as the proponent and was required to prepare a PA in accordance with Schedule 3 of the Land Act.

The PA was received on 22 October 2002 and advertised in the ACT Legislation Register on 21 October 2002 and in the *Canberra Times* on 23 October 2002. Follow up notices were placed in the *Canberra Times* on 9 November 2002 and 23 November 2002. The PA was also available on the Planning and Land Management (PALM) web page for comment throughout the notification period. The public notification period closed on 20 December 2002.

3. Compliance with requirements of the Land (Planning and Environment) Act 1991.

The PA prepared has met the requirements of the Land Act in respect to Gazettal and public notification. The PA was prepared in accordance with Schedule 3 of the Land Act. Copies of the PA were available from the PALM Shopfront, 16 Challis St Dickson, during normal office hours at a price of \$10 a copy. Copies of the PA were lodged with the ACT Library Service and a copy was provided to Alice Campey, Conservation Council of the South-East Region and Canberra (Inc) on 22 October 2002.

4. Adequacy in identifying the range of possible impacts of the proposal on the environment.

The issues identified by the PA fall into the following four categories:

- **Impacts on the Physical Environment:** sustainable urban water management, traffic impacts and public transport.

- **Impacts on the Human Environment:** Aboriginal and European heritage issues, social issues, air quality, contaminated sites, noise and displaced activities.
- **Impacts on the Non-Human Biological Environment:** urban land assessment, conservation of natural resources, flora and fauna and urban edge interface.

The PA satisfactorily identifies the range of possible impacts arising from the proposed development.

5. Technical Evaluation of Potential Environmental Impacts

5.1 Potential Impacts on the Physical Environment

Sustainable Urban Water Management

The PA has identified the issues and impacts associated with stormwater runoff generally. It has described the ‘composite system’ identified in the Gungahlin EIS (1989) for the management of surface water within Gungahlin. This comprised the retention of natural streams alongside major drainage lines, large ponds and retention basins, engineered waterways and conventional stormwater drainage infrastructure.

The PA points out that recent research and a better understanding of catchment land use and management practices in the past 15 years has identified more ‘sustainable’ management practices. These aim to improve water quality in receiving waters, enhance ecological values and amenity, reduce potable water demand and potentially provide long term cost savings.

Identified impacts on water quality and stream biota from urban development include:

- loss of natural stream habitat;
- increased siltation;
- increased flood frequency; and
- an increase in the range of pollutants.

These impacts from urban development result from the extent of impervious areas, the hydraulic connectivity between impervious areas and the receiving waters and the loss of natural habitat by the modification of natural streams.

The PA has identified that sustainable urban water management design principles are to be adopted for the development of the area covered by the extent of the document. This evaluation considers it essential that these design principles be adhered to and implemented in the future development of north Gungahlin. Past experience has shown that excellent design principles are put forward in environmental assessments only to be

taken out of the final design for budgetary or other reasons. Implementation of principles provides a showcase for the ACT Government and instills confidence in the general community that there are gains being made to achieve sustainable development.

The PA goes on to identify four urban land use categories and associated landscape levels to which the range of measures discussed in the document can be applied. These are identified as:

- the block/landscape level;
- the neighbourhood level;
- the major movement/drainage links and their landscape corridors; and
- receiving waters and their floodplain corridors.

The summary table (Table 3) included in the PA sets out the type of management principle that 'may be considered' for each land use category. It stresses that there is also a need to ensure that each of the measures is compatible with upstream and downstream measures proposed and that the cumulative effect of what it termed 'treatment train' measures is such as to meet the catchment wide water quality or flow objectives.

PALM has put in place the Sustainable Index for Residential Development (2001) and is currently determining new initiatives that will ultimately be adopted as ACT design standards.

The document also identifies the use of wetlands to supplement the waterway based detention ponds throughout the North Gungahlin area. It claims that this measure complemented by a range of other measures identified at the individual block level to reduce runoff, will lead to the ponds being located depending on catchment size, likely inflow and pollutant loading. Proposed pond locations are identified in the Structure Plan map. There are six locations where a 'water feature' has been shown on the map.

Finally, the PA indicates that 'sustainable urban water management measures within the development area will be adopted after consideration of the overall benefit of each element, considered in a holistic way in conjunction with all planning, environment, social, public risk, economic and maintenance issues.' There is no guarantee within the document that these identified measures will be implemented in the short or longer term.

It is recommended that:

- the sustainable urban water management measures identified in the PA for all levels of urban land use be considered as a mandatory requirement for all development in North Gungahlin.

The PA has adequately addressed this issue.

Traffic Impacts

Road Network

The PA has identified that new urban areas require a network of public and private transport links internally and need to link with external transport connections. Without these connections the potential exists for traffic movement impacts. The potential for transport impacts to arise lie in three areas. These are:

- the need for transport links outside North Gungahlin to be constructed or enlarged;
- the accessibility of public transport; and
- the greenhouse gas implications for the form of transport chosen.

A revised retail strategy and the rationalisation of the provision of schools has apparently resulted in the need for fewer major facilities in the Structure Plan than was in the original plan. This may bring with it an increase in travel resulting in longer trip lengths. Longer trip lengths may also result in a change in the mode of chosen travel.

Currently, the Sustainable Transport Plan is being prepared and has the aim of maximising accessibility and therefore reducing the need for some trips and to encourage alternative modes of travel. It would be expected to reinforce the range of features already included in the Structure Plan.

The PA has identified a number of projects designed to increase road capacity to meet the growing demand from both private and public transport generated by Gungahlin's growth. These projects are contained within the current ACT Government road construction program for the five years to 2007. They include:

- Barton Highway duplication (completion late 2002);
- Gungahlin Drive duplication (completion late 2002);
- Horse Park Drive extension (estimated as mid 2003);
- Gungahlin Drive extension from the Barton Highway to Belconnen Way (Stage 1) (estimated as mid 2005);
- Gungahlin Drive extension Stage 2 (estimated as mid 2006);
- Majura Road upgrading (estimated as mid 2003);
- Morshead Drive duplication (estimated as mid 2003; and
- William Hovel Drive duplication (estimated as mid 2004).

Additional capital works items currently being planned include the construction of Clarrie Hermes Drive and the duplication of William Slim Drive as well as a range of capacity improvement works in the Majura Road/Pialligo Avenue/Fairbairn Avenue area between 2007 and 2012.

The PA concludes that the proposed road system will meet the demands from public and private transport to and from North Gungahlin, as well as within Gungahlin. It admits there will be some congestion on arterial road connections from Gungahlin to the rest of Canberra during peak periods as is currently occurring on the existing road network

across Canberra. It claims that most of the road network functions, and will continue to function, adequately during peak times.

The difficulty experienced by commuters in travel between North Gungahlin and other parts of Gungahlin or externally to other parts of Canberra will influence the mode of travel chosen, the time of travel and over time, the location of residence or employment. The transport network and the parameters built into the Structure Plan must be able to deliver the required outcomes to justify the high cost of new road provision.

It is difficult to evaluate the likely impacts of new urban areas and increases in expected population. However, the difference in a real extent of the changes proposed in the PA is not much different to those originally proposed in the Territory Plan. Current projects under construction are designed for a considerable increase in traffic volumes or by the ability to duplicate or extend the main arterial road network at some time in the future. Changes in commuter behaviour and policy directions towards sustainable outcomes should ensure that there will be minimal impacts on the current or planned future transport network.

Public Transport

The PA has also identified ways in which the Structure Plan has reacted to the need to encourage the increased use of public transport. These include increased residential densities in areas close to shopping centres, the location of the local collector road network to pick up 95% of all potential residents and allowing a route structure which provides for terminus/layover facilities at a particular location.

Higher residential densities adjacent to centres are proposed in the Structure Plan. The final design of the local neighbourhoods should be based on a walkable radius of 400m (90% of all dwellings), and focussed on an activity node such as a basic unit of open space such as a park and potential community facility.

The only transport infrastructure shown on the current Territory Plan is the arterial road network. Earlier in the PA it is identified that the Structure Plan proposes a more comprehensive transport network, including arterial and local collector roads, the Inter Town Public Transport (IPT) route, local bus routes, cycleways and pathways. The proposed road network has been designed to support very high public transport service standards using buses, a pedestrian and cycleway network, the public transport system generally and the town centre.

Two key arterial roads for North Gungahlin are Horse Park and Mirrabei Drives. Horse Park Drive provides the trunk route in and out of the area while Mirrabei Drive provides a direct connection from the northern areas of Gungahlin to the Town Centre. Minor changes to the alignment of these roads are proposed in the Structure Plan. Mirrabei Drive's alignment has been changed to head north through Moncrieff to intersect with Horse Park Drive at the proposed group centre.

These changes could result in a shift of commuter behaviour away from private car usage towards the use of public transport. However, implementation of policies and strategic directions to try and achieve this shift will have to be put in place. This may mean there needs to be other changes to public transport to ensure implementation is achievable. That action is outside the scope of the PA.

The PA as adequately addressed the issue of traffic impacts.

5.2 Potential Impacts on the Human Environment

Aboriginal and European Heritage Issues

The PA has identified that the North Gungahlin area is home to between 130 and 150 Aboriginal heritage recorded places. These were identified from cultural resource studies dating from the early 1990's together with an overview undertaken in 1998 for the North Gungahlin review. The PA shows heritage sites both proposed for inclusion on the ACT Heritage Places Register and existing sites on the Register at Figure 13. It should be noted that there are more than 40 Aboriginal places to be conserved in open space but not all of these are shown on Figure 13.

An assessment of significance and long-term conservation management was made in consultation with the various Aboriginal groups. The majority of the sites were assessed to have low or very low significance. Collection of some sites was recommended while others were left in situ. Those sites recommended for conservation have been retained in Urban Open Space in the Structure Plan to ensure their protection. The PA considers that the Structure Plan will not have a deleterious effect on the heritage values in the area by offering protection and enhancement for the appreciation of the sites.

At the detailed planning stage for the North Gungahlin development, further discussion with the Heritage Unit of Environment ACT will have to occur to make sure that the goals developed for in-situ conservation can be achieved. On-going management of these sites in open space areas is an issue that has to be addressed.

The PA has indicated increased costs associated with that management may be incurred. It identified those challenges include sites that create access issues, and historic sites that may require conservation maintenance and possible adaptive redevelopment of their surrounds. As well, Aboriginal sites will not tolerate surface ground disturbance.

It is understood from the PA that Environment ACT is working on the future conservation and preservation of pastoral places in the comprehensive context for the expanding suburban landscape.

The PA points out that the Horse Park Homestead and surrounds that contain sites of

Aboriginal and ecological value, has being nominated to an Interim Heritage Place Register and will be further assessed by the ACT Heritage Council. The site has also been listed on the Register of the National Estate and has a classification by the National Trust of Australia (ACT).

Of the sites within areas for development, approximately half are reported as salvaged with the majority still in-situ having been assessed as being of very low significance. The PA identifies that further salvage on these sites prior to development may be necessary bringing with it added costs for further surveys and liaison with the Aboriginal community.

Aboriginal and European heritage are important community assets and have to be assessed, protected and managed appropriately. It will be very important to ensure that this occurs and any added costs to further assess, protect and manage these assets be met by Government. It is recommended that:

- as part of the detailed planning, further discussion occurs with the Environment ACT's Heritage Unit to ensure goals for in-situ conservation of Aboriginal and historic places within North Gungahlin are achieved.

It is considered that the PA has adequately addressed this issue.

Social Issues

The PA has identified the following social issues:

- (a) sustainability objectives;
- (b) centres;
- (c) community facility provision;
- (d) schools;
- (e) housing choice; and
- (f) potential social benefits.

Each section has been evaluated below.

Sustainability Objectives

This section of the PA identified that the Structure Plan proposes a range of benefits for the future residents of North Gungahlin. It suggests it does this by recognising cultural diversity and changing community values and lifestyles, providing opportunities for a range of informal and formal community activities and integrating these into the land use proposals and overall design for the urban environment.

Within the framework of ecologically sustainable development and supporting the overarching principle of inter-generational equity, the key community objectives are

identified as:

- to develop a district which supports and promotes the community life of its residents and produces a built environment which meets the different needs of the community;
- to provide a full range of community facilities and services in accordance with the needs of residents; and
- to locate centres, facilities and open space so as to maximise their accessibility and viability.

Centres

Currently the Territory Plan identifies a limited retail structure in relation to North Gungahlin. It shows two large shopping centres at Forde and Ngunnawal and a local centre at Casey. The Territory Plan reflected the objectives of the original NCDC's Gungahlin Policy Plan that called for the establishment of a local centre in each suburb. The precise locations were not reflected in the Territory Plan because further detailed planning work was required in relation to the suburb designs.

The PA has identified a total of three group and five local centres in the Structure Plan as mixed use centres and reported this was consistent with the Government's objectives for the future directions for the provision of retail services in the ACT. The draft Gungahlin Preferred Retail Structure and Strategy by PALM was released in November 1997 after comprehensive community consultation and detailed modelling.

New group centres are to be located at Casey, Moncrieff (Mirrabei) and Amaroo and will have their development staged in accordance with the residential development of their catchments. The PA has identified the group centres will vary in size from 4,000m² to 10,000m² and be located on main roads at the junction of a number of suburbs so that they are visible and easily accessible. Effective pedestrian and bicycle access will be integrated with their development.

Urban housing opportunities will be co-located with the group centres. Residential sites closest to the retail core will also allow a vertical mix of commercial and residential uses.

The local centres are designed to provide convenience shopping within easy walking distance of residential areas. The PA identifies that these nodes will be designed to have the flexibility to accommodate the changes in community demands over time.

Impacts have also been identified on retail centres in Belconnen and North Canberra that are currently serving the Gungahlin catchment. Kaleen and Dickson are targeted for comment in particular. The possible loss of customers at Kaleen Group Centre may be offset by new residents in the yet to be developed suburb of Lawson. Dickson Group Centre is considered to be overtrading but any impacts will be offset by increased infill development in North Canberra.

Community Facility Provision

Community facility sites mainly next to centres are identified in the PA and shown in the Structure Plan. It claims that these sites will meet all known school demands as well as other community needs and be able to respond to the changing dynamics of the community.

There are a series of potential impacts associated with the development proposed in the Structure Plan. These are identified in the PA. Of those, the major ones would appear to be:

- some residents may have to travel marginally further to reach facilities than in other districts of Canberra. Offsetting this, the PA identifies the proposed high levels of public transport accessibility will assist in overcoming the problem;
- a higher proportion of community facilities are to be provided in the Town Centre and group centres with the consequence that smaller sites will be available in each neighbourhood;
- a slower growth rate for the development of North Gungahlin may mean it takes longer to reach the threshold for the supply of community services. The PA considers that this reinforces the decision to locate them mainly at group centres;
- the provision of a fewer number of facilities than elsewhere. The PA addresses this impact by commenting that those facilities to be provided will generally be larger and of a higher standard than those elsewhere and therefore they will cater for the same per capita demand;
- that fewer schools may be required to support a given population and were less likely to occur in every suburb.

It goes on to recognise that the measures in the Structure Plan include placing community facility sites close to public transport routes, improving accessibility and the opportunity to co-locate facilities with other activities. To back up this judgement, the PA draws attention to other Canberra studies which have shown that community facilities co-located with other commercial and community activity, have higher levels of usage than freestanding and isolated facilities. Co-location is recognised as not only catering for multi-purpose trips, but also allowing for a more efficient use of sites.

The PA indicates that the provision of sites identified in the Structure Plan should be sufficient to meet a range of potential community uses. Each suburb includes community facility sites mainly in or adjacent to centres or open space. It points out that additional sites can be identified in residential areas, urban open space and centres as demand arises, particularly for smaller facilities having a smaller catchment. The PA also comments that sites that are not required within the open space system can be incorporated back into open space thus avoiding potential safety problems and costs associated with vacant blocks.

The PA correctly identifies that ongoing monitoring and consultation with the community is needed to ensure that sufficient sites are available in locations to meet the diverse needs

of the community.

Notwithstanding the above, while it is difficult to predict future needs for unpopulated areas and given the limited Community Facility Land Use policy sites available in the North Gungahlin Structure Plan, it may be necessary that an allocation procedure be developed rather than a first come first served approach for sites that are not already earmarked for specific purposes.

Schools

Within the established areas of Gungahlin there are a large range of community facilities operating including schools. The Structure Plan has identified sites for primary schools at Bonner, Jacka and Taylor and a high school also at Taylor. There is also a reserved school site at Forde that could be used for an alternative community use if not required. The PA has also identified a large community facility site at Moncrieff (Mirrabei) Group Centre that may be suitable for a secondary college if required.

The PA contends that this level of provision for schools should satisfy projected school enrolments which reflect changing community trends such as lower number of children per household. The development sequence for the construction of schools will depend on the relationship between the timing of schools and surrounding residential development.

Housing Choice

Well located and accessible housing is an essential criteria for the provision of housing choice. The PA has identified that the Structure Plan provides the scope for a range of housing choices, including higher density dwellings in areas with good access to facilities, shops, open space and public transport. It also points out that the implementation of this direction at key locations will be important. It also points to the need for the surrounding public realm to be well designed and allow for easy access to public transport, shops and services.

The PA identifies that larger sites for future retirement complexes will be required in North Gungahlin and these should be integrated into the urban fabric. It is also recommended that:

- future development in North Gungahlin considers the recommendations of Housing Affordable Task Force Report (December 2002) and any actions likely to be implemented by the Territory to improve the net increase of affordable housing throughout Canberra.

Potential Social Benefits

The PA has shown that the Structure Plan identifies a range of potential benefits including:

- more strategic linking of community facilities with transport networks, open space, retail centres and residential development;
- the potential for improved access and reduced trips to community facilities by both private and public transport, with the potential for pedestrian access by those living in centre housing precincts; and
- planning for residential development and mixed use development in centres at an early stage.

The PA has adequately addressed this issue.

Air Quality

At the moment, development of Gungahlin is restricted to four suburbs and the PA points out there is little present air pollution. It correctly points out there is potential for a degradation of air quality with the principal factors being emissions from motor vehicle exhausts and wood heaters for domestic heating.

The problem of air pollution is most apparent in the winter months where cold, stable conditions lead to the development of temperature inversions. These trap lower quality air at or near ground level and contain and concentrate the pollutants.

The PA has identified that development of North Gungahlin may see an increase in vehicle usage. According to the PA, the design of each of the suburbs will incorporate the following design features which are designed to maintain emission levels within the required standards:

- wide verges on major arterial road networks;
- good accessibility to public transport routes;
- co-location of shops and higher density housing within a 400m radius to facilitate access through good pedestrian and cycle links; and
- mixed use development at group and local centres to increase opportunities for locally based service provision.

It is claimed that these features will assist in minimising short vehicle trips by facilitating the use of public transport and walking/cycling. The provision of wide verges on arterial roads will ensure that sensitive uses such as child care centres are well set back from roads and any potential emission sources.

It also claims that transport related air emissions are not expected to lead to levels of

pollutants at which health and environmental guidelines would be exceeded. It points to locations in the ACT where air quality monitoring has or is being undertaken that demonstrates that air emission levels are well below relevant health or environmental criteria in all cases.

The PA does identify that Canberra does have a winter particle pollution problem due to emissions from wood heaters. However, it expects that the introduction of more stringent arrangements for the installation of solid fuel heaters including approval and compliance with emission standards coupled with the Government's ongoing public education campaign should ensure that the air quality impacts are reduced.

Although the potential for urban development to impact on the local air quality is low because the topography is 'open' and well ventilated as described in the PA, it will be important to monitor air quality closely in the future as the population levels build up in North Gungahlin and in Gungahlin generally. To this end, it is suggested that a monitoring station be considered for location in Gungahlin so that data is available in the future on which to judge future air quality.

The PA has adequately addressed this issue.

Contaminated Sites

The PA has identified the existence of sheep dips in the general area on the properties of 'Elmgrove', 'Horse Park', 'Mulligans Flat' and 'Eastview'. The Environment Protection Unit of Environment ACT has not carried out any fieldwork in these areas and has pointed out that other potential sources of contamination may exist associated with past and present agricultural activities.

Also the PA has outlined that detailed investigations will be undertaken and appropriate remedial action put on place as part of the detailed planning to be undertaken for each suburb. Any strategies employed will be site specific in each case.

It is considered that the normal procedures to be followed when considering site contamination and remediation will provide for adequate environmental safeguards to be implemented at the appropriate time.

The PA has adequately addressed this issue.

Noise

The PA has identified the potential impacts of aircraft noise on the North Gungahlin development area. Details are provided about the Noise Abatement Area (NAA) introduced in 1995 by Airservices Australia which requires jet aircraft to fly at 5,000 feet and heavy general aviation to fly at 3,000 feet or more above ground level. The PA

indicates that the future suburbs of Forde, Bonner and Jacka lie outside the current NAA boundary but development in North Gungahlin is not constrained by the NAA boundary.

The PA also identifies that there is the possibility that existing residents of Gungahlin may be affected by construction and traffic noise when the new suburbs are developed. Any construction activity will need to comply with the noise requirements of the *Environment Protection Act 1997*.

The PA has adequately addressed this issue.

Displaced Activities

The PA does not provide any discussion about the impacts on the four rural leases that will be affected by the urban development in North Gungahlin other than to say that rural land has been placed on short-term leases and land management practices have changed as a result of increased uncertainty of tenure. It is recommended that issues such as appropriate short-term tenure and land management agreements are considered following the finalisation of the North Gungahlin Structure and in consultation with the rural lessees.

5.3 Impacts on the Non-Human Biological Environment

Urban Land Assessment

The PA indicates that the proposed changes to the urban land area are consistent with detailed urban land assessment undertaken during the original Gungahlin planning and as outlined in the Gungahlin EIS in 1989. The PA also give a commitment that at the more detailed planning stages the principles of the *ACT Land Capability Guidelines* will be applied.

The PA also states that the land development will be in accordance with the requirements outlined in the Environment ACT guidelines for *Erosion and Sediment Control During Land Development 1998*. A range a of measures are proposed to control erosion and retain sediments on site including diversion structures, off-stream sediment retention ponds, silt fences and progressive vegetation to aid stabilisation.

The PA has adequately addressed this issue.

Conservation of Natural Resources

The PA includes a discussion about the understanding and growing awareness of conservation and environmental issues generally in the ACT and implications for the

development of North Gungahlin. The PA states that since the initial planning of North Gungahlin detailed ecological studies have been undertaken which has resulted in significant changes to planning of this area, including the expansion of the Mulligan's Flat Nature Reserve. The PA also mentions the emerging acceptance of the principles of sustainable development including elements such as inter-generational equity, protection of biodiversity and the precautionary principle which have influenced the current planning for North Gungahlin. Details of how these principles have been applied to the development of North Gungahlin are not discussed in detail except to say that the principles of Sustainable Urban Stormwater Management will be adopted.

YellowBox/Red Gum Grassy Woodland

The PA provides a detailed assessment of the impacts of the North Gungahlin development on the Yellow Box/Red Gum Grassy Woodland present in the area and measures undertaken to provide significant portions of this woodland. The PA states that there are significant areas of YBRG woodland in the Gungahlin area. If these, 362 hectares of high conservation YBRG woodland has been retained in the Mulligan's Flat Nature Reserve and other areas of this woodland (approximately 820 hectares) in Gooroo and Kinlyside are subject to assessment as part of the 2002 review of Action Plan 10 and planning studies.

Within the North Gungahlin area, there are several patches totalling 147 hectares of high and moderate conservation value YBRG woodland. Of this area, 46.2 hectares is included within proposed future urban open space areas. The remaining 100.8 hectares may be incorporated into the urban fabric at the detailed planning stages although the PA states that retention of remnant patches of YBRG woodland as viable ecological communities with a matrix of urban development is unlikely as they are small, fragmented and subject to competing land use pressures.

In the Appendices to the PA reference is made to the current studies undertaken by Environment ACT to review Action Plan 10 (Yellow Box-Red Gum Grassy Woodland). These studies are due to be completed by April 2003 and the PA gives a commitment that the outcomes of this review will be considered in finalising the North Gungahlin Structure Plan.

Other Woodlands

The PA states that North Gungahlin contains areas of regenerating woodland which are of potentially high conservation value and the proposed urban development will impact on these other woodland communities. The planning for North Gungahlin has considered the presence of these woodlands in the design and location of the outer edge of urban development and retains the woodland communities to the north as a continuous native woodland corridor as Hills, Ridges and Buffer areas.

In the remaining areas of North Gungahlin, the PA concedes that the integration or retention of small fragmented woodland areas in the lower slopes will not be possible, although there will be some trees that will be retained as individual specimens during the detailed planning stages of development. Some of these trees may also be protected under the provisions of the ACT's tree protection legislation.

Forestry Plantation

The PA refers to an area of eucalypt plantings which were established over 20 years ago and have formed a modified woodland community with some ecological and landscape value. The PA states that the North Gungahlin Structure Plan will not impact on this plantation. Nor is it likely that harvesting of the plantation for fuel will occur and the plantation will be allowed to mature and become part of the continuous woodland corridor to the north of Gungahlin.

Natural Temperate Grassland

There is approximately 32 hectares of natural temperate grassland in North Gungahlin to the south east of Horse Park Homestead. Action Plan No.1 assesses this grassland as having moderate to low botanical significance. The PA acknowledges that development of the future suburb of Bonner will impact on this grassland which will not be retained in its entirety although parts may feature as landscape elements within the urban fabric.

The PA also refers to the uncommon plant species, the Emu Foot *Cullen tenax* which has been recorded at a site on the eastern side of Gundaroo Road in the proposed urban area of Forde. The PA gives a commitment to further consider this species will be undertaken in conjunction with Environment ACT at the detailed planning stages to determine future management options.

Wetlands

The PA refers to the impacts on and protection measures proposed for the Horse Park Wetland which has been identified as the most significant wetland within the North Gungahlin area and is listed as part of the Horse Park precinct on the Register of the National Estate and is nominated for listing on the ACT Heritage Register. The PA confirms that the wetland will be protected by including it within an area of Urban Open Space which will be subject to specific planning policies and management practices.

The Heritage Unit in Environment ACT have advised that the curtilage for Horse Park Homestead is yet to be determined and that the Heritage Council will identify the required curtilage in due course.

The PA acknowledges that the conservation of this wetland not only depends on this physical protection but also on regulating the flow and quality of water flowing into it from future development areas. As outlined in the PA it is recommended that prior to

development:

- the final curtilage for the Horse Park precinct is determined in consultation with the Environment ACT's Heritage Unit.
- detailed evaluation of geotechnical and hydraulic investigations of the areas around the wetland are undertaken.
- options for managing stormwater with a view to maintaining the natural flow regime through the wetland are investigated and implemented.
- the possible treatment of other wetland areas in North Gungahlin are investigated to enhance their ecological values.

Fauna

The PA states that the North Gungahlin areas supports a diversity of native fauna species which is largely attributed to the high value habitat contained within the woodland and grassland communities.

The PA provides details about the bird species which have been declared vulnerable or endangered in North Gungahlin under the Nature Conservation Act and the protection measures proposed for these species.

There is some discussion about other bird or general fauna species which may be found in the North Gungahlin area although the PA does not indicate if a comprehensive survey of flora and fauna species has been undertaken as part of this planning study. There is a general statement in the PA that areas of woodland retained around the periphery of and adjacent to North Gungahlin development areas and the proposed open space system will contribute to a network of natural corridors linking habitat areas. It is recommended that:

- detailed flora and fauna surveys are undertaken, where appropriate, at the implementation planning stage for development in North Gungahlin.

Urban Edge Interface

The PA acknowledges that recent bushfires both locally and regionally have demonstrated the potential for such events to occur close to residential areas and recognises the need to consider a range of prevention and management strategies in the design of new residential interface areas.

The PA provides details about the proposed provision of buffer or fire management zones for the urban edge interface zones for North Gungahlin. These zones may range from 60m

to 100m in width depending on adjacent topography and aspect. The PA also provides details of the fire management practices required during the transitional stages of development of North Gungahlin.

The PA has adequately addressed this issue.

6. Community Comments on the Preliminary Assessment

A total of seven (8) public submissions were received as a result of the public notification of the Draft Variation to the Territory Plan (DVP) and the PA. Specific issues raised in these submissions on the PA have been considered below.

Concerns were raised about the loss of high quality Yellow Box-Red Gum Grassy Woodland and other woodland and areas of temperate grassland.

Both the Conservation Council, the Canberra Ornithologists Group (COG) and the Friends of Grassland raised concerns about the loss of approximately 100 hectares of endangered Yellow Box-Red Gum Grassy woodland and other woodland areas in North Gungahlin. COG were concerned that the existing reserve system is inadequate to conserve a declining suite of woodland birds, that further loss of woodland habitat will be detrimental to bird species already under pressure due to loss of habitat and that areas classified as “other woodland” may have high conservation value.

The PA has assessed the impacts of the proposed future development of North Gungahlin on the endangered and other woodland communities in North Gungahlin concluding that areas of very high conservation value woodland identified in Action Plan 10 are to be conserved in the Mulligan’s Flat Nature Reserve and Gooroo to the east and Kinlyside to the west of North Gungahlin. A further 46 hectares of remnant Yellow Box-Red Gum Grassy Woodland will be retained within urban open space within the proposed North Gungahlin area. This is consistent with the recommendations in Action Plan 10 and as stated in the Appendix to the PA that although the Yellow Box-Red Gum Grassy Woodland is listed as an endangered ecological community it will not will not be feasible to preserve it in every place it occurs.

Concerns were raised about the inadequate assessment of flora and fauna, biodiversity and related conservation values.

COG were also concerned that community groups like themselves had not been able to access much of the area currently under leasehold to assess the conservation values of these areas. They were also concerned about the lack of an holistic view to the planning of Gungahlin in relation to its conservation values, particularly as they relate to birds.

While the PA has adequately discussed the impacts of development on the endangered ecological communities and species in the North Gungahlin area and their associated Action Plans, there is only a general discussion about other flora and fauna within the future development area. The PA mentions that the Gungahlin EIS (1989) noted that kangaroos were common and that the red-necked wallaby, wombat and echidna were also present. The EIS also noted the scarcity of information on reptiles and amphibians. There is no indication in the PA whether further surveys of flora and fauna have been undertaken (other than for the endangered communities and species) since the 1989 EIS.

There is a general statement in the PA that areas of woodland retained around the periphery of and adjacent to North Gungahlin development areas and the proposed open space system will contribute to a network of natural corridors linking habitat areas. The PA does not however provide any evidence about whether these corridors will provide any protection for native fauna species.

It is recommended that detailed flora and fauna surveys are undertaken, where appropriate, at the implementation planning stage for development in North Gungahlin and that community groups (such as the Canberra Ornithologists Group) are consulted in any proposed surveys.

Concerns about the protection of the conservation values of the Mulligan's Flat Reserve and the proximity of development in Forde and Bonner to this important conservation area.

Two submissions raised concerns about the proximity of the proposed development in Forde and Bonner to the Mulligan's Flat Nature Reserve and recommended measures to protect the ecological values of the reserve including:

- establishing appropriate fencing and buffers between the reserve and houses
- utilising edge roads
- implementing landscape guidelines for adjacent development to prevent the spread of weeds into the reserve
- introducing cat and dog controls as lease covenants in suburbs adjoining the reserve.

The PA includes a discussion on the proposed mitigation measures to protect the Mulligan's Flat Nature Reserve which includes a proposed 30-60 wide buffer which will fulfil both conservation and fire management requirements. The PA concludes that this buffer area will assist in reducing the potential impacts associated with nearby residential areas.

It is recommended that at the implementation planning stage issues such as appropriate buffer areas, edge street, landscape guidelines and pet controls are further discussed with Environment ACT.

Concerns were raised that the Structure Plan has been released prior to the outcome of the review of Action Plan 10 for Grassy Woodland and the Woodland Conservation Strategy.

The PA acknowledges (in response to comments from the Conservator of Flora and Fauna) that the outcomes of the review of Action Plan 10 (referred to as the Lowland Woodland Strategy) will be considered in finalising the North Gungahlin Structure Plan.

Concerns about the amount of land identified as 'Community Facilities' in the Structure Plan to accommodate future non-Government Schools.

It was considered that a larger proportion of land be identified for the provision of Catholic School sites in accordance with demographic projections and consistent with the proposed development sequence. The sites should be an area of 3.0 to 3.5 hectares for a primary school and 10.0 to 10.5 hectares for a secondary school.

While the PA provides details about the provision of government schools in the North Gungahlin area and the provision of community facilities in general for the future suburbs, there is no assessment of the provision for non-government schools. It is recommended therefore that further discussions are undertaken with the appropriate non-government school organisations to ensure that appropriate provision for future non-government schools is provided in North Gungahlin.

The provision for the Bicentennial National Trail (BNT) in the North Gungahlin Structure Plan is supported.

There was general support in submissions for the realignment of the BNT and equestrian trail into an off-road buffer area around the urban area. An alternative route within the reserve of the north-western side of Gundaroo Road was proposed to improve safety.

There is no discussion in the PA about impacts on the equestrian trails in the North Gungahlin area which is proposed to be accommodated in the road reserve alongside Gundaroo Road then follow the edge of the existing urban development and will move incrementally as the urban edge develops. It is recommended that the final alignment for the BNT along Gundaroo Road is determined in consultation with the relevant ACT and National equestrian groups and Environment ACT.

7. Evaluation of need for further Assessment

Compliance with requirements of the Land Act

The PA prepared for the proposed development has met the requirements of the Land Act in respect to Gazettal and public notification. The PA was prepared in accordance with

Schedule 3 of the Land Act. A copy of the PA was delivered to the Conservation Council of the South-East Region and Canberra (Inc.) as per the requirement in Section 117 of the Land Act.

Resolution: No further assessment is required.

Unresolved issues or impacts identified in the Minister's evaluation which are of sufficient significance to warrant further Assessment.

No outstanding or unresolved issues were identified.

Resolution: No further Assessment is required.

8. Conclusion

From the above technical evaluation it is concluded that the Preliminary Assessment adequately addresses the potential impacts of the proposal on the environment. No further environmental impact assessment is required.

9. Recommendations

It is recommended that:

Sustainable Urban Water Management

- the sustainable urban water management measures identified in the PA for all levels of urban land use be considered as a mandatory requirement for all development in North Gungahlin.

Aboriginal and European Heritage Issues

- the final curtilage for the Horse Park precinct be determined in consultation with the Environment ACT's Heritage Unit.
- as part of the detailed planning, further discussion be undertaken with the Environment ACT's Heritage Unit to ensure goals for in-situ conservation of Aboriginal and historic places within North Gungahlin are achieved.

Schools

- further discussions be undertaken with the appropriate non-government school organisations to ensure that appropriate provision for future non-government schools is provided in North Gungahlin.

Housing Choice

- future development in North Gungahlin consider the recommendations of Housing Affordable Task Force Report (December 2002) and any actions likely to be implemented by the Territory to improve the net increase of affordable housing throughout Canberra.

Air Quality

- a monitoring station be considered for location in Gungahlin so that data be available in the future on which to judge future air quality.

Displaced Activities

- appropriate short-term tenure and land management issues are considered following the finalisation of the North Gungahlin Structure and in consultation with the rural lessees.
- the final alignment for the BNT along Gundaroo Road be determined in consultation with the relevant ACT and National equestrian groups and Environment ACT.

Wetlands

- detailed evaluation of geotechnical and hydraulic investigations of the areas around the wetland be undertaken
- options for managing stormwater with a view to maintaining the natural flow regime through the wetland be investigated and implemented.
- the possible treatment of other wetland areas in North Gungahlin be investigated to enhance their ecological values.

Flora and Fauna

- the outcomes of the review of Action Plan 10 (referred to as the Lowland Woodland Strategy) will be considered in finalising the North Gungahlin Structure Plan.



ACT Government

PLANNING AND LAND MANAGEMENT GROUP
URBAN SERVICES

LAND (PLANNING AND ENVIRONMENT) ACT 1991

**VARIATION TO THE
TERRITORY PLAN**

No.130

North Gungahlin

**(the suburbs of Bonner, Casey, Forde, Jacka,
Moncrieff, Taylor and Part of Amaroo and
Ngunnawal)**

June 2003

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FOREWORD

Aboriginal people have lived in the region now known as the Australian Capital Territory for tens of thousands of years. The European colonisation of Australia disrupted Aboriginal traditional land use and has constrained the association of Aboriginal people with land, to their detriment. The ACT and wider region is still occupied by descendants of the Aboriginal people who lived in this area and places of Aboriginal cultural heritage places provide tangible reminders of their traditional land use.

PALM would like to acknowledge the relationship of Aboriginal people to the lands that are the subject of this Variation to the Territory Plan and the significance of the cultural heritage places that demonstrate traditional Aboriginal land use, to the Aboriginal and wider community.

EXPLANATORY STATEMENT

Note

This document contains references to Planning and Land Management (PALM) which was replaced by a new organisation, ACT Planning and Land Authority (ACTPLA), on 1 July 2003. These references relate to work carried out under the administration of PALM prior to 1 July 2003.

1. Background

Planning for Gungahlin dates back to the 1970s, when the National Capital Development Commission (NCDC) first commissioned surveys of the area. In the 1980s the NCDC continued the planning and in 1988 released a draft plan for Gungahlin for comment, and an accompanying Environmental Impact Statement (EIS) which formed the basis of the original National Capital Plan Map and Territory Plan for Gungahlin. The original Gungahlin Policy Plan was gazetted in 1989. In 1991 when development in Gungahlin began, the plan was amended to include more detailed planning for the suburbs of Amaroo, Casey, Harrison, Ngunnawal and Nicholls. It was amended again in 1992 to provide for the development of the Harcourt Hill estate in the suburb of Nicholls.

Since the introduction of the Territory Plan in October 1993, two major variations in Gungahlin have been gazetted. The Mulligans Flat Variation (Number 15, 1994) significantly expanded the Nature Reserve, and the Gungahlin Town Centre and Central Area Variation (Number 53, 1995), in response to the discovery of the Striped Legless Lizard (*Delma impar*), substantially altered the original plan for the town centre in both its location and development as an urban village.

Further work has also occurred, through the preparation of Action Plans, to protect and manage threatened species and ecological communities declared under the *Nature Conservation Act 1980*. Action Plans that are relevant to the area subject to this Variation have been developed for Natural Temperate Grassland, the Yellow Box-Red Gum Grassy Woodland (YBRG), and species including the Golden Sun Moth and several birds. The locations of these communities and species are recognised in the planning for this area.

Since the release of the draft Variation, Environment ACT has completed a review of Action Plan 10 (Yellow Box/Red Gum Grassy Woodland). This review takes into account significant areas of Yellow Box/Red Gum Grassy Woodland requiring further study at Gooroo (East Gungahlin) and Kinlyside, both adjacent to the area subject to this Variation. The outcomes of this study are part of a draft ACT Lowland Woodland Conservation Strategy (Action Plan 27). The outcomes of this review have been taken into consideration in finalising the North Gungahlin Structure Plan and the principles and policies are consistent with the draft Lowland Woodland Conservation Strategy.

Changes in trends for urban management and a growing emphasis on principles of sustainable development have also impacted on initial planning. These include the development of alternative approaches to urban water management and the co-location of community facilities, incorporation of Aboriginal and European heritage and the location of retail centres as a result of changing shopping trends.

Canberra's population growth in greenfield developments over the next 15 to 20 years will be concentrated in Gungahlin. The Gungahlin Development Sequence (April 2000) provided an agreed order for development to occur in Gungahlin, to guide decisions about a wide range of infrastructure and support services, many of which require a lead-time of several years. Now under review, the sequence focuses development for the foreseeable future (based on current growth rates) in the Ginninderra Creek catchment and ensures that effective use will be made of the major existing investment in schools, roads, stormwater and other infrastructure networks.

The Gungahlin community will continue to evolve as new technologies and trends emerge. In response to these changes, and those outlined above the government has undertaken a review of the existing planning for the undeveloped northern areas of Gungahlin to ensure that development now will be appropriate for the future.

2. North Gungahlin Structure Plan (the Structure Plan)

This Variation revises the planning for the northern, undeveloped area of Gungahlin in response to the Gungahlin Structure Plan. This revision is necessary due to changes in approaches to urban management and government policies, the relocation of the Gungahlin Town Centre, and a better understanding of cultural heritage and ecological issues.

The Structure Plan covers an area of approximately 1,500 hectares, located predominantly north of the existing established area of Gungahlin. The furthest point of residential development is approximately 15 kilometres from Civic and 5 kilometres from the Gungahlin Town Centre. The Structure Plan confirms the planning for the remaining undeveloped areas of the existing suburbs Amaroo and Ngunnawal and introduces a revised structure for six additional suburbs. It is anticipated that these suburbs will provide around 14,100 dwellings, accommodating approximately 34,500 persons when fully developed.

The Structure Plan establishes a robust and flexible framework of objectives, principles and land use policies to guide the continuing development of the area within the context of sustainable development. One of the primary objectives of the Structure Plan is to ensure that the development of North Gungahlin incorporates sustainability principles including

ecological, social, cultural and economic considerations. Ecological studies have played a major role in the planning of Gungahlin from its initial stages. As ecological knowledge has expanded there have been significant changes to the planning of Gungahlin, including the establishment and expansion of the Mulligans Flat Nature Reserve at Forde and the relocation and redesign of the town centre to conserve native grassland habitat.

Whilst the planning principles and policies recognise the importance of conservation of native grasslands and grassy woodlands, it will not be feasible to preserve remnants of endangered communities in every place they occur. Retention of remnants in urban areas may only occasionally be realistic when considering urban development and infrastructure requirements against the size, ecological quality and connectivity of grassland and woodland remnants. Sites of Aboriginal and European cultural heritage significance, including the Horse Park precinct and Gundaroo Road are identified and conserved within the urban fabric.

The Structure Plan aims to provide for an accessible and efficient public transport system. The proposed commercial centres contain the highest residential densities with further medium density housing areas located within easy walking distance of public transport services. The pedestrian and cycle networks will establish effective links between residential areas, schools, neighbourhood centres, recreational resources and public transport networks.

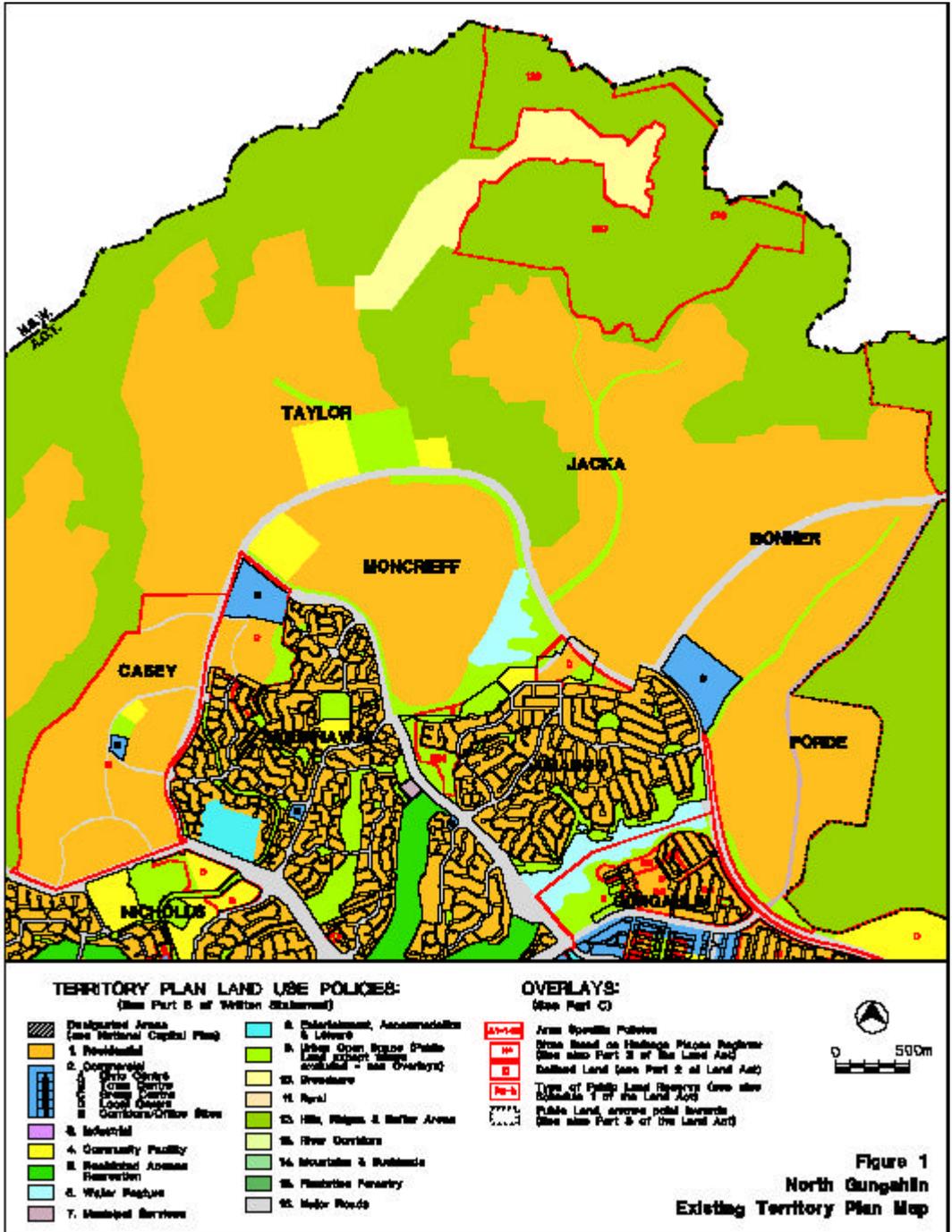
As a result of changing community profiles and attitudes with a greater emphasis on home based care, the Structure Plan identifies community facility sites in each neighbourhood, with further sites potentially available in commercial centres.

Sustainable urban water management design principles are to be adopted for the development of North Gungahlin. The principal objective is to secure economic, social and environmental benefits of integrated 'water in the landscape' (including water sensitive urban design techniques) and 'total water cycle' based designs to achieve a better balance of water across the landscape, at the block, neighbourhood, district and catchment levels. Adoption of these principles by the Structure Plan will improve water quality in receiving waters, enhance ecological values and amenity, reduce potable water demand, and potentially provide long term cost savings.

The Structure Plan places a great deal of emphasis on the design of suburbs and neighbourhoods, which are intended to foster a strong sense of community among residents. Each suburb has a centre, which includes a local centre, an area of mixed uses, medium density residential developments and in the case of Bonner, Jacka and Taylor, a primary school. To provide access to these facilities the fundamental determinant in the suburb design process is a 400m unit of walking distance or approximately 5 minute walk from local centres.

Groups of suburbs will focus on group centres, while the whole urban area is designed to focus on the Gungahlin Town Centre. The Structure Plan provides for 3 group centre sites, 5 local centres, one new high school and at least 3 new primary schools.

The open space network is designed to incorporate a system of natural floodways and, where possible, a representative range of woodlands and grasslands as well as significant Aboriginal and European heritage sites. The open space system is responsive to topography and other natural and cultural features.



3. Changes to the Territory Plan Map

The Variation redefines the basic land use policy framework of the existing Territory Plan as shown on Figure 1 and introduces a greater level of detail. Detailed planning and the landscape characteristics of the site generate a series of suburbs divided by major transport routes or open space corridors incorporating ridgelines, natural drainage lines and other significant landscape, ecological and heritage features. Mirrabei Drive, a major north-south arterial, is realigned and the collector road network identified. The Variation reflects the recommendations of engineering studies on stormwater management by replacing a single large pond with a series of smaller water quality and retardation ponds. The location of major commercial and community facilities is revised and new sites are identified for local facilities. The urban edge is further redefined together with the Hill Ridges and Buffer Area boundary. The area is covered by a Defined Land Overlay (see Section 5) to enable further refinement during later detailed planning stages.

The principal planning philosophy supporting the Variation is to provide a sustainable base for the integration of the natural and human settings. The natural environment is therefore better protected and integrated with the layout of the individual suburbs. The urban environment is rearranged to provide stronger focal points for the community to use, and at the same time more intensely developed uses are sited to encourage use of public transport.

The planning principles and policies for the broad structure are that:

- development should encourage an environment that facilitates sustainability in terms of ecological, cultural, social and economic considerations;
- the landscape setting and values of the site should be recognised and enhanced. Existing significant landscape features will be retained;
- the local neighbourhood should be based on a walkable radius of 400m, and focussed on an activity node such as a basic unit of open space (such as a park and potential community facility);
- residential areas should be based on a series of inter-connected suburbs (each generally containing 3 or 4 neighbourhoods) with their own local centre, typically adjoining a primary school site and open space corridor;
- mixed and multiple uses will be permitted at all levels of the urban structure;
- group centres serving larger populations should be well located on major roads in order to serve a cluster of suburbs to ensure the long term viability of the centre;
- an integrated cycling route network should be created within and between communities consistent with national standards;
- the open space system should form a continuous web of spaces that contains a sequence of destinations eg. centres, schools, parks, community facilities, ovals, ponds and hilltop lookouts;
- the road hierarchy should be clearly legible and provide good and safe access to all users and encourage high levels of public transport usage;

- the links between sustainable urban water management and downstream ecological impacts on flora and fauna, both through the direct impact of altered flow regimes caused by urban development and through water quality impacts partially driven by these altered flow regimes should be recognised. Appropriate sustainable urban water management measures will be adopted to protect downstream ecology; and
- Aboriginal and historic heritage place will be recognised and significant sites conserved in public open space where appropriate.

The changes to the Territory Plan Map are detailed at Attachment A of the Variation. These changes reflect the various elements of the Structure Plan.

Following the Variation process, further detailed planning will be undertaken. This detailed planning could take the form of Concept Plans, Development Control Plans, Estate Development Plans and Implementation Plans, consistent with existing land use policies, design and siting codes and any relevant principles and policies for Defined Land. Other areas, notably the plans for Commercial Centres, major public open space and conservation areas, may require the preparation of Centre Master Plans and related Land Management Plans respectively.

3.1 Residential Areas

The residential areas further refine the boundary between the natural landscape setting and urban development, and closely correspond to the current Territory Plan boundary. There are six new suburbs, Bonner, Casey, Forde, Jacka, Moncrieff, and Taylor, which are incorporated in the Residential Land Use Policy. The basic structure of each suburb is characterised by the following elements:

- a neighbourhood or local centre, which typically incorporates a small group of buildings (retail/commercial) together with a park and/or site for community facilities;
- a linear open space network based primarily on drainage lines, incorporating pedestrian paths and cycleways;
- a clearly articulated road hierarchy where the engineering design and landscape treatment reflect the proposed traffic function of each street;
- local parks sited in locations that conserve natural or cultural heritage features wherever possible;
- defined local bus routes with bus stops within 500m of at least 95% of dwellings; and
- housing choice with increased densities close to major nodes and transport corridors.

The Structure Plan proposes a mixture of housing types with increased densities close to activity nodes, such as group centres and local centres. It is estimated that this will comprise around 20% of the total housing yield. In these areas the Structure Plan proposes to apply the Residential B8 and B9 Area Specific Policies. PALM has recently undertaken a review of these policies to assess their relevance in light of more recent developments in the Gungahlin Town Centre and proposed development in North Gungahlin. The proposed changes to the B8 and B9 policies are described at Section 4, (Proposed Changes to the Territory Plan Written Statement) and detailed at Attachment A, Part 2.

3.2 Shopping Centres

The Structure Plan proposes three group centres, at Casey, Moncrieff (Mirrabee) and Amaroo, and five local centres at Bonner, Casey, Forde, Jacka and Taylor. The retail structure is consistent with the BIS Retail Study released in early 1999 and the outcomes of community consultation processes.

The group centre developments will be carefully planned, being aligned with the staged development of Gungahlin. Centre sizes will be reviewed close to the time of their release, but will generally vary in site area from 4,000m² to 10,000m². Effective pedestrian and bicycle access will be integrated with their development, as will strong public transport links.

The group centres will act as 'nodes' for employment, retailing, community and entertainment facilities and will provide a focal point for several suburbs. Each of the group centres will incorporate significant opportunities for the co-location of 'urban housing' ie. higher density multi-unit residential developments so that an effective mixed use character can be established. The residential land use policy of sites closest to the retail core will permit a vertical mix of commercial and residential uses.

The five local centres aim to provide convenience shopping with 'mixed use' characteristics within walking distance of the adjoining residential areas. These centres will be designed to be flexible to accommodate the changes in community demands over time. Local centres will also be supported by concentrations of medium density housing which will foster the 'mixed use' characteristics of the precinct.

3.3 Community Facilities

The Structure Plan identifies community facility sites throughout the new suburbs, introducing a greater level of detail in terms of their location. Most community facility sites are located close to commercial centres thus providing good access to public transport, open space, and schools, and facilitating a sense of community.

Current site identification is based on estimated demand at the time of structure planning. Detailed facilities planning and provision is based on estimated demand and demographic characteristics before and during the development of an area.

The location and distribution of facilities with specialised siting requirements and large land take, such as schools, need to be refined prior to more detailed planning. Changing community needs will affect the number and types of facilities required, resulting in the need for planning to retain a degree of flexibility. Sites for government primary schools are identified at Bonner, Jacka and Taylor. The site at Taylor is co-located with a government high school. A further site is set aside for a possible education facility (college) at Moncrieff.

In addition to intended school sites, other possible community facility sites are identified within the open space system for community facilities requiring a smaller land take, such as churches, scout halls and community halls. Demonstrated demand for the development of these sites will be established in later detailed planning stages.

3.4 Open Space and Hills Ridges and Buffer Areas

The Structure Plan emphasises the importance of urban open space as a structural element, contributing to sustainability as well as providing a recreational resource and visual amenity for the future residents of North Gungahlin. The 'web' of open space defines, and gives identity to, each of the six North Gungahlin suburbs as well as meeting traditional open space needs.

The resultant linear open space system shown on the Structure Plan is designed not only to protect the natural drainage system and major ridgelines, but also to create the opportunity for a comprehensive off-road movement system suitable for pedestrian, cycle and, to a lesser extent, equestrian users. A further important feature of the open space system is that it connects local centres, group centres and bus routes to optimise land use relationships and to encourage multi-purpose trips.

Within the suburb of Jacka, the Horse Park Homestead and Wetlands area is to be retained and protected in the urban open space system, and will be subject to specific planning policies and management practices. The area includes cultural and heritage values associated with both European and Aboriginal occupation. The wetlands are identified as an area of high aquatic ecosystem value and provide habitat for Latham's Snipe, a species subject to international migratory bird agreements.

In Forde the open space system reflects the cultural heritage significance of the Gundaroo Road, with the alignment being retained and utilised as an open space corridor. A former road alignment adjacent to Horse Park Drive near Casey, encompasses areas of Yellow Box/Red Gum woodland which is also being retained within urban open space.

Adjustments will also be made to the boundary of the Hills, Ridges and Buffer Policy Areas to reflect more detailed planning and facilitate urban edge management, including consideration of bushfire hazard reduction. Such fire mitigating measures would be reflected in a fire management plan prepared by the relevant land manager.

The Structure Plan also identifies a more comprehensive and sustainable urban stormwater management system, where overland stormwater and flood movements are accommodated predominantly in road reservations and within the web of open space.

3.5 Natural Resources

The principles and policies of the North Gungahlin Structure Plan and the Variation have been reviewed following the recent release of the draft ACT Lowland Woodlands Conservation Strategy for the conservation of woodland communities. They were found to be consistent in their approach to conservation and management of native vegetation and associated species. The North Gungahlin area contains a large component of remnant native vegetation that varies in terms of its ecological integrity, depending on the nature of previous land uses. The value of the area for wildlife depends to a significant degree on this previous land use history, and current land uses.

The ACT Flora and Fauna Committee, established under the *Nature Conservation Act 1980* is responsible for assessing the conservation status of flora and fauna in the ACT, and the ecological significance of potentially threatening processes. Where in its opinion a species

or community is under threat, a recommendation for declaration is made, and if adopted, an Action Plan is prepared in response by the Conservator of Flora and Fauna. An Action Plan includes proposals for the identification, protection and survival of a threatened species or community.

Action plans 10 and 15-20 are the subject of assessment in the draft ACT Lowland Woodland Conservation Strategy. All Action Plans were reviewed to determine the extent of recorded information and conservation recommendations for endangered communities or vulnerable/threatened species in the ACT, and the following were found to be relevant to the North Gungahlin Structure Plan:

Action Plan No. 1	Natural Temperate Grassland
Action Plan No. 7	Golden Sun Moth (<i>Synemon plana</i>)
Action Plan No. 10	Yellow Box/Red Gum Grassy Woodland
Action Plan No. 15	Hooded Robin (<i>Melanodryas cucullata</i>)
Action Plan No. 16	Swift Parrot (<i>Lathamus discolor</i>)
Action Plan No. 17	Superb Parrot (<i>Polytelis swainsonii</i>)
Action Plan No. 18	Brown Treecreeper (<i>Climacteris picumnus</i>)
Action Plan No. 20	Regent Honeyeater (<i>Xanthomyza phryga</i>)

In order to provide for balanced planning outcomes, it is not feasible to preserve all ecological elements. However, the ACT planning process allows flexibility in its approach to accommodate conservation imperatives outlined in Action Plans prepared under the *Nature Conservation Act (1980)*. These plans indicate that some natural features are not proposed to be protected in full but elements could be considered for incorporation into the urban fabric as part of the detailed planning process.

This principle is implemented in the planning for the North Gungahlin Structure Plan where ecological assets, including the Horse Park Wetland, some remnant patches of Yellow Box/Red Gum woodland such as the eucalypt arcade in Casey and some areas of Natural Temperate Grassland will be maintained and protected within open space and parks. These outcomes demonstrate that protection of the environment plays an important role in planning in the ACT and will be continued through the implementation of the North Gungahlin Structure Plan area and subsequent stages of the detailed planning process.

Yellow Box/Red Gum Grassy Woodland

The most significant of the woodland communities in the ACT, the Yellow Box/Red Gum (YBRG) Grassy Woodland community occurs throughout the ACT. Declaration of this ecological community as endangered in May 1997 emphasised the significance of the woodland community locally and its role in the provision of habitat for a variety of common and vulnerable animal and bird species. Very high conservation value woodland areas identified by Action Plan No. 10 and the subsequent draft Lowland Woodland Conservation Strategy (LWCS) are located in the Mulligans Flat Nature Reserve and Gooroo to the east, and Kinlyside to the west, of North Gungahlin. Smaller remnant patches (totalling 147 ha) of high conservation value woodland are identified in areas proposed for future urban development in North Gungahlin.

Adjoining the eastern boundary of Forde, an area of very high and high conservation value woodland is identified in Action Plan No.10 and the draft LWCS. 19 ha of this woodland have now been incorporated into Mulligans Flat Nature Reserve under Variation to the Territory

Plan No. 182. The North Gungahlin Structure Plan takes this into account by modifying the structure of the proposed future suburb of Forde and incorporates planning principles and policies to address the buffer area between the future urban area of Forde and the Nature Reserve. The remaining woodland in Forde will not be retained as a woodland community, however high value individual trees and stands of trees capable of being incorporated into the urban fabric will be retained in open space.

Several remnant patches of high and moderate conservation value YBRG grassy woodland are located within the North Gungahlin area. The distribution of these remnant patches within the Structure Plan, and the proposed future management options for these areas within the urban fabric are summarised in the tables below.

Distribution of Yellow Box/Red Gum Grassy Woodland – North Gungahlin

North Gungahlin Suburbs	Area of Remnant YBRG by suburb (ha)	Proposed result for remaining woodland	
		Included within urban open space (ha)	May be incorporated into urban fabric subject to later & more detailed planning processes (ha)
Forde*	43.3	10.3	33
Bonner	60.1	19.2	40.9
Jacka	14.6	2.5	12.1
Moncrieff	10	3.2	6.8
Casey	19	18	1
TOTAL	147 100%	53.2 36%	93.8** 64%

Note:

Areas of YBRG stated, are polygon areas ie areas around individual trees or groups. The density of trees within these polygons could vary.

*An additional 19ha area was recently removed from Forde and incorporated into the Mulligans Flat Nature Reserve under Variation No. 182 to the Territory Plan, August 2002.

**Individual trees and stands of trees will be incorporated into the urban area as appropriate.

Distribution of Yellow Box/Red Gum Grassy Woodland – Gungahlin District

Gungahlin District Areas (see Fig 12)	TOTAL AREA OF YBRG WOODLAND (HA)	Future management options for YBRG community
Mulligans Flat Nature Reserve	362 ha	362 ha retained in Reserve (includes 19ha from DVP182)
Gooroo	648 ha	570 ha subject to assessment as part of 2002 review of Action Plan 10 and planning studies
Kinlyside	251	251 ha subject to assessment as part of 2002 review of Action Plan 10 and planning studies
North Gungahlin	147	93.8ha incorporated into urban fabric 53.2ha included within urban open space
TOTAL	1408 ha (100%)	

ACT SCALE

Total Area YBRGGW = 7888 ha (100%)

North Gungahlin area affected = 93.8 ha (1.2%)

Note : Areas of YBRG stated, are polygon areas ie areas around individual trees or groups. The density of trees within these polygons could vary.

Retention of remnant patches as viable ecological communities within a matrix of urban development is unlikely as they are small, fragmented and subject to competing land use pressures. It is not proposed to retain remnant patches as viable examples of their vegetation type within the areas of urban development. Later more detailed planning will look at options for incorporating the trees into the urban fabric where possible. Action Plan 10 states that some of these areas may be included in urban parks, roadside reserves or as part of the landscape setting for community purposes. Opportunities to retain and enhance groups of trees may also occur where areas of open space associated with natural creek corridors and internal ridgelines between the suburbs proposed by the Structure Plan co-incide with the location of these remnant areas. Individual trees identified as having ecological value by surveys for the detailed suburb planning will be protected to the extent possible by mechanisms such as incorporation within the urban fabric. These trees may be eligible for protection under the ACT's tree protection legislation when development occurs and leases are issued.

Planning proposals contained in the North Gungahlin Structure Plan have been developed in consultation with Environment ACT. They take account of the information contained within the recently released draft ACT Lowland Woodland Conservation Strategy (LWCS) (specifically Section 5.4 Gungahlin Woodland Complex). A key objective of this Strategy is to establish a comprehensive, adequate and representative system of reserves and other woodland areas protected for their conservation value.

The draft LWCS concluded that significant conservation gains can be made, by avoiding greenfield development in areas containing large areas of Yellow Box/Red Gum woodland. In its initial response to the draft LWCS, the Government has announced that about 750Ha of Yellow Box/Red Gum and other lowland woodland types in the Gooroo area will be protected in a new Nature Reserve. This area includes land that was originally scheduled for development as parts of new suburbs for Gungahlin. It contains woodland in good ecological condition, which forms a major link between Mulligans Flat and Majura Nature Reserves and retains habitat suitable for vulnerable woodland birds including the Hooded Robin and Brown Treecreeper (Vulnerable species).

It is intended, where appropriate, to incorporate suitable trees and stands of trees into the urban fabric of the proposed North Gungahlin suburbs. Detailed planning for Forde has identified three groups of mature Yellow Box/Red Gum trees that will be protected within urban open space areas. This will result in some habitat elements being retained for native fauna tolerant of urban environments. An additional 19ha of Yellow Box/Red Gum Grassy Woodland was added to the Mulligans Flat Nature Reserve as a result of DVP 182 in April 2002.

Other woodlands

Both botanical and ecological values are also attributed to other woodland communities, primarily for wildlife habitat and wildlife corridors. North Gungahlin contains areas of regenerating woodland that are of potentially high conservation value in the context of the ecological resources of the ACT and the local area. The proposed urban development will impact on these other woodland communities.

The North Gungahlin Structure Plan limits development on the higher slopes, and considered the presence woodlands in the design and location of the outer edge of urban development. The Structure Plan retains the woodland communities to the north as a continuous native woodland corridor in the Hills, Ridges and Buffer areas land use policy of the Territory Plan, and NCOSS under the National Capital Plan.

The scattered nature of small, fragmented woodland areas across the lower slopes of the study area makes their integration and/or conservation as isolated communities within the urban fabric virtually impossible. However, it is anticipated that there will be trees that have individual value independent of their role in a forest or woodland ecosystem ie trees with particularly good nesting hollows. A tree survey conducted during the detailed planning stage for each suburb will identify trees with high ecological values. Further design work at the detailed planning stage will then offer feasible retention and protection options for these trees within the urban area, such as incorporation in small parks, village centres and road reserves. These trees also may be eligible for protection under the ACT's tree protection legislation when development occurs and leases are issued.

Forestry Plantation

The plantation area to the north of the urban development area of North Gungahlin was established for the production and supply of fuelwood for the ACT. The eucalypt plantings have been in place for over 20 years, during which time they have matured sufficiently to integrate with the existing native woodland vegetation in that location, to form a modified woodland community, to which some ecological and landscape value can now be attributed.

The implementation of the North Gungahlin Structure Plan will not have any impact on this plantation. Future harvesting for fuelwood is unlikely to occur. As a result it will be allowed to mature and contribute to the continuous woodland corridor skirting the north of the ACT along the NSW border. The decision not to harvest the plantation to provide a supply of fuelwood to the ACT is also consistent with current initiatives aimed at the reduction of the use of fuelwood appliances, to prevent deterioration in air quality over the ACT.

Individual trees and stands of trees within the areas of forward tree plantation in Jacka and Taylor are to be incorporated into the urban fabric where practicable for landscape purposes.

Natural Temperate Grassland

Due to its pastoral history, very little of the native grassland community thought to have existed in the Gungahlin area now remains. Declaration of the Natural Temperate Grassland as an endangered ecological community in April 1996 recognised the decline in the distribution of the grassland community and its changing composition as a result of land use history. Action Plan 1 in its recognition of the decline of this community identified several areas of natural temperate grassland in the Gungahlin District, three of which are protected in reserves to the south of the North Gungahlin Structure Plan area (Mulanggarri, Gungahlin and Crace Nature Reserves). The Action Plan assessed the area of grassland identified in the North Gungahlin area as having moderate to low botanical significance. As other better examples of higher order grassland are reserved in the Gungahlin area, not all of the grassland in North Gungahlin will be retained, though parts may be kept as landscaped feature elements within the urban fabric.

Development of the proposed future suburb of Bonner will impact on Grassland Action Plan Site No.1. The Action Plan has assigned a moderate botanical significance rating to the 10.3 ha *Wet Themeda* component of this grassland, and a low conservation value to the remaining 21.8 ha *Danthonia* grassland. The Structure Plan does not propose to retain the entire grassland area although parts may feature as landscape elements within the urban fabric such as within areas of open space associated with natural drainage lines, internal ridgelines and/or local parks. Further consideration of these options will occur at later detailed planning stages.

Parts of the grasslands are habitat for an uncommon plant species, the Emu Foot *Cullen tenax*. The species has also been recorded at a site on the eastern side of Gundaroo Rd in the proposed urban areas of Forde. Further investigations of the Forde location by Environment ACT have shown that there are only a few plants in a very degraded site. Environment ACT has advised that the site is not worthy of retention nor is translocation of the few plants from this location. Further consideration of this species in the Bonner area will be required in conjunction with Environment ACT at the detailed planning stage to determine future management options.

Wetlands

The Horse Park Wetland is identified as the most significant wetland within the North Gungahlin area, and in the Gungahlin District. The significance of its cultural and ecological values is demonstrated by its listing as part of the Horse Park precinct on the Register of the National Estate, inclusion in "A Directory of Important Wetlands in Australia", classification by the National Trust of Australia (ACT) and nomination for listing on the ACT Heritage Register.

The *Directory of Important Wetlands in Australia* noted the potential threat to the Horse Park wetlands from suburban development, and that it needed to be carefully managed to minimise impacts on the hydrology of the site. Potential impacts on the population of Latham's Snipe by domestic pets was also noted.

The Structure Plan proposes to protect the wetland by including it within a substantial area of Urban Open Space (generally incorporating the curtilage boundaries identified by the Register of the National Estate listing for the wetland) which will be subject to specific planning policies and management practices. At the detailed planning stage, further consideration of sensitive edge development, access options and future permissible uses for passive recreation will be undertaken.

The conservation of this wetland within an urban environment depends not only on its physical protection, but also on regulating the flow and quality of water flowing into it from future urban development. Options for managing stormwater with a view to maintaining the natural flow regime through the wetland will require further investigation. A decision on the appropriate action will depend on detailed evaluation of geotechnical and hydraulic investigations of the areas around the wetland.

Other wetland and aquatic ecosystem habitat occurs through drainage lines in the North Gungahlin area. The possible treatment of these areas to enhance their ecological values, consistent with the principles of sustainable urban stormwater management, will be subject to further investigation during later detailed planning stages in the land development process.

Wildlife

North Gungahlin and the surrounding region support a diversity of native mammals, birds, reptiles and invertebrates. The presence of many of these species in the area can largely be attributed to high value habitat contained within the various types of woodland and grassland communities found throughout the region.

Action Plans have been prepared for the ecological communities and species listed as threatened in the ACT and several of these items occur in the North Gungahlin area. Earlier in this section, Action Plans for YBRG Grassy Woodland community and Natural Temperate Grassland communities were discussed, including Structure Plan proposals for the incorporation of elements of these communities in the future development. Coupled with the existing reservation of large tracts of the YBRG Grassy Woodland community in the Mulligans Flat Nature Reserve, high quality habitat beneficial to their associated fauna species will be retained elsewhere.

Five bird species, declared as either vulnerable or endangered, which are known to occur in the North Gungahlin area, are the subject of Action Plan No.s 15 to 18 and 20. For each of the identified species, their distribution occurs predominantly in and around the Mulligans Flat Nature Reserve, and in some instances the Gungahlin District, including the Village of Hall and its environs. The major habitat for these bird species is the YBRG grassy woodland, and the retention of large tracts in the Mulligans Flat Nature Reserve and the adjoining area of Gooroo will create one of the largest areas of protected endangered communities of this type in the region, making a substantial contribution towards the achievement of the Action Plan conservation objectives for these threatened bird species.

In addition to the areas of woodland retained around the periphery of and adjacent to the North Gungahlin development area, the proposed 'web' of open space throughout North Gungahlin will also contribute to a network of natural corridors, linking key areas of habitat within the urban fabric to these peripheral areas. Principles and policies are included in the Structure Plan to address the management of the buffer areas between the proposed future suburbs and the Nature Reserve.

While it may not be feasible to preserve the entire ecological community within the urban fabric, the habitat value of individual trees and stands of trees, and their landscape amenity value will be retained. Additional habitat resources for some bird species can be expected in the longer term from native gardens established by new residents.

As discussed in the wetlands section above, a substantial area incorporating the Horse Park wetlands is to be placed into Urban Open Space as public land with specific management requirements. This action, in part, responds to the habitat value of the wetlands for the migratory Latham's Snipe, and recognition of the importance of retaining this wetland habitat within the future North Gungahlin development area. The large curtilage area retained will assist to prevent intrusion of the wetlands by domestic pets from the surrounding areas.

The wetland will also provide habitat for several of the frog species known to occur in North Gungahlin. The Structure Plan proposes to retain the creeks and corridors to minimise change within the urban fabric in their natural location, where possible, assisting ecological connectivity through the urban area. Several off-line ponds proposed by the Structure Plan to contribute to the management of stormwater may also contain some alternative habitat value for frogs and other species in place of farm dams, removed as the development front progresses.

The endangered Golden Sun Moth (Action Plan No. 7) has been recorded at Mulligans Flat North, in the hills, ridges and buffer area north of the proposed North Gungahlin urban area. This area is already contained in the Mulligans Flat Nature Reserve, on the northern side of Gundaroo Road. The Structure Plan does not propose any disturbance or development of this area.

Mulligans Flat Nature Reserve provides a refuge and habitat for the known reptile species that occur in North Gungahlin. The potential impact of the Structure Plan on these species outside the Nature Reserve due to habitat disturbance and destruction will be significant given previous experience with land development. In addition, there is not a strong tolerance to many reptile species, particularly snakes, by residents in urban areas, so retention or improvement of remnant habitat areas by residents, such as occurs for birds, is unlikely to occur.

3.6 Urban Edge Interface

To ensure that the level of risk from the threat of bushfire is reduced at the interface with the new suburbs, the Structure Plan recognises provision for buffer or fire management zones extending into the Hills Ridges and Buffer areas of the Territory Plan to create a fuel load modified area between the residential and bushland areas. These zones may range in width, depending on adjacent topography and aspect. In addition to their function for fire management, these zones will also contain a service corridor that may include infrastructure

services, access tracks for land management purposes, recreation trails, and catch drains for water management purposes in accordance with the Urban Edge Zone section of the Canberra Landscape Guidelines.

The Hills Ridges and Buffers land use area boundaries are adjusted at the suburb interface to reflect more detailed planning and consideration of topographic features surrounding and within the new suburbs. Whether the interfaces are permanent or in transition, (ie the interface is only temporary due to further development) they will require different management applications to mitigate the impact of bushfires on the immediate community. These adjustments will continue to be made during later detailed planning stages.

Bushfire Mitigation

As a general rule, protecting the community from bushfire impacts requires the integration of four major policy strategies, of which land use planning and urban design may be addressed through the Structure Plan. An objective of bushfire mitigation in planning is to ensure that the level of fire risk is reduced and the level of fire protection is improved at interface areas. Key issues to be considered in planning to achieve this objective include:

- Consideration of topographic features
- Inclusion of a bushfire protection zone within buffer zones
- Landscape design and vegetation type
- Road design and location that ensures multiple safe access and egress points for fire fighting and evacuation,
- Water requirements, ensuring a sufficient supply at the interface and
- Design and siting of buildings.

The urban edge design and management will be consistent with vulnerability assessment, based on topographic features, fuel loads, prevailing climatic conditions and key planning considerations as listed above.

Mulligans Flat Nature Reserve

To fulfil this important conservation requirement, the proposed buffer area for the urban interface between Forde and Bonner with the Mulligans Flat Nature Reserve will contain several elements to create an overall zone that is managed primarily for bushfire protection but endeavours to maintain conservation values where compatible. The zone will include a fenced area within the standard buffer between the urban area and Nature Reserve. This will create a higher maintenance conservation management area within the buffer area. This conservation management area will assist in reducing the potential impacts associated with nearby residential areas including the incursion of weeds, predation by domestic pets, dumping of rubbish, inappropriate access and removal of plants/timber. This buffer will also form part of the fire management zone, similar to that described earlier in this section between residential areas and Hills Ridges and Buffer land use areas or the Nature Reserve.

Equestrian Trails

An off-road trail for equestrian and other uses is intended to follow the urban edge. It will link the existing National Trail entering the ACT from NSW along Gundaroo Road, with the existing trail, showground and horse facilities at Hall to the west of North Gungahlin. It will require the widening of the road reserve alongside Gundaroo Road where it passes adjacent to the Nature Reserve to accommodate the parallel trail, then follows the edge of the existing urban development and will move incrementally as the urban edge develops.

This urban edge trail will function both as a local equestrian trail and as a section of the National Trail. Future planning studies will investigate opportunities for further development of recreation/equestrian trails in North Gungahlin, including the possibility of trails extending into the Hills, Ridges and Buffer areas.

3.7 Transport Network

The transport network is comprehensive, including roads, an inter-town public transport route (IPT), local bus routes, cycle ways and pathways. The road network has been established using a range of road types including arterial, boulevard, avenue, local road, minor road and laneways. A feature of the boulevards is the provision of service roads, which allow for residential frontage but not necessarily access to these key roads. They will also contain continuous verge planting, footpaths and trunk cycle paths. Avenues are a smaller version of boulevards, without the service roads and catering to a lower vehicle capacity. The collector road network is designed to maximise public transport usage, with the pedestrian and cycle network linking residential areas with schools, commercial centres and recreational resources. Generally roads of collector status and above are shown on the Structure Plan.

Of the two key roads for the North Gungahlin area, Horse Park Drive provides the trunk route in and out of the area. It protects existing and planned urban areas from traffic infiltration and directs traffic to destinations outside of Gungahlin. Horse Park Drive is supplemented by Mirrabai Drive, which provides the direct connection from the northern areas of Gungahlin to the Town Centre. Both the alignments of Horse Park and Mirrabai Drives are slightly changed to reflect the new structure.

The Gungahlin IPT is a major public transport corridor, which runs along Flemington Road, through the Town Centre to Mirrabai Drive, and terminates at the Moncrieff Group Centre.

The collector road network is designed to encourage greater public transport usage and supplement the ITP system. The road network satisfies the ACTION criteria, by requiring 90% of dwellings to be located within 400m of a bus route and 95% of dwellings to be within 500m of a potential bus stop.

An extensive off-road equestrian/recreation and cycle network is proposed, as part of the open space system, to serve the Town Centre, schools and other activity nodes. An off-road network will also be provided serving main employment centres and connections to the ITP route.

3.8 Stormwater Management

Recent research and a better understanding of catchment land use and management practices since the initial planning of Gungahlin, has identified more sustainable management practices that improve water quality in receiving waters, enhance ecological values and amenity, reduce potable water demand, and potentially provide long term cost savings.

Sustainable urban water management design principles are to be adopted for the development of North Gungahlin. The principal objective is to secure economic, social and environmental benefits of integrated 'water in the landscape' (including water sensitive design techniques) and 'total water cycle' based designs to achieve a balance of water across the landscape, at the block, neighbourhood, district and catchment levels.

The Structure Plan incorporates a more comprehensive stormwater system, where overland stormwater and flood movements are accommodated mainly in the proposed web of urban open space. The proposal for a linked park system allows for a number of other goals to be achieved in addition to management of stormwater, including provision for off road bicycle paths and walking trails, and the provision of wildlife corridors. This is consistent with current thinking where stormwater is now regarded as a major resource rather than a problem to be exported as quickly as possible.

The stormwater strategy embodied in the Structure Plan also allows the opportunity for smaller ponds to be constructed as shown on the Structure Plan Map (See **Figure 2**). These are capable of being designed with a more natural appearance than the larger ponds, and for water quality reasons will be constructed “off-line”, ie to the side of the creek rather than on the line of the creek (such as the facility on David Street in Turner). Their benefits are related to the establishment of water features and habitats within the open space system, as well as assisting with stormwater management.

The proposed large water quality control pond between Amaroo and Moncrieff is replaced by a series of smaller, localised ponds further upstream. A small pond will still be required together with a dry retardation basin for flood management purposes. It is proposed, as a secondary use, that the district playing fields associated with the proposed Amaroo High School be located within the dry retardation basin.

4. Proposed Changes to the Territory Plan Written Statement Residential B8 and B9 Area Specific Policy Review

The Variation amends two of the area specific policies in the residential policies in the Territory Plan Written Statement. The B8 area specific policy aims to allow for higher density mixed use development and provides for residential development up to a maximum of four storeys. Small scale offices, restaurants, community facilities and shops may be permitted at ground floor level. The B9 area specific policy aims to provide for a range of intensive residential uses including a variety of medium to high density housing types. The policy allows for development up to three storeys.

The B8 and B9 policies apply to land adjacent to the Town Centre in the Gungahlin Central Area. The North Gungahlin Structure Plan promotes higher density development in strategic locations close to activity nodes, such as at group and local centres by also applying the Residential B8 and B9 Area Specific Policies in these locations.

4.1 Residential B8 Area Specific Policy

While the concept of mixed uses and higher densities is supported, some of the controls and uses in the B8 policy were not considered appropriate in a mixed-use context. This Variation amends the B8 policy as follows:

- (i) The title and objectives of the policy have been amended to be more generic and have a wider application.

- (ii) Some of the uses have been deleted as they are inappropriate or unnecessary in a mixed-use context. These include:
- Car park (only appropriate as an ancillary use)
 - Club (Impacts not appropriate and more likely to be located in commercial areas)
 - Emergency services facility (Impacts not appropriate)
 - Outdoor recreation facility (Large land take facilities not consistent with intensive higher density development. Smaller facilities may occur as ancillary to Parkland.)
 - Recyclable materials collection (Scale and impacts not appropriate)
 - Service station (Impacts not appropriate)
 - Place of Assembly (Scale not appropriate, more likely to occur as community activity centre)

- (iii) The land use restrictions at Clause 2.10 and Performance Controls of the Residential Policy have been exempted and individual uses have been replaced with the Group definitions listed below:

COMMUNITY USE means a *child care centre, a community activity centre, a community theatre, a cultural facility, an educational establishment, a health facility, a hospital, a place of worship, and/or a religious associated use.*

COMMERCIAL ACCOMMODATION USE means a commercial accommodation unit, guesthouse, hotel, motel or tourist resort but does not include a caravan park/camping ground or group or organised camp. (refer Variation 158, Group Centre Policies)

NON RETAIL COMMERCIAL USE means a business agency, financial establishment, office or public agency. (refer Variation 158)

The changes have the effect of removing some of the restrictions on gross floor area, concentration and location that apply to uses such as guest house, community activity centre and health facility, through the general residential policy. The former B8 policy did not treat additional uses consistently because not all uses were subject to the more general restrictions in the Residential Policy. In the standard residential context, the restrictions are aimed at protecting amenity and ensuring development is compatible with the surrounding residential area. However the general residential controls are not considered appropriate in a mixed-use context.

- (iv) New controls have been introduced for noise attenuation for potential noise generating uses where they are located adjacent to residential/ commercial accommodation use.
- (v) The gross floor area restriction of 200m² has been applied to other relevant uses to limit the scale of development and potential impacts on town/commercial centres and adjacent residential development. These include:
- COMMUNITY USE
 - Craft workshop
 - Drink establishment

The restriction has been clarified so that it applies per tenancy as well as per establishment.

- (vi) The restriction on upper floor uses has been reworded to limit uses, other than residential or commercial accommodation, to the ground floor level.
- (vii) The building height control has been amended to specify a general building height of 3 storeys. However buildings up to a maximum of 4 storeys may be permitted where provided for in a Building Envelope Plan.

A Building Envelope Plan is a plan that specifies building envelopes and any other specific block development controls and is linked to, and approved along with, an Estate Development Plan. An Estate Development Plan sets out the proposed pattern of subdivision and infrastructure works for an estate. This Estate Development Plan needs to be approved before works are undertaken and leases are granted for the subdivided blocks. The Estate Development Plan may also include a streetscape concept plan. Estate Development Plans will need to be prepared for logical parcels of land before development proceeds.

- (viii) The Design and Siting Clause has been amended to apply the Urban Housing Code to multi unit development. This code is based on the Australian Model Code for Residential Development and was introduced in conjunction with the Residential B11 and B12 Area Specific Policies to promote well-designed medium density development.

4.2 Residential B9 Area Specific Policy

This Variation also amends the title and objectives of the B9 policy so that they now apply to areas beyond the Gungahlin Town Centre. The clause relating to building height has been amended to refer to the term 'Building Envelope Plan.' The Design and Siting Clause has been amended to apply the Urban Housing Code to medium density development.

5. Defined Land

The Variation identifies the North Gungahlin Structure Plan area as defined land in accordance with the provisions of the Land Act. The Territory Plan Map is amended to add the defined land overlay to the site. Section 7(3)(e) of the Land Act states that where the Territory Plan identifies land as Defined Land, it shall also set the principles and policies for its development.

It is important that the planning of an area the size of North Gungahlin is not unduly constrained during its period of development. The Defined Land process enables the Territory Plan to be progressively updated in line with the current best practices while maintaining principles and policies identified for each area. In summary, the process is:

- The land is identified as Defined Land and the principles and policies for its development are set out in the Territory Plan through the normal Plan Variation process;
- Detailed subdivision plans for the development of the site are prepared progressively in accordance with the principles and policies set out in the approved Variation; and

- On approval of the subdivision plans, PALM subsequently varies the Territory Plan by a notice in the ACT Legislation Register pursuant to section 32 of the Land Act. This Variation specifies the boundaries and purposes for which the various parts of the land may be used. On commencement of the subsequent Variation, the land ceases to be Defined Land.

The principles and policies for the development of Defined Land are detailed at Part 3 of Attachment A.

6. Consultation on the Draft Variation

The Variation was released as a draft for public comment in October 2002 with comments closing on 20 December 2002. Written submissions received on the draft Variation were made available for public perusal. Comments from the Conservator of Flora and Fauna received prior to the release of the draft Variation were considered in preparing the document for public release.

A Preliminary Assessment (PA) was released for comment in parallel with the Draft Variation to the Territory Plan. The PA evaluation concluded that potential impacts of the proposal on the environment were adequately addressed and no further environmental impact assessment would be required. The PA evaluation report made a number of recommendations which have been considered in finalising the Variation.

Issues raised in the submissions were considered by PALM and a report was prepared and submitted to the ACT Executive. Reports on consultation with the Conservator of Flora and Fauna, the National Capital Authority and the ACT Heritage Council were also submitted to the Executive.

Since the release of the draft Variation, Environment ACT has completed a review of Action Plan 10 (Yellow Box/Red Gum Grassy Woodland). This review takes into account significant areas of Yellow Box/Red Gum Grassy Woodland requiring further study at Gooroo (East Gungahlin) and Kinlyside, both adjacent to the area subject to this Variation. The outcomes of this study are part of a draft ACT Lowland Woodland Conservation Strategy (Action Plan 27). The outcomes of this review have been taken into consideration in finalising the North Gungahlin Structure Plan and the principles and policies are consistent with the draft Lowland Woodland Conservation Strategy.

7. Revision of the Draft Variation

A number of revisions have been made to the Variation as a result of the consultation and preliminary assessment process. These are described below.

- The National Capital Authority raised the issue of the proposed arterial road connecting Gungahlin and NSW and advised that an amendment to the National Capital Plan would be required if PALM intended to delete the connection. Although a road is permitted in this location under the Hills Ridges and Buffer Areas Policy in the Territory Plan, the connection has been reinforced in the principles and policies. In particular, at Attachment A, 3.1 General Planning Principles and at 3.2 Suburbs, Bonner new principles have been added to maintain road connection with Gundaroo Road and NSW. The proposed North Gungahlin Structure Plan, Figure 2, has been updated to reflect the extension of Gundaroo Road, as have the Outline Plan Generators (Figures 5,6)

- Following the preparation of the draft Variation, detailed planning studies have been undertaken for Forde, which have led to revisions in the principles and policies for that suburb. In particular, specific policies for Forde have been amended to increase areas for open space and retention of endangered species, increase the number of major road access points to the suburb and clarify the alignment of the open space spine. The Outline Plan generators for Forde have been amended accordingly (Figures 3,4).
- Since the draft variation was released, detailed subdivision plans have been prepared for several areas in the suburb of Amaroo and the Defined Land Overlay no longer applies in these circumstances. Consequently the Defined Land overlay at Figure 1 in the Explanatory Statement and Figure 2 in Attachment A has been amended. Land use policies have also been amended to reflect the Amaroo community precinct. (Refer also to Figure 15 Ngunnawal/ Amaroo Outline Plans).
- The statistics in Section 3.5 in the Explanatory Statement relating to the Distribution of Yellow Box/Red Gum Grassy Woodland – North Gungahlin have been changed to reflect the increased retention of woodland in revised planning for Forde.
- References to the review of Action Plans in the Explanatory Statement have been updated in accordance with the release of the draft ACT Lowland Woodland Conservation Strategy.
- An additional General Planning Principle has been added to Attachment A relating to urban edge design in response to bushfire inquiry outcomes.
- Section 5.6 Urban Edge Interface has been updated in light of the recent bushfire, to include details on bushfire mitigation and urban edge planning principles. The term equestrian in parentheses has been removed from paragraph one, to reflect the mixed-use nature of recreation trails.
- The boundary of the 12C Hills Ridges and Buffer Areas Area Specific Policy and the Defined Land Boundary have been adjusted in Figure 2 to follow the urban edge. The 12 C Area specific Policy defines the Eucalypt Plantation.
- The Public Land boundary in Figure 2 has been corrected to follow the boundary of the Mulliganas Flat Nature Reserve established by Variation 182 in September 2002.

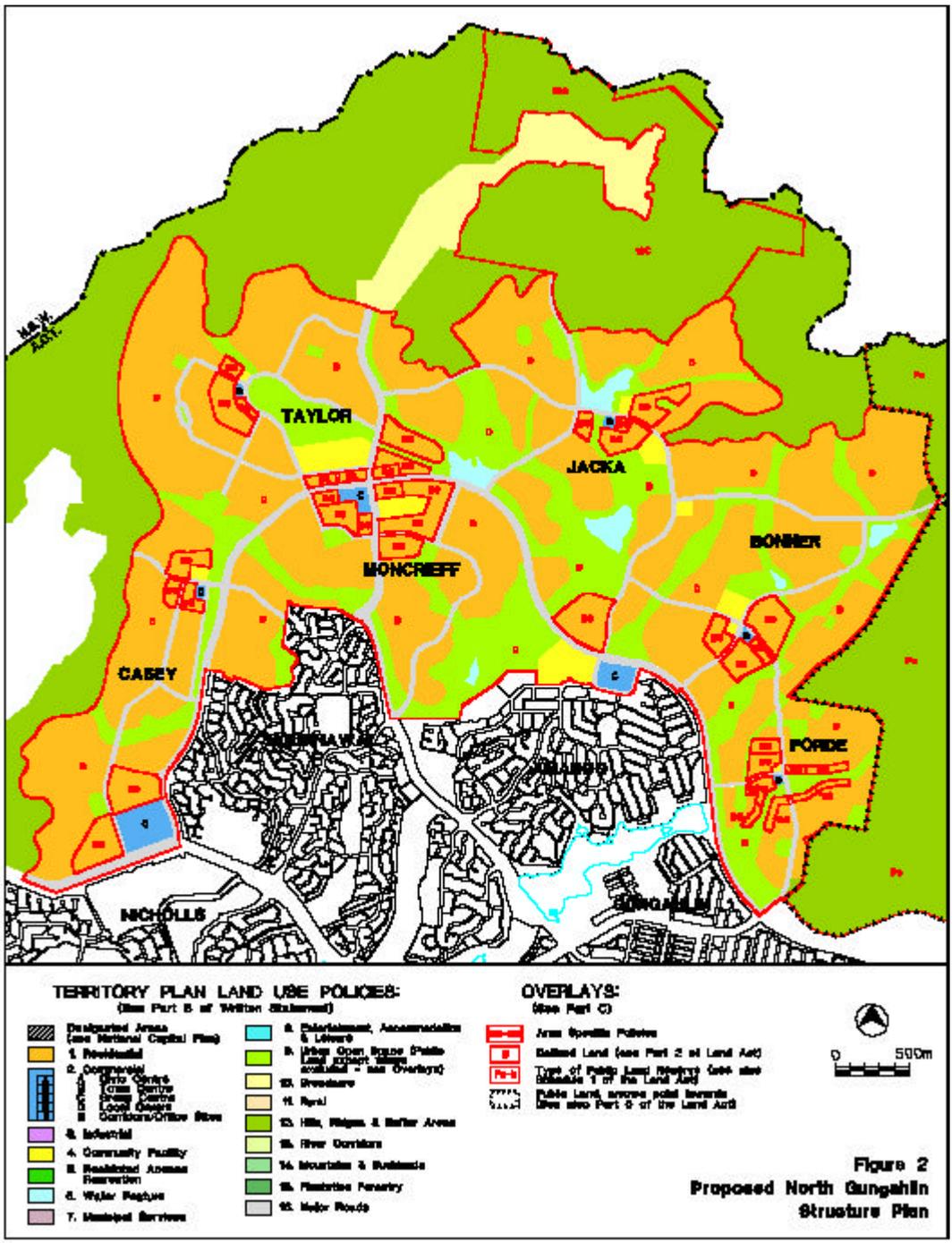
ATTACHMENT A

1. *Variation to the Territory Plan Map*

The Territory Plan Map is varied for the area identified as “Area Subject to the Variation” as follows:

1. Residential Land Use Policy
 - define the suburbs of Bonner, Casey, Forde, Jacka, Moncrieff, and Taylor and adjust the suburbs of Amaroo and Ngunnawal.
 - add Residential B8 and B9 Area Specific Policy Overlays.
2. Major Roads Land Use Policy
 - amend alignments of Horse Park Drive and Mirrabei Drive and identify internal road network.
3. Commercial Land Use Policy
 - relocate the two group centres previously proposed at Forde and at the intersection of Horse Park and Mirrabei Drives and identify a third group centre at Casey.
 - identify five local centres in the suburbs of Bonner, Casey, Forde, Jacka and Taylor.
4. Urban Open Space Land Use Policy
 - define revised open space system.
5. Community Facility Land Use Policy
 - identify community facility sites.
 - Confirm the Amaroo community precinct
6. Water Feature Land Use Policy
 - reduce the size of the water management pond in Amaroo and identify a series of smaller ponds.
7. Hills Ridges and Buffer Areas Land Use Policy
 - revise the urban development edge,
 - adjust the boundary of the 12C Area Specific Policy, Eucalypt Plantations Gungahlin, and
8. Add the Defined Land Overlay.

as indicated in **Figure 2**.



2. ***Variation to the Territory Plan Written Statement***

- (i) **At Part B1 Residential Land Use Policies, Clause 4 Area Specific Policies replace Area B8 Gungahlin Town Centre – Residential Mixed Use, as follows:**

“Area B8: Residential Mixed Use

Objectives

- To promote a range of intensive residential uses combined with appropriate non-residential uses in highly accessible locations adjacent to the Gungahlin Town Centre and other identified commercial centres.
- To provide for small-scale leisure, recreation, community and commercial activities in conjunction with intensive residential development.

Controls

Land Use

Add to Schedule 1: Communications facility⁺, COMMERCIAL ACCOMMODATION USE, COMMUNITY USE, Craft workshop, Drink establishment⁺, Indoor entertainment facility⁺, Indoor recreation facility, NON RETAIL COMMERCIAL USE, Pedestrian plaza, Restaurant and Shop.

⁺ may be subject to mandatory preliminary assessment in accordance with Appendix II of the Plan.

Land Use Restrictions

COMMUNITY USE, Craft workshop, Drink establishment, Indoor entertainment facility, Indoor recreation facility, NON RETAIL COMMERCIAL USE, Restaurant, Shop

- shall be designed and located to minimise impacts on residential or commercial accommodation development. All noise-generating activities are to meet relevant criteria including Environment Protection Regulations.
- shall not be permitted above ground floor level.
- except for Indoor recreation facility shall be limited to 200m² in gross floor area per establishment or tenancy.

COMMUNITY USE, COMMERCIAL ACCOMMODATION USE – relevant land use restrictions at Clause 2.10 do not apply.

Building Height

Replace Clause 2.2 with: The maximum height of buildings shall generally be 3 storeys. Buildings may be built to a maximum of 4 storeys where provided for in an approved Building Envelope Plan.

Design and Siting

Development of multi unit housing shall be in accordance with the Urban Housing Code at Appendix III.3 or its replacement.

Performance Controls

COMMUNITY USE, COMMERCIAL ACCOMMODATION USE Home business – relevant performance controls at Clause 2.11 do not apply.”

- (ii) **At Part B1 Residential Land Use Policies, Clause 4 Area Specific Policies replace Area B9 Gungahlin Central Area – Residential, as follows:**

“Area B9 Urban Residential

“Objectives

- To promote a range of intensive residential uses including a variety of medium and high density housing types adjacent to commercial centres.

Controls

Building Height

Replace Clause 2.2 with: The maximum height of buildings shall generally be 2 storeys. Buildings may be built to a maximum of 3 storeys where provided for in an approved Building Envelope Plan.

Design and Siting

Development of multi unit housing shall be in accordance with the Urban Housing Code at Appendix III .3 or its replacement.

3. Principles and Policies for Development of Defined Land

Section 7(3)(e) of the Land Act states that where the Territory Plan identifies land as Defined Land, it shall also set the principles and policies for its development. The Land included in this Variation is proposed to be 'Defined Land' pursuant to section 7(3)(e) of the Land Act. The Defined Land process establishes that the development of this land must be consistent with the Principles and Policies contained in this Variation. In addition the process enables the Territory Plan to be progressively updated as the detailed designs for the area unfold.

3.1 General Planning Principles

- The development of North Gungahlin should incorporate sustainability principles including economic, social, cultural and economic considerations.
- The landscape setting and values of the North Gungahlin urban area are to be recognised and enhanced. Boundary hills and significant internal ridges within the urban fabric are to be protected from development and planted with native vegetation. Significant trees should be incorporated into the urban fabric where possible.
- Conservation and Heritage Precincts such as Horse Park Homestead and Wetlands are to be retained and protected within urban open space.
- Detailed planning is to take advantage of the natural, cultural and heritage characteristics of the area and extend them to create a program to support and strengthen the community's identity.
- The local neighbourhood is to be based on a walkable radius of 400m, and focussed on an activity node such as shops, community facility or school.
- Community facility sites should be located close to public transport and in places where, for reasons of safety, people already have a cause to congregate particularly at shopping centres and schools.
- Public open space, within close proximity to, local centres, together with various other nominated sites, may be utilised for possible community and recreation facility uses. The size and type of facility will be determined at a later detailed planning stage.
- Retail centres serving larger populations should be well located on major roads in order to serve a cluster of suburbs and ensure the long-term viability of the centre.
- Sustainable urban water management design principles are to be adopted to secure economic, social and environmental benefits of integrated 'water in the landscape' (including water sensitive urban design techniques) and 'total water cycle' based designs to achieve a better balance of water across the landscape.
- An integrated cycling and pedestrian network should connect commercial centres, schools, parks, ovals, and hilltops and provide links to trunk routes.
- The road hierarchy should be legible and provide good and safe access to all users and encourage high levels of public transport usage. Boulevards and Avenues are identified in specific locations.
- Subdivision design should encourage housing diversity and enhance access to energy efficient house design. Higher density residential development is to be located around activity nodes and transport routes.

- The national equestrian trail will be planned to move incrementally to follow the urban edge as development areas progress.
- Major public utilities are to be provided as required.
- Aboriginal and historic heritage places are to be recognised and significant sites conserved in public open space where appropriate.
- Road connectivity with Gundaroo Road is to be maintained
- The urban edge will be designed in accordance with any agreed outcomes of inquiries and reviews following the recent bushfires in the ACT

3.2 Suburbs

The Outline Plan generators diagrams and the Outline Plans indicate the manner in which the Territory Plan will be implemented for each suburb. The Outline Plans are included to assist in the understanding of the implications of the Variation to the Territory Plan.

Only the primary road system is shown on the Outline Plans and the alignments are representative of the planning intentions.

The Outline Plans indicate the location of the various land uses proposed for each suburb and reflect the requirements shown on the Outline Plan generators diagrams.

Forde

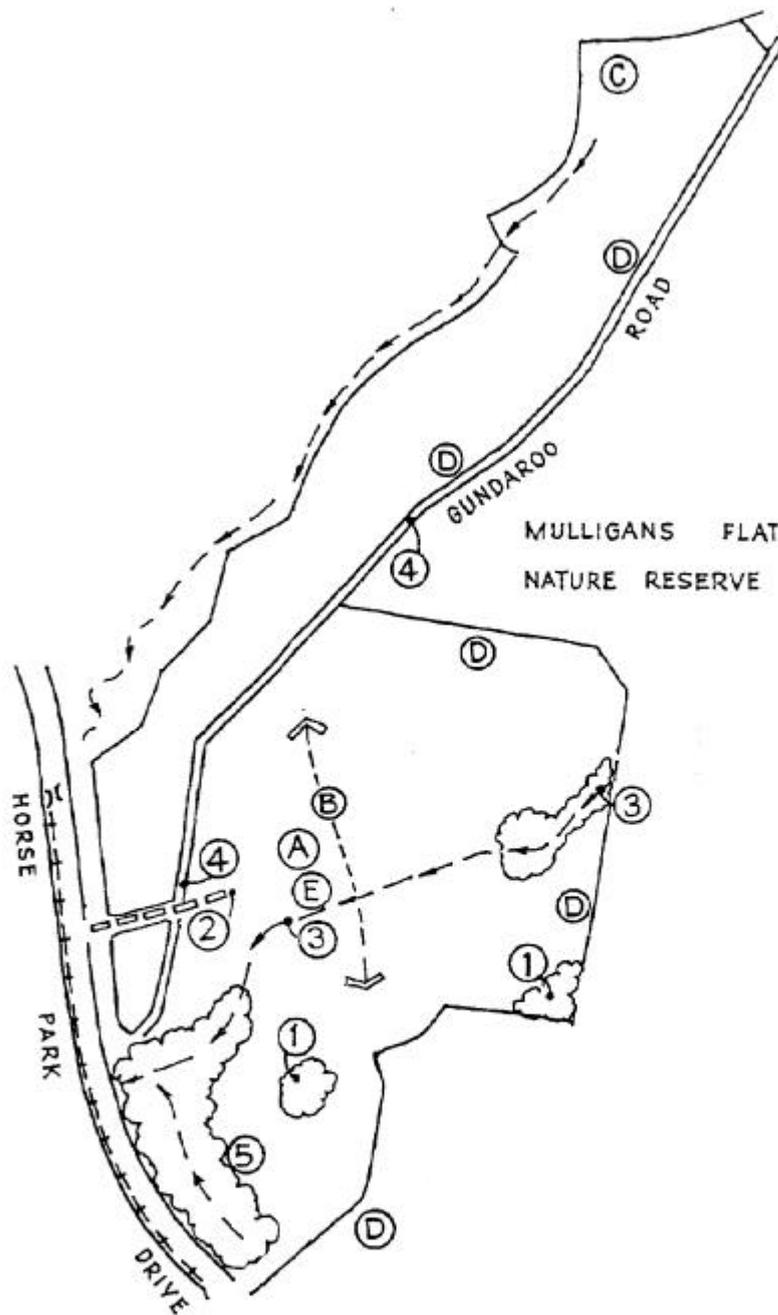
Forde is a highly defined suburb being contained by Mulligans Flat Nature Reserve, the Gundaroo Road connection into NSW and the major east-west arterial, Horse Park Drive. The suburb is located in the south east of the Structure Plan and is adjacent to the Gungahlin Town Centre.

GENERAL POLICIES (Refer to Fig. 3)

- A. The local centre, will incorporate and be adjacent to areas of high density residential, community facilities and the central open space spine.
- B. A local bus route will be accommodated through the suburb via the local centre and areas of higher density.
- C. A water detention feature is required to the north and is to be located within the natural drainage line in open space.
- D. Edge roads to be utilised wherever possible as a buffer between residential development and areas of open space. An edge road shall be predominantly used as a buffer where the adjoining open space contains substantial cultural heritage or environmental value.
- E. Provide an area close to the local centre for a community facility site.
- F. Provide for an urban edge trail (equestrian and other uses) that will move incrementally as the urban edge develops.

SPECIFIC POLICIES (Refer to Figs. 3 and 4)

- 1. Several areas are identified for open space, parkland, specifically to protect existing remnant tree patches with conservation values and to create an active recreation interface with Mulligans Flat Nature Reserve.
- 2. The main road access to the suburb from Horse Park Drive is to be of boulevard character up to the first major southern intersection.
- 3. An open space spine, along the natural creek line, is proposed through the suburb linking Mulligans Flat to the central and mixed-use higher density housing area. This spine will also accommodate such facilities as pedestrian pathways and cycleways.
- 4. Gundaroo Road reservation (within Forde) is to be retained in urban open space, thereby preserving the existing lines of trees. To the north, Gundaroo Road will form a buffer between the urban edge and Mulligan's Flat. This interface will be subject to special controls.
- 5. An area of swampy lowlands is to be retained in urban open space, adjacent to Horse Park Drive to the south of the suburb. The area is to be treated in a manner, which enhances its ecological value, consistent with the principles of sustainable urban water management.



LEGEND

-  Boulevard
-  Avenue
-  Drainage line
-  Possible bus route
-  Trunk cycleway (on-road)
-  Pedestrian underpass)

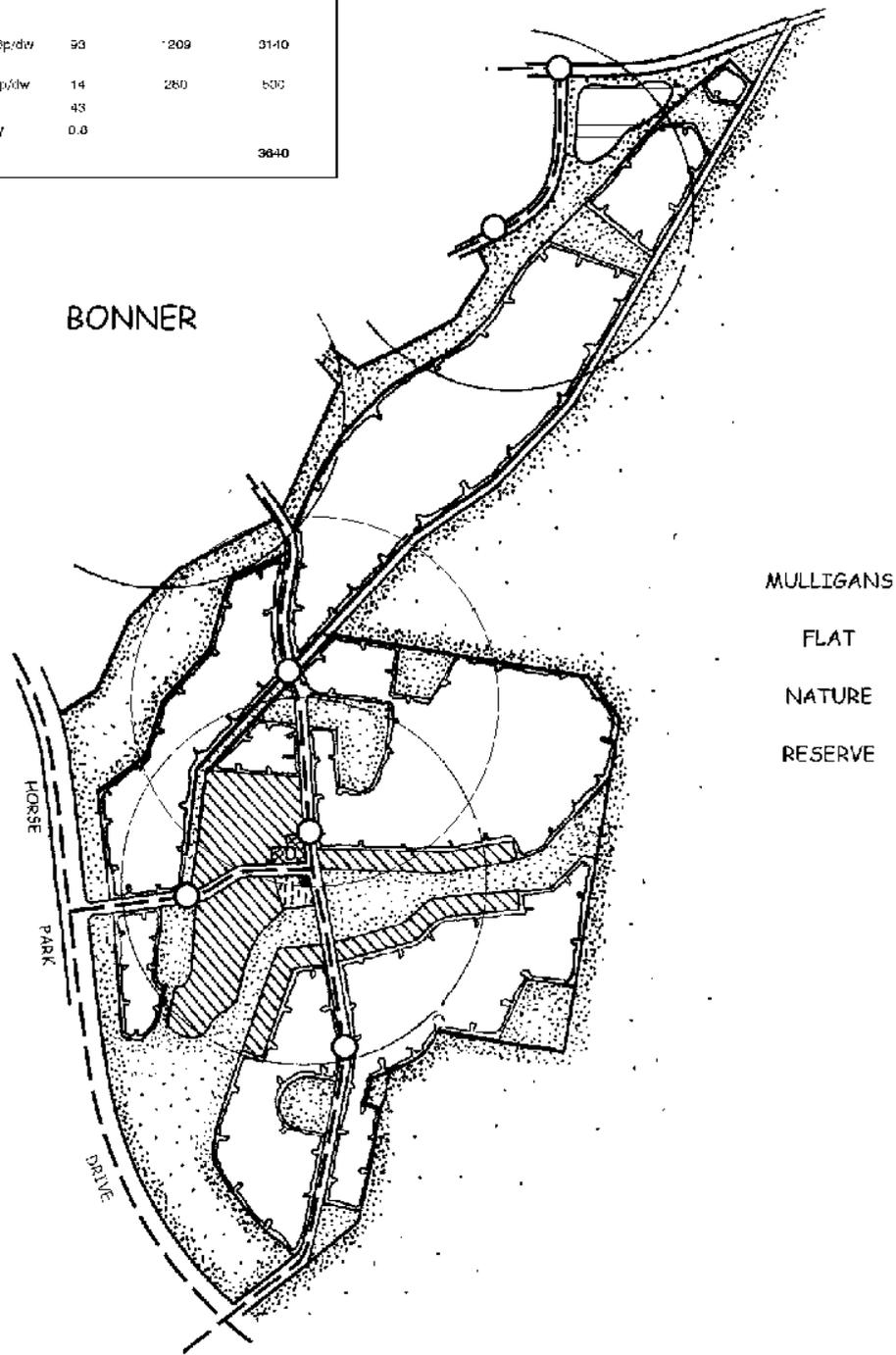
 Trees to be retained



0 500
metres

Figure 3
Forde
Outline Plan generators

LAND TYPE	AREA(ha) approx	DWELLINGS approx.	POPULATION approx
Residential @ 1.3dw/ha and 2.8p/dw	93	1209	3140
Urban residential @20dw/ha and 1.8p/dw	14	280	500
Open space	43		
Community facility	0.6		
Population Total			3640



LEGEND

- Residential
- Higher density residential
- Open space
- Community facility (including schools)
- Local centre
- Water detention feature

- Possible community facility site
- Possible bus route
- Possible bus stop
- 400m radius - 5min walk



Figure 4
Forde - Outline Plan

Bonner

Natural landscape features generally delineate the edges of this suburb with a ridge adjoining the western flank, open space to the east and woodlands within Hills, Ridges and Buffer land use area along the northern edge.

The suburb is located generally north of Forde and north east of Amaroo.

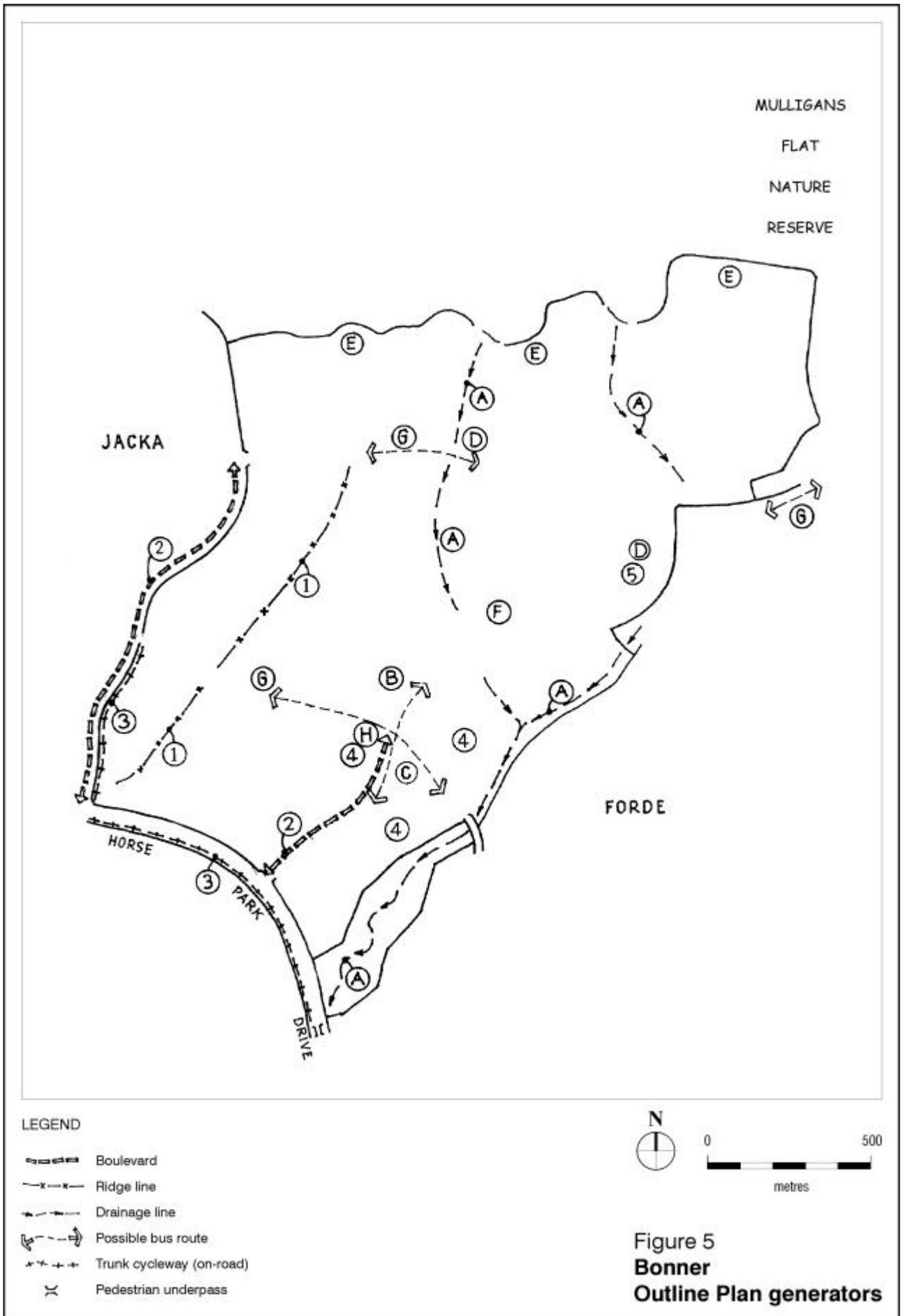
GENERAL POLICIES (Refer to Fig.5)

- A. Both the central north-south and eastern open space spines are based on existing drainage paths.
- B. A centrally located primary school and neighbourhood oval, adjacent to a mixed-use/higher density housing area, is required.
- C. The location of a local centre and associated higher density residential areas are placed at the intersection of the collector road system and bus routes to maximise exposure and encourage higher public transport usage.
- D. Opportunities are to be provided for small-scale community facility sites in open space in convenient locations predominantly along public transport routes.
- E. Edge roads are to be utilised wherever possible as a buffer between residential development and areas of open space. An edge road shall be predominantly used as a buffer where the adjoining open space contains substantial cultural heritage or environmental values.
- F. A water detention feature is required adjacent to the north-south open space spine.
- G. Local bus routes are to be provided through the suburb, encouraging public transport usage.
- H. Provide an area close to the local centre for a possible community facility site.
- I. Provide for an urban edge trail (equestrian and other uses) that will move incrementally as the urban edge develops.

SPECIFIC POLICIES (Refer to Figs. 5 and 6)

- 1. The north-south ridge to the west of the suburb is to be retained and protected in urban open space.
- 2. The suburb is accessed from Horse Park Drive by two roads, each of which shall be boulevard status both in design and nature.
- 3. Trunk cycleway to be provided to connect to Horse Park Drive trunk cycleway.
- 4. Higher density housing is to be provided adjacent to the local centre.
- 5. Cultural and/or heritage site (Aboriginal Heritage) to be preserved within open space.

6. Maintain road connection with Gundaroo Road and NSW.



LAND TYPE	AREA(ha) approx	DWELLINGS approx.	POPULATION approx
Residential			
@ 13dw/ha and 2.6p/dw	177	2300	6000
Urban residential			
@20dw/ha and 1.8p/dw	17	340	600
Open space	50.2		
Community facility	4.3*		
Population Total			6600

Note: *includes a school site

MULLIGANS
FLAT
NATURE
RESERVE



LEGEND

-  Residential
-  Higher density residential
-  Open space
-  Community facility (including schools)
-  Local centre
-  Water detention feature
-  Possible community facility site
-  Possible bus route
-  Possible bus stop
-  400m radius - 5min walk



Figure 6
Bonner - Outline Plan

Jacka

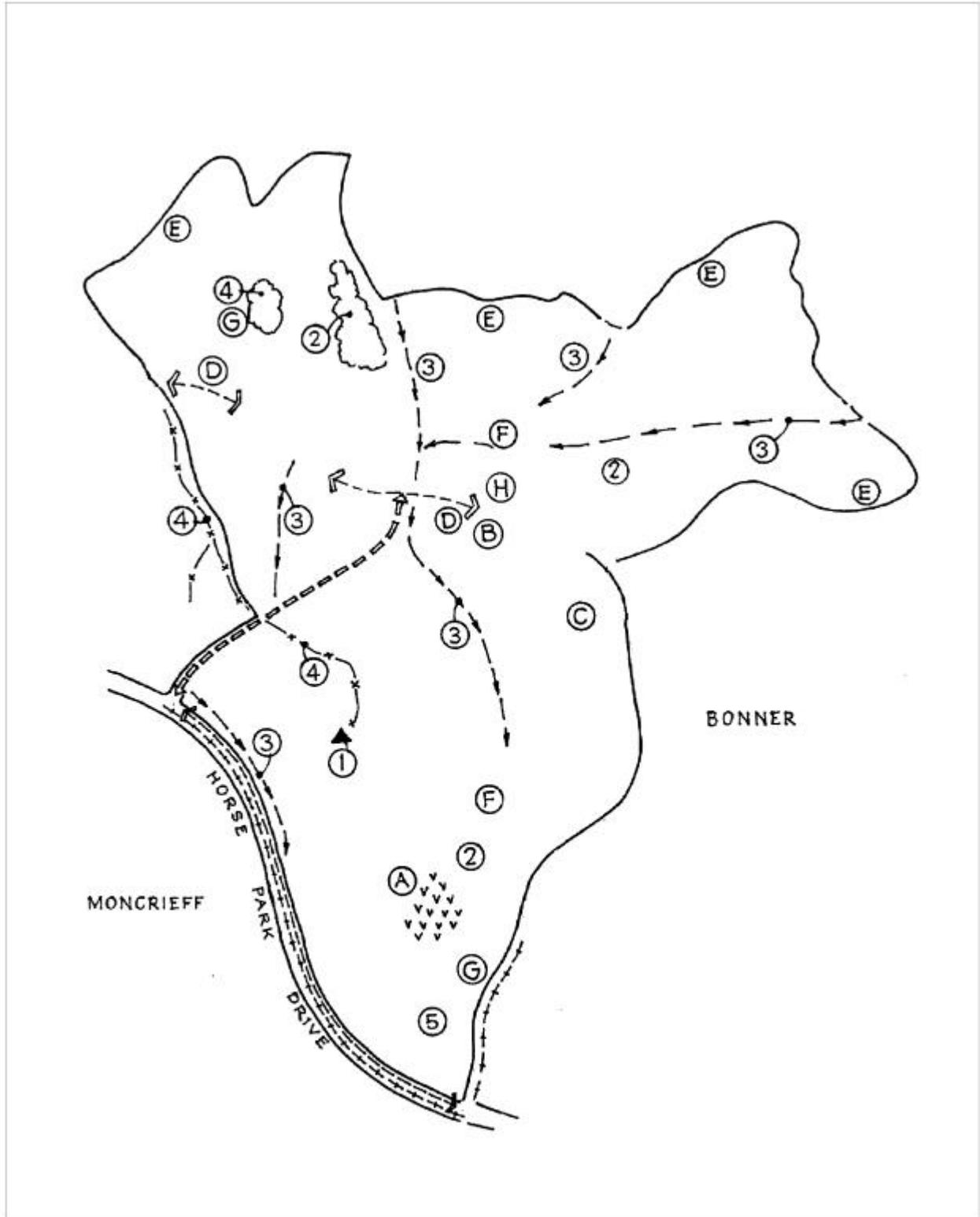
This is a relatively large, physically complex and interesting suburb located centrally within the Structure Plan area, and focuses on the Horse Park Wetlands and heritage precinct.

GENERAL POLICIES (Refer to Fig. 7)

- A. The Horse Park Wetlands and heritage precinct is to be protected by inclusion within a substantial area of Urban Open Space (generally incorporating the curtilage boundaries identified by the Register of the National Estate listing for the wetland) which will be subject to specific planning policies and management practices. The precinct shall have high visibility and ease of access. The wetlands are to be protected by upstream stormwater management techniques.
- B. A local centre is to be located in the centre of the suburb incorporating areas of higher residential density.
- C. A primary school, neighbourhood oval and district playing fields are to be located upstream of the wetlands and central to the school catchment.
- D. Local bus routes to be provided through the suburb, encouraging public transport use.
- E. Edge roads are to be utilised wherever possible as a buffer between residential development and areas of open space. An edge road shall be predominantly used as a buffer where the adjoining open space contains substantial cultural heritage or environmental values.
- F. To ensure the integrity of water quality and flow to the wetland area, water management features are to be located upstream. The formation and design of these features will be the subject of further hydraulic studies.
- G. Opportunities are to be provided for small-scale community facility sites generally located in open space in convenient locations predominantly along public transport routes.
- H. Provide an area close to the local centre for a possible community facility site.
- I. Provide for an urban edge trail (equestrian and other uses) that will move incrementally as the urban edge develops.

SPECIFIC POLICIES (Refer to Figs.7 and 8)

- 1. A hilltop reserve lookout is to be located on the major spur of higher country to the west of wetlands area. This spur is to connect back to the permanent non-urban land to the north via open space.
- 2. Cultural natural and/or heritage sites are to be preserved within open space.
- 3. Existing drainage lines are to contribute to a linear park system.
- 4. Significant hilltops and ridges are to be retained in urban open space.
- 5. An area of higher density housing is to be provided adjacent to Amaroo Group Centre.



LEGEND

-  Boulevard
-  Ridge line
-  Drainage line
-  Possible bus route
-  Trunk cycleway (on-road)
-  Pedestrian underpass
-  Trees to be retained
-  Existing wetlands

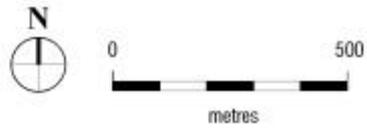
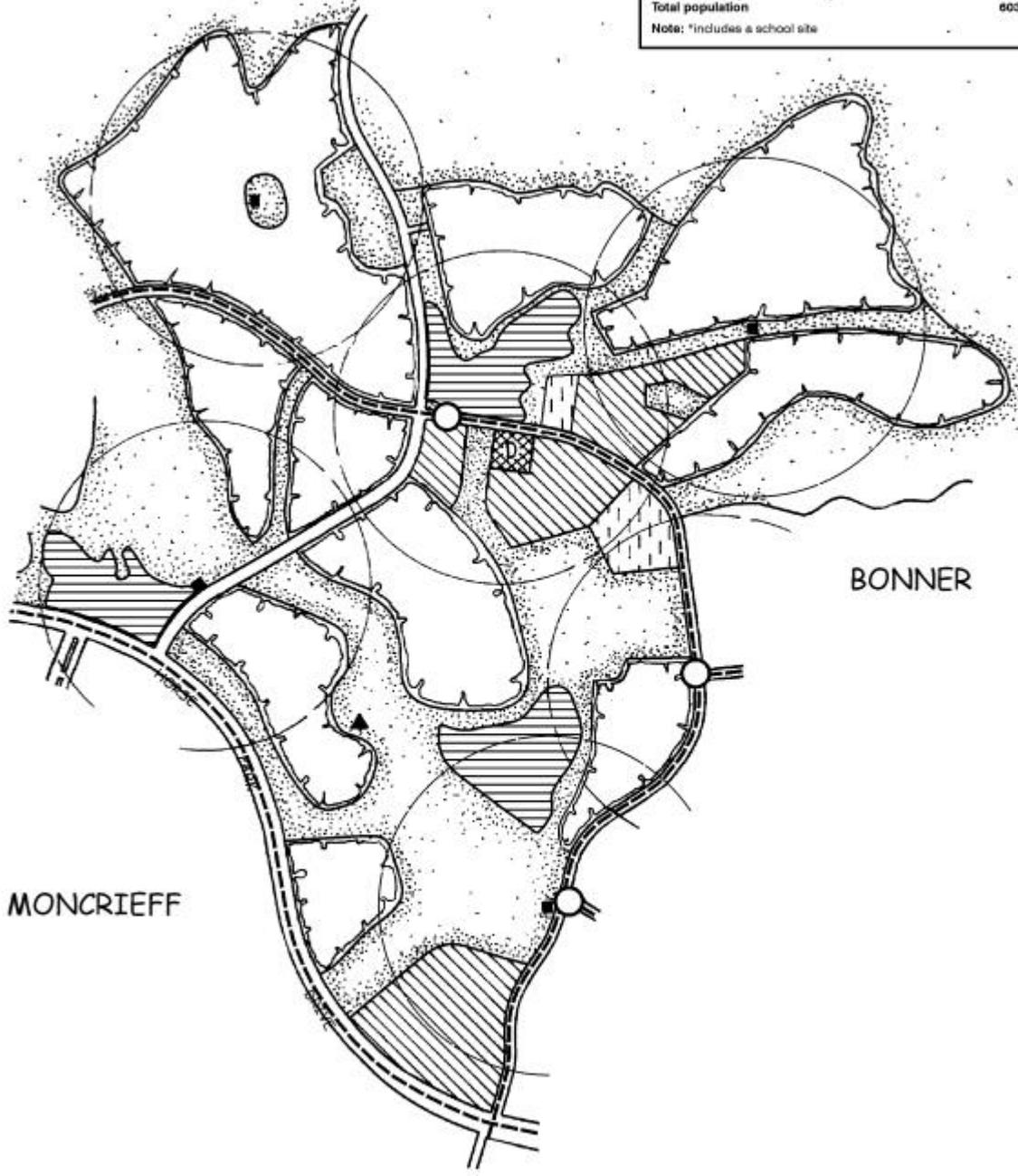


Figure 7
Jacka
Outline Plan generators

LAND TYPE	AREA(ha) approx	DWELLINGS approx.	POPULATION approx
Residential @ 13dw/ha and 2.6p/dw	103	1960	5170
Urban residential @20dw/ha and 1.8p/dw	24	480	660
Open space	90.2		
Community facility	4.3*		
Total population			6030

Note: *includes a school site



LEGEND

- Residential
- Higher density residential
- Open space
- Community facility (including schools)
- Local centre
- Water detention feature

- Lookout
- Possible community facility site
- Possible bus route
- Possible bus stop
- 400m radius - 5min walk



Figure 8
Jacka - Outline Plan

Moncrieff

This is a relatively small suburb, essentially made up of three hills and defined around its north, eastern and western boundaries by Horse Park Drive and is located north of the existing suburbs of Ngunnawal and Amaroo. The suburb is to be developed to provide a strong sense of local identity, achieved by creating hilltop parks.

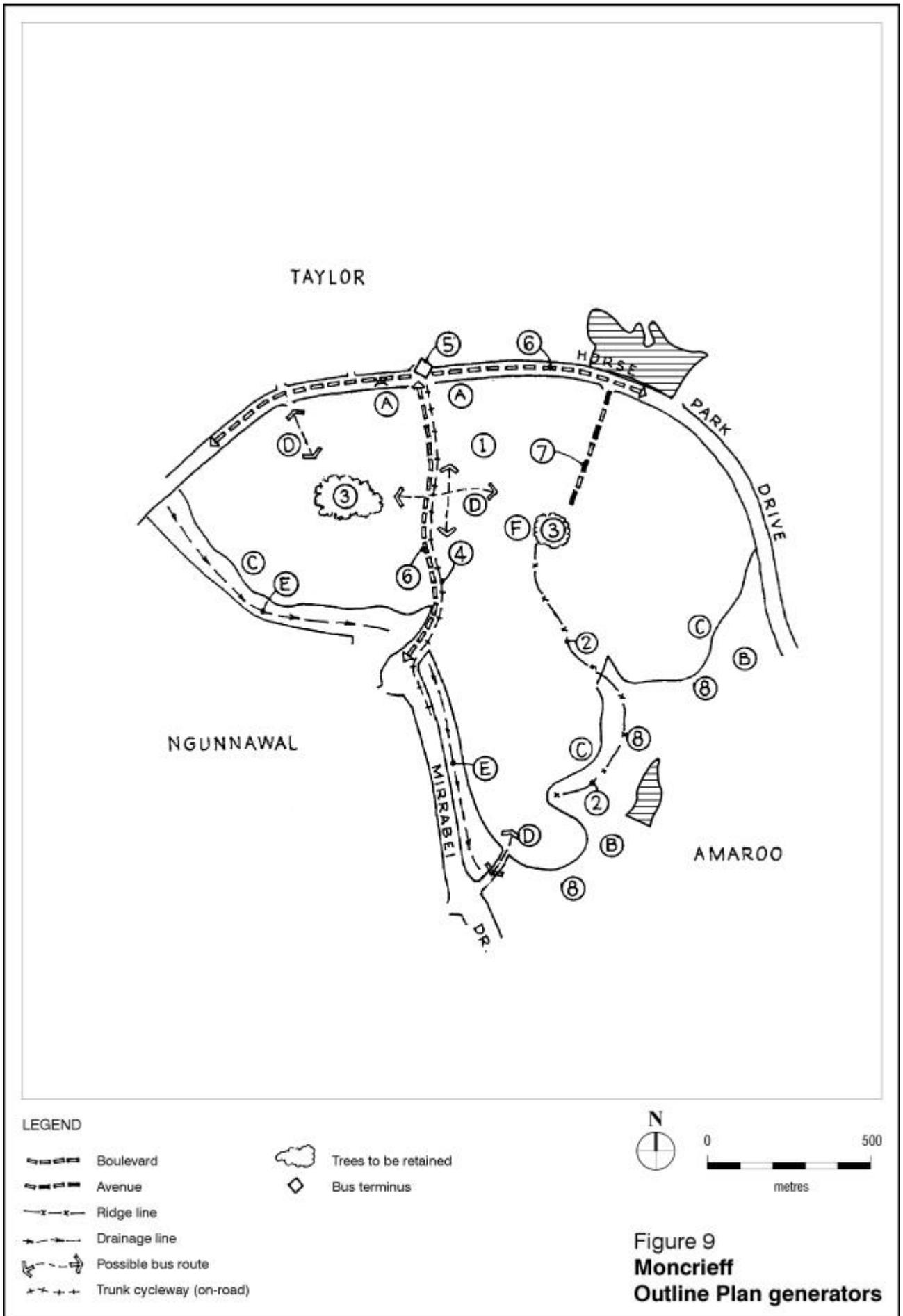
GENERAL POLICIES (Refer to Fig.9)

- A. A group centre and higher density housing at the intersection of Horse Park and Mirrabai Drives shall be developed, in layout and design, on the principles of an 'urban village', closely aligned towards public transport use. Each of the intersecting roads shall be designed as urban boulevards, with at-grade pedestrian crossings. The precinct shall be integrated with the major open space system, directly to the north.
- B. Bushland revegetation shall be undertaken on the steeply sloped ridge on the eastern edge of Moncrieff overlooking the Amaroo District Playing Fields.
- C. Edge roads are to be utilised wherever possible as a buffer between residential development and areas of open space. An edge road shall be predominantly used as a buffer where the adjoining open space contains substantial cultural heritage or environmental values.
- D. Local bus routes are to be provided through the suburb, encouraging public transport usage.
- E. Open space spine is to be based on existing drainage paths.
- F. Opportunities are to be provided for small-scale community facility sites in open space in convenient locations predominantly along public transport routes.

SPECIFIC POLICIES (Refer to Figs.9 and 10)

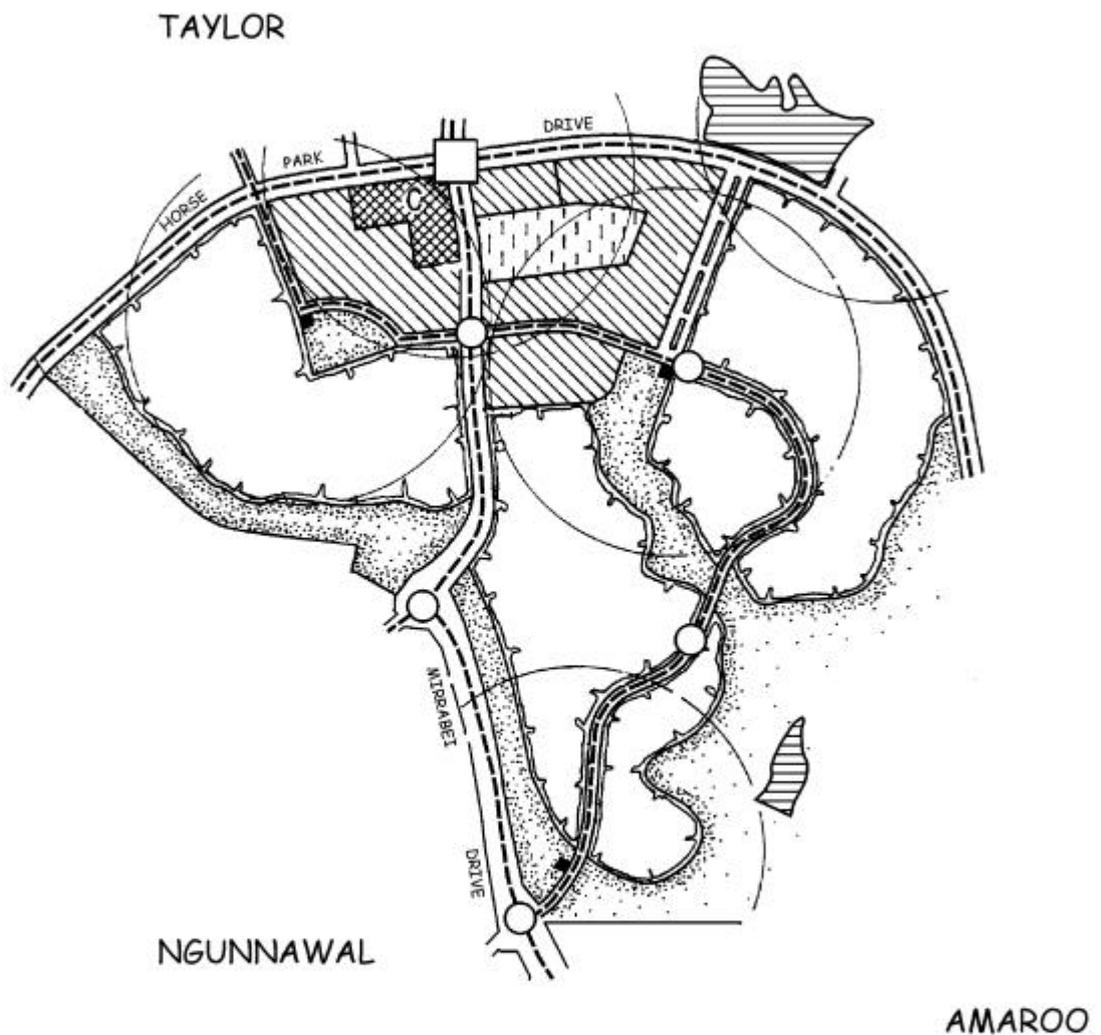
- 1. A site is to be reserved for a potential secondary college adjacent to the group centre.
- 2. The east-west ridge that connects to a generally north-south avenue to Horse Park Drive is to be retained and protected.
- 3. Significant hilltops and ridges are to be retained in urban open space.
- 4. A trunk cycleway is to be provided along Mirrabai Drive connecting with trunk cycleway on Horse Park Drive.
- 5. An Inter-town Public Transport (IPT) route is to be provided along Mirrabai Drive with a terminus to be located at the group centre.
- 6. Roads are to be designed as boulevards.
- 7. The road connection to be designed as an avenue and align with water management feature as a terminating view.

8. No development is to be permitted on eastern escarpment.



LAND TYPE	AREA(ha) approx	DWELLINGS approx.	POPULATION approx
Residential @ 13dw/ha and 2.6p/dw	100	1300	3380
Urban residential @20dw/ha and 1.8p/dw	24	480	860
Open space	22		
Community facility	4.6*		
Total population			4240

Note: *includes a reserved community site



LEGEND

- Residential
- Higher density residential
- Open space
- Community facility (including schools)
- Group centre
- Water detention feature

- Possible community facility site
- Possible bus route
- Possible bus stop
- Possible bus terminus
- 400m radius - 5min walk



**Figure 10
Moncrieff - Outline Plan**

Taylor

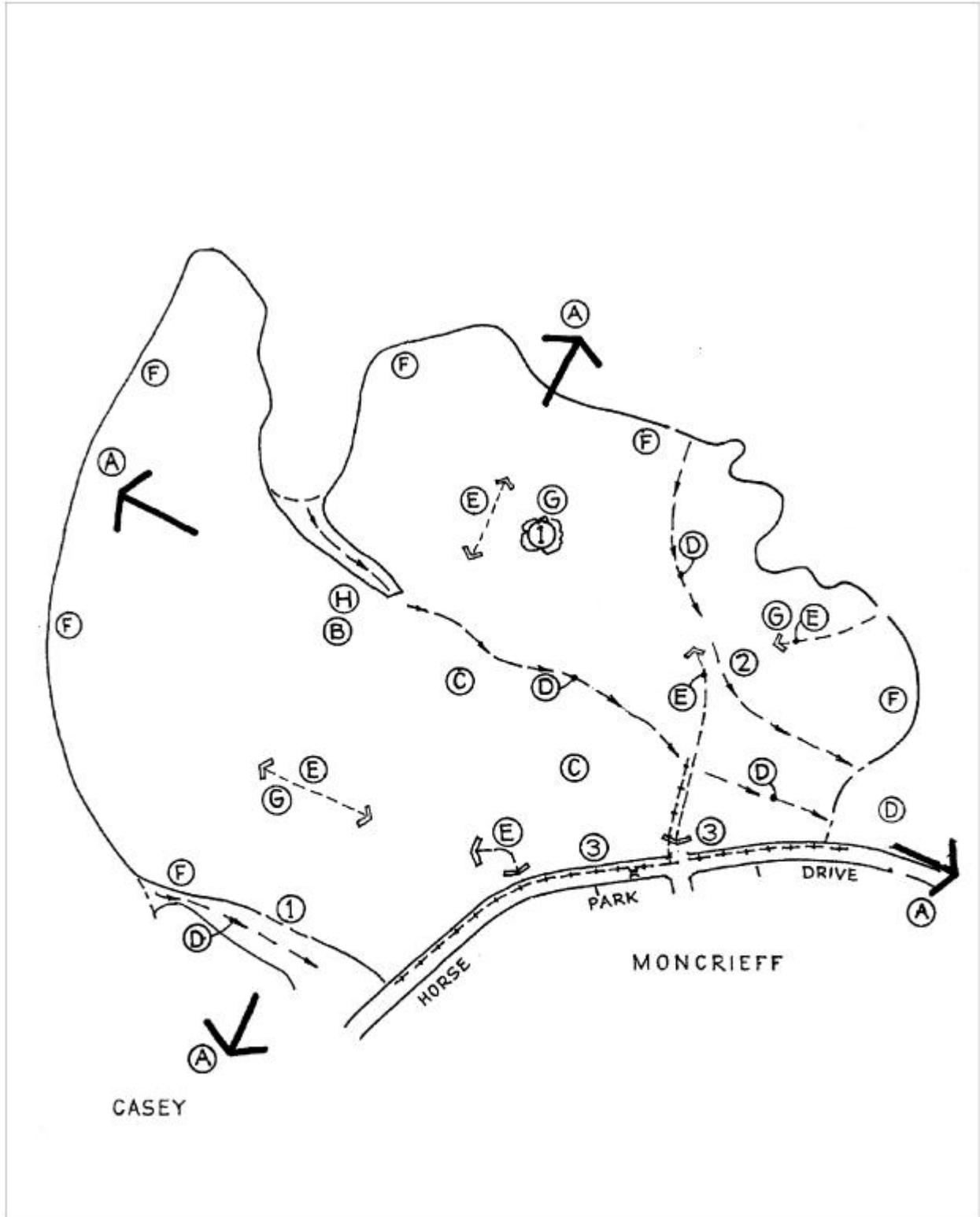
A relatively large suburb which provides the highest (Australian Height Datum) residential land in Canberra, is located in the north west corner of North Gungahlin.

GENERAL POLICIES (Refer to Fig. 11)

- A. Two axes are defined which give structure to the area; North-south from the high country north of Taylor with a line of site to Black Mountain Tower, and east-west from Horse Park Wetland to One Tree Hill. These axes then form the basis for road and open space alignments.
- B. A local centre together with adjacent higher density housing is to be centrally located.
- C. District playing fields and a neighbourhood oval are to be located adjacent to government primary and high school sites.
- D. Landscaped floodways interconnect throughout the north of the suburb and terminate at a landscaped water management feature to the east.
- E. Local bus routes are to be provided through the suburb, encouraging public transport usage.
- F. Edge roads are to be utilised wherever possible as a buffer between residential development and areas of open space. An edge road shall be predominantly used as a buffer where the adjoining open space contains substantial cultural heritage or environmental values.
- G. Opportunities are to be provided for small-scale community facility sites in open space in convenient locations predominantly along public transport routes.
- H. Provide an area close to the local centre for a possible community facility site.
- I. Provide for an urban edge trail (equestrian and other uses) that will move incrementally as the urban edge develops.

SPECIFIC POLICIES (Refer to Fig. 11 and 12)

- 1. A park is to be located on the hilltop.
- 2. Heritage site (European heritage - ruins) and adjacent significant trees are to be located in urban open space.
- 3. Part of the group centre and higher density housing shall be co-located opposite Moncrieff at intersection of major roads.



LEGEND

-  Boulevard
-  Drainage line
-  Possible bus route
-  Trunk cycleway (on-road)
-  Trees to be retained

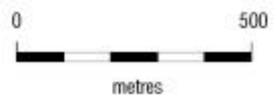
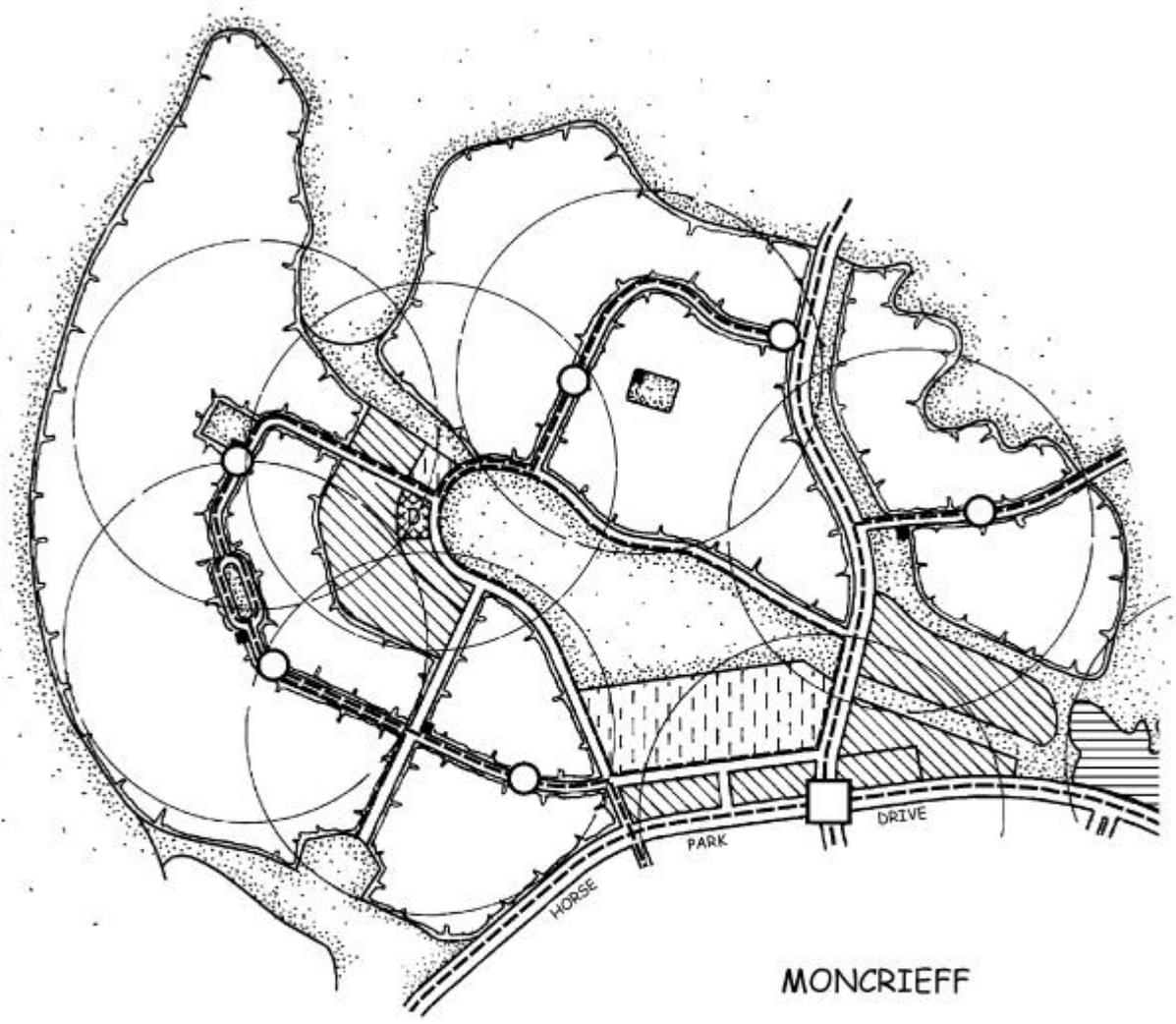


Figure 11
Taylor
Outline Plan generators

LAND TYPE	AREA(ha) approx	DWELLINGS approx.	POPULATION approx
Residential @ 13dw/ha and 2.6p/dw	206	2680	6970
Urban residential @20dw/ha and 1.8p/dw	23	460	830
Open space	48		
Community facility	10.6		
Total population			7800



CASEY

MONCRIEFF

LEGEND

- Residential
- Higher density residential
- Open space
- Community facility (including schools)
- Local centre
- Water detention feature

- Possible community facility site
- Possible bus route
- Possible bus stop
- Possible bus terminus
- 400m radius - 5min walk

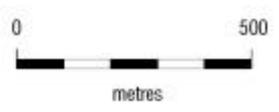


Figure 12
Taylor - Outline Plan

Casey

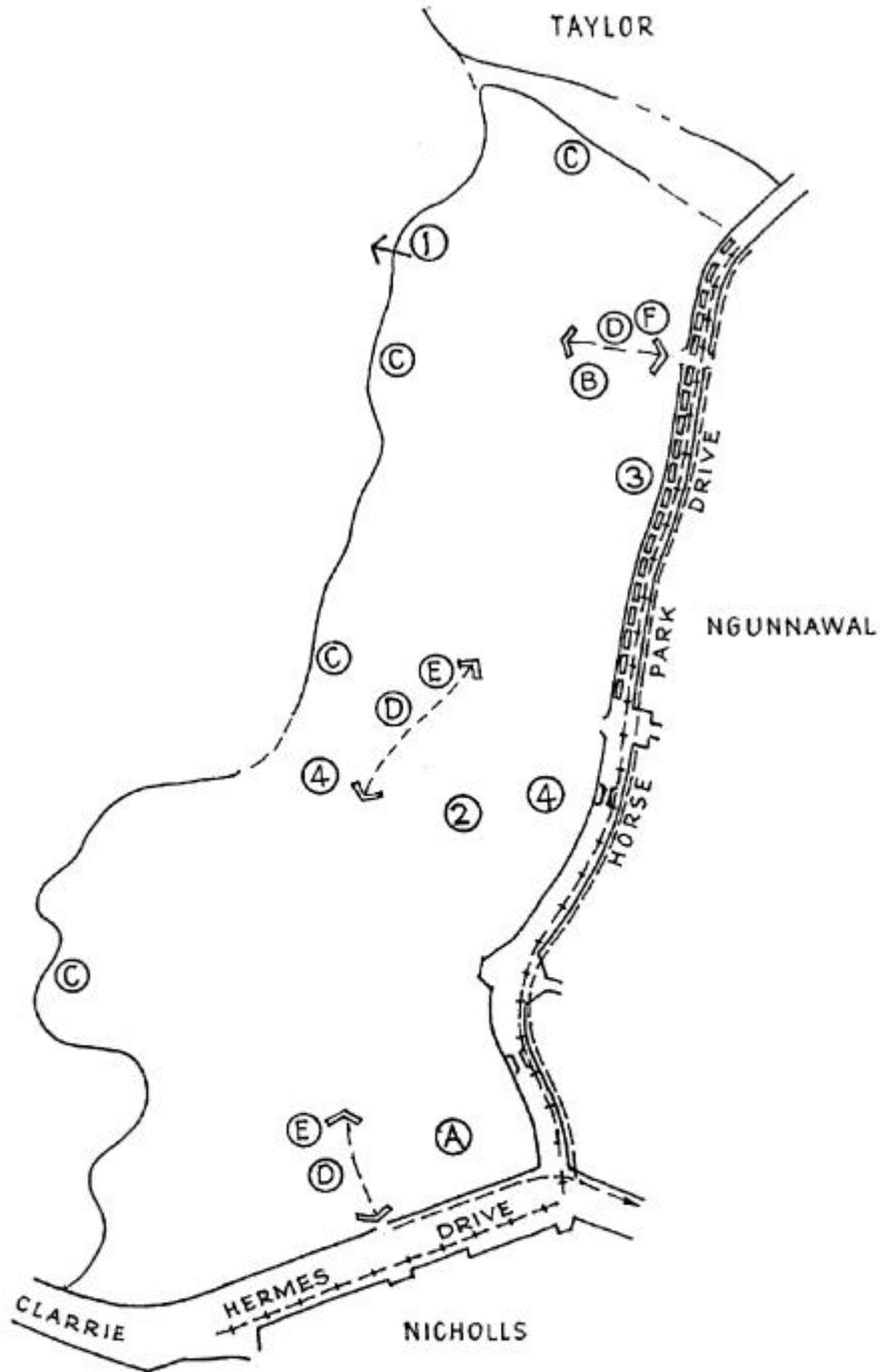
This suburb forms the western edge of North Gungahlin and occupies a relatively narrow strip of land between Horse Park Drive and the treed ridge lines to the west which form the visual backdrops, separating the suburb from Hall and the Kinlyside valley.

GENERAL POLICIES (Refer to Fig. 13)

- A. A group centre with adjoining higher density housing and an open space site is to be developed in the southeastern corner at the intersection of Horse Park and Clarrie Hermes Drives.
- B. A local centre with adjoining higher density housing and an open space site is to be located to the north of the suburb.
- C. Edge roads are to be utilised wherever possible as a buffer between residential development and urban open space. An edge road shall be predominantly used as a buffer where the adjoining open space contains substantial cultural heritage or environmental values.
- D. A local bus route is to be provided through the suburb via the local and group centres and areas of higher density.
- E. Opportunities are to be provided for small-scale community facility sites in open space in convenient locations predominantly along public transport routes.
- F. Provide an area close to the local centre for a possible community facility site.

SPECIFIC POLICIES (Refer to Figs.13 and14)

- 1. A possible road connection to the Kinlyside Valley is to be identified to the north of the suburb.
- 2. A neighbourhood playing field to be located within the east-west linear park.
- 3. A significant stand of trees with high conservation value marking an old north-south road alignment adjacent to Horse Park Drive is to be protected, retained and managed within the urban open space system. An edge road is to be provided adjacent to the old north-south road alignment and adjacent trees.
- 4. Stands of trees with high conservation value bisect the suburb and enhance the bushland character of the resultant open space linkage back to the ridge. This link is to be preserved in the form of an east-west linear park.



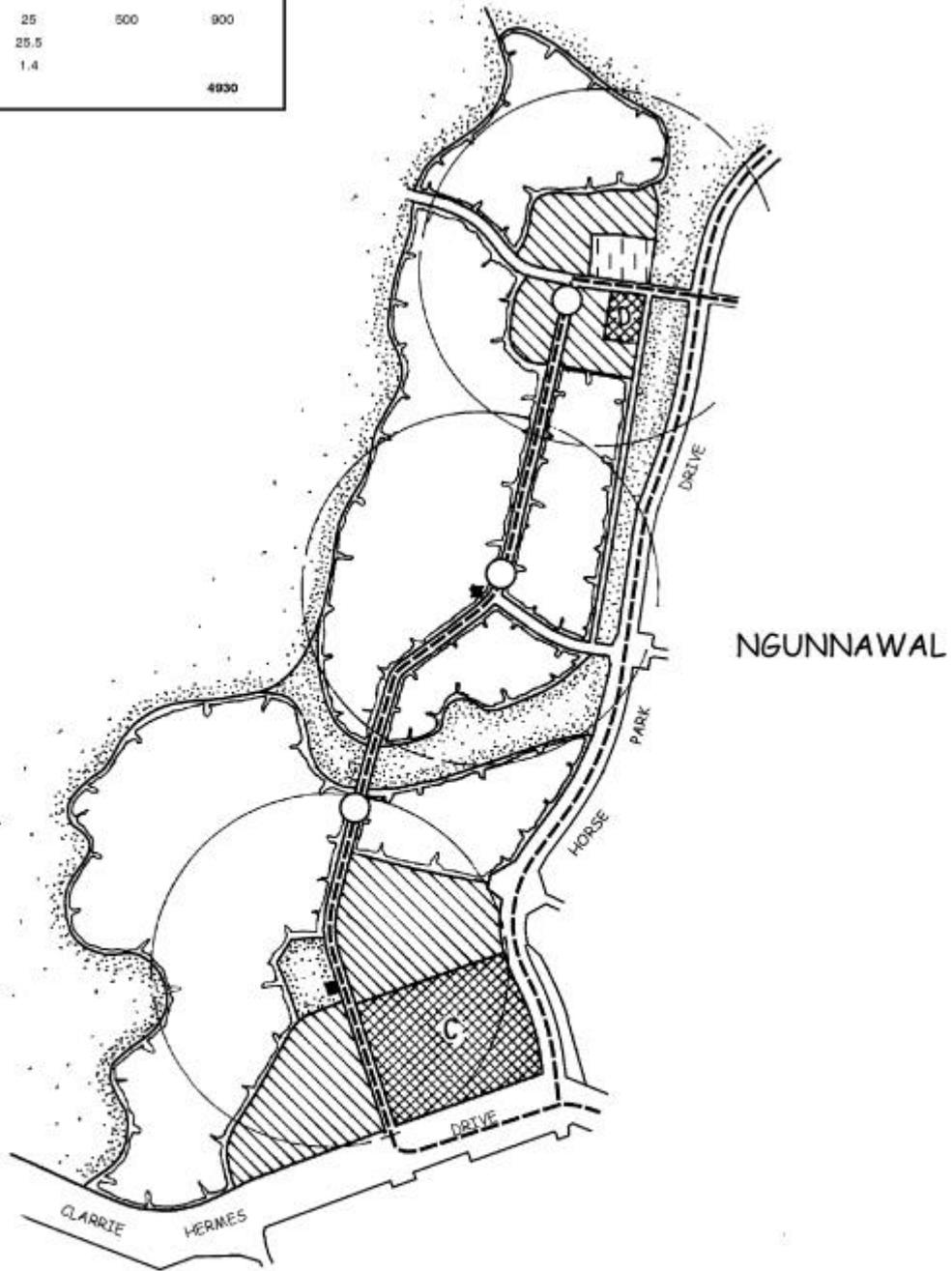
LEGEND

-  Boulevard
-  Drainage line
-  Possible bus route
-  Trunk cycleway (on-road)
-  Pedestrian underpass
-  Trees to be retained



Figure 13
Casey
Outline Plan generators

LAND TYPE	AREA(ha) approx	DWELLINGS approx.	POPULATION approx
Residential @ 13dw/ha and 2.6p/dw	119	1550	4030
Urban residential @20dw/ha and 1.8p/dw	25	500	900
Open space	25.5		
Community facility	1.4		
Population Total			4930



LEGEND

- Residential
- Higher density residential
- Open space
- Community facility (including schools)
- Local centre
- Group centre

- Possible community facility site
- Possible bus route
- Possible bus stop
- 400m radius - 5min walk



Figure 14
Casey - Outline Plan

Part Ngunnawal

(Refer to Fig. 15A)

A relatively small area of low-density housing remains to be developed in north west Ngunnawal.

A local park protecting existing stands of trees is to be established on the small ridge along the eastern flank of this area. Identify possible site for community facility.

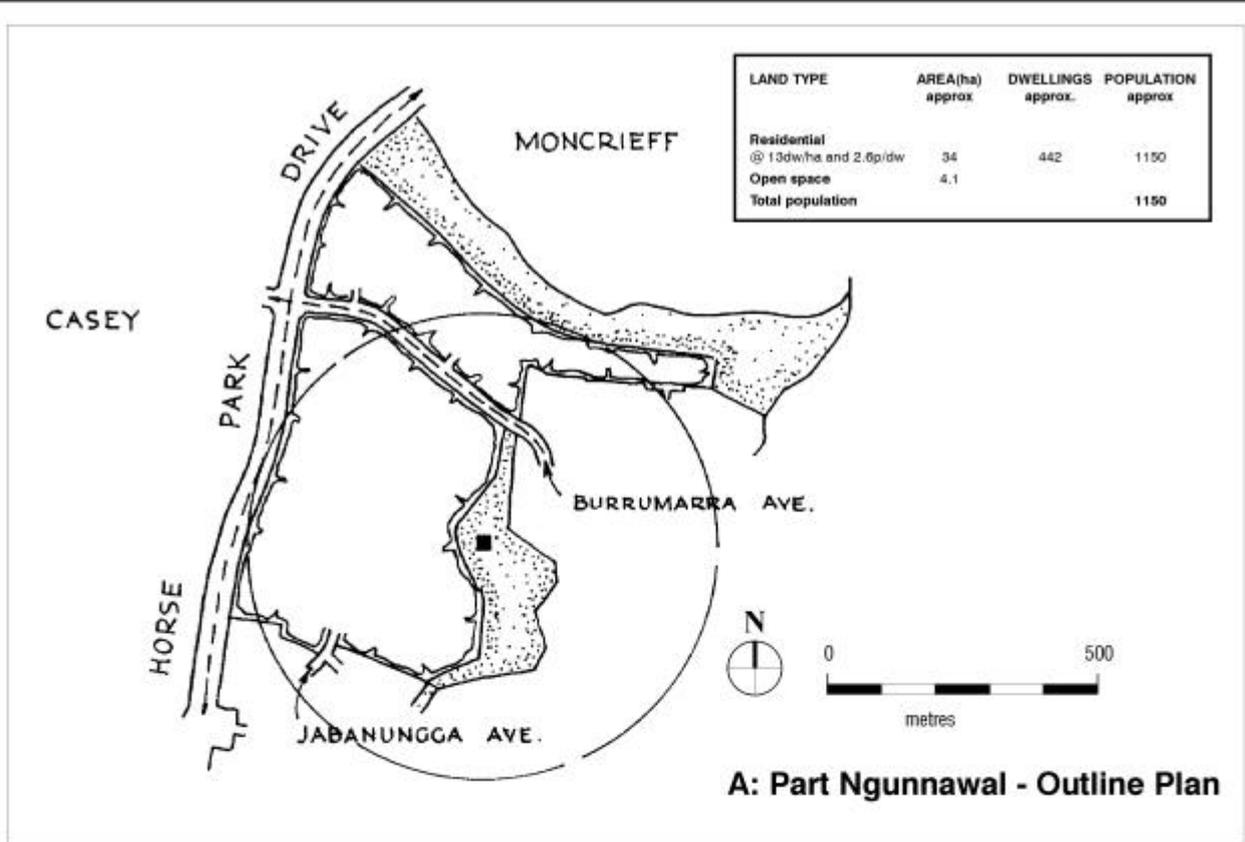
Burrumarra Avenue is to be extended through the precinct as the main collector road, providing a direct link to Casey Local Centre.

Part Amaroo

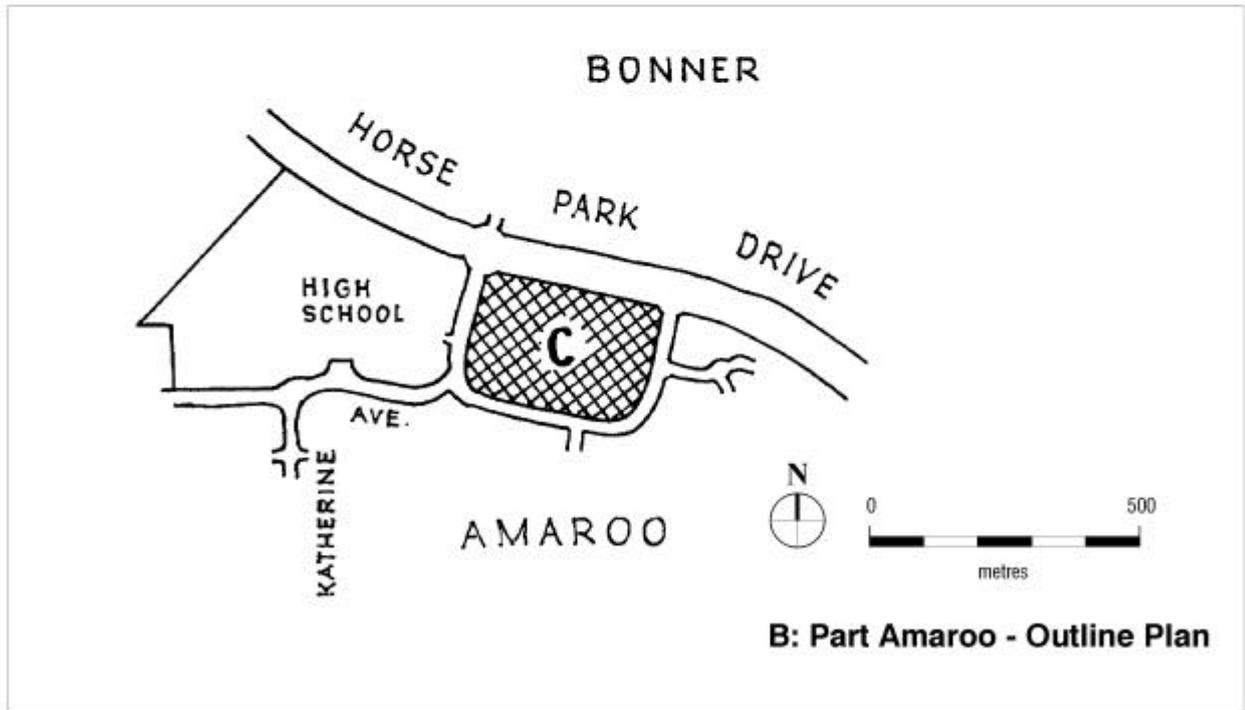
(Refer to Fig. 15B)

The area comprises the Amaroo Community Precinct and contains a proposed group centre.

Development of the group centre shall be in stages and incorporate opportunities for commercial uses, community facilities and higher density residential housing.



A: Part Ngunnawal - Outline Plan

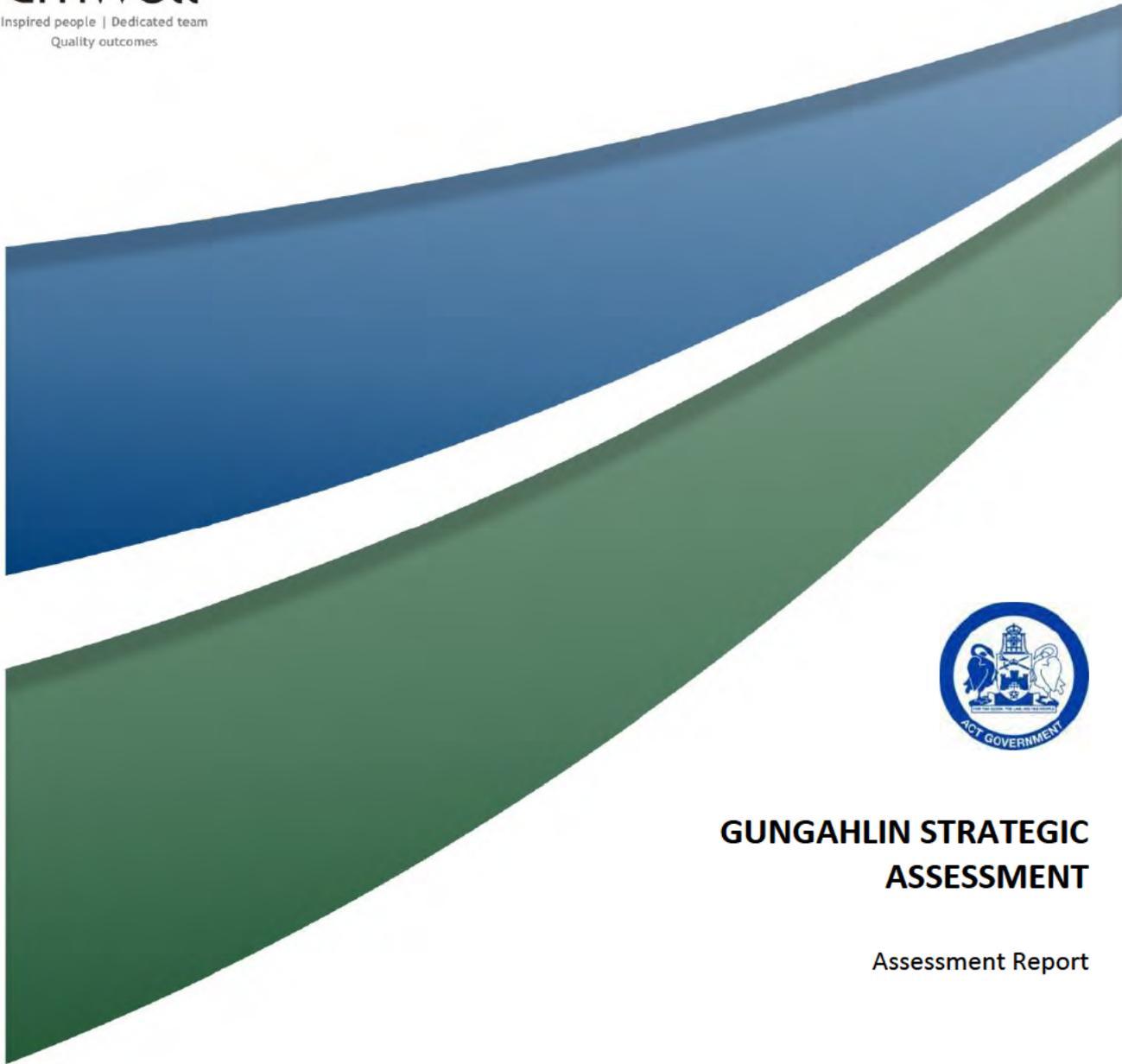


B: Part Amaroo - Outline Plan

LEGEND

-  Residential
-  Higher density residential
-  Open space
-  Community facility (including schools)
-  Local centre
-  Group centre
-  Water detention feature
-  Possible community facility site
-  Possible bus route and stop
-  400m radius - 5min walk
-  Bus terminus

**Figure 15
Ngunnawal/Amaroo -
Outline Plans**

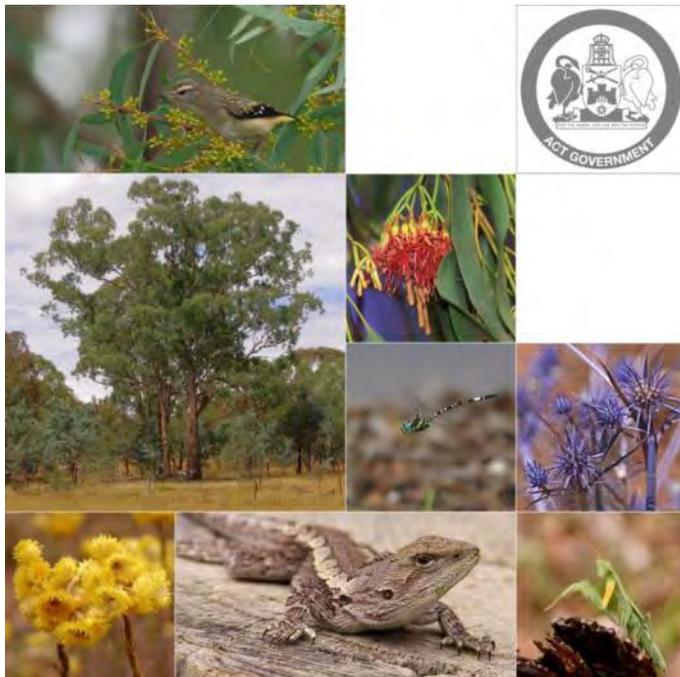


GUNGAHLIN STRATEGIC ASSESSMENT

Assessment Report

FINAL

May 2013



Disclaimer

In preparing this report, Umwelt has relied on third party data provided by various sources to the ACT Government and in no way warrants the accuracy or precision of information upon which this report has been prepared. While care has been taken to ensure that information contained in this report is true and correct at the time of publication, subsequent changes to legislation, policy and available information may impact on the accuracy of this information.

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GUNGAHLIN STRATEGIC ASSESSMENT

Assessment Report

FINAL

May 2013

Prepared by

Umwelt (Australia) Pty Limited

on behalf of

ACT Economic Development Directorate and

ACT Environment and Sustainable Development
Directorate

Project Director: **Peter Cowper**

Project Manager: **Karina Carwardine**

Report No. **8024/R02/V7**

Date: **May 2013**



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Executive Summary

Background

In October 2012, the Australian Capital Territory (ACT) and Commonwealth governments commenced a Strategic Assessment under Part 10 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The focus of this agreement is assessment of the potential impacts to Matters of National Environmental Significance (MNES) from development of the remaining greenfield sites in Gungahlin, the northern-most district in the ACT.

The Gungahlin development was commenced in 1991 following consideration and approval of the project through an Environmental Impact Statement (EIS) under the *Environment Protection (Impacts of Proposals) Act 1974* (EPIP Act). More recently, land releases have also been approved under the provisions of Part 9 of the EPBC Act. Completion of the Gungahlin development ('the Plan') is described by this report and seeks to establish a balance of residential, employment and conservation areas within the district, and to streamline the planning and development process for the remaining urban areas.

This assessment report analyses the potential impacts and outcomes of the Plan in relation to the requirements of the EPBC Act.

This Strategic Assessment comprises three documents as follows:

- The Strategic Assessment Report (this report) which provides a comprehensive assessment of the impacts of the Plan on MNES;
- The Strategic Assessment Biodiversity Plan (the *Biodiversity Plan*) (Umwelt, 2013a)¹ which describes the elements of the proposal and commitments of the ACT Government for the protection and ongoing management of MNES; and
- A Preliminary Risk Assessment (the PRA) (Umwelt, 2013b)², which is a document prepared to meet ACT Government requirements for scoping impacts under the PD Act. The PRA is attached as **Appendix 2** to this document.

The Biodiversity Plan

This report is intended to be read in conjunction with the *Biodiversity Plan*. The *Biodiversity Plan* identifies a range of commitments for the MNES affected by urban development in the Gungahlin district on the basis of analysis presented in this Assessment report. Commitments in the *Biodiversity Plan* build upon the long history of forward and strategic environmental planning in the ACT around the avoidance and mitigation of environmental impacts resulting from development.

¹ Umwelt (2013a) *Gungahlin Strategic Assessment Biodiversity Plan: Consultation Draft*, prepared for ACT Economic Development Directorate and ACT Environment and Sustainable Development Directorate, Canberra (March, 2013)

² Umwelt (2013b) *Preliminary Risk Assessment, Gungahlin Strategic Assessment: Consultation Draft*, prepared for ACT Economic Development Directorate and ACT Environment and Sustainable Development Directorate, Canberra (March, 2013)

Existing Environment

Vegetation Communities

Gungahlin is an area that was once typified by a range of natural habitats including natural grasslands, woodlands and open forest. Gungahlin retains relatively large grassland and lowland woodland remnants that are extensively cleared in other parts of the ACT and in surrounding regions of NSW. These areas of lowland woodlands and grasslands provide important habitat for threatened flora and fauna species and several regionally uncommon species.

Two threatened ecological communities that are listed as threatened under the EPBC Act occur within Gungahlin:

- white box – yellow box – Blakely’s red gum grassy woodland and derived native grasslands (box gum woodland); and
- Natural temperate grasslands of the southern tablelands and Australian Capital Territory (natural temperate grassland).

The Gungahlin district supports 1,875 hectares of box gum woodland. This figure represents 23% of the total extent of box gum woodland in the ACT and contains some of the biggest, best connected and most diverse patches of this vegetation type remaining in Australia. The Gorooyarroo – Mulligan’s Flat Nature Reserves woodland patch is the largest patch remaining in the ACT and due to its high connectivity, size and diversity, is a key area for maintaining functioning woodland systems nationally. Sixty two per cent (62%) of the remaining (23%) box gum woodland in Gungahlin is currently reserved.

There are about 180 hectares of natural temperate grassland and a further 166 hectares of closely associated native pasture (regenerating to natural temperate grassland) remaining in Gungahlin. This represents 18% of the total remaining area of the grassland community in the ACT. Within Gungahlin, 162 hectares (90%) of the remaining area of this critically endangered (EPBC) grassland is currently in nature reserves. Less than 2 hectares are within a development zone, and the remaining areas are within Hills, Ridges and Buffers land use zone (Mulvaney, 2012).

Flora

The vegetation communities within Gungahlin support a number of uncommon flora species. In Gungahlin, all known locations of threatened plant species are within existing nature reserves, and populations are monitored and managed for conservation (Mulvaney, 2012).

Fauna

The woodlands and grasslands within Gungahlin district support a diversity of fauna species, including arboreal and terrestrial mammals, birds, reptiles and invertebrates.

Woodland communities, with the presence of tree hollows and structural complexity provide value with nesting sites, shelter and food resources for a number of species, including birds and mammals.

Grasslands provide habitat, and a source of food for both herbivores and predators. Invertebrates are the most dominant faunal element present (ACT Gov’t, 2005a), however grasslands also provide important habitat for a number of reptile species.

Migratory and mobile species utilise a larger area in Gungahlin such as the woodland complex of Mulligan’s Flat and Gorooyarroo Nature Reserves, the hills, ridges and buffers

zoned areas along the northern border of the ACT, and areas of retained woodland within the urban area.

Landscape Connectivity

The Gungahlin district plays an important role in landscape connectivity across the northern part of the ACT providing connectivity not only to other locations within the ACT but also for habitat remnants in NSW. In particular, the Kinlyside – Hall; northern lease area; and the Mulligan's Flat – Gorooyarroo Nature Reserves grassy woodland complexes provide the key linkages.

Impacts to Matters of National Environmental Significance

The impacts to MNES as a result of the Plan would be to the following species and community:

- box gum woodland (critically endangered ecological community);
- golden sun moth (critically endangered species);
- striped legless lizard (vulnerable species); and
- superb parrot (vulnerable species).

Box Gum Woodland

The development of Gungahlin would impact a total of 126 hectares of box gum woodland, ranging from low to moderate-high quality. The total impact to box gum woodland has been reduced substantially from the original plan for development proposed in the Territory Plan (ACT Gov't, 2008c), by avoiding 439 hectares of the community. The avoidance strategy avoids all remaining high quality occurrences of the community and avoids a substantial component of the moderate-high quality remnants.

Golden Sun Moth

The Plan would impact on 180 hectares of varying quality golden sun moth habitat from Kenny, Throsby, Moncrieff, Taylor and Jacka. This is considered the unavoidable impact to the species required to provide adequate land for population growth in Gungahlin.

This total impact has been reduced significantly from the original plan for development proposed in the Territory Plan, by avoiding 148 hectares of golden sun moth habitat, primarily in Kinlyside and north Throsby.

Superb Parrot

The majority of records of superb parrot in Gungahlin occur in Gorooyarroo and Mulligan's Flat Nature reserves which are within formal nature reserves. Superb parrot is considered a generalist species which would have the ability to utilise a range of woodland and forest habitat while moving through the landscape (Mulvaney, 2012).

Impact to all known superb parrot nesting trees will be avoided by the Plan; however a number of potential nesting trees would be impacted by the action. These potential nesting trees to be impacted are all located within 'Throsby Ridge'.

The known breeding and movement areas of Throsby neck between Mulligan's Flat and Gorooyarroo Nature Reserve, in addition to the known breeding area on 'Throsby Ridge'

will be avoided as part of the Plan. Despite the avoidance of direct impacts of clearing, there remains the potential for edge effects to adversely affect superb parrots, particularly during the breeding season.

Striped Legless Lizard

Striped legless lizard habitat is located within the development areas of Kenny and Gungahlin Town Centre (east).

Sullivan's Creek flows through striped legless lizard habitat in Kenny. The actual creek line appears not to be utilised and the wetter areas of Kenny appear to be less favoured habitat. Nevertheless stormwater management works and a possible trunk sewer following the creek line could impact between 2 – 3 hectares of habitat. Direct impacts of a further 158 ha of habitat have been avoided. All the habitat area will be managed as part of a new nature reserve.

Within Gungahlin Town Centre (east), 14 hectares of habitat at the northern extent of the Mulanggari Grasslands population would be removed. The impacts of the development of this area are considered to have been offset in the relocation of the town centre and creation of Mulanggari Grasslands (as well as Gungaderra and Crace) Nature Reserves through Territory Plan Variation 53 (see **Section 2.2**).

Outcomes for MNES

The commitments in the Plan are targeted to the affected MNES however also consider broader biodiversity and conservation management objectives which are important not only to the ACT under Territory legislation but also matters of significance at other scales. To this effect, implementation of the Plan would not only serve to maintain or enhance the conservation status of affected MNES in the ACT but also result in a beneficial effect to biodiversity in general. The Plan would result in the following benefits to MNES:

- habitat improvement through assisted natural regeneration of areas that presently do not meet the definition of the listed community;
- improvement in the understorey diversity and hence overall quality of woodlands that presently meet the definition of the listed community;
- habitat improvement of areas likely to be suitable for golden sun moth in the long term given likely regeneration of box gum woodland in some locations where the species also presently occurs;
- assisted natural regeneration of hollow forming trees in areas likely to be suitable as future nesting sites;
- improved understanding of the habitat requirements and management of grasslands for golden sun moth and striped legless lizard; and
- improved habitat condition for striped legless lizard at Kenny.

In summary, the commitments include:

- further avoidance of areas that support habitat for MNES on land presently designated as either Future Urban Area or broadacre;

- increased investment in habitat enhancement beyond the minimum level required under the Territory's statutory duty of care; and
- increased investment in research targeted at the affected MNES and guided by action planning objectives.

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APPENDICES

- 1 Terms of Reference
- 2 Preliminary Risk Assessment

List of Abbreviations

ACT	Australian Capital Territory
ACTPLA	ACT Planning and Land Authority
ANZECC	Australian & New Zealand Environment & Conservation Council
CAR reserve	Comprehensive, Adequate and Representative reserve
CEMP	Construction Environment Management Plan
CPR	Conservation Planning and Research unit (under ESDD)
EDD	Economic Development Directorate
EIS	Environmental Impact Statement
EP Act	<i>Environment Protection Act 1997</i> (ACT)
EPA	Environment Protection Agency
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i> (Cwth)
EPIP Act	<i>Environment Protection (Impact of Proposals) Act 1974</i> (Cwth, repealed)
ESA	Emergency Services Agency
ESDD	Environment and Sustainable Development Directorate
IAPZ	Inner Asset Protection Zone (for the purpose of bushfire hazard management)
LDA	Land Development Agency (under EDD)
MNES	Matters of National Environmental Significance
NC Act	<i>Nature Conservation Act 1980</i> (ACT)
NCA	National Capital Authority
NCDC	National Capital Development Commission
NCP	National Capital Plan
NSW	New South Wales
OAPZ	Outer Asset Protection Zone (for the purpose of bushfire hazard management)
PA	Preliminary Assessment
PALM Act	Australian Capital Territory (Planning and Land Management) Act 1988 (Cwth)
PD Act	<i>Planning and Development Act 2007</i> (ACT)
PIT	Plan Implementation Team
PRA	Preliminary Risk Assessment
SEWPaC	Commonwealth Department of Sustainability, Environment, Water, Population and Communities
TaMS	Territory and Municipal Services Directorate
TSC Act	<i>Threatened Species Conservation Act 1995</i> (NSW)

1.0 Introduction

1.1 Objectives

The objective of this assessment report is to analyse the potential impacts and outcomes of the Plan for the development of Gungahlin ('the Plan') in relation to the requirements of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The Plan is described in detail in the *Biodiversity Plan*, which should be read in conjunction with this report.

1.2 What is Strategic Assessment

1.2.1 The EPBC Act

The EPBC Act is the Commonwealth Government's key piece of environmental legislation. It provides the legal framework for the protection and management of nationally and internationally important flora, fauna, ecological communities, and heritage places. These are defined under the EPBC Act as MNES.

The eight matters of MNES are:

- world heritage properties;
- national heritage places;
- wetlands of international importance (i.e. RAMSAR wetlands);
- nationally threatened species and ecological communities;
- migratory species;
- Commonwealth marine areas;
- the Great Barrier Reef Marine Park; and
- nuclear actions (including uranium mining).

Also covered under the EPBC Act is actions taken by Commonwealth agencies or on Commonwealth land.

1.2.2 Strategic Assessments

Strategic Assessments (Part 10 of the EPBC Act) provide an opportunity to assess proposed actions at a larger scale and longer timeframe than traditional site-by-site assessments.

As an overview, the process occurs in two steps:

- Assessment and endorsement of a 'policy, plan or program' (in this case, referred to as 'the Plan'); and
- Approval of actions, or classes of actions, associated with the Plan. This potentially allows development to proceed across a large area without the need for EPBC approval for individual sites.

This process is detailed in **Figure 1.1**.

The Commonwealth Government Department of Sustainability, Environment, Water, Population and Communities (SEWPaC) administers the strategic assessment provisions of the EPBC Act and provides advice to the Commonwealth Minister throughout the process.

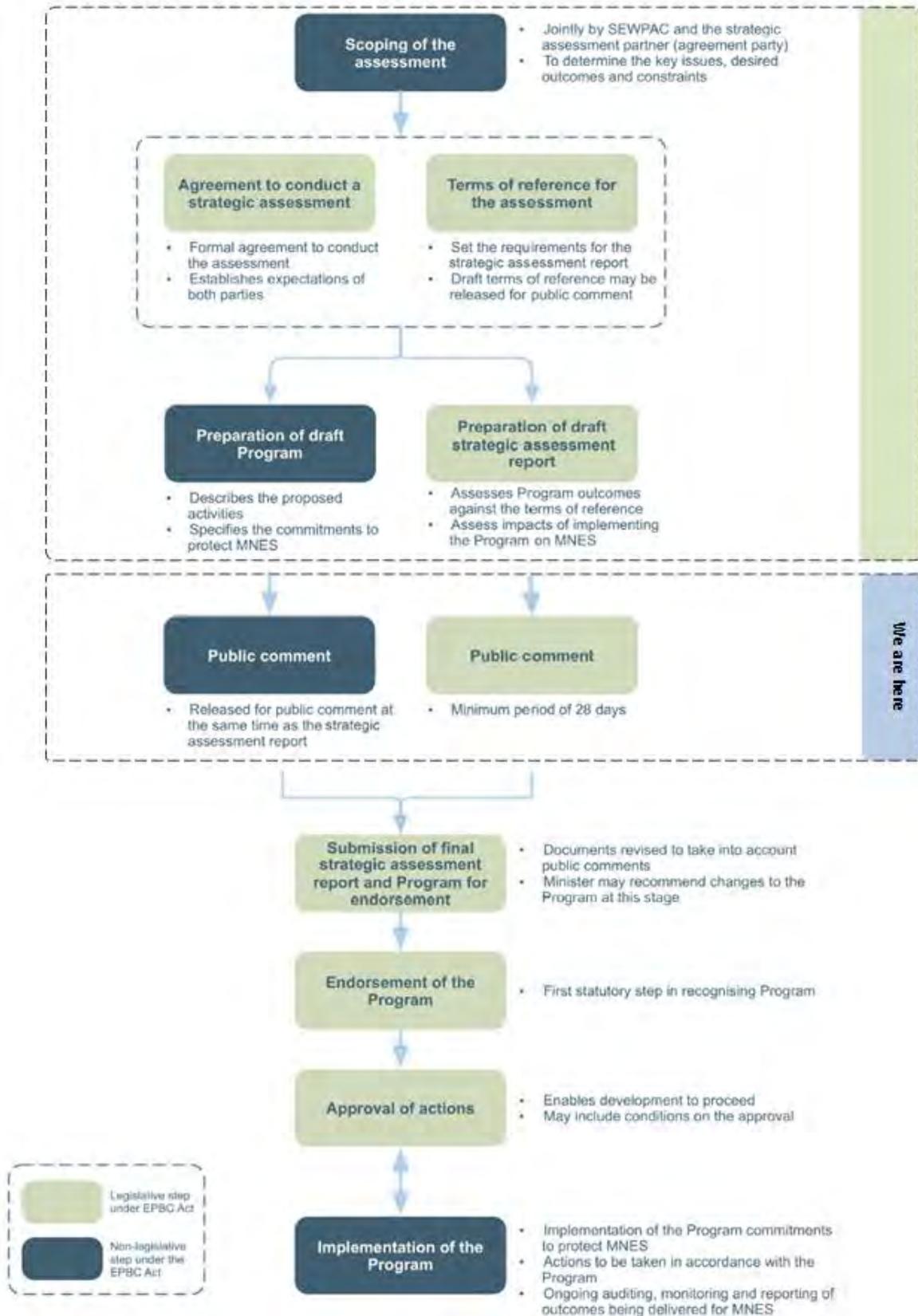


Figure 1.1 - Strategic Assessment Process

Fig

Source: Australian Gov't (2012a³)

2.0 Purpose and Description of the Project

2.1 Summary of the Plan

The Plan will provide for urban development and conservation, including:

- residential, commercial, community and open space land uses and related infrastructure within the district of Gungahlin over the next 20 years;
- an avoidance and mitigation strategy which will place an additional 781 hectares of land supporting threatened species and communities into protected areas⁴ within the district; and
- a package of direct and indirect offsets for further biodiversity enhancement and conservation gains for the protected matters for which the residual impact would still be significant despite the avoidance and mitigation strategy.

2.2 History of the Plan

The planning of Gungahlin commenced in the 1970s with the first surveys commissioned for the area. The location and details of future urban areas as identified in 1989 have been refined over the past 2 decades, including the addition of significant areas of land into nature reserve. The following **Figure 2.1** illustrates the major stages in development and planning of Gungahlin. The elements on this timeline are described in greater detail in the following **Table 2.1**.

³ Australian Government (2012a) *A Guide to Undertaking Strategic Assessments*, Department of Sustainability, Environment, Water, Population and Communities, Canberra (March, 2012)

⁴ Protected area definition includes Nature Reserve and Hills, Ridges and Buffers land use zones under the Territory Plan. See World Conservation Union (IUCN) protected areas categories - <http://www.environment.gov.au/parks/iucn.html>

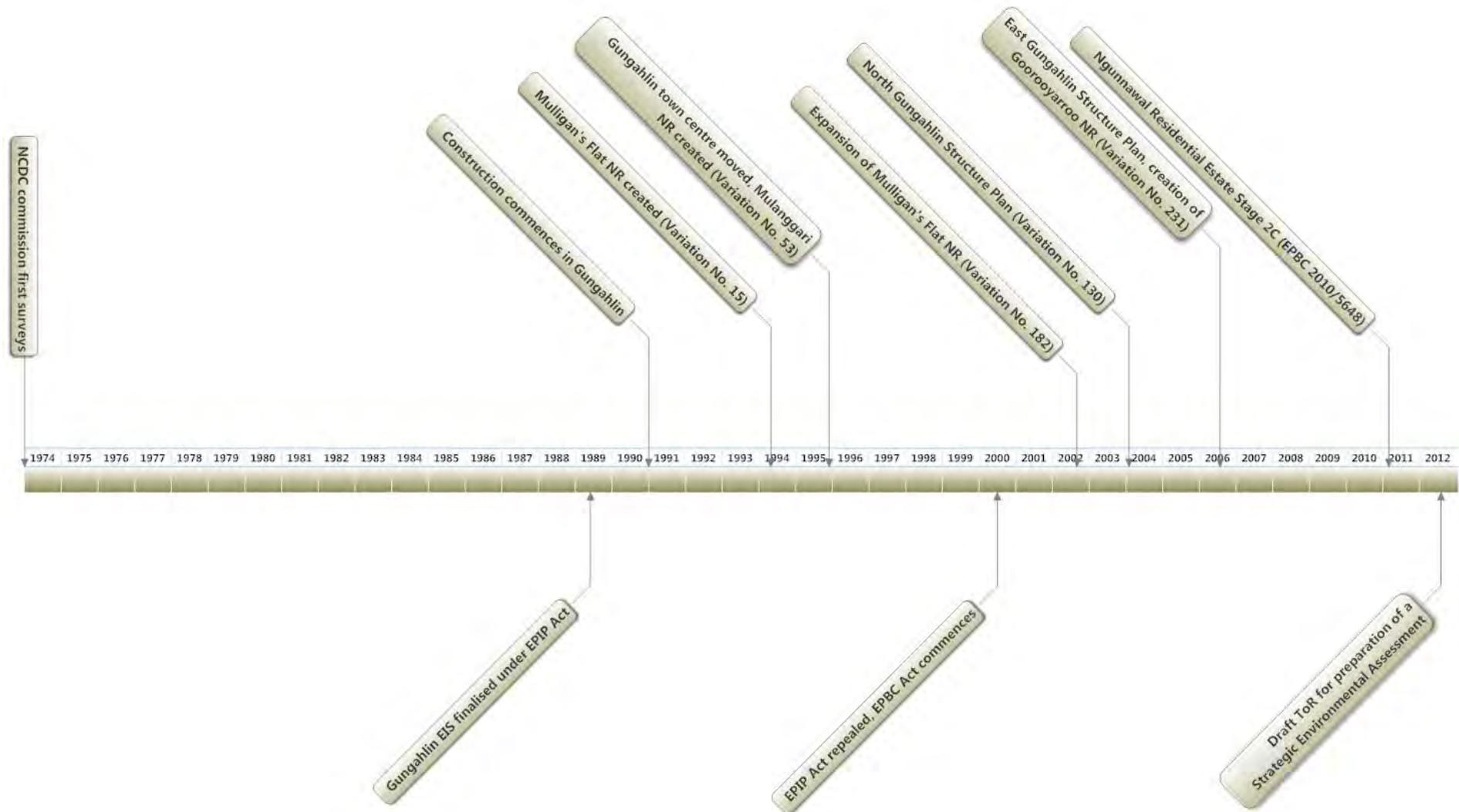


Figure 2.1 - Timeline of planning and development in Gungahlin
 (to be read in conjunction with Table 2.1)

Table 2.1 - History of the Gungahlin Plan

Date	Description of Plan
1970s	National Capital Development Commission (NCDC) commissioned the first surveys of the Gungahlin area.
1989	Gungahlin Environmental Impact Statement released and approved under the Environment Protection (Impact of Proposals) Act 1974 (EPIP Act). Gungahlin Policy Plan gazetted.
1991	Development of Gungahlin began.
May 1994	Mulligan's Flat (Variation No. 15) Significantly expanded the Mulligan's Flat Nature Reserve in an enlarged Hills, Ridges and Buffer Areas land use policy area.
Dec 1995	Gungahlin Town Centre and Central Area (Variation No. 53) In response to the discovery of striped legless lizard (<i>Delma impar</i>), the original plan for the town centre was substantially altered in both its location and development as an urban village.
July 2000	EPIP Act repealed by the Environmental Reform (Consequential Provisions) Act 1999. EPBC Act commences. Despite approval of Gungahlin EIS under the EPIP Act in 1989, individual referrals under the EPBC Act have been prepared for new developments in the Gungahlin Region from 2000 to 2012.
Sept 2002	Public Land – Nature Reserve (Variation No. 182) An additional 19 hectare area was removed from Forde and incorporated into the Mulligan's Flat Nature Reserve.
Feb 2004	North Gungahlin (Variation No. 130) Amended the Territory Plan for North Gungahlin by confirming the planning for the remaining undeveloped areas of Amaroo and Ngunnawal and introducing a revised policy framework for six new suburbs namely, Bonner, Casey, Forde, Jacka, Moncrieff, and Taylor.
Aug 2006	East Gungahlin (Variation No. 231) Created the Gorooyaroo Nature Reserve, to protect approximately 750 hectares of high conservation value box gum woodland and other woodlands, reducing the amount of land available for residential development in Gungahlin by approximately 300 hectares. Also revised planning for Kenny, Throsby and part of Harrison.
Mar 2011	Ngunnawal Residential Estate Stage 2C (EPBC 2010/5648) EPBC Approval Conditions included incorporation of the Bonner 4 East offset area into Mulligan's Flat Nature Reserve. This created Mulligan's Flat North.
Aug 2012	Draft Terms of Reference for the EPBC Act Strategic Assessment provided to the ACT Government.
Oct 2012	On 2 October 2012, the Department of Sustainability, Environment, Water, Population and Communities (SEWPaC) entered into an agreement with the ACT Government Environment and Sustainable Development Directorate and the ACT Government Economic Development Directorate to undertake a strategic assessment of proposed urban development at Gungahlin, ACT.
March 2013	Draft Biodiversity Plan and Strategic Assessment Reports on public exhibition. Public consultation undertaken.

2.3 Planning Framework

2.3.1 East Gungahlin (Throsby and Kenny)

The action is consistent with the EIS (NCDC, 1989) proposed in the context of the ACT's plan for development of the Territory. The action is consistent with the ACT Territory Plan which identifies the affected land as 'Future Urban Areas', and with the Structure Plan for East Gungahlin (Variation No. 231) which identifies the following planning policies and principles for the suburbs:

- 1) Development should be sustainable in terms of ecological, cultural, social and economic considerations.
- 2) To establish conservation areas and provide for management arrangements which are sufficient to conserve threatened fauna, woodlands and grasslands.
- 3) To ensure land uses adjacent to conservation areas do not have significant adverse impacts on threatened species.
- 4) The landscape setting and values of the site should be recognised and enhanced. Existing significant landscape features will be retained.
- 5) The local neighbourhood should be based on a walkable radius of 400m from an activity node, such as a local centre, park or community facility.
- 6) Residential areas should be arranged in a series of inter-connected suburbs, each with their own local centre, typically adjoining a primary school site and open space corridor.
- 7) Mixed uses will be permitted adjacent to commercial centres and other key locations.
- 8) Group centres serving larger populations should be well located on major roads in order to serve a cluster of suburbs.
- 9) An integrated cycling route network should be created within and between communities consistent with national standards.
- 10) The open space network should connect key destinations such as local centres, group centres, schools, parks, community facilities, ovals, ponds and hilltop lookouts.
- 11) The road hierarchy should be clearly legible and provide good and safe access to all users.
- 12) The pattern of urban development should encourage high levels of public transport usage.
- 13) The links between sustainable urban water management and downstream ecological impacts on flora and fauna should be recognised. The potential for urban development to alter flow rates and degraded water quality should be addressed and appropriate sustainable urban water management measures adopted accordingly.
- 14) Aboriginal and European heritage places will be recognised and significant sites conserved in public open space where appropriate. Land uses adjacent to places to be conserved are not to have significant adverse impacts on the retention of the place.

- 15) Conservation areas will be part of the overall landscape character of East Gungahlin. Strategies will be developed at the detail planning stage to protect the interface of conservation from urban development impacts.

The Structure Plan for East Gungahlin was supported by a Preliminary Assessment (PA) under the now repealed *Land (Planning and Environment) Act 1991* which examined the potential impact of the proposed changes on the physical, natural and human environments. An evaluation of the PA was on behalf of the Minister for the Environment concluded that the PA was adequate and no further environmental impact assessment was required.

2.3.2 North Gungahlin (Jacka, Taylor and Kinlyside)

The action is consistent with a number of statutory planning documents that have been developed since 1989.

The action was first detailed in the Environmental Impact Statement for Gungahlin (NCDG, 1989), which showed the general locations of Jacka and Taylor to the north of Gungahlin, and Kinlyside to the west. The same configuration of the suburbs is shown in the National Capital Plan, "General Policy Plan for Metropolitan Canberra" first published in 1984, identifying the suburbs as urban areas.

More recently, the Canberra Spatial Plan's (ACTPLA, 2004b)⁵ 'Future Residential Areas Map' identified Jacka and Taylor in their current configuration as 'Future Greenfield Residential' areas, and Kinlyside was identified as a combination of 'Future Greenfield Residential', and 'Rural Setting'.

The Structure Plan (Variation No. 130) for North Gungahlin (ACTPLA, 2003)⁶ provided policies for the planning of Jacka and Taylor, and outlined plans for development of the suburbs. The Structure Plan identified that Jacka and Taylor could support approximately 2,500 dwellings each. This was followed by the Jacka Concept Plan (ACTPLA, 2008b)⁷, which showed more detailed planning for Jacka, and revised this estimate to approximately 1500 dwellings, due to a reduction in developable area based on additional heritage and environmental studies undertaken. The Structure Plan for North Gungahlin was supported by a Preliminary Assessment (PA) under the now repealed *Land (Planning and Environment) Act 1991* which examined the potential impact of the proposed changes on the physical, natural and human environments. An evaluation of the PA was on behalf of the Minister for the Environment concluded that the PA was adequate and no further environmental impact assessment was required.

The Territory Plan, which is the key statutory planning document in the ACT, shows the current proposed configuration of the suburbs. The development of Greenfield sites in Gungahlin is considered a priority to meet housing demand, in particular, affordable housing in the ACT.

⁵ ACT Government (2004b) *Canberra Spatial Plan*. ACT Planning and Land Authority. March 2004. Accessed online www.actpla.act.gov.au. November 2012.

⁶ ACT Government (2003). *Variation to the Territory Plan No. 130 North Gungahlin (the suburbs of Bonner, Casey, Forde, Jacka, Moncrieff, Taylor and Part of Amaroo and Ngunnawal)*, *Land (Planning and Environment) Act 1991*. Accessed online: November 2012 www.actpla.act.gov.au

⁷ ACT Government (2008b). *Jacka Concept Plan*. ACT Planning and Land Authority. Accessed online: November 2012. www.actpla.act.gov.au

2.3.3 Environmental Impact Assessments under Commonwealth, State or Territory Legislation

The proposed action was assessed as part of the overall development of Gungahlin in the 1989 Gungahlin Environmental Impact Statement (NCDC, 1989), which was completed under the EPIP Act.

The action as described in the Plan will also require approval under the ACT's PD Act. The action will also trigger the ACT *Nature Conservation Act 1980* (NC Act) due to the clearing of more than five hectares of native vegetation within a 'Future Urban Area' under the Territory Plan, as well as potentially resulting in a 'significant adverse impact' under the PD Act on a species or ecological community that is endangered Item 1, of Schedule 4. This would result in the requirement for an Impact Track Assessment under the PD Act. It is considered that it could be progressed using one of two approaches as prescribed by the PD Act:

- 1) Assessment under the 'Impact Track' process, where an Environmental Impact Statement (EIS) would be required; or
- 2) Assessment under the 'Impact Track' following granting of an exemption under Section 211 of the PD Act. For an exemption to be granted under S.211, an application to the ACT Planning and Land Authority would need to be submitted identifying the extent of work already undertaken, identifying management and mitigation measures. Subsequently, the ACT Minister responsible for the PD Act would determine whether a S.211 exemption should be granted.

If the action is assessed under an EIS, full community consultation will be required, as well as consultation with stakeholders in the ACT Government, Heritage Council, Conservator of Flora and Fauna, emergency services and utility providers. Regardless, the current strategic assessment process under Part 10 of the EPBC Act also includes public consultation as a result of the statutory process required for strategic assessments.

2.3.4 National Capital Plan

The National Capital Plan (NCP) is the strategic plan for Canberra and the Territory. It ensures that 'Canberra and the Territory are planned and developed in accordance with their national significance'. The Territory Plan must not be inconsistent with the NCP.

The Plan would result in some areas currently shown as urban spaces under the NCP becoming hills, ridges and buffers (under the NCP land use definition). The NCP states that:

Hills, ridges and buffer spaces are to remain substantially undeveloped in order to protect the symbolic role and Australian landscape character of the hills and ridges as the scenic backdrop to the Parliamentary Zone, Civic and other National Capital precincts, to maintain the visual definition and physical containment of the surrounding towns and to ensure that their landscape, environmental and recreation values become an integral part of the National Capital.

It is not intended that the hills and ridges serve only as public open space. They are intended for multiple use appropriate to the location and character of each hill area. They will be used as vantage points from which people can view the city and to provide a quiet refuge from urban living. They will also serve as wildlife and access corridors linking urban areas with other parts of the Territory's open space system. Their continued use for recreation, tourism and appropriate urban services must be in a manner consistent with maintenance of their environmental qualities.

This description of the hills, ridges and buffers spaces provided by the NCP is not considered to be inconsistent with the proposed land use of avoidance areas under the Plan.

The NCP states that hills, ridges and buffer spaces around Gungahlin would be more precisely defined through the detailed planning of urban development. This would be consistent with the current process being undertaken by the ACT Government. A variation to the NCP will be requested by the ACT Government to ensure consistency between the NCP and the Territory Plan as a result of implementing the Plan.

It is considered that the Plan, and future variation to the Territory Plan following approval and endorsement, would not be inconsistent with the National Capital Plan.

2.3.5 Planning and Policy Tools

The planning framework that underpins the Plan for the Gungahlin area provides a legal basis for a number of other key policies, strategies and plans that will guide decision making at both the strategic planning and development assessment stages. These other policies and strategies are discussed below in more detail.

Conservation Strategies

The National Strategy for the Conservation of Australia's Biological Diversity (ANZECC, 1996)⁸ presented a nationally ratified strategy with the goal of protecting biological diversity and maintaining ecological processes and systems. This Strategy included the identification of nine principles upon which the overarching goal would be achieved, the eighth of which was:

'Central to the conservation of Australia's biological diversity is the establishment of a comprehensive, representative and adequate system of ecologically viable protected areas integrated with the sympathetic management of all other areas, including agricultural and other resource production systems'.

In support of this principle were a series of objectives that considered conservation objectives with associated actions for land both in formal reserves and outside protected areas across freehold, leasehold and other Crown lands. These objectives and actions were broadly directed to State and Territory governments in order to assist with the development of policy and implementation programs.

Providing a greater level of understanding as to what a comprehensive, adequate and representative (CAR) reserve system would be comprised of, the '*Nationally Agreed Criteria for the Establishment of a Comprehensive, Adequate and Representative Reserve System for Forests in Australia*' (Australian Gov't, 1997)⁹ was prepared. While the purpose of this document was to support the Regional Forest Agreement implementation of the National Forest Policy, it does provide guidance on what the targets should be for forests in a CAR reserve system. Criteria relating to biodiversity included:

- As a general criterion, 15% of the pre-1750 distribution of each forest ecosystem should be protected in the CAR reserve system with flexibility considerations applied according

⁸ ANZECC (1996) *The National Strategy for the Conservation of Australia's Biological Diversity*, Report prepared by the Australian & New Zealand Environment & Conservation Council, Commonwealth Department of the Environment, Sport & Territories. Canberra.

⁹ Australian Government (1997) *Nationally Agreed Criteria for the Establishment of a Comprehensive, Adequate and Representative Reserve System for Forests in Australia*, a report by the joint ANZECC / MCFFA National Forest Policy Statement Implementation Sub-committee, Commonwealth of Australia. Canberra.

to regional circumstances, and recognising that as far as possible and practicable, the proportion of Dedicated Reserves should be maximised;

- Where forest ecosystems are recognised as vulnerable, then at least 60 per cent of their remaining extent should be reserved; and
- All remaining occurrences of rare and endangered forest ecosystems should be reserved or protected by other means as far as is practicable.

The list of criteria continues and also extends into specific considerations for old-growth, wilderness and reserve design. However as a general guide, these three criteria provide context for considering conservation planning in the ACT from regional (Fallding, 2002)¹⁰ and bioregional (Australian Gov't, 2011)¹¹ perspectives.

In implementing the National Strategy (ANZECC, 1996), the ACT Government prepared '*The ACT Nature Conservation Strategy*' (ACT Gov't, 1997)¹². This document identified the need to manage conservation both within a formal CAR reserve system and also on non reserve land including:

- leased rural lands;
- urban areas with nature conservation assets;
- road easements and other unleased land; and
- Commonwealth land.

The framework established by the ACT Strategy has guided the conservation planning activities of the Territory and Gungahlin subsequent to the completion of the Gungahlin EIS.

Together with subsequent policy documents such as the ACT Lowland Woodland (Action Plan 27) and Grassland (Action Plan 28) strategies (ACT Gov't, 2004; ACT Gov't 2005)¹³, the extent of Gungahlin's reserved areas has increased with improved understanding of the area's ecological values and likely impact of implementing the plan of development as considered in the Gungahlin EIS. This increase in reserve area, particularly relevant to Gungahlin was foreshadowed by the Nature Conservation Strategy (ACT Gov't, 1997) in noting:

'While the nature conservation estate is impressive in areal terms, it should not be assumed that the biological diversity of the ACT is comprehensively represented. Grassland and woodland ecosystems are poorly represented in the reserve system and riverine systems are also an area of concern. Habitat critical to the continued survival of some threatened species and communities occurs in these ecosystems and a special conservation effort is warranted'.

¹⁰ Fallding, M (2002) *Planning Framework for Natural Ecosystems of the ACT and NSW Southern Tablelands*. Natural Heritage Trust, NSW National Parks and Wildlife Service and Land & Environment Planning.

¹¹ Australian Gov't (2011) *Interim Bioregionalisation for Australia* <http://www.environment.gov.au/parks/nrs/science/bioregion-framework/ibra/index.html> [accessed 12 Aug 2011]

¹² ACT Government (1997) *The A.C.T. Nature Conservation Strategy*, Environment ACT, Canberra

¹³ ACT Government (2005) *A Vision Splendid of the Grassy Plains Extended: ACT Lowland Native Grassland Conservation Strategy*. Action Plan No. 28, Act Department of the Arts, Heritage and Environment, Canberra.

Since publication of the Strategy, protection of the grassland and woodland communities has increased with the gazettal of additional nature reserves. This has in places, significantly reduced the area that had been identified originally under the Gungahlin EIS or Territory Plan for urban development of one form or another. Additional to the formally gazetted nature reserves, substantial parts of north-west Gungahlin also fall under the Hills, Ridges and Buffers zone in the Territory Plan that effectively provides for the protection of natural features including visual amenity and ecological function.

Notwithstanding the current extent of nature reserves and land zoned for environmental protection in Gungahlin, it would still be argued that the ACT has not achieved a CAR reserve system under the criteria proposed by the Australian Government (1997). This is particularly due to the fact that the communities and a number of species of concern are considered to be either endangered or critically endangered under both Territory and Commonwealth legislation. This is inconsistent with the conclusions of Rutherford (2011a)¹⁴, however, does not detract from the fact that the ACT has a solid history in commitment to biodiversity conservation as demonstrated above, that affords due recognition to the importance of ensuring environmental issues are appropriately managed from a strategic perspective.

Future Reserve Establishment

With the National Strategy (ANZECC, 1996) in place for over 17 years, the Commonwealth published '*Australia's Strategy for the National Reserve System 2009–2030*' (Australian Gov't, 2009)¹⁵ which builds on the momentum resulting from the 1996 strategy. This has been further supported by the publication of '*Australia's Biodiversity Conservation Strategy 2010-2030*' (NRMC, 2010)¹⁶. Actions identified in these documents will continue to influence conservation planning in the ACT and specifically Gungahlin with consistent objectives for building a national CAR reserve system.

2.4 Rationale

2.4.1 Territory Context

Based on ACT Government projections, the ACT's population is expected to grow from an estimated 365,000 in 2011 to 457,300 by 2030, and to over 550,000 by 2059 (ACT Gov't, 2012b)¹⁷. This population growth presents challenges to the government to provide affordable housing, infrastructure and services while conserving natural values present in the Territory.

To accommodate this projected population growth, the number of dwellings in the ACT needs to increase by approximately 45,000 by 2030 (ACT Gov't, 2012a) and over 100,000 by

¹⁴ Rutherford P (2011a) *Strategic Biodiversity Conservation – Gungahlin District, ACT*, unpublished report to the ACT Department of Land and Property Services (April 2011).

¹⁵ Australian Government (2009) *Australia's Strategy for the National Reserve System 2009–2030*, prepared by the National Reserve System Task Group convened under the Natural Resource Policies and Program Committee; endorsed by The Natural Resource Management Ministerial Council. Canberra (May 2009)

¹⁶ NRMC (2010) *Australia's Biodiversity Conservation Strategy 2010-2030*, Australian Government, Department of Sustainability, Environment, Water, Population and Communities, Natural Resource Management Ministerial Council, Canberra.

¹⁷ ACT Government (2012b) *ACT Planning Strategy: Planning for a Sustainable City*, Environment and Sustainable Development Directorate, Canberra (July, 2012)

2059 (ACT Gov't, 2011c)¹⁸. This need would be met by greenfield development and urban infill. The regions of Gungahlin and Molonglo Valley contain the only remaining areas for greenfield development classified as 'future urban areas' under the Territory Plan. This remaining supply of greenfield land is estimated to support approximately 48,000 dwellings, which is the projected housing demand to 2030 (ACT Gov't, 2012a).

The ACT has never had an *ad hoc* approach to greenfield development. Planning for Gungahlin began in the 1970s when the National Capital Development Commission (NCDC) commissioned the first surveys of the area. Planning continued throughout the 1980s, and a draft plan and environmental impact statement (EIS) for Gungahlin were released in 1988 and 1989 respectively (NCDC, 1989)¹⁹. The Gungahlin Policy Plan was gazetted in 1989, and was amended in 1991 when development began, to include more planning detail for a number of suburbs (ACT Gov't 2006b)²⁰.

The Territory Plan (ACT Gov't 2008c)²¹ identifies six future urban areas in Gungahlin; the suburbs of Kenny, Throsby, Moncrieff, Jacka, Kinlyside and Taylor. These suburbs have been identified since early planning of the region in the 1980's and their development is considered a priority to meet housing demand. The ACT Government's annual Indicative Land Release Program (ACT Gov't, 2012e)²² identifies priority land release areas in the ACT required to meet housing demand over the next four years. Of the 19,500 dwelling sites included in the residential land release program for 2012 - 2016, 25 per cent are located in the greenfield areas of Gungahlin.

At the last Census (2011) the population of the Gungahlin District was estimated to be 47,303 (ABS, 2011)²³. By 2021, the district is expected to accommodate around 72,900 people (ACT Gov't, 2011d)²⁴. When fully developed, the population is likely to be between 90,000 and 100,000 people (ACT Gov't, 2010a)²⁵, similar to the established regions of Belconnen and Tuggeranong (see **Figure 2.2**).

A commitment to balance nature conservation and urban development has been historically demonstrated throughout the development of Gungahlin. Since the introduction of the Territory Plan in October 1993, a number of major variations to Gungahlin have been made which have resulted in the creation or increase in area of the following nature reserves: Mulanggari, Gungaderra, and Crace Grasslands, and Mulligan's Flat and Goorooyarroo Woodland reserves. In addition, the Territory Plan protects the hills and ridges from development, maintaining ecological connectivity along the northern border of the ACT.

¹⁸ ACT Government (2011c) *Background Paper 7: Housing, Environment and Sustainable Development*, Canberra (October, 2011). Accessed online (5/10/12): http://www.actpla.act.gov.au/data/assets/pdf_file/0003/25680/Planning_Background07_Housing.pdf

¹⁹ NCDC (1989) *Gungahlin Environmental Impact Statement, Final Statement*, Commonwealth of Australia, Canberra (January 1989)

²⁰ ACT Government (2006b) *Variation to the Territory Plan No. 231*, ACT Planning and Land Authority, Canberra (August, 2006)

²¹ ACT Government (2008c) *Territory Plan – Current Version R96*, ACT Government, Canberra (September, 2012)

²² ACT Government (2012e) *Australian Capital Territory Indicative Land Release Programs: 2012-13 to 2015-16*, Economic Development Directorate, Canberra (June, 2012)

²³ Australian Bureau of Statistics (2011) *Gungahlin (SA3), QuickStats*, viewed 5 October 2012 http://www.censusdata.abs.gov.au/census_services/getproduct/census/2011/quickstat/80104?opendocument&navpos=220

²⁴ ACT Government (2011d) *ACT Population Projections by Suburbs and Districts: 2009-2021: Gungahlin*, Chief Minister and Cabinet Directorate, Canberra (June, 2011)

²⁵ ACT Government (2010a) *Gungahlin Town Centre Planning Report*, ACT Planning and Land Authority, Canberra (November, 2010)

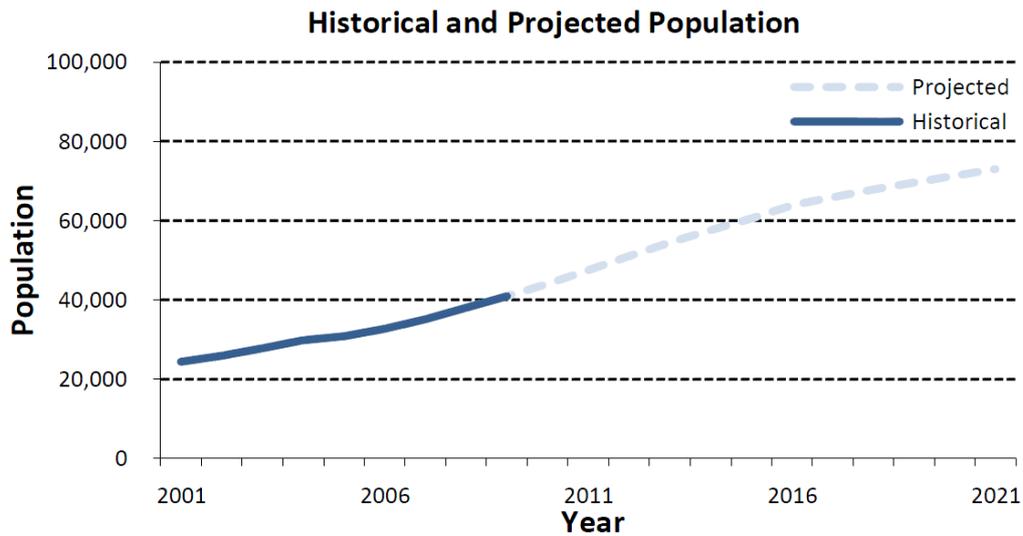


Figure 2.2 - Historical and Project Population Growth for Gungahlin
Source: ACT Gov't (2011b)

2.4.2 Project Drivers

There are two main drivers for this strategic approach to environmental assessment and management for the development of Gungahlin.

Firstly, the Plan, if approved, will streamline the process for the rest of development in Gungahlin, by removing the requirements for further assessment of individual developments under the EPBC Act. Development would be able to proceed without further assessment, streamlining the process and improving land supply and affordability. To date Gungahlin has been subject to a piecemeal assessment process requiring environmental offsets to be established on a per-development basis. This approach has resulted in significant time delays and economic impacts to the ACT Government. Streamlining the process would result in reductions in cost and risk, and have a positive impact on the ability of the government to meet housing demand and supply more affordable housing.

Secondly, the Plan would result in the establishment and management of a consolidated offset package rather than numerous small offsets which would typically be the result of multiple assessments through the referral process and possible subsequent approval under Part 9 of the EPBC Act. The establishment of small offsets on an 'as required' basis does not guarantee results or improvement to values at a landscape scale. Smaller scale offsets are also accompanied by greater administrative costs. The establishment of a large, consolidated addition to the existing reserve system, with a large financial component aimed at improving values within the offset and in surrounding areas would help to achieve environmental outcomes at a landscape scale while minimising the inefficiencies experienced through the smaller scale, site-by-site approach.

Both the Commonwealth and the ACT Governments acknowledge the advantages of strategic, landscape level assessments of some major development programs. By addressing the combined unavoidable impacts at an early stage, resources can be optimised to establish offsets that are viable and cost-effective. A consolidated offset would reduce establishment and administration costs, and optimise the benefits of funding for on-ground management activities.

The Plan aims to result in an optimal balance between the requirement for land for urban development, and the protection of natural values present in Gungahlin, taking into account the balance of land already protected in the region.

In summary, the strategic assessment of development has clear benefits over the alternative of numerous smaller release areas including the potential to:

- minimise delays of individual referrals and economic impacts of delaying land release;
- reduce inefficiencies caused by site-by-site implementation of offsets;
- achieve environmental outcomes at a landscape scale; and
- enable consideration of the ACT's history of voluntary or previous conservation, as relevant to Gungahlin where significant areas have been withdrawn from potential development and permanently protected for conservation.

2.5 The Plan

2.5.1 Key Components

Urban Development

Urban development of the north of Gungahlin will complete the planned district. Once complete, Gungahlin would provide residential and employment lands for a population of around 90,000 to 100,000 people (ACT Gov't, 2010a).

The intent of urban development in the ACT is 'to provide safe, convenient, accessible and attractive neighbourhoods that meet the diverse and changing needs of the community'. This encompasses several factors including:

- offering a wide choice in good quality housing and associated community and commercial facilities;
- providing for local employment opportunities;
- encouraging walking, cycling and use of public transport;
- minimising energy and water consumption; and
- promoting a sense of place through neighbourhood focal points and the creation of a distinctive identity which recognises and, where relevant, preserves the natural environment (ACT Gov't, 2009)²⁶.

The key planning principles and policies for future urban areas reflect the following objectives (ACT Gov't, 2009):

- to balance provision of sustainable and efficient urban structure with biodiversity protection and enhancement of environmental attributes through design;
- to express the natural landscape character in ways that define neighbourhoods, promote community identity and enhance connectivity of natural systems; and
- to develop an urban structure of compact, walkable neighbourhoods with relatively intense, mixed-use centres that are capable of supporting appropriate residential,

²⁶ ACT Government (2009) *Residential Subdivision Development Code*, ACT Planning and Land Authority, Canberra (Effective Date: 2 October 2009). Accessed online: <http://www.legislation.act.gov.au/ni/2008-27/copy/66235/pdf/2008-27.pdf>

commercial and social opportunities and minimise non-renewable energy use and car dependence.

The general design principles as detailed in the following section have not been reviewed in light of the propose reduction of urban areas. This review would be undertaken once the strategic assessment processes is completed, and Commonwealth approval for actions has been given. The reviews may result in significant changes, in particular to the commercial precincts, however would not be inconsistent with the Plan.

Infrastructure

The development of the remainder of Gungahlin will require development of supporting infrastructure in the suburbs. However, the majority of arterial roads proposed to service the new suburbs have already been built, and will only require extension or duplication to meet the new urban areas.

The key planning principles and policies for infrastructure in future urban areas reflect the following objectives (ACT Gov't, 2009):

- to create street networks in which the function of each street is clearly identified, providing acceptable levels of access, safety and convenience for all users;
- to encourage walking and cycling by providing safe, accessible, convenient and legible movement networks to destinations within and beyond the neighbourhood;
- to provide adequate infrastructure for all modes of transport, and incorporate accessible, efficient and safe public transport that is an attractive alternative to the private car;
- to demonstrate that the network capacity of roads, transit ways and utilities infrastructure can be sufficient to cost-effectively maintain the efficient functioning of the city as a whole;
- to ensure that the design of neighbourhoods takes into account environmental constraints including flooding and bushfire risk; and
- to ensure that residential areas are adequately serviced with sewerage, water, storm water, fire fighting, electricity, gas, street lighting and communication services in a timely, cost-effective, coordinated and efficient manner that supports sustainable development practices and asset maintenance needs and to promote the use of road verges or other public land for the provision of reticulated services where topography and other site constraints allow.

Protected Areas

The ACT already has a range of measures under the PD Act and the NC Act to avoid and mitigate the impacts of urban development on the ACT's biodiversity. Through the planning process, and following thorough assessments of conservation values, the Government sets aside critical areas as conservation reserves. Because of this, the ACT has some 54% of its total area set aside in formal conservation reserves (ACT Gov't 2012a)²⁷.

²⁷ ACT Government (2012a) *Draft ACT Nature Conservation Strategy 2012-22*, Environment and Sustainable Development Directorate, Canberra (September, 2012). Accessed online (9/10/12): http://timetotalk.act.gov.au/storage/NCS%202012_text_V7.pdf

The Gungahlin Region contains areas of important biodiversity value. The Plan identifies those areas which have already been protected by the ACT Government during the course of development in Gungahlin, including Mulligan's Flat, Goorooyarroo, Mulanggari, Gungaderra and Crace Nature Reserves; and also provides for the incorporation of significant additional areas of value into the reserve system and the enhancement of these areas with management commitments and funding.

The Plan will protect the areas of highest conservation value within the development area; and improve the landscape function of the existing reserve system. In total, within the Gungahlin Strategic Assessment Area, an additional 781 hectares of land supporting threatened species and communities will be incorporated into protected areas (657 hectares into Nature Reserves, and 98 hectares into Hills, Ridges and Buffers). The process for adding this land into protected areas is discussed in below.

Process for Protecting Additional Land

Outside of national parks, land can be protected for conservation in two land use categories under the Territory Plan:

- **Hills, Ridges and Buffers.** This zone represents non-urban land for which there is a mandate for management for environmental, cultural, recreational and aesthetic values. Objectives of the Hills, Ridges and Buffers zone (NUZ3) are:
 - Conserve the environmental integrity of the hill system as a visual backdrop and a unified landscape setting for Canberra
 - Provide opportunities for appropriate recreational uses
 - Conserve the significant cultural and natural heritage resources and a diversity of natural habitats and wildlife corridors
 - Provide predominantly open buffer spaces for the visual separation of towns and to provide residents with easy access to hills, ridges and buffer areas and associated recreation facilities
 - Provide opportunities for appropriate environmental education and scientific research activities
- **Nature Reserve overlay.** Land that is identified within the Nature Reserve overlay (Pc) is also non-urban land within the broad NUZ3 zone but with the specific designation as Public land that has been gazetted with the objectives (as defined by Schedule 3 of the PD Act) to:
 - Conserve the natural environment; and
 - Provide for public use of the area for recreation, education and research.

While the broad objectives of the Hills, Ridges and Buffers zone are largely consistent with that of land which is subject to the Nature Reserve overlay, one of the primary differences between these zones is that activities such as extensive agriculture could persist, albeit with approval. Despite that, the Hills, Ridges and Buffers zone provides for a relatively a high level of protection for environmental values and is accordingly considered from the perspective of land that would be managed in a way that is not inconsistent with the requirements for environmental protection and conservation of biodiversity. The Hills, Ridges and Buffers zone (NUZ3) is largely equivalent to the "E3 – Environmental Management" zone under the NSW *Standard Instrument – Principal Local Environmental Plan 2006*.

The change of tenure to Hills Ridges and Buffer zones will be amended via a Territory Plan variation and areas considered under the Strategic Assessment are proposed to be given protective status under a Concept Plan/Precinct Code. Uses will be limited to those which are in keeping with the conservation outcomes specified in the commitments of the Gungahlin Strategic Assessment.

For the purposes of this assessment, and the Plan, Hills, Ridges and Buffers (NUZ3) and lands subject to the Nature Reserve overlay (Pc) are considered to be consistent with the objectives of management for biodiversity offsets. By comparison, the Future Urban (FUA) and Broadacre (NUZ1) areas are not considered to be consistent with a biodiversity conservation objective.

The process for changing land use zonings requires a variation under the Territory Plan. Variations to the Territory Plan take place with the following process²⁸:

- 1) **Preparation of a Draft Plan Variation:** Draft plan variations are prepared by the ACT Planning and Land Authority. When preparing the variation, any relevant planning reports or strategic environmental assessments must be considered to determine whether the variation would be consistent with the statement of strategic directions of the Territory Plan.
- 2) **Public Consultation:** The draft plan variation and any associated background papers would be made available for public inspection and comment.
- 3) **Interim Effect:** Draft variations may have interim effect for a defined period meaning that during the defined period, in addition to not doing anything inconsistent with the Territory Plan, the Territory, the Executive, a Minister or a territory authority must not do any act, or approve the doing of an act, that is inconsistent with the Territory Plan if it were varied in accordance with the draft plan variation.
- 4) **Revisions or Withdrawal:** ACTPLA may revise or withdraw a draft plan variation after the end of the public consultation period. Unless it is withdrawn, the variation must be given to the Minister for approval.
- 5) **Minister's Role:** Once received, the Minister must approved the draft plan variation, return it to ACTPLA with written directions, or refer it to an appropriate committee of the Legislative Assembly. If the draft plan variation is referred to a Legislative Assembly committee the Minister must wait for the committee's report before subsequently approving it or referring it back to ACTPLA.
- 6) **Approval and Tabling in Legislative Assembly:** If the Minister approves a plan variation, it must be presented to the Legislative Assembly. The Assembly has the power to reject the plan variation. If the Legislative Assembly does not reject the approved plan variation within five sitting days after it is presented, a date for commencement is fixed. Public notification of the commencement of the variation is required.

In summary of this, the process for transfer of land would be initiated in accordance with the timeframes established in **Table 4.1 (Section 4.1.4)** of the Plan. The variation to the Territory Plan for each area would be completed by ESDD, and it would be reported to the Commonwealth by the Plan Implementation Team (PIT) following approval by the Legislative Assembly.

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http://www.actpla.act.gov.au/tools_resources/legislation_plans_registers/plans/territory_plan/territory_plan_master_page

It is considered unlikely that a variation to the Territory Plan to meet the commitments of the Plan would be rejected by the ACT Government.

Summary

In summary, the key components of the Plan are shown in **Figure 2.3** below as a combination of urban development and avoidance areas.

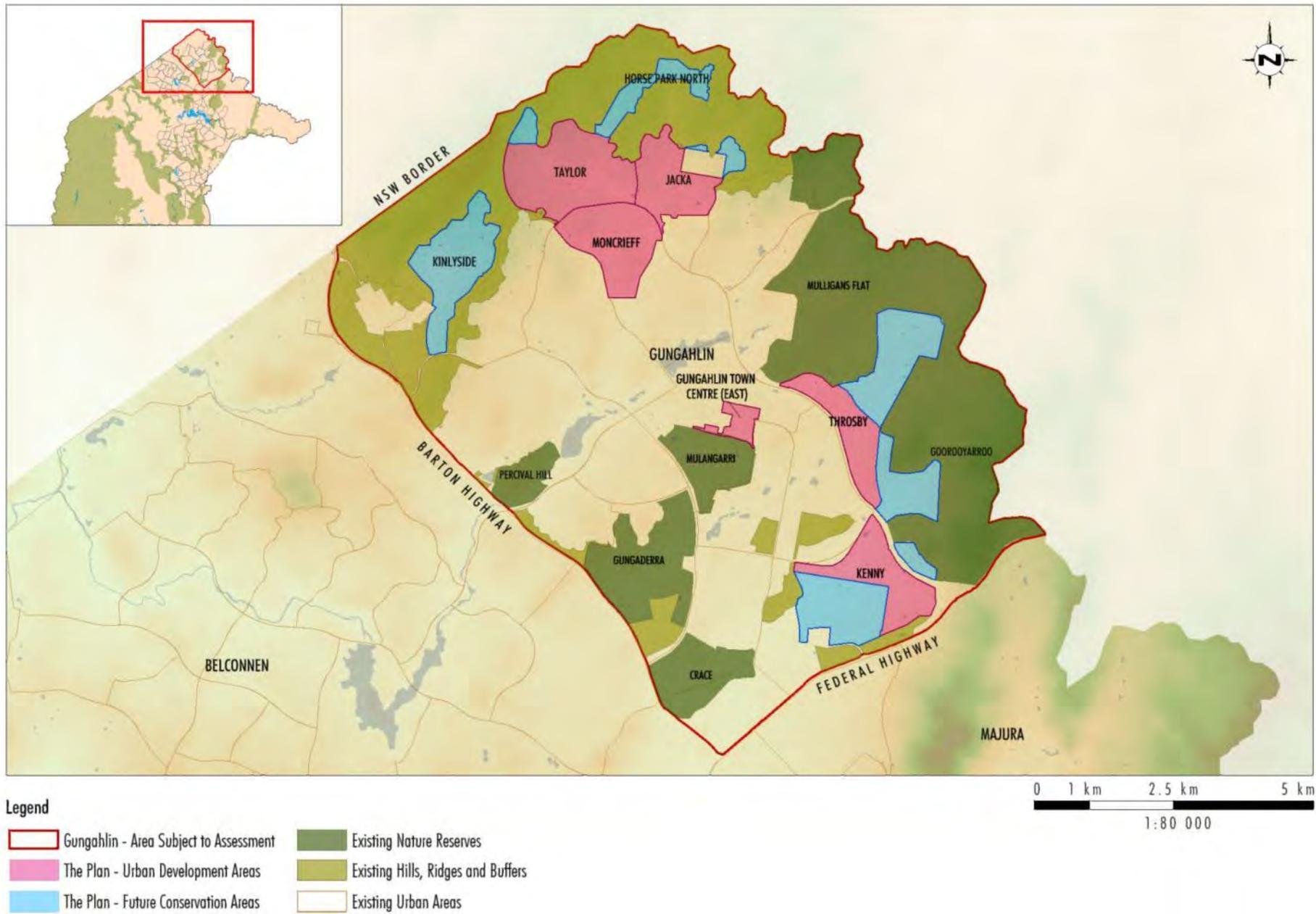


Figure 2.3 - Summary of the Plan

2.5.2 Detailed Description of Urban Development Component

The components of urban development included in the Plan are based on future urban areas identified in the Territory Plan. Urban development (and associated infrastructure) would generally include the following activities:

- construction of infrastructure, including roads and services (water, sewerage, storm water, electricity, gas and telecommunications) within the suburbs;
- construction of water quality and flood mitigation ponds and/or wetlands and associated works (flood ways etc);
- establishment and landscaping of open space areas for passive and active recreation; and
- development of urban blocks within the suburbs including the construction of dwellings (single and multi-storey), community facilities (including schools, places of worship, etc.) and commercial premises.

For the purpose of assessment, these key components are expanded in the following section to give a more detailed indication of what the action entails for each of the following Gungahlin suburbs subject to the Plan.

The planning principles and suburb maps in the following section are sourced from the ACT Territory Plan, and concept or structure plans prepared as a requirement under the PD Act. These principles have not yet been amended based on the recommendations of the Plan however provide an indication of the proposed land uses and design concepts for the future urban areas.

Gungahlin Town Centre (east)

This area is located directly to the east of the existing Gungahlin Town Centre, bounded by Anthony Rolfe Avenue to the north; the suburb of Franklin to the east; and Mulanggari Grasslands Nature Reserve to the south.

The area of development is 36 hectares, and includes Block 1 Section 11, Block 1 Section 230, Block 1 Section 231, Block 3 Section 233 and Block 1 Section 299 in the District of Gungahlin.

The proposed land uses of the area include commercial and mixed use, as well as community facilities and open space.

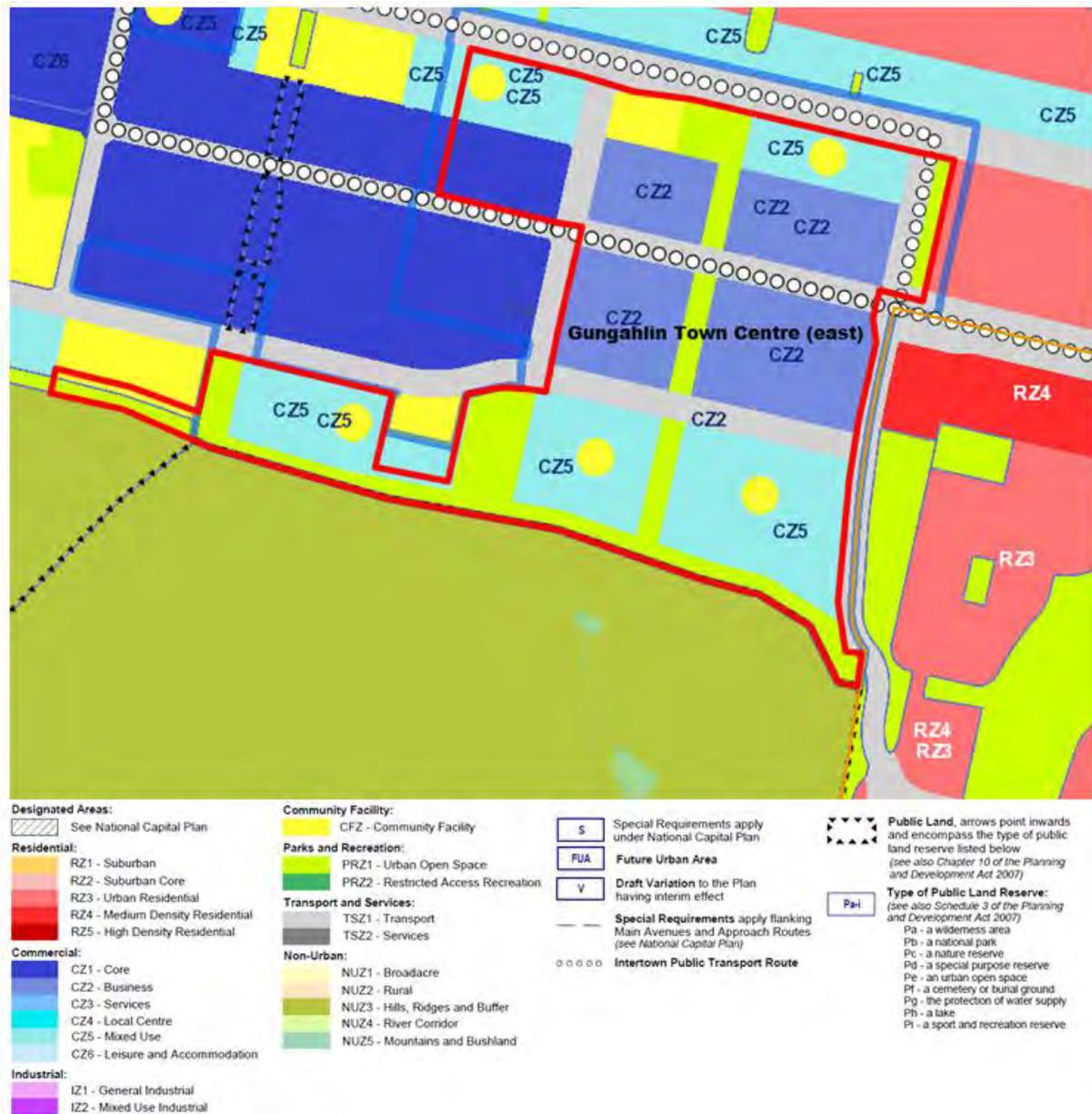


Figure 2.4 - Gungahlin Town Centre (east)
Red outline indicates extent of development

The following principles will apply to development within the area subject to Gungahlin Town Centre structure plan (ACT Gov't, 2011e²⁹):

1. The town centre is to provide the main commercial and community focus for the district population of Gungahlin.
2. Encourage the development of a retail environment in the Town Centre that creates a distinct point of difference from other centres.
3. The concentration of commercial and retail activity in the town centre is to ensure an efficient pattern of development.
4. Stage retail development to complement the growth in population of Gungahlin.
5. Planning policies are to promote the town centre as vibrant and viable with a wide range of

²⁹ ACT Government (2011e) *Gungahlin Town Centre Structure Plan*, ACT Planning and Land Authority, Canberra (December 2011)

services, facilities and employment and provide opportunities for higher density residential development.

6. Provide opportunities for business investment and employment that supports both daytime and night-time economic activities in the town centre.

7. To enable development of viable offices, large land parcels intended for this purpose should remain intact.

8. Support and encourage the location of ACT, Commonwealth Government and private sector offices within the Town Centre.

9. Higher density development in the town centre is to be encouraged, particularly in suitable locations that are well served by public transport.

10. Improvement to urban design and encouragement of mixed-use development, which provide for home-based employment and small scale workplaces, in the town centre is to enhance and strengthen its role.

11. *Ensure residential uses within mixed use areas incorporate acoustic design measures to ensure that the provisions of the Environment Protection Act are complied with.*

Table 2.2 - Summary of Values in Gungahlin Town Centre (east)

MNES	Summary of Impacts
Striped legless lizard	<p>Targeted surveys for striped legless lizard were undertaken by Biosis in 2012³⁰ on the site. These surveys identified a previously unknown population on the site, to the north of the previously identified population within Mulanggari Nature Reserve. The surveys concluded that there was likely to be a contiguous high density population of striped legless lizard within the southern half of the site (south of Flemington Road). At the time of survey, the likelihood of occurrence of the species on the site was delineated based on the land management regime currently in place. The area of the site north of Flemington Road, was subject to frequent mowing, which had rendered the site unsuitable for the species. Since the survey described by Biosis (2012), the habitat in the south of the site has been intensively mown in accordance with approved bushfire hazard requirements, and it is considered likely that the habitat quality for striped legless lizard would have been impacted as a result. Despite this, it is likely that striped legless lizard persist within the area affected by the proposed action albeit at a lower density than occurred previously.</p> <p>14 hectares of habitat would be impacted.</p>
Box gum woodland	<p>In 2012, Biosis Research undertook vegetation surveys across the site, which identified a small patch of native vegetation in the south eastern corner of the site that met the criteria for box gum woodland. The assessment concluded that 0.5 hectares of box gum woodland was present on the site.</p>

Horse Park North (broadacre)

This area is located to the north of the future urban area of Taylor. While identified as a potentially developable area in the Strategic Assessment Agreement, it will be avoided entirely in the Plan (along with 34 hectares of low to moderate quality box gum woodland) and will not be assessed further.

³⁰ Biosis Research (2012) *Striped Legless Lizard (Delma impar) Survey and Vegetation Assessment Report*, Unpublished report to the ACT Government

Jacka (north)

Jacka is located in north Gungahlin, at Canberra's northern edge. The suburb lies to the north of the suburb of Amaroo and the future Horse Park Drive alignment and west of the suburb of Bonner.

The area of development in Jacka (north) includes part of Rural Blocks 796, 814 and 815 in the District of Gungahlin. The likely block yield for Jacka is expected to be approximately 1,500 blocks (ACT Gov't, 2008a)³¹.

The development boundary for Jacka (north) as defined in the Plan has been determined avoiding the already approved and constructed Jacka (south) and the Horse Park Wetland heritage precinct in central Jacka (Block 766 in **Figure 2.5** below). The Plan also avoids the 'Elm Grove' heritage precinct in the north east corner of the suburb.

³¹ ACT Government (2008a) *Jacka Concept Plan*, ACT Planning and Land Authority, Canberra (January, 2008)

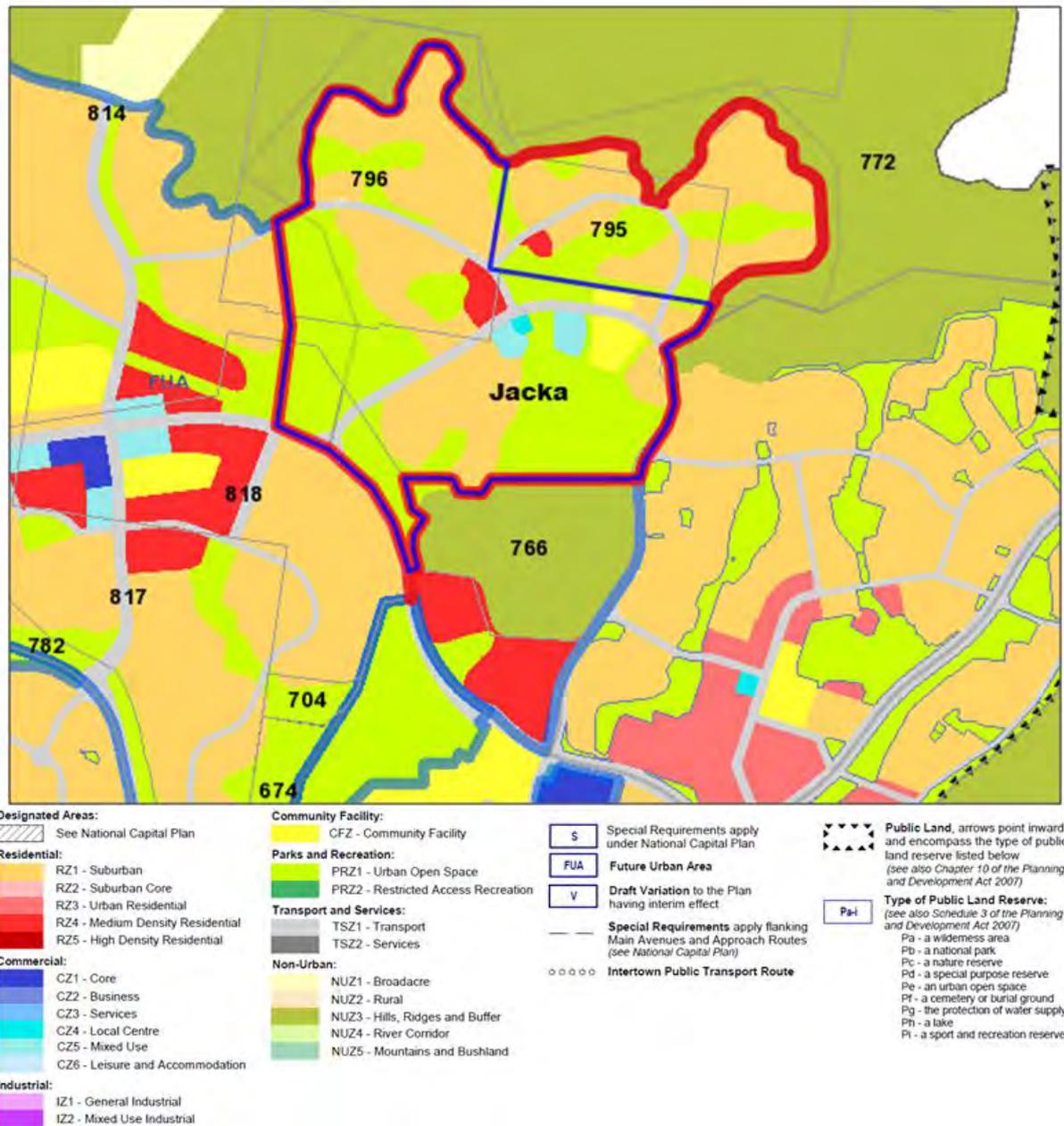


Figure 2.5 - Jacka (north)
 Red outline indicates extent of development from Territory Plan;
 Blue indicates extent of development under the Plan

The design principles for Jacka as detailed in the Jacka Concept Plan (ACT Gov't, 2008a) are listed below:

Planning Principles

A number of design principles have been adopted as part of the Jacka Concept Plan. These principles are set out below. They incorporate the relevant planning principles from Variation to the Territory Plan No. 130.

- The Horse Park Wetland and heritage precinct is to be protected by inclusion within a substantial area of Urban Open Space (generally incorporating the curtilage boundaries identified by the Register of the National Estate listing for the Wetland), which will be subject to specific planning policies and management practices. The precinct shall have high visibility but restricted access by the public. The wetlands are to be protected by the inclusion upstream of water sensitive urban design techniques.
- A “convenience” local shopping centre is to be located centrally in the suburb (with uses able to change in parallel with changing community needs) adjacent to areas of higher residential

density.

- A primary school, neighbourhood oval and district playing fields are to be located upstream of the wetlands and central to the school catchment and near the local centre.
- Local bus routes to be provided through the suburb, encouraging public transport use.
- Edge roads shall be provided around the edge of residential development immediately adjacent to the suburb edge and act as a buffer between residential development and areas of open space. An edge road shall be predominantly used as a buffer where the adjoining open space contains substantial cultural heritage or environmental values and in areas identified in the bushfire risk assessment.
- To ensure the integrity of water quality and flow to the wetland area, water sensitive urban design water management measures are to be implemented in the locations identified upstream of the Horse Park Wetland. The detail design of these measures will be the subject of future hydraulic studies.
- Provide an area close to the local centre for a community facility site adjacent to the main public transport route on the distributor road.
- Provide for an urban edge trail (equestrian and other uses) around the outer edge of Jacka that will move as the urban edge develops, subject to land management and tenure arrangements.
- Provide hilltop reserves on the western ridgeline and in other strategic locations that provide opportunities for lookouts and viewsheds.

In summary, the principles for development in Jacka would ensure the protection of Horse Park Wetlands, with low impact development and water sensitive urban design upstream of the wetlands, preserve open space on the hills and ridgelines, and manage bushfire risk from the north with edge roads.

Table 2.3 - Summary of Values in Jacka

MNES	Summary of Impacts
Golden sun moth	ACT Government Wildlife Atlas Mapping shows three distinct patches of golden sun moth habitat throughout Jacka (north) (see Figure 5.4). These patches equate to approximately five hectares of low quality habitat. In addition to records available through ACTMAPi, a report produced by Geoff Butler & Assoc. and Vertego Environmental Consultancy (2011) ³² confirmed the presence of golden sun moth in low numbers generally in accordance with the records in the northern half of Jacka as indicated by ACT Government records. Up to 5 hectares of habitat is expected be impacted in Jacka.
Box gum woodland	Jacka (north) contains approximately 26 hectares of low to moderate quality box gum woodland in the north western quadrant (Figure 5.2). The majority of this would be avoided by the Plan.
Offsite/adjacent values	No MNES are known to be present north of the suburb boundary, and would therefore not be impacted by asset protection activities.
Heritage Values	The Elm Grove and Horse Park Wetlands heritage precincts while considered significant under Territory legislation however are not MNES, and therefore will not be assessed in this strategic assessment.

³² Geoff Butler & Assoc. and Vertego Environmental Consultancy (2011) *Golden Sun Moth (Synemon plana) survey of proposed suburb of Jacka, Gungahlin*, Report for ACT Land Development Agency (February, 2011)

Kenny

The suburb of Kenny is in East Gungahlin. It is located west of the Federal Highway, south of Horse Park Drive, and east of the existing suburb of Mitchell.

The area of development in Kenny identified in the Territory Plan includes part of blocks 699, 742, 775, 792 and 820 in the district of Gungahlin. The suburb was expected to yield approximately 3,500 dwellings as well as commercial development, community facilities and open space (ACT Gov't, 2010b)³³.

However, the extent of development in Kenny has been reduced significantly since the East Gungahlin Structure Plan (ACT Gov't, 2010b), due to the identification of a significant population of striped legless lizard, and the presence of a geological subsurface feature across a large part of the suburb. The geological feature identified on the site is a groundwater discharge area featuring layers of alluvium which present challenges to development activities and storm water management in the area.

Based on the avoidance of constraints on site, the developable area of Kenny has been reduced by 50% and would now include just Blocks 699 and 792, with a total area of 164 hectares, as shown in **Figure 2.6**.

Notwithstanding the creation of a reserve in Kenny, the primary watercourse flowing through the area, Sullivan's Creek, will require storm water management works, some of which may occur within the footprint of the proposed reserve. In addition to this, a trunk sewer may need to be installed in the vicinity of Sullivan's Creek. The need for specific infrastructure in and around Sullivan's Creek will be determined in the detailed design stages in consultation with the PIT. These storm water management works and trunk sewer following the creek line could impact between 2-3 hectares of striped legless lizard habitat. Direct impacts of a further 158 hectares of habitat have been avoided, and the habitat area will be managed as part of a new nature reserve.

The suburb of Kenny is on the ACT Government's indicative land release program. The first stage of residential land release in Kenny was scheduled to commence in 2012-13, with further releases planned in 2013-14, however this has been delayed due to the identification of additional site constraints as discussed above.

³³ ACT Government (2010b) *Structure Plan: East Gungahlin (including the suburbs of Kenny, Throsby, Part of Harrison, and Goorooyaroo Nature Reserve)*, ACT Planning and Land Authority, Canberra (Effective May, 2010)

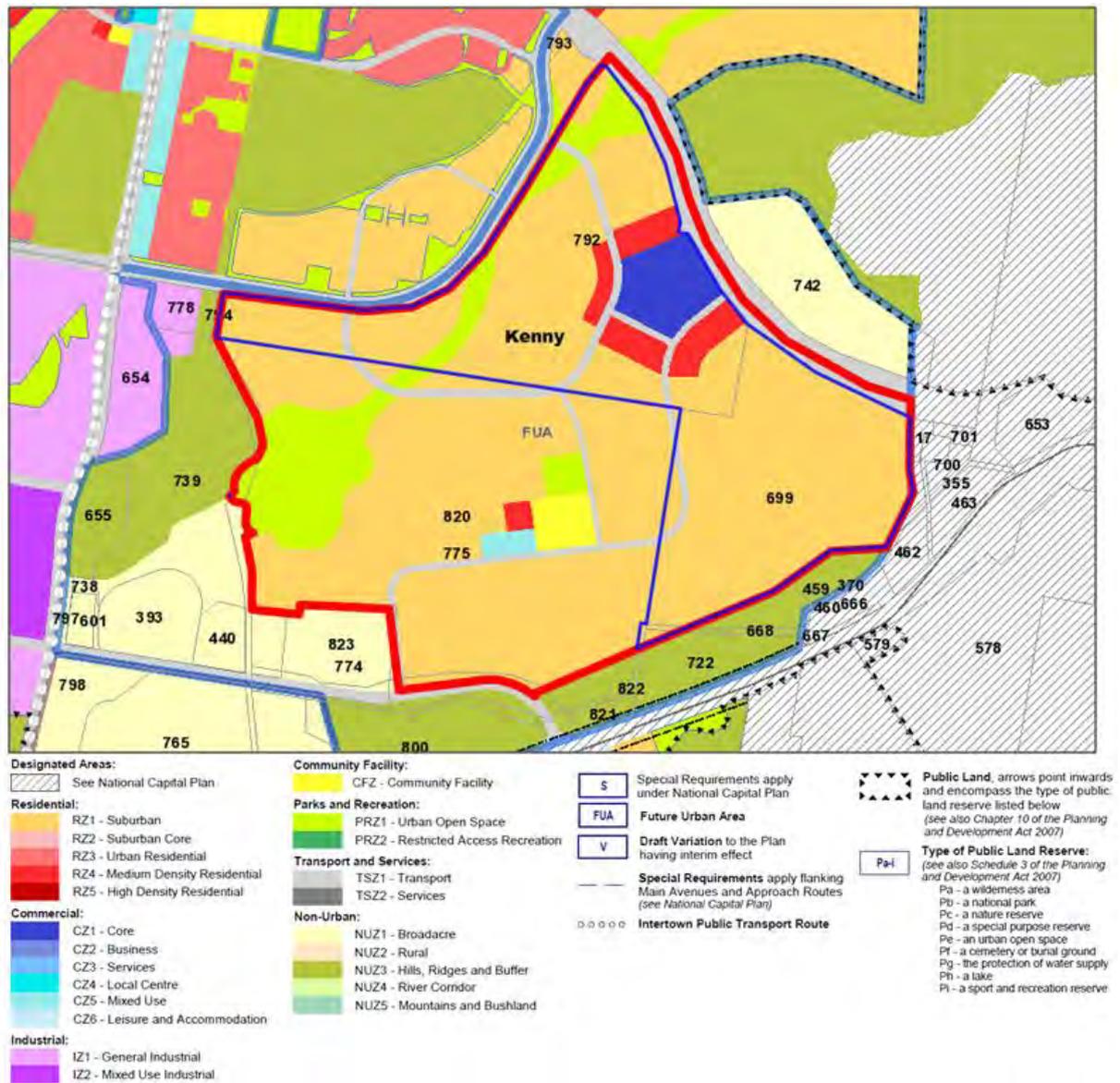


Figure 2.6 - Kenny

*Red outline indicates extent of development from Territory Plan;
Blue indicates extent of development under the Plan*

The general design principles for Kenny are detailed in the East Gungahlin Structure Plan (ACT Gov't, 2010b):

General Policies

- A Group Centre with adjoining higher density housing is to be developed at a major road intersection with Horse Park Drive.
- Edge roads to be utilised wherever possible as a buffer between residential development, urban open space, nature reserves, heritage precinct and other adjoining land uses.
- A local bus route is to be provided through the suburb via the Group Centre, areas of higher density and primary school site, encouraging public transport usage.
- Opportunities are to be provided for small-scale community facility sites in open spaces in convenient locations predominantly along public transport routes.
- Neighbourhood oval to be located adjacent to proposed Government Primary School.
- A water detention feature is required as part of Sullivan's Creek Drainage Study.
- Higher density and mixed-use residential areas will be located adjacent to the primary school.
- Development is to be for Broadacre purposes that complement the reserve.

- Specific policies
- Existing drainage lines to contribute to linear park
- Cultural and/or natural heritage sites are to be preserved within open space and provide a pedestrian/cycling underpass to urban areas of Kenny east of Horse Park Drive.
- Cycleway/pedestrian link to be provided within open space.
- Well Station Road (heritage trail) and adjacent trees to be retained in open space.
- Ensure Sandford Street extension to Federal Highway connection.

These principles for development in Kenny are likely to be amended due to the reduction in developable area.

Table 2.4 - Summary of Values in Kenny

MNES	Summary of Impacts (by Suburb)
Golden sun moth	<p>Golden sun moth has been recorded in low numbers in the northern corner of Kenny and in the north east adjacent to Horse Park Drive, and may be present in low numbers in other parts of the area (Hogg, 2010a)³⁴. From mid November 2010 to mid January 2011 three meandering surveys across Kenny for Golden Sun Moth were undertaken during suitable climatic conditions, which confirmed the populations in the north and north east of Kenny (see Figure 5.4), but did not identify any additional areas. A restricted survey of Kenny in 2009 also observed a small number of moths in the northern corner³⁵.</p> <p>Approximately 2 hectares of habitat occur within the impacted area of Kenny, with an average quality of low to moderate.</p>
Striped legless lizard	<p>During Spring 2011 extensive tile surveys were undertaken across southern Kenny. Arrays of roofing tiles were laid out to define the extent of a known population in Kenny.</p> <p>In Kenny, 150 captures were made of a maximum of 127 individual lizards. Lizards were caught over approximately 95 hectares of the Kenny development area and about 130 ha over the wider Kenny area (Figure 5.5). An estimate of the total population of SLL within Kenny was made based on average home ranges for the lizards and capture rates within the tile arrays, as around 1,000 SLL within the Kenny development area, and up to 1,250 across the wider Kenny area.</p> <p>Based on the 2011 survey results, the size of the population of SLL within Kenny is likely to be around 1,000 individuals.</p> <p>This large population occurs within Block 775 / 820. This population will be largely avoided by the Plan. Potential indirect impacts to MNES are discussed further in Section 5.</p>
Box Gum Woodland	<p>Approximately 93 hectares of low diversity EPBC woodland occurs at Kenny. This woodland is characterised by old and highly productive 300 – 450 year old trees. The woodland at Kenny is classified as Yellow Box on lowland valley flats (below 620m) vegetation type that has been extensively cleared elsewhere and now has a highly restricted distribution. Over 90% of the MNES woodland will be protected at Kenny including the majority of the 300 trees recorded on site and estimated to be over 200 years old.</p> <p>Approximately 7 hectares of woodland would be impacted by development.</p>

³⁴ David Hogg Pty Ltd (2010a) *Kenny Background Investigations Ecological Assessment*, report to Indesco Pty Ltd (2010)

³⁵ Advice provided by Michael Mulvaney of Conservation, Planning and Research, emailed 27 January 2012

Kinlyside

Kinlyside is located at the western edge of Gungahlin, between Casey, and the village of Hall. The area supports a number of significant ecological values, including box gum woodland, golden sun moth habitat, and recently identified pink-tailed worm-lizard habitat. Kinlyside will be avoided entirely as a result of the Plan. No direct or indirect impacts to Kinlyside are considered likely.

Moncrieff

Moncrieff is located in north Gungahlin to the south of the future urban areas of Jacka and Taylor, and north of the existing suburban areas of Ngunnawal and Amaroo.

Moncrieff includes part of Blocks 674, 704, 782, 817 and 818 in the District of Gungahlin. Moncrieff is advanced on the indicative land release program, with 500 blocks identified for release in 2013-14 with additional releases in the years following.

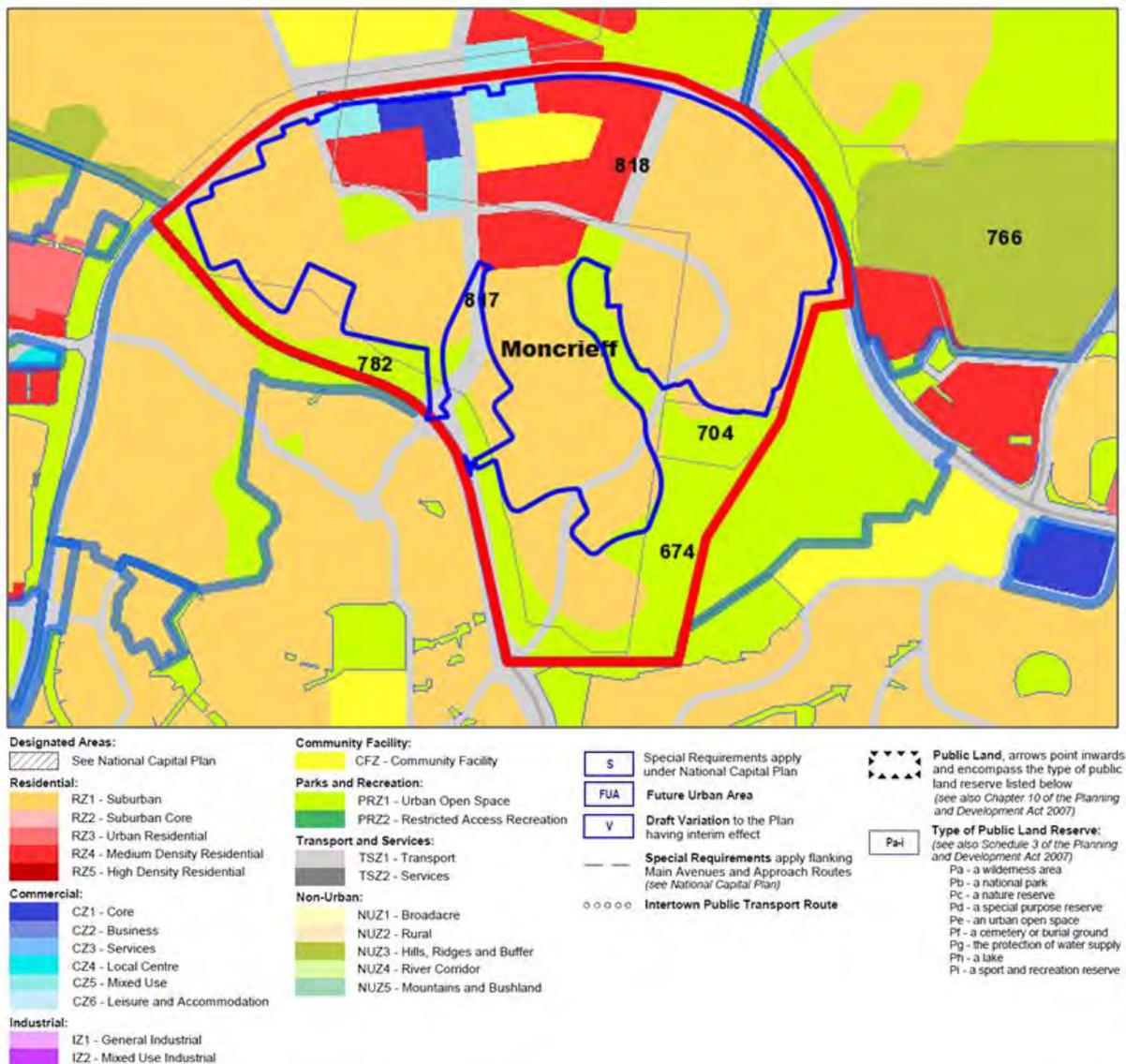


Figure 2.7 - Moncrieff
 Red outline indicates extent of development from Territory Plan;
 Blue indicates extent of development under the Plan

The general design principles for Moncrieff are detailed in the Moncrieff Concept Plan (ACT Gov't, 2008d) as:

General Policies

- A group centre and higher density housing at the intersection of Horse Park and Mirrabai Drives shall be developed, in layout and design, on the principles of an 'urban village', closely aligned towards public transport use. Each of the intersecting roads shall be designed as urban boulevards, with at-grade pedestrian crossings. The precinct shall be integrated with the major open space system, directly to the north.
- Bushland revegetation shall be undertaken on the steeply sloped ridge on the eastern edge of Moncrieff overlooking the Amaroo District Playing Fields.
- Edge roads are to be utilised wherever possible as a buffer between residential development and areas of open space. An edge road shall be predominantly used as a buffer where the adjoining open space contains substantial cultural heritage or environmental values.
- Local bus routes are to be provided through the suburb, encouraging public transport usage.
- Open space spine is to be based on existing drainage paths.
- Opportunities are to be provided for small-scale community facility sites in open space in convenient locations predominantly along public transport routes.

Specific policies

- A site is to be reserved for a potential secondary college adjacent to the group centre.
- The east-west ridge that connects to a generally north-south avenue to Horse Park Drive is to be retained and protected.
- Significant hilltops and ridges are to be retained in urban open space.
- A trunk cycleway is to be provided along Mirrabai Drive connecting with trunk cycleway on Horse Park Drive.
- An Inter-town Public Transport (IPT) route is to be provided along Mirrabai Drive with a terminus to be located at the group centre.
- Roads are to be designed as boulevards.
- The road connection to be designed as an avenue and align with water management feature as a terminating view.
- No development is to be permitted on eastern escarpment.

Table 2.5 - Summary of Values in Moncrieff

MNES	Summary of Impacts (by Suburb)
Golden sun moth	Moncrieff contains a widespread population across the south-west and west of the site, comprising approximately 38 hectares of moderate quality habitat (Figure 5.4). This habitat largely overlaps with secondary grassland meeting the criteria of box gum woodland.
Box gum woodland	Approximately 40 hectares of box gum woodland have been identified in Moncrieff (Hogg, 2011) ³⁶ (Figure 5.2). The woodland is rated the woodland as being of varying qualities; low, medium, medium-high and high. These quality classes were determined based on a number of factors, including ground storey diversity, upper storey, and presence of regeneration. ACT Government mapping however shows 59 hectares of box gum woodland, which has been used in the assessment as a conservative approach.

³⁶ David Hogg Pty Ltd (2011) *Moncrieff Residential Estate Option 5B Ecological Assessment*, prepared for the ACT Land Development Agency (June, 2011)

The outline of development as shown in **Figure 2.7** is the result of extensive assessment and consultation to avoid impact to high quality areas. The design principles for Moncrieff, with protection of the ridgelines in the south and east will retain native vegetation, including all high quality box gum woodland, and will be managed for these values.

Impacts to MNES are discussed further in **Section 5**.

Taylor

The suburb of Taylor is located at the northern edge of Gungahlin, west of the future suburb of Jacka, and north of Casey.

The development of Taylor would include part of Rural Blocks 780 (to become blocks 816 and 817), 796, 814 and 815 in the District of Gungahlin. Taylor is expected to support approximately 3,000 dwellings, as well as commercial space, community facilities and open space (ACT Gov't, 2008b)³⁷.

³⁷ ACT Government (2008b) Structure Plan North Gungahlin (including the suburbs of Bonner, Casey, Forde, Jacka, Moncrieff, Taylor and Part of Amaroo and Ngannawal), ACT Planning and Land Authority (Effective December, 2008)

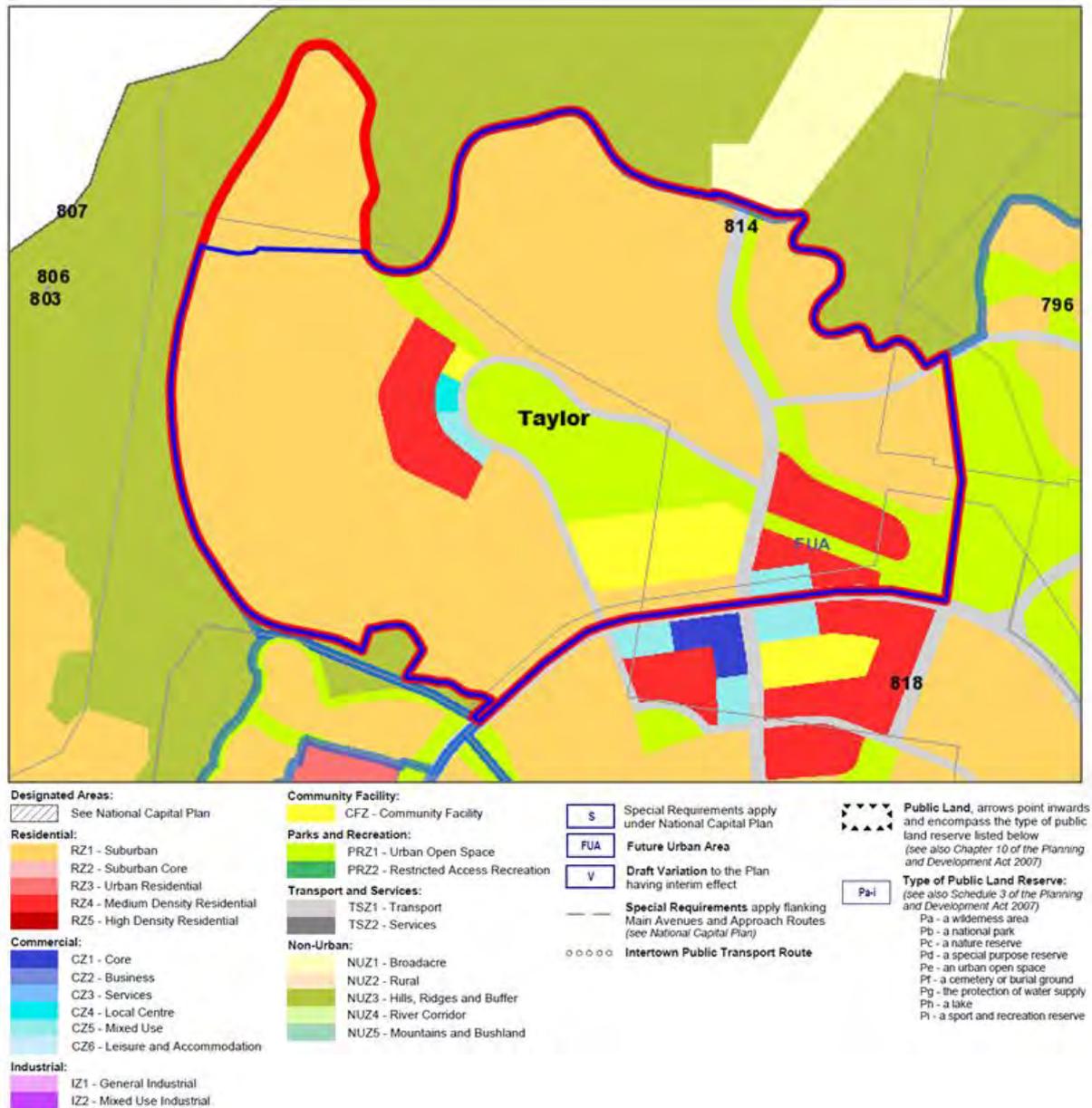


Figure 2.8 - Taylor

*Red outline indicates extent of development from Territory Plan;
 Blue indicates extent of development under the Plan*

The general design principles for Taylor are detailed in the North Gungahlin Structure Plan (ACT Gov't, 2008b) as:

General Policies

- Two axes are defined which give structure to the area; North-south from the high country north of Taylor with a line of site to Black Mountain Tower, and east-west from Horse Park Wetland to One Tree Hill. These axes then form the basis for road and open space alignments.
- A local centre together with adjacent higher density housing is to be centrally located.
- District playing fields and a neighbourhood oval are to be located adjacent to government primary and high school sites.
- Landscaped floodways interconnect throughout the north of the suburb and terminate at a landscaped water management feature to the east.
- Local bus routes are to be provided through the suburb, encouraging public transport usage.
- Edge roads are to be utilised wherever possible as a buffer between residential development and areas of open space. An edge road shall be predominantly used as a buffer where the

<p>adjoining open space contains substantial cultural heritage or environmental values.</p> <ul style="list-style-type: none"> • Opportunities are to be provided for small-scale community facility sites in open space in convenient locations predominantly along public transport routes. • Provide an area close to the local centre for a possible community facility site. • Provide for an urban edge trail (equestrian and other uses) that will move incrementally as the urban edge develops. <p>Specific policies</p> <ul style="list-style-type: none"> • A park is to be located on the hilltop. • Heritage site (European heritage - ruins) and adjacent significant trees are to be located in urban open space. • Part of the group centre and higher density housing shall be co-located opposite Moncrieff at intersection of major roads.
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Table 2.6 - Summary of Values in Taylor

MNES	Summary of Impacts (by Suburb)
Golden sun moth	<p>A survey by David Hogg Pty Ltd (2012)³⁸ found that golden sun moths were widely distributed at a low level of activity throughout native pasture and secondary grassland within western Taylor (Figure 5.4), with fewer moths observed on the higher slopes and the greatest concentration in the central area. This result is consistent with recent findings that golden sun moth is widely distributed in very low numbers and with a fragmented population throughout secondary grassland areas in Gungahlin.</p> <p>Development of Taylor would impact on approximately 56 hectares of low to moderate quality golden sun moth habitat, occurring within native pasture and secondary grassland.</p>
Box gum woodland	<p>Approximately 8 hectares of low quality box gum woodland is located in the north western tip of Taylor (Figure 5.2). This patch would be avoided by the Plan.</p> <p>Approximately 2 hectares of low quality secondary grassland would be impacted by development.</p>

Impacts to these MNES are discussed further in **Section 5**.

Throsby

The suburb of Throsby is located to the north of Horse Park Drive, between the Mulligan's Flat and Gorooyaroo Nature Reserves. The blocks in Throsby affected by the proposed action include rural blocks 718 and 733 and result in development of 148 hectares in the district of Gungahlin.

Development of a district playing field facility on Block 718 has been concurrently assessed under the ACT's PD Act and EPBC Act in a bilateral Environmental Impact Statement (EIS). This assessment was assessed separately due to time priorities in developing the facility, however has now been combined into the larger strategic assessment process.

The proposed action under the Plan would result in a substantial reduction to the development area of Throsby from 432 hectares (as shown in the Territory plan **Figure 2.9**) to 148 hectares. This is due to the avoidance of high quality areas containing superb parrot

³⁸ David Hogg Pty Ltd (2012) *Taylor Golden Sun Moth Survey*, Report to Conservation Planning and Research, Canberra (February, 2012)

habitat, golden sun moth and box gum woodland in the north and east of the suburb. These values are discussed further below.

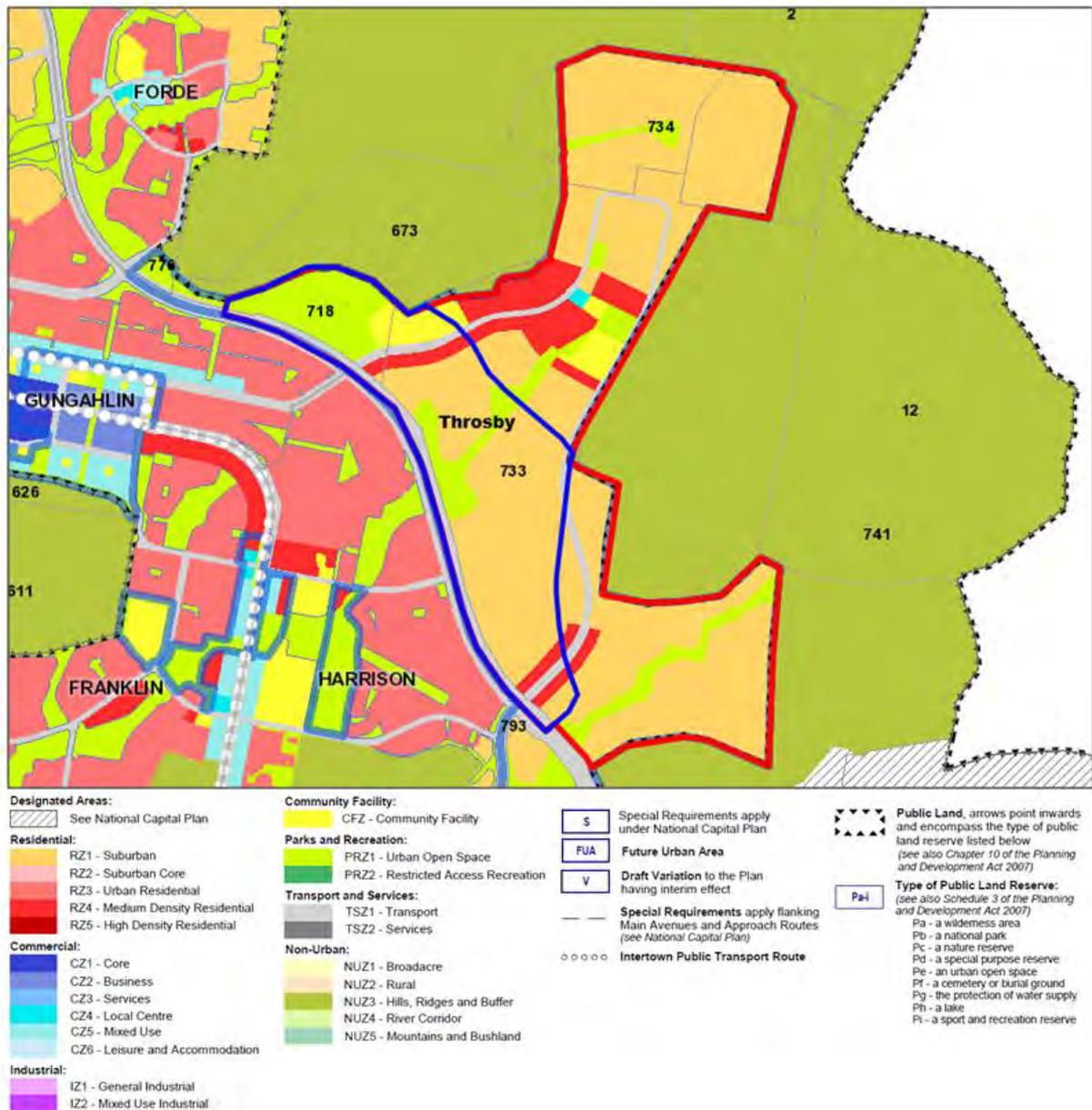


Figure 2.9 - Throsby

*Red outline indicates extent of development from Territory Plan;
 Blue indicates extent of development under the Plan*

The general design principles for Throsby are detailed in the East Gungahlin Structure Plan (ACT Gov't, 2010b). These have not been revised for the reduced size of the suburb.

General Policies

- The local centre will incorporate and be adjacent to areas of higher density housing and community facilities sites. Higher density areas may include provision for mixed-use development.
- A local bus route to be accommodated through the suburb via the local centre, areas of higher density and schools.
- Water detention features are required to be located within the natural drainage line in open space.

- Edge roads to be utilised wherever possible as a buffer between residential development, areas of open space and nature reserves.
- Provide an area close to the local centre for a community facility site.
- Government Primary school to be located centrally within the suburb.
- Opportunities are to be provided for small-scale community facility sites in open space in convenient locations.

Specific policies

- Road connections to the suburb to be from extensions of Anthony Rolfe Avenue and Well Station Drive.
- Cultural natural and/or heritage sites are to be retained in open space.
- Existing drainage lines to contribute to linear parks and combine pedestrian and cycleway links.
- Areas of higher density housing to be located along major transport routes within the suburb and adjacent to local centre.
- Site to be identified for a secondary school adjacent to District Playing fields.
- Suitable site to be identified for District Playing Fields.
- The land uses for the northern part of Throsby with Gorooyarroo and Mulligan's Flat Nature Reserves will be confirmed closer to land release, following an assessment of the environmental values within the reserves.

Further detail on design principles is included in the Supplementary Report.

Throsby and its surrounding areas contain high ecological values, including golden sun moth habitat, box gum woodland, and superb parrot nesting trees. The avoidance of the majority of these values has resulted in the substantial reduction in the developable area of the suburb.

Table 2.7 - Summary of Values in Throsby

MNES	Summary of Impacts (by Suburb)
Golden sun moth	<p>Surveys were undertaken for golden sun moth in Throsby for the 2010/11 emergence season by Eco Logical (2011b)³⁹. The report produced by that study rated habitat quality, and identified presence/absence of species within their survey areas. The habitat within the affected area in Throsby is rated between 'High' and 'Moderate', with a patch of low quality habitat in the north-western corner.</p> <p>Eco Logical (2011b) considered that due to the distance between the records for golden sun moth in the north and south of Throsby, they were likely separate populations; therefore the proposed action is likely to impact only on the southern population.</p> <p>From mid-November 2011 to mid-January 2012 a survey program involving four days of survey effort in each of the Mulligan's Flat and Gorooyarroo reserves was undertaken. A total of 127 moths over about 115 hectares were observed within the Mulligan's Flat reserve, while around 100 golden sun moths were observed over about 150 hectares within Gorooyarroo reserve. Golden sun moth habitat in both reserves is continuous with that of North Throsby, so that a large population spread over around 350 ha of continuous habitat will be reserved.</p> <p>The area of habitat expected to be impacted by the Plan has fluctuated in a number of assessments, based on seasonal conditions, however a conservative</p>

³⁹ Eco Logical (2011b) Golden Sun Moth Surveys at One Tree Hill, Kinlyside and Throsby, report to Conservation Planning and Research (2011)

	figure of 78 hectares has been used in this assessment (Figure 5.4).
Box gum woodland	Within the development footprint of Throsby, there is 32 hectares of low to moderate quality box gum woodland (shown in the southern part of Throsby in Figure 5.2). This area of woodland is the end of a larger patch that extends into Gorooyarroo Nature Reserve, and as such the proposed action is not expected to fragment the larger patch.
Superb parrot	Superb parrots are known to breed in the southern end of Throsby (Throsby Ridge), Gorooyarroo Nature Reserve and along Gungaderra Creek. There are potential breeding trees identified within the proposed affected area in Throsby; however there are not any records of breeding pairs within the affected area. The potential breeding trees were identified on the basis of visible hollows of a size potentially suitable for Superb Parrots. There are a large number of breeding trees within Throsby Ridge however, and some breeding has also occurred within the 'Throsby neck', Mulligan's Flat and Gorooyarroo Reserves.

Impacts to MNES are discussed in details in **Section 5**, including potential indirect impacts to adjacent values, such as nesting trees.

2.6 Alternatives to the Plan

The Plan presents an alternative to the proposed staged development of the District of Gungahlin as proposed in the 1989 Gungahlin Environmental Impact Statement (NCDC, 1989), and as currently shown in the Territory Plan (ACT Gov't 2008a).

Figure 2.10 illustrates the concept for development posed in 1989 for Gungahlin as presented in the EIS (NCDC, 1989). It also depicts in white dashed lines the extent of the land subject to future urban area overlays as shown in the Territory Plan. These outlines present two alternatives to the Plan. Both would impact on a significantly larger amount of land for urban development, and result in less land preserved in conservation areas.

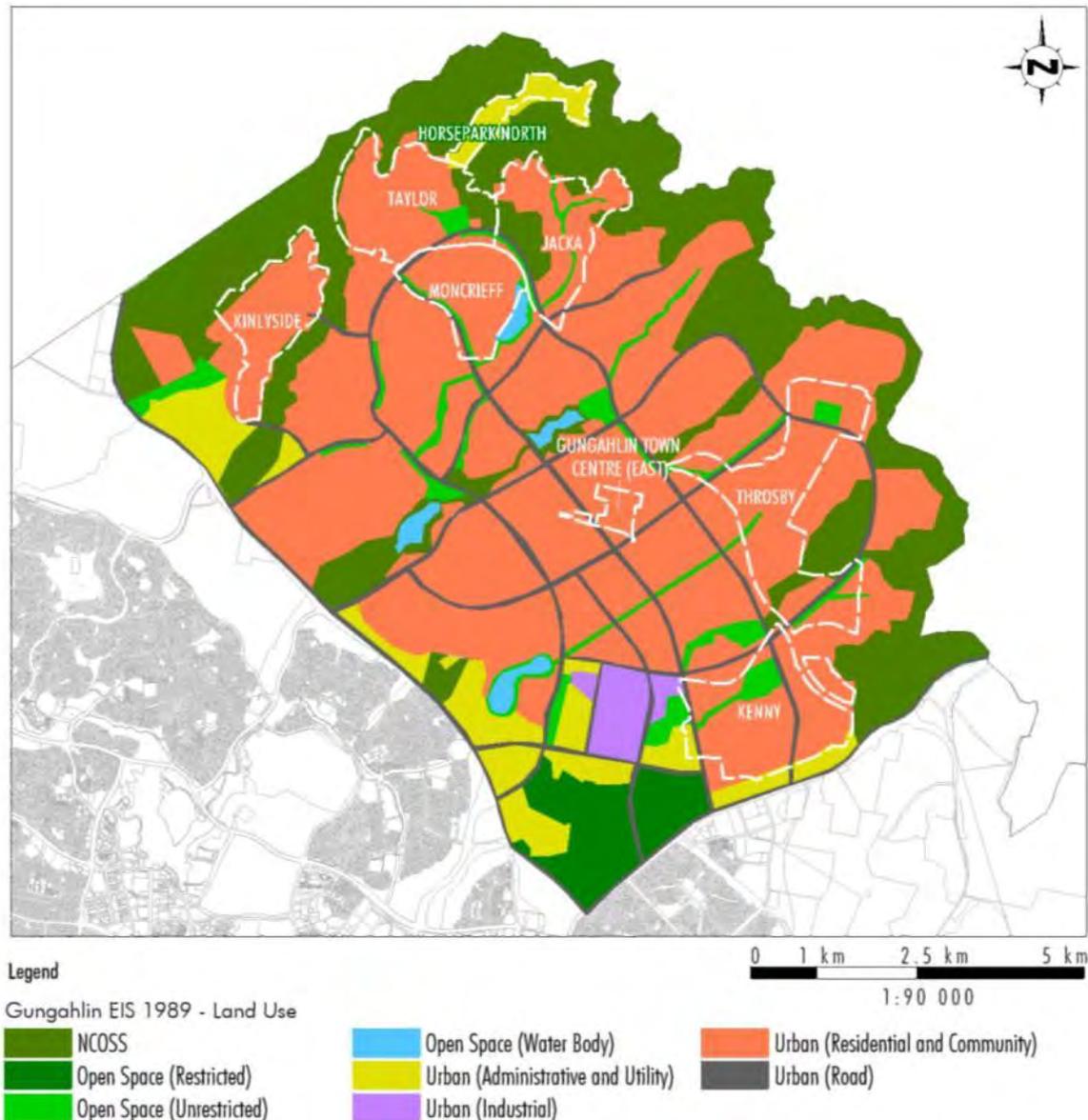


Figure 2.10 - Conceptual plan for development of Gungahlin in 1989

In regards to alternatives to the actions described by the Plan, all future urban areas were considered in terms of the potential benefit of their inclusion into a conservation network. Considerations included:

- optimal reserve design in order to minimise operational costs;
- inclusion of the areas most likely to positively contribute to effective conservation of biodiversity while avoiding areas that were either isolated, significantly modified or of limited value given other attributes including configuration.

The avoidance and mitigation measures proposed under the Plan in addition to the associated offsets would result in a feasible balance between the imperative of biodiversity conservation and development of sustainable communities. Further alternatives to what is presented in the Plan would be limited by one or more factors that affected the efficiency of the outcome. These can be summarised as follows:

- Reduction of the urban footprint would serve to not only create a fragmented nature reserve system, it would also fragment the urban environment in an unsustainable

manner resulting in higher infrastructure and whole of life maintenance costs. For example, this would be the case in Moncrieff given that, on the basis of currently available data, ecological values in Taylor are relatively low and reservation of Moncrieff would create an isolated patch requiring significant investment in managing edge effects.

- Based on available data, there would be limited benefit in setting aside areas such as Taylor due to comparatively low ecological values. While restoration could be considered, the investment in this was not considered as beneficial as improving areas with greater potential and existing values.

The location of potential offsets was also considered such that locations elsewhere in the ACT or in NSW were an option however this was limited by a number of factors including:

- Management of the impacts is most effectively dealt with at the local level hence; impacts in Gungahlin are managed within the Gungahlin district. This ensures that local communities and species can continue to persist within the local area.
- Potentially complicated cross jurisdictional legal issues associated with management, monitoring and enforcement.
- Management of offset sites and investment in various activities to enhance conservation values is most effective if undertaken within a discrete area. This relates to the efficiencies of scale when dealing with one or several large reserves in Gungahlin as opposed to more widely dispersed offset sites elsewhere in the ACT or NSW.
- Funding of offsets in NSW would introduce complexity in the funding, management and reporting structures that if avoided would ensure more effective application of funds to the MNES of concern.
- By limiting the offset sites to the ACT, control and responsibility of the Plan's implementation remains with the ACT Government. This will ensure objectives are met and that through adaptive management over time, the investment under the Plan remains relevant to the local conservation issues. This is of particular importance when considered against issues such as climate change and the potential that phenomenon has for affecting conservation issues.
- The concept presented in the Plan is considered to be the most optimal solution in seeking to satisfy the Territory's responsibilities under Act and Commonwealth legislation in addition to meeting demand for sustainable communities and affordable housing. Notwithstanding this, the adaptive management framework built into the Plan will ensure that as scientific knowledge of the environment in Gungahlin improves with implementation of the Plan, opportunities for adaptation and consideration of alternatives will be possible.

3.0 Ecologically Sustainable Development

The Gungahlin Plan represents a new approach to assessing the cumulative impacts of regional development on the environment; based on an overarching plan for development that has been in place for a number of decades. The greenfield land release in the Plan aligns projected population growth in the ACT with the timely delivery of housing, infrastructure, community facilities and employment opportunities.

3.1 Understanding the Need for the Plan

Developable land in the ACT is restricted by spatial constraints, with approximately 54% of the Territory set aside in formal conservation reserves (ACT Gov't, 2012a)⁴⁰, and with no land development permitted on hills and ridges under the Territory Plan (as per **Section 2.5.1**), there is limited further opportunity for urban expansion.

The ACT Planning Strategy (ACT Gov't, 2012b)⁴¹ identifies a plan for meeting projected population growth in Canberra; a combination of urban infill and greenfield development. Only two areas are currently identified in the Territory Plan as greenfield future urban areas, Molonglo Valley, and north Gungahlin. Greenfields development in north Gungahlin is a priority for meeting housing demand and providing affordable housing as the most rapidly growing region in the ACT.

The anticipated population growth requires structured and clear planning to ensure future communities are built with ecologically sustainable development (ESD) principles in mind. The ESD principles help form the aims of the Plan; ensuring liveable communities; protecting threatened flora and fauna for the benefit of future generations; reducing unnecessary delays and costs in releasing land for development; and undertaking forward planning to benefit both short and long term outcomes for the government, the community and the environment. The Plan is consistent with the ACT Planning Strategy with its aim to accommodate housing growth in sustainable greenfield areas.

3.2 The Plan versus the Alternative

A range of alternatives are discussed in **Section 2.6** and identify in terms of development that two alternatives exist, both of which are considered to represent an unacceptable level of impact to matters protected under the EPBC Act and the ACT's NC Act. Beyond this, the other alternative is the 'do nothing' option.

The 'do nothing' option is also considered unacceptable for a range of reasons including:

- Development of Gungahlin has been progressing since completion of the 1989 Environmental Impact Statement (NCDC, 1989)⁴² in accordance with the *Environment Protection (Impact of Proposals) Act 1974*, to halt development in all areas that would

⁴⁰ ACT Government (2012a) *Draft ACT Nature Conservation Strategy 2012-22*, Environment and Sustainable Development Directorate, Canberra (September, 2012). Accessed online (9/10/12): http://timetotalk.act.gov.au/storage/NCS%202012_text_V7.pdf

⁴¹ ACT Government (2012b) *ACT Planning Strategy: Planning for a Sustainable City*, Environment and Sustainable Development Directorate, Canberra (July, 2012)

⁴² NCDC (1989) *Gungahlin Environmental Impact Statement, Final Statement*, Commonwealth of Australia, Canberra (January 1989)

affect protected matters would result in a fragmented and unsustainable urban landscape with an equally dysfunctional system of reserved areas given configuration and lack resources to manage them;

- The ACT Government has a responsibility to provide affordable housing as described by the ACT Planning Strategy (ACT Gov't, 2012b) which would not be realised under this option.

The Plan represents a compromise position in which the majority of significant impacts would be avoided. Further to this, mitigation measures would serve to reduce residual and indirect impacts while an extensive package of direct and indirect offsets would provide for conservation gains not only for the significantly affected threatened species and communities but also for biodiversity in general.

3.3 Principles of Ecologically Sustainable Development

The EPBC Act emphasises the importance of the principles of ecologically sustainable development (ESD). These principles are derived from the Intergovernmental Agreement on the Environment (Australian Gov't 2010)⁴³ and have integrated into the approach and planning of north Gungahlin. The National Strategy for Ecologically Sustainable Development, endorsed by all Australian jurisdictions in 1992, defines the goal of ESD as: 'Development that improves the total quality of life, both now and in the future, in a way that maintains the ecological processes on which life depends' (Australian Gov't, 1992)⁴⁴.

In summary, ESD is development which aims to meet the current needs of the population, while still conserving our natural environment for the benefit of future generations. To achieve this, the environmental resources which form the basis of our economy must be used in a way which maintains their range, variety and quality, while still utilising them to develop industry and generate employment (Australian Gov't, 1992).

Section 3A of the EPBC Act discusses the following ESD principles:

- **The Integration Principle:** decision-making processes should effectively integrate both long-term and short-term economic, environmental, social and equitable considerations.
- **The Precautionary Principle:** if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.
- **The Principle of Intergenerational Equity:** that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations.
- **The Biodiversity Principle:** the conservation of biological diversity and ecological integrity should be a fundamental consideration in decision-making.

⁴³ Australian Government (2010) *Intergovernmental Agreement on the Environment*, Department of Water, Sustainability, Environment and Communities, Accessed online (November 2012):<http://www.environment.gov.au/about/esd/publications>

⁴⁴ Australian Government (1992) *National Strategy for Ecologically Sustainable Development*, prepared by the Ecologically Sustainable Development Steering Committee and Endorsed by the Council of Australian Governments (December, 1992)

- **The Valuation Principle:** improved valuation, pricing and incentive mechanisms should be promoted.

Development in the ACT must consider the principles of sustainable development under the PD Act. The Gungahlin Plan incorporates a range of mechanisms to achieve and promote the key principles of ecologically sustainable development.

3.3.1 The Integration Principle

Both short and long term economic, environmental, social and equitable considerations have been considered in the development of Gungahlin.

Canberra is a planned city, with its future urban areas, including Gungahlin, having been subject to a long history of planning. All future urban areas in Gungahlin have had a structure plan prepared, which identifies planning principles for the design of the suburb, including environmental conservation of key values, neighbourhood design, community facilities and accessibility, and open space and recreational opportunities. The Territory Plan has a key role in delivering sustainable development. As discussed further in **Section 3.3.4** below, the Territory Plan's Statement of Strategic Directions (ACT Gov't, 2010c) ensures development reflects land capability constraints, particularly environmental values, ecosystems and ecological processes. Sustainable development and design are specified as objectives for urban, commercial and community land use zones under the Territory Plan.

The PD Act legislates the development of a planning strategy for the ACT to set out "long term planning policy and goals to promote the orderly and sustainable development of the ACT, consistent with the social, environmental and economic aspirations of the people of the ACT (Section 105, PD Act)." The ACT Planning Strategy (ACT Gov't, 2012b) identifies both short and long term actions required to implement the sustainable development of the ACT. Continued development of the Gungahlin greenfield areas, as supported by the Government's land release program, is identified as both a short and long term action to support the development of Canberra.

The early structure-planning of suburbs in Gungahlin ensures good neighbourhood design, with strong links between residential, open space and community facilities. Commercial space within the suburbs help to provide work opportunities near homes, and cycle paths promote active transport, reducing the consumption of energy and resources. Early planning is also flexible and can be adjusted to meet the needs of a growing city, and new knowledge of constraints. As such, the design principles for urban areas listed in **Section 2.5.2** would be reviewed in light of the outcomes of the Strategic Assessment.

The Plan is consistent with the ACT Planning Strategy, and would help to ensure the Integration Principle is applied in the development of Gungahlin with the balanced consideration of economic, environmental and social outcomes.

3.3.2 The Precautionary Principle

To satisfy the precautionary principle, emphasis has been placed on the anticipation and prevention of environmental damage at an early stage, rather than a reactive response.

The environmental impact assessment and the strategic assessment processes are precautionary in nature, as they provide a procedure to assess and evaluate the uncertainty of environmental impacts prior to development proceeding.

The process of planning for Gungahlin since the 1980s has also demonstrated a precautionary approach. This is evident through the numerous variations to the Territory Plan

resulting in alteration of development footprints to avoid areas of environmental value and the creation of nature reserves. Nature reserves created through this process include Percival Hill, Mulanggari, Gungaderra, Crace, Gorooyaroo and Mulligan's Flat.

As part of the requirements for approval under the PD Act, a risk based assessment is required in order to consider the range of activities and associated direct and indirect impacts that would result from a proposed action. This Preliminary Risk Assessment (PRA) process allows for the identification of information gaps and risks to the broader environment including social, economic and environmental factors within which Commonwealth requirements are also considered. Accordingly, this process facilitates design review and refinement such that avoidable impacts can be defined and requirements for subsequent mitigation and offsetting can be considered. The precautionary principle is accordingly the central tenet to the PRA in ensuring that proposals do not progress in a manner that is uninformed.

The PRA considers 'all of the likely activities that will be involved in the construction, operation and decommissioning of the project with further consideration given to all the impacts that these activities could lead to'⁴⁵, which includes risks to MNES under the EPBC Act in addition to matters protected under Territory legislation. The PRA also includes mitigation measures to minimise impacts, as well as the identification of requirements to ensure compliance during construction and operation.

Risks to MNES would be assessed in the PRA in the following project phases:

- 1) Design: Environmental approvals activities, including preparation of strategic assessment, time delays and public consultation;
- 2) Construction: clearing of vegetation and earthworks; and
- 3) Operation: management of environmental values within asset protection zones.

In summary, the PRA will deliver outcomes for MNES, as well as matters of Territory significance.

3.3.3 The Principle of Intergenerational Equity

The Plan has been established to support the principle of intergenerational equity. The principle in this instance is considered in two ways; firstly, protecting threatened species and communities for future generations, and secondly, providing adequate housing and communities for future population growth.

The Plan has been developed in response to an identified need in the community for a balance between protection of the ACT's natural values and provision of housing.

The incorporation of large areas of land into the existing reserve system under the Plan will protect natural values, particularly MNES. The avoidance of these areas will also improve landscape function, and contribute to the aim of producing a comprehensive, adequate and representative (CAR) reserve system. These areas will be subject to active management for improvement of quality for MNES during an establishment period, and then ongoing management as part of the reserve system in-perpetuity.

⁴⁵ ACTPLA (undated) *Preparation of an Application for Scoping, Preparation of an Application for an Environmental Significance Opinion: A Guide* ACT Planning and Land Authority, Accessed online at: http://www.actpla.act.gov.au/data/assets/pdf_file/0017/21617/Application_for_scoping.pdf

The commitment to preserving natural values from development under conservation land use zonings and providing sufficient funding will help to protect them and ensure these values are available for the enjoyment of future generations.

The development of Gungahlin will help to provide adequate housing for future generations. The planning of neighbourhoods with open spaces, community facilities, and alternative transport options will help to make these suburbs liveable and sustainable in the long term, promoting population and economic growth of the ACT. In addition, the ability to provide affordable housing will help current generations to be able to afford their own homes, and provide future generations with adequate, functional and sustainable communities to live in.

3.3.4 The Biodiversity Principle

The Plan for Gungahlin focuses on the conservation of biological diversity and ecological integrity while still meeting urban development outcomes. Biodiversity is a primary informing constraint for all development in the ACT. The Territory Plan's Statement of Strategic Directions (ACT Gov't, 2010c) states:

'The pattern of development is to reflect land capability constraints... Particular attention will be given to the need to conserve soil, water and vegetation; maintain biological diversity; safeguard important ecosystems and ecological processes; and provide and protect wildlife corridors.'

The Residential Subdivision Development Code (ACT Gov't, 2009a) discusses the planning process and the levels of decision making required for new urban development, and highlights the profound effect on the landscape of subdividing rural and semi-natural environments for urban expansion. Biodiversity constraints and the protection and integration of natural systems inform decisions at the initial structure-planning level. The following figure demonstrates how the conservation biodiversity is a fundamental consideration for the ACT Government in decision making.

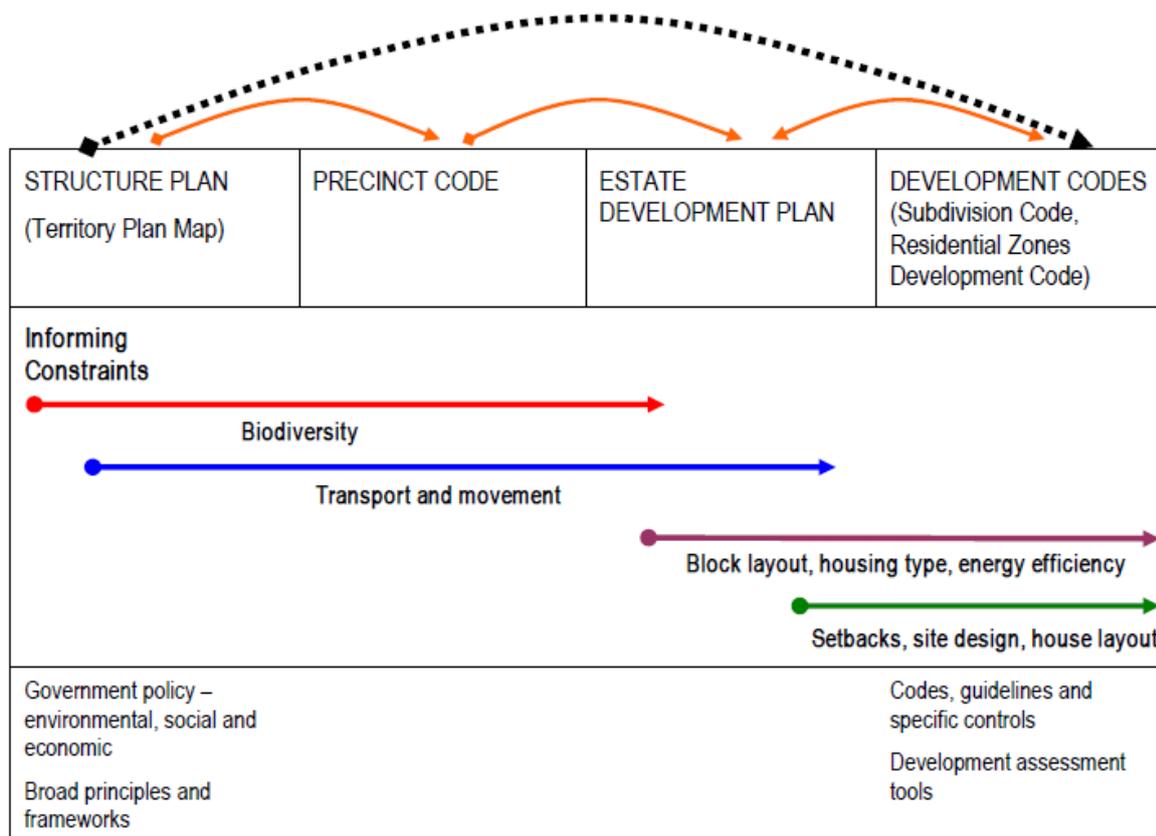


Figure 3.1 - The Planning Process and Levels of Decision Making

Source: Figure 1 from the Residential Subdivision Development Code, ACT Gov't (2009a)

This diagram illustrates the importance placed on biodiversity and natural values by the ACT Government, and the commitment to minimise impact when designing urban development areas. Biodiversity constraints, including assessment of EPBC and NC Act matters are an informing constraint at the initial stage of structure planning through to detailed estate development plans. At a project planning level, environmental risks are assessed through the preparation of a PRA (as discussed in **Section 3.3.2**), where identification of risks to EPBC MNES is explicitly required.

This Plan undertakes further consideration of MNES, and protects additional areas to those already avoided in early structure-planning stage.

Section 5 of this report provides a detailed analysis of outcomes for MNES under the Plan. It is considered that the Plan will provide appropriate outcomes for biological diversity and ecological integrity, particularly those protected by the EPBC Act.

3.3.5 The Valuation Principle

A significant component of the Plan is for provision of ongoing funding to the protection and improvement of ecological services within the reserve system. This is discussed in detail in the Biodiversity Plan and the Supplementary Report.

The funding provided is considered a realistic estimate of the money required to provide continued support, on-ground management and works, and administration for the MNES.

Streamlining the process for approvals under the EPBC Act in Gungahlin will also help to minimise unnecessary costs being accrued by the ACT Government from the cost of site-by-site assessments and establishment of small offsets.

4.0 Existing Environment

This section provides a detailed description of the existing environment in the Gungahlin district likely to be affected by the Plan. It describes:

- the broad environmental and heritage values of the area that may be impacted (both directly and indirectly);
- important ecological processes in the environment, including components of biodiversity and landscape connectivity; and
- an introduction to threatened species and communities occurring in the region, relevant to both Commonwealth and ACT environmental legislation.

The MNES protected under the EPBC Act and matters of conservation significance under the ACT's NC Act that may be affected by the proposed action are introduced and discussed briefly in this section. Impacts to MNES are discussed in more detail in **Section 5**, including assessment of the nature and significance of potential impacts as a result of the proposed action. Impacts to matters protected under the NC Act are discussed in **Section 6**.

4.1 Regional Context

The Australian Capital Territory (ACT) is located primarily within the South Eastern Highlands bioregion while the south western part of the Territory is located within the Australian Alps bioregion (**Figure 4.1**). The Australian Alps bioregion component of the ACT is made up entirely of the higher elevation areas primarily within Namadgi National Park and represents approximately 54,450 hectares (23%) of the ACT. The majority 181,300 hectares (77%) of the ACT are within the South Eastern Highlands bioregion and also includes the area considered in this assessment.

The South Eastern Highlands bioregion is described by the Australian Government (2000)⁴⁶ as being typified by the following characteristics:

'Steep dissected and rugged ranges extending across southern and eastern Victoria and southern NSW. Geology predominantly Palaeozoic rocks and Mesozoic rocks. Vegetation predominantly wet and dry sclerophyll forests, woodland, minor cool temperate rainforest and minor grassland and herbaceous communities. Large areas, particularly in the Box-Ironbark Forests, were felled for fuel and timber for the mines during the gold rushes in Victoria. Large areas have also been cleared in NSW for grazing or plantations'.

⁴⁶ Australian Government (2000) Revision of the Interim Biogeographic Regionalisation of Australia (IBRA) and Development of Version 5.1: Summary report, report prepared by Environment Australia (November 2000)



Figure 4.1 - Biogeographic Regions in the ACT (project area outlined in red)

Source: Australian Gov't (2012b⁴⁷)

The South Eastern Highlands were traditionally occupied by nomadic Aboriginal groups, who would travel according to availability of food sources. European settlement of the region began in the 1820's, with agricultural and urban development underway by the 1830's.

Past and present land-use pressures have had a major consequence for the biodiversity of the South Eastern Highlands. Natural temperate grasslands have declined by 99.5% in the Murrumbateman subregion since European settlement. Similarly, the woodlands of the South Eastern Highlands are under threat with the wide spread box gum grassy woodland community reduced from a total pre-European extent of 295,000 hectares to 25,200

⁴⁷ Australian Government (2012b) *Dataset: Interim Biogeographic Regionalisation for Australia (IBRA), Version 7 (Regions) - States and Territories*, Accessed online (December 2012): <http://www.environment.gov.au/metadateexplorer/explorer.jsp>

hectares. The remaining vegetation is highly fragmented and has resulted in the loss of connectivity of the communities across the landscape (Australian Gov't, 2009a)⁴⁸. The high levels of clearing and fragmentation have led to many of the vegetation communities on the South Eastern Highland being listed under threatened species legislation.

The South Eastern Highlands supports a diversity of flora and fauna, including numerous threatened species and communities listed under the NSW *Threatened Species Conservation Act 1995* (TSC Act) and the ACT NC Act in addition to a number of protected matters under the EPBC Act.

At a local context, Gungahlin is the northern-most district in the ACT. It is bounded by the Federal Highway to the south-east, the Barton Highway to the south-west and the ACT/NSW border to the north. The Gungahlin district supports a diversity of flora and fauna, containing areas of important biodiversity value. Gungahlin has extensive areas of retained lowland woodland, which are significant in both a local and regional context, as well as areas of native grassland. These areas provide important habitat for a range of threatened species of both Territory and national significance.

Gungahlin also has numerous Aboriginal, European and natural heritage values which are discussed in **Section 4.3.1** below.

4.2 Natural Environmental Values

This section discusses the broad environmental values that occur within Gungahlin. For the purposes of assessment, this includes values that are protected under both Commonwealth and ACT legislation.

The values are discussed below under the headings of vegetation types, flora, fauna, and aquatic/riparian ecosystems

4.2.1 Vegetation Types

The ACT Lowland Woodland Strategy (Action Plan 27) (ACT Gov't, 2004a)⁴⁹ defines vegetation types in the ACT based on altitude, aspect, topography and underlying geology. Vegetation types characteristic of the northern Gungahlin area, likely to have been present prior to European settlement include:

- Woodland on Low Hills and Plains: Within this woodland type and present in the Gungahlin area, Action Plan 27 describes the community 'tablelands and slopes yellow box – red gum grassy woodland' dominated by yellow box (*Eucalyptus melliodora*), Blakely's red gum (*E. blakelyi*) and apple box (*E. bridgesiana*). This community is listed as 'yellow box – Blakely's red gum grassy woodland', an Endangered Ecological Community (EEC) under the NC Act. It is also a component of the federally listed 'white box – yellow box – Blakely's red gum grassy woodland and derived native grassland' which is listed as a Critically Endangered Ecological Community (CEEC) under the EPBC Act. This woodland type typically occurs in lower slope positions; refer to labels 'D' and

⁴⁸ Australian Government (2009a) *Australia's Strategy for the National Reserve System 2009– 2030*, prepared by the National Reserve System Task Group convened under the Natural Resource Policies and Program Committee; endorsed by The Natural Resource Management Ministerial Council. Canberra (May 2009)

⁴⁹ ACT Government (2004a). Action Plan No. 27 Woodlands for Wildlife, ACT Lowland Woodland Conservation Strategy, Environment ACT, Canberra (March, 2004)

'E' in **Figure 4.2** for a schematic representation of this community's occurrence in the landscape;

- Woodland on Dry Hill Slopes and Mountain Foothills. Within this woodland type and present in the Gungahlin area, Action Plan 27 describes 'tablelands dry shrubby box woodland', dominated by Bundy (*E. goniocalyx*), Mealy Bundy (*E. nortonii*), Red Box (*E. polyanthemos*), Apple Box and Broad-leaved Peppermint (*E. dives*). This woodland type can occur on lower exposed slopes where it intergrades with yellow box–red gum grassy woodland and has a similar structure and understorey floristic composition; refer to label 'F' in **Figure 4.2** for a schematic representation of this community's occurrence in the landscape.

Figure 2.2
Landscape Distribution of
Lowland Ecological
Communities in the ACT.

- A: Natural Temperate
Grassland
B: Tablelands Valley Snow
Gum Grassy Woodland
C: Riparian Woodland
D: Yellow Box–Red Gum
Grassy Woodland
E: Secondary Grassland
(Yellow Box–Red Gum)
F: Tablelands Dry Shrubby
Box Woodlands
G: Tablelands Brittle Gum
Dry Forest

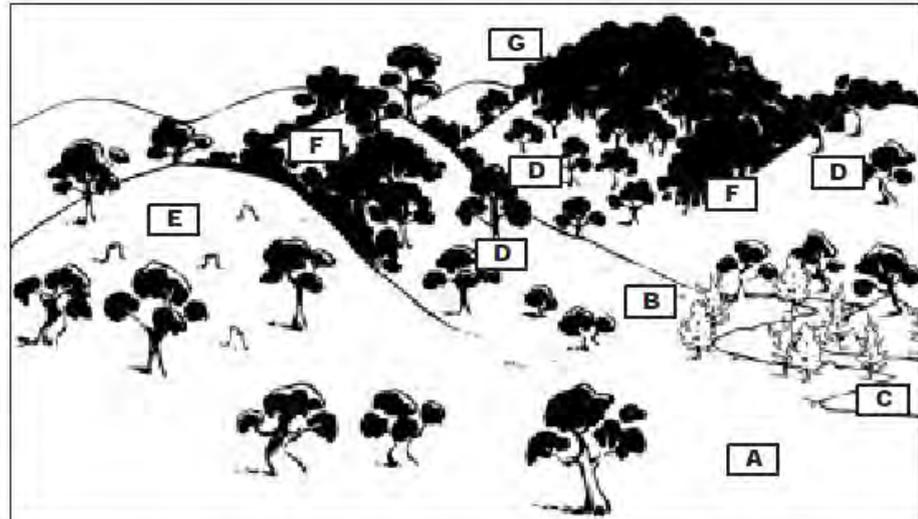


Figure 4.2 - Distribution of Lowland Ecological Communities in the ACT

Source: Figure 2.2 from Action Plan 27, ACT Gov't (2004a)

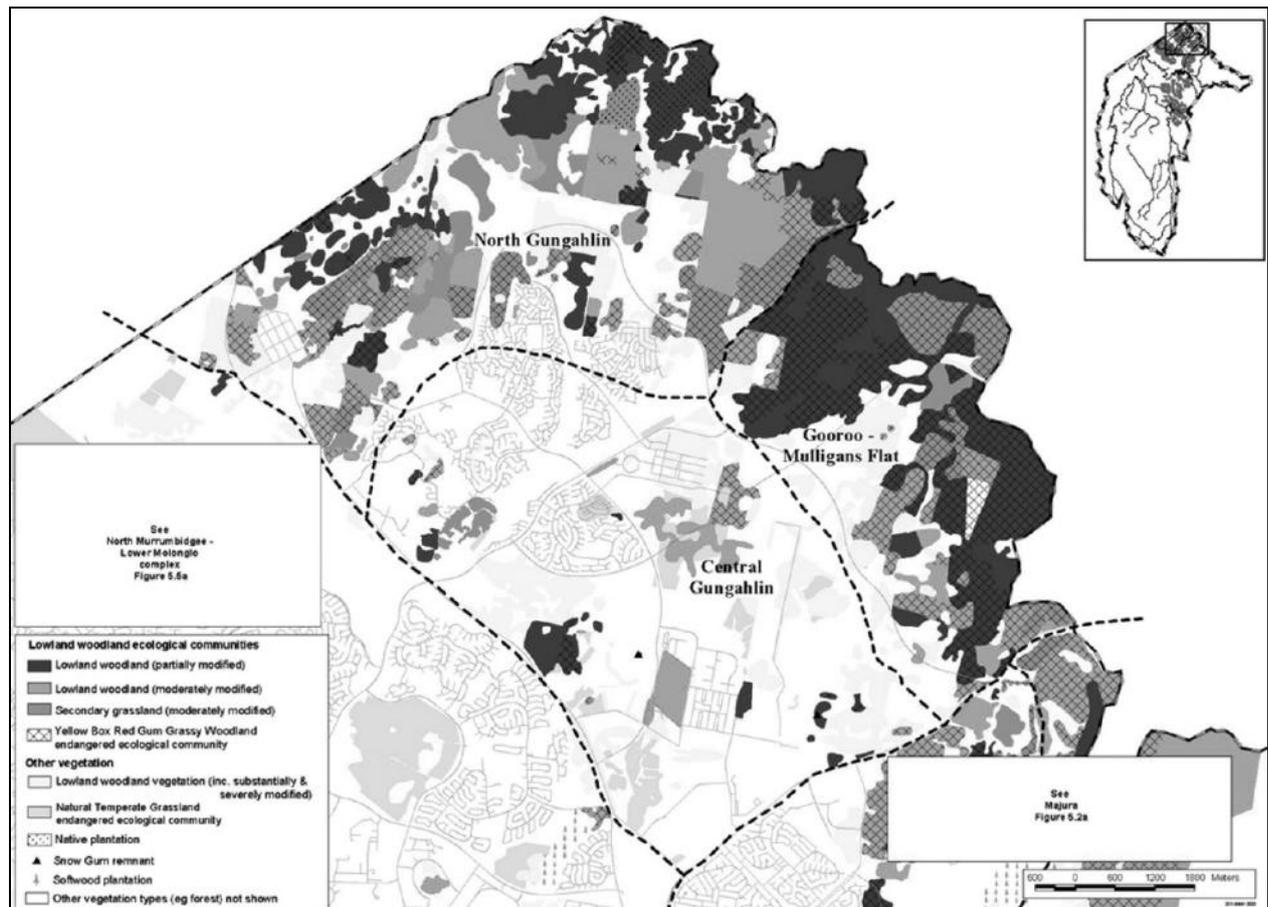


Figure 4.3 - The Gungahlin Woodland Complex
 Source: Figure 5.1a from Action Plan 27, ACT Gov't (2004a)

With respect to Gungahlin, Action Plan 27 offers the following description for the Gungahlin complex within which the Plan would operate:

'The Gungahlin complex (4,435 hectares) retains continuous areas of lowland woodland along the northern and eastern hills, inter-mixed with dry forest on the upper slopes. It is one of the largest areas of contiguous woodland in the ACT region. Woodland (including 1920 hectares of yellow box – red gum) merges with native and exotic grasslands on the valley floors where scattered trees of the former yellow box – red gum woodland are frequently retained. Highly modified woodland, much of which contains only scattered trees, as well as areas that have been cleared of trees and native understorey and developed as part of the new town of Gungahlin, form a major discontinuity in the central area.

The current vegetation in the Gungahlin district comprises remnants of the previously present communities; however despite the significant clearing and fragmentation that has occurred, the ACT's lowland woodlands are of national significance, being amongst the biggest, best connected, most botanically diverse examples of their type (ACT Gov't, 2011a)⁵⁰.

Two endangered ecological communities listed under the EPBC Act are present within the Gungahlin district, 'white box - yellow box - Blakely's red gum grassy woodland and derived

⁵⁰ ACT Government (2011a) *ACT Woodland Restoration Implementation Plan*, Territory and Municipal Services, Canberra (January, 2011)

native grassland' (box gum woodland) and 'natural temperate grassland of the southern tablelands of NSW and the Australian Capital Territory' (natural temperate grassland).

Within a study area of the southern part of the southern tablelands (Fallding, 2002)⁵¹ describes the previously extensive box gum woodland has been reduced from an estimated pre-1750 extent of 23% to 9% of the region in 2000. Although it is difficult to accurately estimate the extent of natural temperate grassland prior to European settlement, it represented the dominant ecological community in lower elevation areas of the ACT, forming part of the woodland-grassland mosaic (ACT Gov't, 2005a)⁵².

Both the box gum woodland and natural temperate grassland communities are highly fragmented, reduced in distribution and degraded across their previous ranges. Areas of remnant vegetation within urban areas are subject to a number of threats, including:

- pastoral and agricultural development;
- urban and infrastructure development;
- weed invasion;
- changes in fire regime; and
- introduced exotic and invasive species.

Whole of landscape analysis of impacts of future developments in the Gungahlin District have been undertaken recently in a number of studies, in particular 'Strategic Biodiversity Conservation – Gungahlin District, ACT' (Rutherford, 2011)⁵³ and draft variation reports submitted in support of variations to the Territory Plan. The Rutherford (2011) report among others have considered whole of landscape impacts for the area, and cumulative impacts of development. These documents have drawn on the historical planning decisions by the ACT Gov't to protect areas of ecological significance within Gungahlin, as well as addressing future requirements for the avoidance, mitigation and offsetting of development in areas of ecological value.

The protection of large areas of vegetation from development within Gungahlin has occurred over the past 20 years. This has occurred as a response to increased understanding of ecological values, and informally offsetting the impacts of new developments. Variations to the Territory Plan have also resulted in significant increases in the extent of conservation reserve in Gungahlin, and include:

- Mulligan's Flat (Variation No. 15, Commenced: 20.05.1994);
- Gungahlin Town Centre and Central Area (Variation No. 53, Commenced: 15.12.1995);
- North Gungahlin (Variation No. 130, Commenced: 19.02.2004);

⁵¹ Fallding M (2002) *Planning Framework for Natural Ecosystems of the ACT and NSW Southern Tablelands*, Natural Heritage Trust, NSW National Parks and Wildlife Service and Land & Environment Planning (2002)

⁵² ACT Government (2005a) *A Vision Splendid of the Grassy Plains Extended: ACT Lowland Native Grassland Conservation Strategy. Action Plan No. 28*, Environment ACT, Canberra (2005)

⁵³ Rutherford P (2011) *Strategic Biodiversity Conservation – Gungahlin District, ACT*, unpublished report to the ACT Department of Land and Property Services (April 2011)

- Public Land – Nature Reserve (Variation No. 182, Commenced: 05.09.2002); and
- East Gungahlin (Variation No. 231, Commenced 25.08.2006).

These variations have resulted in the creation of the following nature reserves: Mulanggari, Gungaderra, and Crace Grasslands, and Mulligan's Flat and Gorooyaroo Woodland reserves (**Figure 4.4**). In addition, the Territory Plan has protected the hills and ridges from development, maintaining ecological connectivity along the northern border of the ACT.

Table 4.1 - Size of Nature Reserves in Gungahlin

Reserve Name	Type of Reserve		Area (ha)	
	Grassland	Woodland	Per reserve	Total
Mulanggari Grasslands	✓		148	601
Gungaderra Grasslands	✓		287	
Crace Grasslands	✓		166	
Percival Hill		✓	79	1,591
Mulligan's Flat		✓	807	
Gorooyaroo		✓	705	

Within the reserves of Gungahlin, a range of ecological conditions representative of the ACT are protected, including box gum woodland, with associated woodland birds and rare flora, and natural temperate grassland, with associated reptiles and invertebrates.

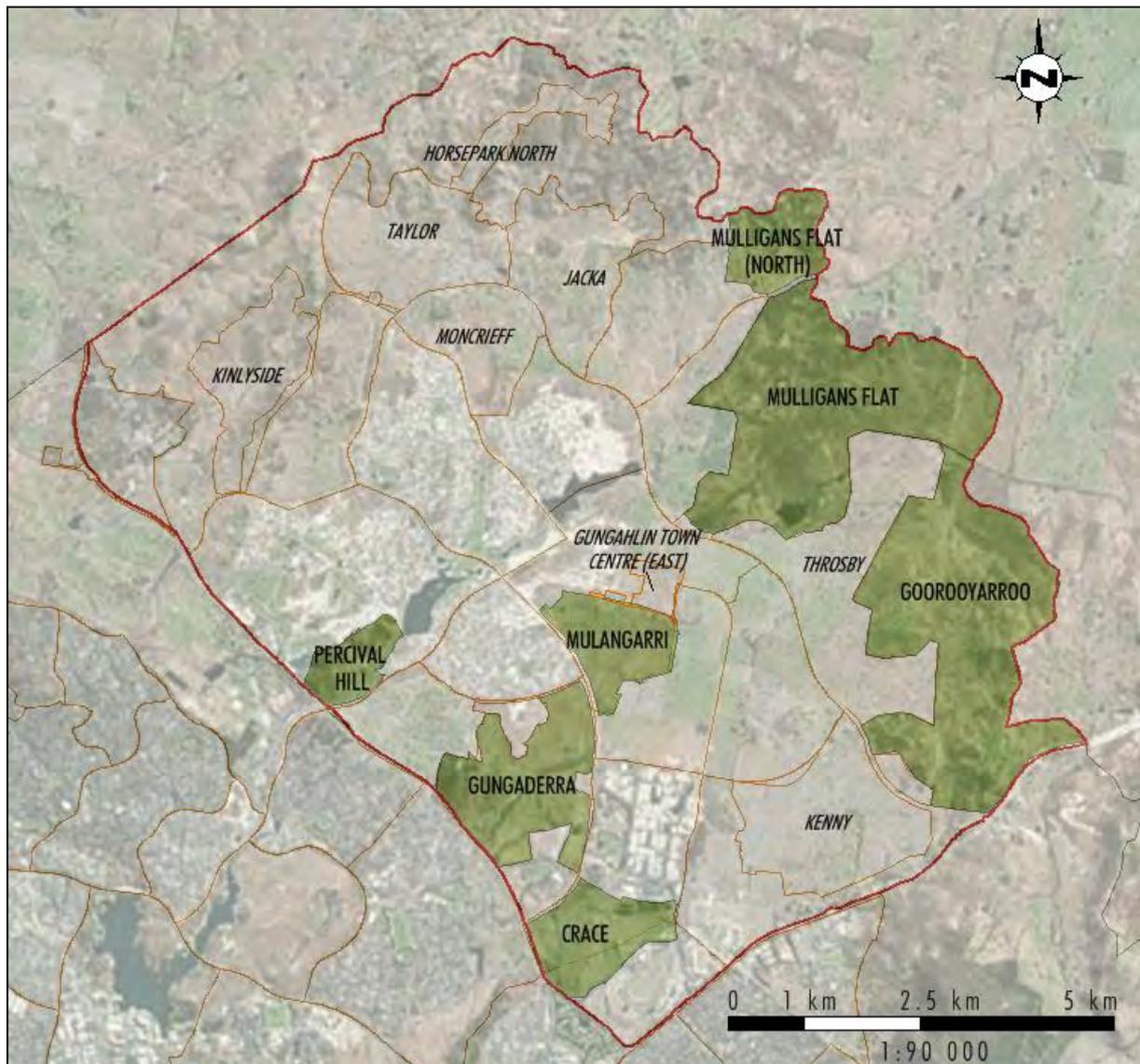


Figure 4.4 - Current Reserves in Gungahlin

4.2.2 Flora

The vegetation communities within Gungahlin support a number of uncommon flora species. These species range from locally common, but nationally endangered species, such as the hoary sunray; to rare, endemic species such as the Ginninderra peppercress. In Gungahlin, all known locations of threatened plant species are within existing nature reserves or open space, and populations are monitored and managed for conservation (Mulvaney, 2012)⁵⁴. Mulvaney (2012) describes the floristic quality of the Gungahlin district:

Since the 1990s, floristic data has been collected from over 1000 sites in the NSW/ ACT region. In general much of the native vegetation within Gungahlin, particularly around the northern and western rim, has high floristic value in comparison to that found within grassy ecosystems across the wider ACT and south-east NSW region. Areas in the southern half of Moncrieff, Mulanggarri Grassland Reserve, Goorooyarroo Nature

⁵⁴ Mulvaney, M. (2012) *The Extent and Significance of Gungahlin's Biodiversity Values. Technical Report 24*. Environment and Sustainable Development Directorate, Canberra.

Reserve, National Transmission Station on Bellenden Street and on a rural lease in Taylor contain plots with exceptional floristic quality. Other areas of high floristic diversity include North Throsby, much of Kinlyside, Crace Nature Reserve, the rural lease to the north of Bonner, some patches of woodland remaining in Jacka, and the north-western part of Taylor. Only one plot consistent with this method has been established in Mulligan's Flat Nature Reserve. This plot contains records of very high floristic value and it is likely that other areas of the reserve if surveyed would also record similar values.

Areas in Gungahlin with relatively low floristic value include much of Jacka, Taylor, Kenny and the southern section of Throsby.

The presence or absence of locally and regionally significant plant species has been determined through a range of surveys. As part of the lowland woodland mapping program undertaken in 2003-2004, species lists were prepared for 310 woodland polygons, encompassing the majority of undeveloped land in Gungahlin. Across these polygons, 331 native plant species were recorded, with a total of about 10,000 records of individual native plants. In addition to these surveys, comprehensive plant species data was collected along 78 transects established in northern Gungahlin by Eco Logical (2011a); from 39 (20m x 20m) plots established by Conservation, Planning and Research; and by Butler and Associates (2010)⁵⁵. In total, the presence of locally uncommon species and those of significance in an ACT context were searched for within 523 polygon or plot locations across Gungahlin (Mulvaney, 2012). It is considered that there is a high level of confidence in the location of threatened plant species and/or suitable habitat within Gungahlin.

Vegetation fragmentation, encroaching urbanisation, as well as grazing pressures from domestic and native animals are general threats to the survival of these uncommon flora species

4.2.3 Fauna

The woodlands and grasslands within Gungahlin district support a diversity of fauna species, including arboreal and terrestrial mammals, birds, reptiles and invertebrates.

In the woodland communities, the presence of tree hollows, fallen timber, trees of different ages, a mid-level shrub layer and a grassy understorey create a structural complexity that is considered to have high ecological value as it provides nesting sites, shelter and food resources for a number of species (Eco Logical, 2011a)⁵⁶.

Grasslands provide habitat, and a source of food for both herbivores and predators. Invertebrates are the most dominant faunal element in grasslands and are involved in most ecological processes (ACT Gov't, 2005a), and in the ACT, grasslands also provide important habitat for a number of reptile species.

Within Gungahlin, grassland specialists such as striped legless lizard and golden sun moth are generally restricted in their range to remnants of habitat, including Crace, Mulanggari and Gungaderra Grassland Reserves. The poor ability of grassland specialists to disperse means they are sensitive to habitat fragmentation.

Migratory and mobile species such as mammals and woodland birds generally utilise a larger range of habitat for foraging and breeding, such as woodland in Mulligan's Flat and Goorooyarroo Nature Reserves, the hills, ridges and buffers zoned areas along the northern

⁵⁵ Geoff Butler & Assoc. and Vertego Environmental Consultancy (2010) Ecological Assessment Review for Jacka Urban Area, prepared for Land Development Agency (2010)

⁵⁶ Eco Logical Australia (2011a) Gungahlin vegetation survey and mapping report – Ecological communities and threatened species within the Gungahlin strategic assessment area, prepared for ACT Government Conservation Planning and Research (August, 2011)

border of the ACT, and areas of retained woodland within the urban area. These mobile species are sensitive to loss of habitat features, such as tree hollows, structural complexity, and loss of connectivity between foraging and nesting habitats.

The woodlands and grasslands of Gungahlin provide habitat for a number of species that are protected under Commonwealth and/or ACT threatened species legislation. The Plan has the potential to impact on several of these species, or their habitat. This is discussed in the following sections.

4.2.4 Aquatic and Riparian Ecosystems

The Gungahlin district is located within two of the ACT's water catchments, the Ginninderra Catchment and the Canberra Catchment. The Ginninderra Catchment contains Ginninderra Creek, Halls Creek, Horse Park Creek, minor permanent and ephemeral creeks and two constructed ponds - Yerrabi and Gungahlin Pond. Ginninderra Creek is the major tributary to Lake Ginninderra in Belconnen, which then continues into the Murrumbidgee River on the western border of the ACT.

The Canberra Catchment contains Sullivan's Creek and other minor tributaries which flow south into Lake Burley Griffin before entering the Molonglo River, a tributary of the Murrumbidgee River. Gungahlin is located within the Murray-Darling Basin Catchment.

Many of the drainage lines and creeks within Gungahlin are highly modified and degraded from a history of rural land use and urban development, and construction of ponds and dams. Riparian zones are often degraded with weeds, or have been altered for recreational use.

Database searches have found that two threatened fish species have the potential to occur within the Gungahlin district: Murray cod (*Maccullochella peelii*) and Macquarie perch (*Macquaria australasica*). However, only the Murray Cod occurs within Gungahlin, having been released into Yerrabi and Gungahlin ponds.

4.2.5 Landscape Function and Connectivity

The Gungahlin district plays an important role in landscape connectivity across the northern part of the ACT providing connectivity not only to other locations within the ACT but also for habitat remnants in NSW. In particular, the Kinlyside – Hall; northern lease area; and the Mulligan's Flat – Gorooyarroo nature reserves grassy woodland complexes provide the key linkages.

Mulvaney (2012) identifies that the key to maintaining Gungahlin's biodiversity and conservation values is:

'to protect and maintain the large patches of woodland and native grassland and enhance their connectivity and functioning.

This includes minimising the urban edge on reserved lands, and enhancing the connections and extent of habitat that rim the north-western, northern and north-eastern portions of Gungahlin, including woodlands in the Hall – Kinlyside area, the northern leases, Mulligan's Flat Nature Reserve, North and east Throsby and Gorooyarroo areas. Grassland conservation within Gungahlin will be largely focused on enhancing existing reserves and restricting their further fragmentation'.

4.3 Matters of National Environmental Significance (MNES)

The *Environment Protection & Biodiversity Conservation Act 1999* (EPBC Act) is Commonwealth legislation providing for the protection of nationally significant natural or cultural values and the regulation of certain activities. These are known as matters of national environmental significance (MNES). The eight matters of MNES are:

- world heritage properties;
- national heritage places;
- wetlands of international importance (i.e. Ramsar wetlands);
- nationally threatened species and ecological communities;
- migratory species;
- Commonwealth marine areas;
- the Great Barrier Reef Marine Park; and
- nuclear actions (including uranium mining).

Also covered under the EPBC Act are actions taken by Commonwealth agencies or on Commonwealth land.

The Australian Government's Protected Matters Search Tool (Australian Gov't, 2012c)⁵⁷ was used to generate a list of matters with the potential to be impacted by the Plan. These are discussed in the following sections.

4.3.1 Heritage Values

The heritage values within Gungahlin have been considered in this Strategic Assessment in the context of the EPBC Act, which provides protection to nationally significant heritage places and items. However, objects and places protected under the ACT's *Heritage Act 2004* have also been considered to provide a local context to heritage values.

Table 4.2 - Heritage Values in the Gungahlin District

Heritage List	Protected as a MNES	Relevant for consideration under the Strategic Assessment	Number of Places / Items in Strategic Assessment Area
World Heritage List	Yes	Yes	0
National Heritage List	Yes	Yes	2 (nominated)
Commonwealth Heritage List	No	Yes	2
Register of the National Estate	No	Yes	25

⁵⁷ Australian Government (2012c) *Protected Matters Search Tool*, Department of Sustainability, Environment, Water, Population and Communities, Canberra (Last Updated: November, 2012)
Accessed online: <http://www.environment.gov.au/epbc/pmst/index.html>

ACT Heritage Register	No	No	6 (nominated) 3 (provisionally registered) 14 (registered)
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World Heritage Properties

There are no World Heritage properties that occur within the vicinity of Gungahlin district.

National Heritage Properties

Two nominated places on the National Heritage List are identified in the protected matters search for Gungahlin. These are:

- Canberra – Central National Area and Inner Hills (nominated place); and
- Canberra and Surrounding Areas (nominated place).

The central national area nomination highlights Canberra's significance from its beginning and early development and its representation as an outstanding achievement in town planning and social idealism of the early twentieth century. Canberra – Central National Area and Inner Hills includes the inner historic area of central Canberra and the Inner Hills part of the National Capital Open Space System and the inner garden city suburbs (Australian Gov't, 2012d)⁵⁸.

The Canberra and surrounding areas nomination describes an area of significant heritage value and are accordingly nominated on the National Heritage List on this basis. The nomination notes that Canberra is of outstanding significance because it is a planned town and constructed to symbolise, and function as, the epicentre of Australian democracy (Australian Gov't, 2012).

The development of Gungahlin in a manner consistent with the principles and policies of the Territory Plan is unlikely to impact on the nature or character of Canberra and its surrounding areas.

Commonwealth Heritage Places

There are two historical heritage places in Gungahlin listed on the Commonwealth Heritage List. These are:

- Gungahlin Homestead and Landscape; and
- Gungahlin Complex.

The Gungahlin Complex comprises a complex of buildings, a carriage way and loop with tree plantings, former garden areas and former paddocks with dams and water race remnants. The separate listing of 'Gungahlin Homestead and Landscape' forms part of the Gungahlin Complex. The complex is of significant heritage value as the homestead is one of the only

⁵⁸ Australian Government (2012d) *Canberra – Central National Area and Inner Hills, Northbourne Ave, Canberra ACT Australia*. Australian Heritage Database <http://www.environment.gov.au> (Report Produced Wed Nov 13 09:36:15 2012)

remaining late 19th century country estates of pre-Canberra rural district (Australian Gov't, 2012i)⁵⁹.

The Plan is unlikely to impact on the character or values of the Gungahlin Complex.

Register of the National Estate

Due to significant levels of overlap between heritage lists at the national, state, territory and local government levels, the Register of the National Estate (RNE) was closed in 2007 and is no longer a statutory list. The RNE is now an archive to more than 13,000 places including many places of local or state significance.

The listing of a place on the RNE does not in itself create a requirement for Commonwealth protection; listing however, may provide relevant information for decision makers regarding protection. RNE places are protected under the EPBC Act if they are also a national or world heritage place, or are leased by the Commonwealth. A search for MNES to a distance of 10 kilometres from Gungahlin resulted in over 200 returns of items listed on the RNE. Given the nature of the proposed action described by the Plan and the limited likelihood of any impact to items not within the Gungahlin district, the following places are limited to those which occur within one kilometre of Gungahlin.

Table 4.3 - Items Listed on the Register of the National Estate

Name	Location	Likelihood of Impact
Natural		
Ginninderra Park Grassland	Crace	Unlikely
Gungahlin Grassland and Gungahlin Hill	Crace	Unlikely
Mount Ainslie, Mount Majura and Mount Pleasant	Ainslie	Unlikely
Mulligan's Flat	Gungahlin	Avoided by Plan
Ginninderra Creek Road Cut	Nicholls	Unlikely
Indigenous		
Kinlyside Artefacts Site	Kinlyside	Avoided by Plan
Mulligan's Flat Aboriginal Quarry	North of Jacka and Bonner	Potential Offsite Impacts
Red Hill	Mulanggarri	Unlikely
Historic		
Crinigans Hut Ruin	Amaroo	Unlikely
Deasland Homestead and Dairy	Nicholls	Unlikely
Giralang Primary School	Giralang	Unlikely
Gold Creek Homestead	Ngunnawal	Unlikely
Gungaderra Station	Mulanggarri	Unlikely
Hall Village Precinct	Hall	Unlikely
Palmerville	Giralang	Unlikely
The Valley	Gungahlin	Unlikely
Wattle Park Uniting Church Complex	Hall	Unlikely
Ginninderra Police Station / Residence and Stables	Ginninderra	Unlikely

⁵⁹ Australian Government (2012e) *Canberra and Surrounding Area, s Northbourne Ave, Canberra ACT Australia*. Australian Heritage Database <http://www.environment.gov.au> (Report Produced Wed Nov 13 09:45:32 2012)

(former)		
Ginninderra Schoolhouse Group	Nicholls	Unlikely
Ginninderra Village Precinct	Nicholls	Unlikely
Gungahleen Schoolhouse	Lyneham	Unlikely
Gungahlin Complex	Crace	Unlikely
Gungahlin Homestead and Landscape	Crace	Unlikely
Horse Park Homestead Complex, Sedgeland and Surrounds	Jacka	Potential Offsite Impacts
Wells Station	Mulanggarri	Unlikely

ACT Heritage Register

The following provides some context to locally significant heritage values; however is not a comprehensive assessment of all the heritage values protected under the ACT Heritage Register. Despite not requiring assessment under the EPBC Act, these places will continue to be protected under ACT legislation during the planning and development process.

Table 4.4 - ACT Heritage Register Places in the District of Gungahlin

Key	Registration Status
A	Nomination to the Heritage Register
B	Provisionally Registered
C	Registered Places or Objects

Status	Place	Location	Likelihood of Impact
A	Aboriginal scarred trees (n=4)	Hall / Kinlyside Area	Avoided by Plan
A	Gungahlin Homestead (CSIRO)	Crace	Unlikely
A	Ginninderra Creek Road Cutting	Nicholls	Unlikely
A	Creek landscape	Gungahlin	Unlikely
A	Aboriginal Quarry, Mulligan's Flat	North of Jacka and Bonner	Potential Offsite Impacts
A	Aboriginal Sites in Kinlyside	Kinlyside	Avoided by Plan
B	Gungaderra Homestead (Red Hill Station)	Harrison	Unlikely
B	Gubur Dhaura (Aboriginal Ochre Quarry and Historic Mining Area)	Franklin	Unlikely
B	Horse Park Homestead (including Aboriginal and natural site complex)	Jacka	Potential Offsite Impacts
C	Hall Village Heritage Precinct	Hall	Unlikely
C	Elm Grove Homestead Precinct	Jacka	Avoided by Plan
C	The Valley ruin (The Valley)	Gungahlin	Unlikely
C	Aboriginal Chert Quarries	Near Mulanggarri NR	Unlikely
C	Aboriginal Places along Urban and Rural Bushfire Containment Lines	Kinlyside, Casey, Goorooyarroo, Kenny	Potential in Kenny. Avoided by Plan in Kinlyside.
C	Aboriginal Places in Belconnen, Coree, Cotter River, Gungahlin, Paddy's River and Stromlo	Casey, Goorooyarroo, Ngunnawal	Unlikely
C	Aboriginal Places in Forde, Fyshwick and Hume	Forde	Unlikely

Status	Place	Location	Likelihood of Impact
C	Aboriginal Places in Gungaderra Creek Catchment	Throsby / Mulligan's Flat	Potential
C	Aboriginal Places in Canberra Nature Park Fire Trails	Mulligan's Flat	Unlikely
C	Aboriginal Places in the Districts of Belconnen and Gungahlin	Throsby / Goorooyarroo, Moncrieff / Jacka	Potential
C	Aboriginal Places in Amaroo, Gungahlin and Kaleen	Amaroo, Gungahlin and Kaleen	Unlikely
C	Aboriginal Places in Dairy Station Creek Valley, Gungahlin Drive, Horse Park Drive and Symonston	Casey / Taylor	Potential
C	Old Coach Road (Bungendore to Ginninderra)	Mulligan's Flat	Unlikely
C	Mulligan's Flat Ploughland	Throsby	Avoided
Other	Tree of Aboriginal cultural importance	Moncrieff	Unlikely

Of particular significance to the Plan, are Elm Grove Heritage Precinct and Horse Park Homestead precincts in Jacka, which will be avoided. The Horse Park Homestead precinct contains a regionally significant example of a permanent, lowland freshwater marsh, which also provides habitat for Latham's snipe, an EPBC listed migratory bird.

In addition to these places, identified Aboriginal places/objects (whether registered or not) are protected under the *Heritage Act 2004*, and will be assessed by the ACT Government.

4.3.2 Wetlands of International Significance

Ramsar wetlands are recognised as a matter of national environmental significance under the EPBC Act. Ramsar wetlands are those that are representative, rare or unique wetlands, or are important for conserving biological diversity.

The Protected Matters Search Tool (Australian Gov't, 2012c) identified three Ramsar wetlands as potentially relevant to the Plan due to them occurring in the same catchment. These wetlands are:

- Banrock Station wetland complex;
- Coorong and Lakes Alexandrina and Albert; and
- Riverland.

These sites are located in South Australia in the lower reaches of the Murray River, and are considered in light of the nature of development and the proposed water control measures to be sufficiently far from Gungahlin that there is unlikely to be any measurable impact to the sites as a result of development.

In addition, one Ramsar site is located in the ACT. Ginini Flats Wetlands Complex is located in the Namadgi National Park, approximately 50 kilometres upstream of the proposed development area. It is not expected to be impacted by the Plan.

4.3.3 Threatened Species and Ecological Communities

A Protected Matters Search (Australian Gov't, 2012c) was undertaken for the entire region of Gungahlin. This included a 10 kilometre buffer to the area of interest in order to identify all EPBC listed species and ecological communities that have the potential to occur within Gungahlin. These results were then assessed and the list of relevant MNES refined based on a review of literature relevant to the area to determine the likelihood of occurrence of these species within the Plan area. The following tables identify the results of the Protected Matters Search Tool.

Species or communities with a likelihood of occurrence of known, likely or potential are discussed in detail. Species and communities with the potential to be impacted by the Plan are then subject to a complete analysis in Part 5 of the report.

Table 4.5 - Definitions of Likelihood of Occurrence

Likelihood	Definition
Known	Recent and reliable records of the species or community exist within the study area
Likely	Despite a lack of records, it is probable that the species does or will occur in the study area. Lack of recent reliable records may be an indication of survey effort, seasonal variation or other such factors
Potential / Potential Habitat	Characteristics of the study area are not inconsistent with requirements of the species however use of the study area would be infrequent and episodic, potentially associated with unusual or extreme climatic events, e.g. prolonged drought
Unlikely	There are no records for the species, habitat requirements are not met or normal distribution range does not coincide with the study area. Despite this, the species may be present in rare circumstances
No	There is no potential for the species to occur in the study area

Table 4.6 - Key to Threatened Species Status

Ecological Communities		
Status	CEEC	Critically Endangered Ecological Community
	EEC	Endangered Ecological Community
Threatened Species		
Status	V	Vulnerable
	E	Endangered
	CE	Critically Endangered
	X	Extinct
	M	EPBC listed migratory species

Endangered Ecological Communities

Two ecological communities are known to occur within the Gungahlin district (**Table 4.7**). These communities are protected under both the EPBC Act and the NC Act.

Table 4.7 - Threatened Ecological Communities in the Gungahlin District

Generic description	EPBC Act		NC Act		Likelihood of Occurrence
	Listed Name	Status	Listed Name	Status	
Box gum	White box-yellow box-	CEEC	Yellow box/red	EEC	Known

woodland	Blakely's red gum grassy woodland and derived native grassland		gum grassy woodland		
Natural temperate grassland	Natural temperate grassland of the Southern Tablelands of NSW and the Australian Capital Territory	EEC	Natural temperate grassland	EEC	Known

Box Gum Woodland

'Yellow Box/ Red Gum Grassy Woodland' was declared an endangered ecological community under the ACT's NC Act in May 1997. The NC Act Declaration of Species (No. 89 of 1997) listed the community as:

'Naturally occurring woodland of the temperate zone, in which Yellow Box co-occurs with Blakely's Red Gum. It includes the species rich understorey of native tussock grasses, herbs and scattered shrubs, together with a large number of native animal species.'

Box gum woodland occurs either in a woodland form or as derived / secondary grassland (former grassy woodland from which trees have been removed). The community in either context is typified by a ground layer of native tussock grasses and herbs, and a sparse, scattered shrub layer. The broader EPBC description of the community includes white box (*Eucalyptus albens*) along with the locally occurring yellow box (*E. melliodora*) and Blakely's red gum (*E. blakelyi*) as dominant trees where a canopy still occurs, or was once present in the case of secondary grassland sites. The distribution of box gum woodlands and associated grasslands includes the western slopes and tablelands of the Great Dividing Range from southern Queensland through NSW to central Victoria. It is suggested that over 95% of box gum woodlands have been cleared with those remaining representing isolated remnants (Australian Gov't, 2006a)⁶⁰.

The ACT Government's Woodland Conservation Strategy (Action Plan 27) describes the status of the community in the ACT in the following terms:

'The ACT contains the largest remaining remnants of box gum woodland in good condition, reflecting significantly lower levels of stock grazing than the rest of the range of the ecological community. In terms of size, connectivity, diversity and condition, the ACT remnant woodlands are exceptional. It is likely that the system of leasehold title in the ACT has resulted in less likelihood of intensive pasture improvement of a short-lease rural land hold' (ACT Gov't, 2004a).

The component of woodland occurring within Gungahlin is highlighted as one of the largest areas of contiguous woodland remaining in Australia. In the area applicable to the Plan, box gum woodland is located within Mulligan's Flat and Goorooyaroo Nature Reserves and within the future urban areas of Moncrieff, Kenny, Kinlyside, Jacka, Taylor and Throsby. A more detailed analysis of the presence and potential impacts of the Plan on this EEC is provided in **Section 5**.

⁶⁰ Australian Government (2006a) Advice to the Minister for the Environment and Heritage from the Threatened Species Scientific Committee (TSSC) on Amendments to the List of Ecological Communities under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) Department of Sustainability, Environment, Water, Population and Communities, Canberra (May 2006),

Natural Temperate Grassland

'Natural temperate grassland of the southern tablelands of NSW and the Australian Capital Territory' (natural temperate grassland) is a listed endangered ecological community under both the EPBC Act and the NC Act.

Natural temperate grassland is grassy vegetation dominated by moderately tall (25–50 cm) to tall (50–100 cm), dense to open tussock grasses such as *Austrodanthonia*, *Austrostipa*, *Bothriochloa*, *Poa* and *Themeda*. Up to 70% of all plant species may be forbs (i.e. herbaceous, non-grassy/non-grass-like plants). The 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 (Australian Gov't, 2012f)⁶¹.

The extent of natural temperate grassland is relatively well mapped in the ACT, and within the Gungahlin district is known to occur within Mulanggari, Gungaderra and Crace Nature Reserves, North Mitchell open space, and small fragments near Kenny.

A more detailed analysis of the presence and potential impacts of the Plan on this EEC is provided in **Section 5**.

Invertebrates

One (1) threatened invertebrate species listed under the EPBC Act is known to occur within the Gungahlin district.

Table 4.8 - Threatened Invertebrate Species in the Gungahlin District

Scientific Name	Common Name	EPBC Act Status	NC Act Status	Likelihood of Occurrence
<i>Synemon plana</i>	golden sun moth	CE	E	Known

Golden Sun Moth

Golden sun moth (*Synemon plana*) is a medium-sized, day-flying moth. The species is listed as critically endangered under the EPBC Act, and endangered on the NC Act.

Golden sun moth occurs in natural temperate grasslands and open grassy woodlands dominated by wallaby grass (*Austrodanthonia* spp.) (NSW Gov't, 2007)⁶². Historically the species occurred across approximately 2 million hectares of native temperate grasslands in NSW, ACT, Victoria and South Australia. Less than 1% of these temperate grasslands remain and populations of golden sun moth are highly reduced and fragmented. Once considered to be restricted to only natural temperate grasslands dominated by more than 40% coverage of wallaby grass, the species is now found to have a broader tolerance for other species compositions and has been recorded in exotic grasslands displaying a particular preference for Chilean needle-grass (*Nassella neesiana*) (Australian Gov't, 2012f).

⁶¹ Australian Government (2012f) *Species Profile and Threats Database (SPRAT)* Department of Sustainability, Environment, Water, Population and Communities, Canberra. Accessed online <http://www.environment.gov.au> November 2012.

⁶² NSW Government (2007), *Draft NSW and National Recovery Plan for the Golden Sun Moth – Synemon plana*, Department of Environment and Conservation, Queanbeyan NSW (2007)

Conservation of golden sun moth in the ACT was addressed first through Action Plan No. 7 (ACT Government 1998), then in a more integrated context through the *ACT Lowland Native Grassland Conservation Strategy* (ACT Government 2005). Since those Action Plans were prepared, the number of sites where golden sun moth has been recorded in the ACT has increased substantially, to over 70 sites (Mulvaney, 2012).

Golden sun moth is known from 32 sites around Gungahlin, large habitat areas occur within Mulanggari, Crace, Mulligan's Flat and Gorooyarroo Nature Reserves, and within the future urban areas of Throsby, Moncrieff, and Taylor. Surveys undertaken during the spring and summer of 2010-2011 and 2011-2012 across Crace, Mulanggari, Gorooyarroo, Mulligan's Flat and Gungaderra Nature Reserves, as well as Jacka, Taylor, Throsby, Kinlyside and One Tree Hill have provided a well defined extent of habitat across Gungahlin. However, due to a relatively low level of moth emergence across the ACT in these seasons, population size estimates are more uncertain (Mulvaney, 2012). Details on all surveys undertaken for golden sun moth are included in **Section 5.3.1** in the data sources section.

A more detailed analysis of the presence and potential impacts of the Plan on this species is provided in Section 5.

Birds

Five (5) birds listed on the EPBC Act were identified in the protected matters search tool (Australian Gov't, 2012c) as having the potential to occur within Gungahlin, based on known distribution or habitat requirements. Species considered likely to occur are discussed below.

Table 4.9 - Threatened Bird Species within the Gungahlin District

Scientific Name	Common Name	EPBC Act Status	NC Act Status	Likelihood of Occurrence
<i>Anthochaera phrygia</i> ⁶³	regent honeyeater	M, E	E	Known
<i>Lathamus discolor</i>	swift parrot	M, E	V	Known
<i>Leipoa ocellata</i>	malleefowl	V	N/A	No
<i>Polytelis swainsonii</i>	superb parrot	V	V	Known
<i>Rostratula australis</i>	Australian painted snipe	V	N/A	Unlikely

Superb Parrot

Superb parrot (*Polytelis swainsonii*) is listed as vulnerable on the EPBC Act, as well as on the NC Act.

Superb parrot inhabit forests and woodlands including yellow box, red gum woodlands in the Riverina, western slopes and plains and extending onto the southern tablelands in the Canberra region. In the ACT, box gum woodlands form the major habitat for the species, with Blakely's red gum and scribbly gum being the main source of nesting hollows. Critical habitat features for superb parrots include large living and dead trees for nesting sites (ACT Gov't, 2005b)⁶⁴. In the ACT, superb parrots arrive in early Spring and presently nest in two non-urban woodland areas; central Molonglo and woodland in the Throsby, Mulligan's Flat – Gorooyarroo area. Foraging is centred on certain open space and public areas (eg. Mount

⁶³ Note: '*Anthochaera*' is a synonym of the superseded generic name for regent honeyeater '*Xanthomyza*' currently listed on JAMBA.

⁶⁴ ACT Government (2005b) Threatened Species and Communities of the ACT Information Sheet: Superb Parrot (*Polytelis swainsonii*) A vulnerable species, Environment ACT, Canberra (March, 2005)

Rogers and Australian Institute of Sport (AIS) car park) in addition the ovals, street plantings and gardens within Belconnen.

During the breeding seasons of 2009 and 2010, all large hollow bearing trees were searched for signs of breeding activity in areas of Throsby, Jacka, Kinlyside, Moncrieff, Kenny and Taylor. Parts of Mulligan's Flat and Gorooyaroo Nature Reserves were also searched. During spring 2011 further surveys were undertaken in the Hall and north Majura Valley areas. Results of these surveys showed a concentration of breeding within Throsby and Gorooyaroo, with no nest trees identified in any of the other future urban areas (Mulvaney, 2012).

A more detailed analysis of the presence and potential impacts of the Plan on this species is provided in **Section 5**.

Swift Parrot

Swift parrot (*Lathamus discolor*) is listed as endangered under the EPBC Act, and vulnerable on the NC Act.

Swift parrots are a migratory species that use coastal blue gums in southeast Tasmania for breeding in September to December, and in winter are semi-nomadic, foraging in dry woodlands mainly in Victoria and New South Wales. Smaller but significant numbers have been recorded regularly in south-eastern Queensland and occasionally in the Australian Capital Territory and south-eastern South Australia (Swift Parrot Recovery Team, 2001)⁶⁵.

Within the ACT, swift parrots may occur in dry sclerophyll eucalypt forests and box gum woodland, however most records appear to be of birds passing through the region, rarely spending much time at a given site (Taws & Saunders, 2005)⁶⁶. The transitory nature of the species' use of the ACT region suggests that the action would not have a significant impact on swift parrots, particularly as areas of woodland with high value connectivity and quality would be protected under the Plan.

Regent Honeyeater

Regent honeyeater (*Anthochaera phrygia*) is listed as endangered under the EPBC Act and the NC Act. Regent honeyeater has been described by Canberra Ornithologists Group (COG) as a rare, breeding visitor to the ACT (COG, 2012a)⁶⁷.

Regent honeyeaters are known to regularly occur in woodlands with an abundance of mature trees, high canopy cover and a large number of mistletoe. The species feeds on nectar from flowering yellow box and Blakely's red gum and associated mistletoe.

The species is a partially migratory bird which moves north in autumn and winter and returns south for breeding in the spring. Their movements are thought to be governed largely by availability of flowering eucalypts. Breeding is recorded with some regularity in the ACT, but this has tended to involve individual pairs (Australian Gov't, 2012f).

⁶⁵ Swift Parrot Recovery Team (2001) *Swift Parrot Recovery Plan 2001-2005*, Department of Primary Industries, Water and Environment, Hobart. Available online:

<http://www.environment.gov.au/biodiversity/threatened/publications/recovery/swift-parrot/index.html>.

⁶⁶ Taws, N. and Saunders, D. (2005) 'Swift parrot invasions' in *Canberra Bird Notes*. 30(2) pp. 76-78. Canberra Ornithologists Group, Canberra (June, 2005)

⁶⁷ COG (2012a) *Annual bird report: 1 July 2010 to 30 June 2011* *Canberra Bird Notes*, 37(1) pp. 1-92, Canberra Ornithologists Group, Canberra (March 2012)

A more detailed analysis of the presence and potential impacts of the Plan on this species is provided in **Section 5**.

Mammals

Four (4) mammal species listed under the EPBC Act were identified in the PMST as having the potential to occur within Gungahlin, based on known distribution or habitat requirements.

Table 4.10 - Threatened Mammal Species within the Gungahlin District

Scientific Name	Common Name	EPBC Act Status	NC Act Status	Likelihood of Occurrence
<i>Phascolarctos cinereus</i>	koala	V	N/A	Unlikely
<i>Dasyurus maculatus maculatus</i>	spotted-tailed quoll	E	V	Potential
<i>Petrogale penicillata</i>	brush-tailed rock wallaby	V	E	Potential
<i>Pteropus poliocephalus</i>	grey-headed flying fox	V	N/A	Potential

Spotted-tailed Quoll

Spotted-tailed quoll (*Dasyurus maculatus maculatus*) is listed as endangered under the EPBC Act and vulnerable under the NC Act.

While occasional sightings of the species continue across the ACT, including in urban areas, it is understood that the species would occur primarily within Namadgi National Park and the adjoining and extensive national park and wilderness areas to the west and south.

Spotted-tailed quoll is a highly mobile species which is only rarely recorded in the northern ACT, and as such, it considered unlikely the action would impact on its long term survival.

Brush-tailed Rock Wallaby

Brush-tailed rock wallaby (*Petrogale penicillata*) is listed as vulnerable under the EPBC Act and endangered under the NC Act.

In the ACT, a captive population is being managed at Tidbinbilla Nature Reserve, however the species is presumed to be extinct in the wild (ACT Gov't, 1999a)⁶⁸.

Grey-headed Flying Fox

Grey-headed flying fox (*Pteropus poliocephalus*) is listed as vulnerable under the EPBC Act.

This species has in recent years established a diurnal roost in Commonwealth Park, in central Canberra. As grey-headed flying-fox are capable of nightly flights of more than 50km from their roost sites for foraging, the Gungahlin district would fall within the normal foraging catchment of the flying fox colony that roosts in central Canberra, however the action is considered unlikely to impact significantly on the species' foraging or roosting requirements.

⁶⁸ ACT Government (1999a) Brush-Tailed Rock-Wallaby (*Petrogale penicillata*): An Endangered Species. Action Plant No. 22, Environment ACT (1999b)

Reptiles

Three (3) reptile species listed under the EPBC Act were identified in the PMST as having the potential to occur within Gungahlin. The grassland habitats of Gungahlin are known to support a range of reptile fauna, and their presence and distribution are well studied.

Table 4.11 - Threatened Reptile Species within the Gungahlin District

Scientific Name	Common Name	EPBC Act Status	NC Act Status	Likelihood of Occurrence
<i>Delma impar</i>	striped legless lizard	V	V	Known
<i>Aprasia parapulchella</i>	pink-tailed worm lizard	V	V	Likely
<i>Tympanocryptis pinguicolla</i>	grassland earless dragon	E	E	Unlikely

Striped Legless Lizard

Striped legless lizard (*Delma impar*) is listed as vulnerable under both the EPBC and NC Acts. Striped legless lizard were formerly distributed throughout temperate lowland grasslands in the ACT, the south-western slopes and southern tablelands of New South Wales, central and southern Victoria, and the south-eastern corner of South Australia (Cogger *et al.* 1993)⁶⁹. The distribution of the species has declined, with many known sites no longer supporting populations possibly due to habitat fragmentation. Remaining populations are probably small and isolated.

The formerly continuous distribution in the ACT has been reduced to four discrete areas: Gungahlin, the lower Majura Valley, the lower Jerrabomberra Valley and Yarramundi Reach (Coulson, 1995)⁷⁰. A significant proportion of habitat for the species has been protected in Gungahlin by the establishment of Mulanggari, Gungaderra and Crace Grassland Nature Reserves. In a national context these reserves together with the Kenny area support high densities and large populations of striped legless lizard. Gungahlin also supports a high proportion of the total ACT population of this species, and a high proportion of the total lizard population occurring within conservation reserves across its total south-eastern Australian range (Robertson & Smith, 2010; ARAZPA, 1996)^{71,72}.

An extensive survey program for striped legless lizards was run by Conservation, Planning and Research in 2011 in the Jerrabomberra, Majura and Gungahlin Valleys. At survey sites, grids of 25 or 50 roof tiles were laid out in August and September, and checked 12 times until the end of December. Sites surveyed in Gungahlin included Kenny, Throsby, Crace asbestos dump, Gungahlin Town Centre and Franklin; and lizards were detected in every site except for Throsby (Mulvaney, 2012).

⁶⁹ Cogger, HF, Cameron, EE, Sadlier, RA & Egger, P (1993). *The Action Plan for Australian Reptiles*, Australian Nature Conservation Agency, ANCA, Canberra.

⁷⁰ Coulson, G. (1995). *Management directions for the Striped Legless Lizard (Delma impar) in the Australian Capital Territory*. ACT Parks & Conservation Service. Canberra: ACT Parks & Conservation Service.

⁷¹ Robertson, P. and Smith, W., (2010). *National Recovery Plan for the Striped Legless Lizard (Delma impar)*. Department of Sustainability and Environment, Melbourne

⁷² Australasian Regional Association of Zoological Parks and Aquaria (1996) *Population and Habitat Viability Assessment (PHVA) for the Striped Legless Lizard* Based on a workshop held in Canberra 30 July – 2 August 1996.

Surveys were also undertaken in Moncrieff (Biosis Research, 2011)⁷³ which failed to detect the species. Suitable habitat is not available in any other urban release areas in Gungahlin.

A more detailed analysis of the presence and potential impacts of the Plan on this species is provided in **Section 5**.

Pink-Tailed Worm-Lizard

Pink-tailed worm-lizard (*Aprasia parapulchella*) is listed as vulnerable under both the EPBC and NC Acts. It is a cryptic, fossorial species that grows to 14cm. The species is known from a patchy distribution along the foothills of the western slopes of the Great Dividing Range. In the ACT, the species is known to occur primarily between Belconnen and the Molonglo Valley along the Molonglo River, and Mount Taylor, and Farrer Ridge in Tuggeranong (ACT Gov't, 2005a).

The species generally occurs in open grassland habitat dominated by native grasses such as kangaroo, spear and wallaby grass, although may sometimes be found in highly modified grasslands dominated by exotic species. The species is most commonly found sheltering under small, shallowly embedded rocks which are used for thermoregulation and the species may remain under the same rock for long periods. Preference is shown for sunny aspects and avoidance of south facing slopes. Ant burrows are often used to retreat into deeper ground to avoid hot, dry weather (Australian Gov't, 2012f).

A detailed survey for pink-tailed worm lizard was undertaken across the western part of Gungahlin in spring 2012. Three live animals and two sloughed skins were observed close to each other in the Kinlyside - Casey area. There is a further record from 2008 of a shed skin by an ACT Government conservation ranger in part of what is now the suburb of Casey. However, the skin was not deposited, so some doubt remains as to the accuracy of identification. The Casey – Kinlyside records are 10 kilometres from the next nearest records at the Pinnacle in Belconnen or along the Murrumbidgee River in NSW. Pink-tailed worm lizard was not recorded in any of the extensive pit or tile surveys undertaken targeting striped legless lizard across Gungahlin and was not found in targeted rock rolling surveys in Moncrieff, Jacka or Taylor.

Suitable rocky habitat for this species is generally uncommon in Gungahlin and the largest extent is on the eastern side of Kinlyside, the location of observations. Other potential habitat occurs on One Tree Hill, the rural lease to the north of Taylor, and the Throsby Ridge area. None of the remaining known or most likely potential habitat areas are planned for development.

⁷³ Biosis Research (2011) *Moncrieff Threatened Reptile Survey Report*, Prepared for the ACT Land Development Agency, Canberra (March, 2011)

Fish

Two (2) fish species listed under the EPBC Act were identified in the PMST as having the potential to occur within Gungahlin

Table 4.12 - Threatened Fish Species within the Gungahlin District

Scientific Name	Common Name	EPBC Act Status	NC Act Status	Likelihood of Occurrence
<i>Maccullochella peeli</i>	Murray cod	V	N/A	Likely
<i>Macquaria australasica</i>	Macquarie perch	E	E	Potential

Murray Cod

Murray cod (*Maccullochella peeli*) are listed as vulnerable under the EPBC Act. Murray cod is the largest native freshwater fish in Australia, and occurs extensively throughout the Murray-Darling Basin in south-eastern Australia. The species range includes waterways in the Murray-Darling system in South Australia, Victoria, NSW, ACT and Queensland. Its preferred habitat ranges from small clear, rocky streams to large, slow flowing rivers with shelter such as deep holes, rocks, fallen timber, stumps, clay banks or overhanging vegetation.

ACT Government mapping shows the species within Yerrabi Pond and Gungahlin Pond, where it has been released as part of a native fish stocking program. It occurs nowhere else within the Gungahlin district.

Based on the species distribution and habitat requirements, it is considered unlikely that it would be directly impacted by the development. Any potential indirect impacts, such as runoff and water quality impacts would be managed during construction through the CEMP. The CEMP will require sediment and run-off controls in accordance with the *Environment Protection Act 1997* (EP Act). These will be installed prior to construction commencing, and maintained until site stabilisation to ensure run-off is kept to a minimum and water quality is not affected by construction activities. Compliance of these controls would be audited in line with the developer's Environment Protection Agreement or Environmental Authorisation issued under the EP Act. Any breaches of these controls will be recorded and reported to the Environment Protection Authority and remedial actions will be immediately taken.

Macquarie Perch

Macquarie perch (*Macquaria australasica*) are listed as endangered under both the EPBC and NC Acts. The species' preferred habitat is cool, shaded, upland streams with deep rocky pools and substantial cover. In the ACT, Macquarie Perch are restricted to four rivers, the Murrumbidgee, Molonglo, Paddy's and Cotter rivers (ACT Gov't, 1999)⁷⁴.

Based on the species distribution and habitat requirements, it is considered unlikely that it would be directly impacted by the development. Any potential indirect impacts, such as runoff and water quality impacts would be managed during construction through the CEMP. The CEMP will require sediment and run-off controls in accordance with the *Environment*

⁷⁴ ACT Government (1999) Macquarie Perch (*Macquaria australasica*): An endangered species - Action Plan No. 13, Environment ACT, Canberra (1999)

Protection Act 1997 (EP Act). These will be installed prior to construction commencing, and maintained until site stabilisation to ensure run-off is kept to a minimum and water quality is not affected by construction activities. Compliance of these controls would be audited in line with the developer's Environment Protection Agreement or Environmental Authorisation issued under the EP Act. Any breaches of these controls will be recorded and reported to the Environment Protection Authority and remedial actions will be immediately taken.

Flora

Eight (8) flora species listed under the EPBC Act were identified in the PMST as having the potential to occur within Gungahlin. Refer to **Section 4.2.2** for more information on flora surveys and results.

Table 4.13 - Threatened Flora Species within the Gungahlin District

Scientific Name	Common Name	EPBC Act Status	NC Act Status	Likelihood of Occurrence
<i>Leucochrysum albicans</i> var. <i>tricolor</i>	hoary sunray	E	N/A	Known
<i>Lepidium ginninderrense</i>	Ginninderra peppergrass	V	E	Known
<i>Prasophyllum petilum</i>	tarengo leek orchid	E	N/A	Possible
<i>Thesium australe</i>	Austral toadflax	V	N/A	Known
<i>Pelargonium</i> sp. <i>striatellum</i>	Omeo stork's-bill	E	N/A	Unlikely
<i>Arachnorchis actensis</i>	Canberra spider orchid	CE	E	No
<i>Swainsona recta</i>	small purple pea	E	N/A	Possible
<i>Rutidosis leptorrhynchoides</i>	button wrinklewort	E	E	Known

Hoary Sunray

Hoary sunray (*Leucochrysum albicans* var. *tricolor*) is listed as endangered under the EPBC Act. It is a low tufted, perennial herb with silver foliage, which produces a white everlasting flower head with a yellow centre up to 45cm tall. Flowering occurs between spring and summer.

Hoary sunray was once widespread but now occurs primarily on agricultural land roadside easements, cemeteries and railway verges. Hoary sunray currently occurs on the Southern Tablelands and some adjacent areas in an area roughly bounded by Albury, Bega and Goulburn, in the South Eastern Highlands, Australian Alps and Sydney Basin bioregions. Hoary Sunray occurs in a wide variety of grassland, woodland and forest habitats, generally on relatively heavy soils (Sinclair, 2010)⁷⁵.

The only known occurrences of this daisy in Gungahlin are in Mulligan's Flat, Crace and Mulanggari nature reserves, which are small patches including recent restoration plantings. Large populations occur to the east of Gungahlin in Majura Training Area and the Mt Ainslie and Mt Majura Nature Reserves. This is a distinctive perennial plant and as there has been a

⁷⁵ Sinclair, S.J. (2010) *Draft Recovery Plan for the Hoary Sunray (Leucochrysum albicans* var. *tricolor*). Heidelberg, Victoria: Department of Sustainability and Environment.

high level of woodland survey across Gungahlin, it is highly unlikely that the species occurs within proposed action areas (Mulvaney, 2012).

Ginninderra Peppergrass

Ginninderra peppergrass (*Lepidium ginninderrense*) is listed as vulnerable under the EPBC Act, and endangered under the NC Act. Ginninderra peppergrass is a perennial herb to a maximum height of about 20 cm, with one to six branched stems arising from a rootstock, and small flowers which appear in late spring (ACT Gov't, 2003)⁷⁶.

The species was previously known from a single location within natural temperate grassland in the northwest corner of the Belconnen Naval Transmission Station in Lawson, ACT (ACT Gov't, 2012c). Recently however, a population of around 50 plants has been discovered in North Mitchell in a grassland site zoned as Hills, Ridges and Buffers in the Territory Plan. This location is spatially distinct from the Ginninderra floodplain, where the distribution of Ginninderra peppergrass was thought to have been restricted. The only other record of the species in the ACT was from the suburb of Reid in 1952 although recent searches have failed to re-detect the species in the area. The species is geographically isolated from closely related species of *Lepidium* and is not known to occur outside the ACT.

The population in Lawson occurs within the Belconnen Naval Transmission Station on land currently managed by the Department of Defence with the assistance of Environment ACT and specialist consultants. The entire site is being decommissioned and will be disposed of to the ACT Government. This land is listed as critical habitat for the species (ACT Gov't, 2003) and zoned as 'Urban Open Space' in the Territory Plan (ACT Gov't, 2008c)⁷⁷.

The Mitchell population occurs on land zoned as 'Hills, Buffers and Ridges' and is unlikely to be subject to development. Protection and adequate management of the site to mitigate indirect effects is recommended. It is unlikely that the Ginninderra peppergrass within Gungahlin would be directly affected by future development.

Tarengo Leek Orchid

Tarengo leek orchid (*Prasophyllum petilum*) is listed as endangered under both the EPBC Act and the NC Act. The Tarengo leek orchid is a rare orchid of grasslands and grassy woodlands of the Southern Tablelands of New South Wales and in the Australian Capital Territory (Australian Gov't, 2012f).

Tarengo leek orchid is a slender herb to 30 cm, its cylindrical leaf reaching 25 cm. A narrow flowering spike is produced in October to November, with 5 to 18 flowers distributed sparsely along it. It is known to occur at Hall Cemetery in the ACT, and at three sites in NSW. Potentially suitable habitat has also been identified between Hall and Kinlyside in Gungahlin (Mulvaney, 2012), although recent searches failed to locate the plant. Due to the avoidance of Kinlyside in the Plan, the species is unlikely to be impacted.

Austral Toadflax

Austral toadflax (*Thesium australe*) is listed as vulnerable under the EPBC Act. The species is an erect perennial herb to 40 cm high with pale green to yellow-green, glabrous leaves and

⁷⁶ ACT Government (2003) *Ginninderra Peppergrass (Lepidium ginninderrense) - an endangered species*. Action Plan No. 25, Environment ACT, Canberra (2003)

⁷⁷ ACT Government (2008c) *Territory Plan – Current Version R96*, ACT Government, Canberra (September, 2012)

solitary green-yellow flowers (RBG, 2012)⁷⁸. The species appears to be strongly associated with kangaroo grass (*Themeda triandra*) dominated ground cover. The plant is fairly inconspicuous, often being hidden amongst grasses and other herbs.

About 50 plants are known to occur in one location in Mulligan's Flat Nature Reserve. This is the only known location of the species in Gungahlin (Mulvaney, 2012). The species is unlikely to be impacted as a result of implementation of the Plan.

Small Purple Pea

Small purple pea (*Swainsona recta*) is listed as endangered under the EPBC Act. It is a slender, erect perennial plant with few, more or less rigid stems 20 - 30 cm high, with purple or bluish flowers borne in spikes numbering 10 to 21, which are 10–27 cm long. The species is conspicuous in spring but outside this time dies back to its root stock. Habitat for the species includes open woodland in association with Blakely's red gum, yellow box and red box with native grassy understorey dominated by kangaroo grass, spear grasses and poa tussock.

In the spring of 1986, a number of seedlings of the species were recorded in grassland on the western slope of Mt Gungahlin, which is now within the Gungahlin Nature Reserve. The species has not been observed there since and may have been a misidentification, or it is possible that the record relates to plantings of the species. Given the high level of spring survey across suitable habitats in Gungahlin, it is considered unlikely that the species occurs within any of the areas subject to the proposed action (Mulvaney, 2012).

It is considered unlikely that the small purple pea occurs within any of the areas subject to the proposed action (Mulvaney, 2012) and as such, impact to the species as a result of the action is considered unlikely.

Button Wrinklewort

Button wrinklewort (*Rutidosia leptorrhynchoides*) is listed as endangered under both the EPBC and NC Acts. It is a perennial shrub which grows to around 40cm high, with grass like leaves and yellow button flower heads on sparsely branched, erect stems. The species was formerly widespread across the grasslands and grassy woodlands south of the Great Dividing Range in Victoria into south-eastern New South Wales, Australia (Victorian Gov't, 2003)⁷⁹.

Button wrinklewort occurs in 11 sites in the ACT including Campbell, Majura Field Firing Range, Stirling Ridge, Red Hill and Crace Nature Reserve. Crace Nature Reserve contains a population of about 5000 plants, which is the only known occurrence of the plant within Gungahlin. The plant is a distinctive perennial and is highly unlikely to occur in any of the areas subject to the proposed action (Mulvaney, 2012).

⁷⁸ The Royal Botanic Gardens and Domain Trust (2012). *PlantNET - The Plant Information Network System of The Royal Botanic Gardens and Domain Trust*, Sydney, Australia

<http://plantnet.rbgsyd.nsw.gov.au>

⁷⁹ Victorian Government (2003) *Flora and fauna guarantee. Action statement, Button wrinklewort, Rutidosia leptorrhynchoides*, Department of Sustainable and Environment, Melbourne. Accessed online (16/11/12): http://www.dse.vic.gov.au/data/assets/pdf_file/0018/103257/028_Button_Wrinklewort_1992.pdf

Migratory Species

Fifteen (15) migratory species listed under the EPBC Act were identified in the PMST as having the potential to occur within Gungahlin. The EPBC Act lists migratory species protected under a number of international agreements, including the Japan - Australia Migratory Bird Agreement (JAMBA), the China – Australia Migratory Bird Agreement (CAMBA), and the Republic of Korea - Australia Migratory Bird Agreement (ROKAMBA).

Many of these species are listed due to their potential to fly over the site during migration, or occasionally use it as a foraging resource. Gungahlin does not contain significant habitat for the majority of these species.

Table 4.14 - Migratory Birds within the Gungahlin District

Scientific Name	Common Name	EPBC Act Status	Likelihood of Occurrence
<i>Apus pacificus</i>	fork-tailed swift	M	Known
<i>Ardea alba</i>	great egret	M	Known
<i>Ardea ibis</i>	cattle egret	M	Known
<i>Haliaeetus leucogaster</i>	white-bellied sea-eagle	M	Likely
<i>Hirundapus caudacutus</i>	white-throated needletail	M	Known
<i>Leipoa ocellata</i>	malleefowl	V	No
<i>Merops ornatus</i>	rainbow bee-eater	M	Known
<i>Monarcha melanopsis</i>	black-faced monarch	M	Known
<i>Myiagra cyanoleuca</i>	satin flycatcher	M	Potential
<i>Rhipidura rufifrons</i>	rufous fantail	M	Known
<i>Anthochaera phrygia</i>	regent honeyeater	M, E	Known
<i>Gallinago hardwickii</i>	Latham's snipe	M	Known
<i>Rostratula australis</i>	Australian painted snipe	M, V	Unlikely

Fork-Tailed Swift

Status: JAMBA, CAMBA, ROKAMBA; migratory species (EPBC Act)

Fork-tailed swift (*Apus pacificus*) is listed as a migratory, marine species under the EPBC Act. The species is found in south Siberia, north Mongolia, north China and Japan and migrates to south-east Asia and Australia. The species is a non breeding visitor to most regions and states of Australia from inland plains and desert regions such as the Great Victoria Desert and the Nullabor Plain to foothills, coastal areas and offshore islands.

The species is considered native to several countries including Australia, according to the 2009 IUCN Red List (Birdlife International 2009b)⁸⁰.

The global population is unknown, however populations are considered stable across its range, except in Pakistan. Abundance in Australia is also unknown although large flocks of around 90 000 have been recorded near Mildura in Victoria, in 1961, 50,000 at Portland, south-west Victoria, in 1960; and 50,000 at Ivanhoe, NSW.

⁸⁰ BirdLife International (2009b). *Apus pacificus* In: IUCN 2009. IUCN Red List of Threatened Species. Version 2009.2. *Apus pacificus*. IUCN Red List.

Fork-tailed swift is almost exclusively aerial, flying from 1 m to above 300 m in height range, often observed over cliffs and beaches and sometimes well out to sea. The species commonly occurs over a range of habitat types including settled, urban areas in towns and cities. Habitat for the species includes a diverse range of vegetation types and landuse types including dry or open areas, riparian woodland, swamps, heathland, grasslands, sandplains, saltmarsh, rainforests, wet sclerophyll forest, or plantations of pines (Australian Gov't, 2012f). The species is insectivorous, foraging aerially in areas of updraught, especially around cliffs. Fork-tailed swift often roost aerially although have been observed to land on occasion to roost in trees.

Fork-tailed swift arrives in Australia usually around October, entering the country via Northern Territory and remaining highly mobile for the duration of their stay. The species is common in the ACT between December and March with several flocks passing through up to three and four times a year within this period (Australian Gov't, 2012f). Records in the Gungahlin district of fork-tailed swift are from Mulligan's Flat Nature Reserve in 1987. Other more recent ACT observations are from the suburb of Lyneham in the ACT (COG, 2011)⁸¹. Breeding occurs outside of the Australian region between April and July.

No significant threats exist for the species in Australia. Potential threats however include loss or degradation of habitat and predation by feral animals (Birdlife International, 2009b). Due to the aerial nature of its lifestyle, wide distribution and the fact that records of the species in Gungahlin are over 20 years old, potential impact of the proposed action on the species is considered unlikely.

Great Egret

Status: JAMBA, CAMBA; migratory species (EPBC Act)

Great egret (*Ardea ibis*) is a listed migratory marine species under the EPBC Act and a widespread species of southern and eastern Asia and Australasia.

The species is widespread in Australia occurring in all states and territories of the mainland and Tasmania. The largest concentration of breeding colonies in Australia occur in coastal regions of the Northern Territory, although colonies are also confirmed in other areas of Australia including Queensland, north-eastern South Australia, the Darling Riverine Plains region of NSW and the Riverina region of NSW and Victoria. The only areas avoided by the species are in the driest regions of western and central deserts.

Great egret is an uncommon visitor to the ACT (COG, 2011) and only 20 records exist of the species in Gungahlin, with the majority from Yerrabi Ponds (Mulvaney, 2012). Habitat for the species consists of a variety of wetlands, both inland and along the coast, including marshes, floodplains, river margins, lake shores, salt pans, estuaries, coastal swamps, mangroves and mudflats. The species can also be found in more terrestrial habitats, including open fields, agricultural land, rice fields and drainage channels (Australian Gov't, 2012f).

In Australia, great egret is threatened by loss and/or degradation of foraging and breeding habitat through the following processes:

- altered hydrology due to water harvest for irrigation in agricultural areas and drainage and clearing of wetlands for development;
- frequent burning of wetlands that disturbs nesting sites;

⁸¹ Canberra Ornithologists Group (2011) Annual Bird Report: 1 July 2009 to 30 June 2010, Canberra Bird Notes 36(1): 1–80

- salinisation; and
- invasion of habitat by exotic plants or fish.

It is suggested that Gungahlin does not contain significant habitat for the species (Mulvaney, 2012) and as such the proposed action is unlikely to affect great egret.

Cattle Egret

Status: CAMBA; migratory species (EPBC Act)

Cattle egret (*Ardea alba*) is listed as a migratory, marine species under the EPBC Act. The name comes from the association of the species with cattle and the habit of eating ticks and flies off the backs of livestock.

The species was originally native to Africa, south-west Europe and Asia. Global distribution currently however spans a good part of the world. Within Australia the species is widespread and common and migration patterns cross all states and territories.

Breeding occurs in colonies across many regions of Australia. The principal breeding sites however, are on the central east coast from Newcastle to Bundaberg and in major inland wetlands in North NSW, especially the Macquarie Marshes (Australian Gov't, 2012f). The species is an uncommon visitor to the ACT and only 5 records of this species, usually of a few birds, have been recorded at Yerrabi Ponds and near the crematorium in Gungahlin (COG, 2011). Although the species is widespread, prime breeding locations are distant from the ACT and Gungahlin does not contain significant habitat for this species (Mulvaney, 2012). As such potential impact from the proposed action is considered unlikely.

White-Bellied Sea-Eagle

Status: CAMBA; migratory species (EPBC Act)

White-bellied sea-eagle (*Haliaeetus leucogaster*) is listed as a migratory, marine species under the EPBC Act.

Globally the species is distributed across India and Sri Lanka, east to southern China, South-East Asia, Philippines, New Guinea and Australia (Marchant & Higgins, 1993)⁸². It is suggested that approximately 10-20 % of the global population occurs in Australia.

In Australia the species is distributed along the coastline and offshore islands of the mainland and Tasmania. It also occurs inland along some of the larger waterways, especially in eastern Australia. Breeding occurs mostly on the eastern coastline although breeding activity has been recorded along the Murray, Murrumbidgee and Lachlan Rivers in northern Victoria and south-west NSW.

White-bellied sea-eagles are uncommon visitors to the ACT. Sightings are usually of individuals and always occur close to a major water body (COG, 2011). The only two recordings in the region were of two birds near Hall in 2006, and Gungahlin does not contain significant habitat for this species (Mulvaney, 2012).

White-Throated Needle-tail

Status: JAMBA, CAMBA; migratory species (EPBC Act)

⁸² Marchant, S. & P.J. Higgins, eds. (1993) *Handbook of Australian, New Zealand and Antarctic Birds. Volume 2 - Raptors to Lapwings*. Melbourne, Victoria: Oxford University Press.

White-throated needletail (*Hirundapus caudacutus*) is listed as a migratory, marine species under the EPBC Act. The global distribution of the species occurs across Asia and Australasia. Breeding occurs in Asia, from central and south-eastern Siberia and Mongolia, east to Russia and south to northern Japan and north eastern China. The species is widespread in eastern and south-eastern Australia during the winter period and is recorded in all coastal regions of Queensland and NSW and into adjacent inland plains across the western slopes of the Great Divide.

Almost exclusively aerial, the species occurs over variety of habitats, showing particular preference for wooded areas, including open forest and rainforest but also occurring over open heathlands, swamps and treeless grasslands. In Australia the species occurs predominately in the east, usually over coastal and mountainous regions. Records for the species in Gungahlin are from the Mulligan's Flat and Gorooyaroo Nature Reserves (Mulvaney, 2012) and the species is considered an uncommon migrant to the ACT (COG, 2011).

Threats to the species in Australia are limited. Collision with overhead wires and lighthouses is a threat to individuals, although not an entire population. Due to the limited nature of threats to the species or migratory capacity, there are no threat abatement or recovery actions underway or proposed (Australian Gov't, 2012f).

The proposed action is considered unlikely to impact the species.

Rainbow Bee-Eater

Status: JAMBA; migratory species (EPBC Act)

Rainbow bee-eater (*Merops ornatus*) is listed as a migratory, marine species under the EPBC Act. The species occurs from south-east Asia to Australia. In Australia the species is distributed across most of mainland Australia and some offshore islands. It is not present in Tasmania however, or arid regions of central and western Australia. Rainbow bee-eater is a common breeding summer migrant in the ACT (COG, 2011). Records within Gungahlin all occur from Mulligan's Flat and Gorooyaroo Nature Reserves or in woodlands near Hall. The greatest concentrations of the species in the ACT are along the Murrumbidgee and other major rivers where they nest in soft sedimentary soils. No records occur of breeding activity in the Gungahlin district.

Habitat for the species consists of open forests and woodlands, shrublands, and in various cleared or semi-cleared habitats, including farmland and areas of human habitation often in close proximity to permanent water.

Populations in Australia have not been surveyed but are presumed to be reasonably large and the species is not considered globally threatened and therefore unlikely to decline (Australian Gov't 2012). The only identified threat to the species is the introduced Cane toad (*Bufo marinus*). This toad species is not present as far south as the ACT and no other threats have been identified. Records of rainbow bee-eater all occur in nature conservation reserves and woodlands not subject to future development. As such potential impact from the proposed action is considered unlikely. Maintaining and enhancing the extent and connectivity of large remnant patches of native vegetation present in Gungahlin however, will enhance movement and foraging activity for the species (Mulvaney, 2012).

Black-Faced Monarch

Status: Bonn convention; migratory species (EPBC Act)

Black-faced monarch (*Monarcha melanopsis*) is listed as a migratory marine species under the EPBC Act. The Australian distribution of the species occurs along eastern Australia in the

forests of the Great Dividing Range. Habitat consists of rainforest, eucalypt woodlands, coastal scrub and damp gullies. It may be found in more open woodland when migrating. The species has been observed only in rare instances in the ACT, in private gardens and it has been known to pass through habitat in Mulligan's Flat Nature Reserve in Gungahlin. The species is a rare visitor to the ACT and uses habitat within protected nature reserves only on an opportunistic and transitory basis (COG, 2000 & 2004)⁸³. As such, potential impact of development on the species is considered unlikely.

Satin Flycatcher

Status: Bonn convention; migratory species (EPBC Act)

Satin flycatcher (*Myiagra cyanoleuca*) is listed as a migratory marine species under the EPBC Act. The species is widespread in eastern Australia and mainly inhabits heavily vegetated gullies in eucalypt forests and taller woodlands, and during migration occur in coastal forests, woodlands, mangroves and open forest with open understorey and grass ground cover, often near wetlands or watercourses.

Satin flycatcher is a common breeding summer migrant to the ACT (Mulvaney, 2012), departing in late autumn. The species is rarely recorded in Gungahlin however, and records of occurrence in Mulligan's flat and on Gungahlin Hill date from the late 1980s. The species was also recorded more recently in the adjacent township of Hall in 2002. The most frequented habitat of the species is the tall wet forests of the Brindabella Range. Gungahlin does not contain significant habitat for the species (Mulvaney, 2012) and as such, the proposed action is considered unlikely to significantly impact the species.

Rufous Fantail

Status: Bonn Convention; migratory species (EPBC Act)

Rufous fantail (*Rhipidura rufifrons*) is listed as a migratory marine species under the EPBC Act. The species occurs in coastal and near coastal districts of northern and eastern Australia with breeding populations distributed from South Australia-Victoria border, to south and central Victoria and along the eastern coast of Australia up to the Cairns-Atherton region in Queensland. The species overwinters to the north from Cape York Peninsula to Torres Strait and Papua New Guinea.

Habitat preferred by the species includes rainforests, wet forests, swamp woodlands and mangroves. The species is considered an uncommon breeding summer migrant to the ACT (COG, 2011). The species is occasionally recorded in Gungahlin, with records from the Mulligan's Flat and Percival Hill reserves, and woodlands around Hall. The ACT stronghold of the species is the tall wet forests of the Brindabella Range. Gungahlin does not contain significant habitat for the species (Mulvaney, 2012) and as such, the proposed action is considered unlikely to significantly impact the species.

Regent Honeyeater

Status: JAMBA; endangered (EPBC Act)

Regent honeyeater (*Anthochaera phrygia*) has a broad range across south-eastern Australia. It is an irruptive and partly migratory species moving in response to the flowering of a small group of eucalypts (Mulvaney, 2012). Breeding is recorded with some regularity in the ACT, but this has tended to involve individual pairs (Australian Gov't, 2012f).

⁸³ Canberra Ornithologists Group (2000 & 2004) Birds of Canberra Gardens: Black-faced Monarch

Potential impacts to regent honeyeater have been identified as a result of the Plan. A detailed analysis of the presence and potential impacts of the Plan on this species is provided in **Section 5**.

Latham's Snipe

Status: Bon convention; JAMBA, CAMBA, ROKAMBA; migratory species (EPBC Act)

Latham's snipe (*Gallinago hardwickii*) is listed as a migratory species under the EPBC Act. The species is a seasonal migrant, leaving their breeding grounds in Japan to overwinter in Australia. The species arrives in the ACT in mid-August and departs in late-February/ March. In the Canberra region the preferred habitat is shallow, freshwater marshes and bogs. Surveys for Latham's snipe were conducted at Horse Park Wetland between 1992 and 2000 and recorded a maximum of six to 20 birds annually with species present every year. An annual count of between three and 19 birds were recorded at the Jerrabomberra Wetlands during the same period. Latham's snipe is known to use other wetland and flooded grassland areas in Gungahlin and has been recorded along Sullivan's Creek near Kenny and the Gungahlin Ponds near the town centre. Most of the recent records are from ponds within Mulligan's Flat Nature Reserve.

Basic habitat requirements for Latham's snipe include suitable night-time and day-time feeding habitat, and roosting sites. Foraging habitat consists of firm mud with food sources such as Coleoptera adults/larvae (beetles) and Diptera larvae.

The key habitat areas for this species in Gungahlin are Horse Park Wetland and Mulligan's Flat Nature Reserve, both of which will be protected from development (Mulvaney, 2012). The proposed action will avoid significant habitat and as such is not expected to have an impact on the species.

4.3.4 Commonwealth Land

Within a one kilometre radius of the Gungahlin district, there is one Commonwealth area; the Majura Field Training Area. This site is located within the Majura Valley, to the east of Gungahlin. It is considered unlikely that the site would be impacted from the proposed action. Within a wider 10 kilometre radius, there are a large number of Commonwealth areas; however these are considered unlikely to be impacted by any further development in Gungahlin.

4.4 Literature Review

An extensive review of literature has been undertaken as part of the research for the strategic assessment. Where relevant the sources of information are indicated in the sections discussing protected matters and are also summarised in the references section of this report (**Section 9**).

5.0 Impacts on Matters of National Environmental Significance (MNES)

This section provides a detailed analysis of the MNES identified in **Section 4** that may potentially be affected by the proposed action.

Suitability of avoidance actions against the Commonwealth's Offset Policy are discussed in **Section 7**.

Financial offsets for unavoidable impacts are discussed in **Section 5** of the accompanying *Biodiversity Plan*.

5.1 Threatened Ecological Communities

Gungahlin is an area that was once typified by a range of natural habitats including natural grasslands, woodlands and open forest. Gungahlin retains relatively large grassland and lowland woodland remnants that are extensively cleared in other parts of the ACT and in surrounding regions of NSW. These areas of lowland woodlands and grasslands provide important habitat for threatened flora and fauna species and several regionally uncommon species.

Two threatened ecological communities that are listed as threatened under the EPBC Act occur within the study area. These include:

- white box – yellow box – Blakely's red gum grassy woodland and derived native grasslands (box gum woodland); and
- Natural temperate grasslands of the southern tablelands and Australian Capital Territory (natural temperate grassland).

The Gungahlin district supports 1,875 hectares of box gum woodland. This figure represents 23% of the total extent of box gum woodland in the ACT and contains some of the biggest, best connected and most diverse patches of this vegetation type remaining in Australia. The Gorooyarroo – Mulligan's Flat Nature Reserves woodland patch is the largest patch remaining in the ACT and due to its high connectivity, size and diversity, is a key area for maintaining functioning woodland systems nationally. Sixty two per cent (62%) of the remaining (23%) box gum woodland in Gungahlin is currently reserved (see **Table 5.1** and **Figure 5.1**).

There are about 180 hectares of natural temperate grassland and a further 166 hectares of closely associated native pasture (regenerating to natural temperate grassland) remaining in Gungahlin. This represents 18% of the total remaining area of the grassland community in the ACT. Within Gungahlin, 162 hectares (90%) of this critically endangered (EPBC) grassland is in nature reserves. Less than two (2) hectares are within a development zone, and the remaining areas are within Hills, Ridges and Buffers land use zone (Mulvaney, 2012) (**Figure 5.3**). Since European settlement of the Gungahlin district in the 1850's the landscape has been altered by agricultural practices including localised clearing, cropping on alluvial flats and stock grazing. In 1911 the Australian Capital Territory was established and the Commonwealth took control of all land in the ACT, which resulted in the land lease system. As a consequence, many rural leases were not subject to the extensive clearing and pasture improvement so common in other areas of NSW and Australia, and retained much of the original native vegetation cover. Native vegetation in Gungahlin, particularly around the northern and western rim, has a high floristic value in comparison to other grassy ecosystems in the ACT and in south-east NSW region (Mulvaney, 2012).

Gungahlin also supports numerous Territory and Commonwealth listed threatened species in addition to a range of species known to be suffering decline in the region. Species of conservation significance which are listed as MNES include birds, mammals, reptiles, amphibians and invertebrates and are assessed below.

5.1.1 Box Gum Woodland

White box – yellow box – Blakely's red gum grassy woodland and derived native grasslands (box gum woodland) is listed under both Commonwealth and Territory legislation as an endangered ecological community.

Community Description

ACT Nature Conservation Act Listed Community

'Yellow Box/ Red Gum Grassy Woodland' was declared an endangered ecological community (EEC) under the NC Act in May 1997. The NC Act Declaration of Species (No. 89 of 1997) listed the community as:

'Naturally occurring woodland of the temperate zone, in which Yellow Box co-occurs with Blakely's Red Gum. It includes the species rich understorey of native tussock grasses, herbs and scattered shrubs, together with a large number of native animal species.'

EPBC Act Listed Community

The listing advice for 'white box – yellow box – Blakely's red gum grassy woodland and derived native grassland' (Aust Gov't, 2006c)⁸⁴ adopted the extent of 'yellow box – red gum grassy woodland' listed under the NC Act as a component of the EPBC Ecological Community, and Action Plan 27 (ACT Gov't, 2004a) was used as the primary source of information regarding the extent of the community in the ACT.

'The ACT contains the largest remaining remnants of box gum woodland in good condition, reflecting significantly lower levels of stock grazing than the rest of the range of the ecological community. In terms of size, connectivity, diversity and condition, the ACT remnant woodlands are exceptional, especially the presence of larger patches (over 100 ha) in good condition. It is likely that the woodland of the ACT is in better condition overall than in adjacent regions due to the system of leasehold title in the ACT, which meant that short-lease rural lands were unlikely to have been subject to intensive pasture improvement (Aust. Gov't, 2006c)'

Ecological Community Description

Box gum woodland occurs either in a woodland form or as derived / secondary grassland (former grassy woodland from which trees have been removed). The community in either context is typified by a ground layer of native tussock grasses and herbs and a sparse, scattered shrub layer. The broader EPBC description of the community includes white box (*Eucalyptus albens*) along with the locally occurring yellow box (*E. melliodora*) and Blakely's red gum (*E. blakelyi*) as dominant trees where a canopy still occurs.

⁸⁴ Australian Government (2006c) *White Box – Yellow Box – Blakely's Red Gum Grassy Woodlands and Derived Native Grasslands*. Listing Advice (Department of the Environment and Heritage, Canberra)

Present and Past Distribution of the Community

The distribution of box gum woodlands and associated grasslands occur along the western slopes and tablelands of the Great Dividing Range from southern Queensland through NSW to central Victoria. It is suggested that over 95% of box gum woodlands have been cleared with those remaining representing isolated remnants. Remaining patches of woodland are highly modified, degraded and fragmented and occur in small remnants of typically less than 10 hectares (Mulvaney, 2012).

It is estimated that around 5,745 hectares of box gum woodland occurred in the Gungahlin area prior to European settlement. The current extent of the community has been mapped by ACT Government (Mulvaney, 2012) at 1,875 hectares, which represents 32% of the pre-1750 estimated extent. Over 1,100 hectares of this percentage is protected within Mulligan's Flat and Goorooyaroo Nature Reserves, however, 715 hectares of box gum woodland occurs in areas zoned as future urban areas, including Kinlyside, Moncrieff, Jacka, Taylor, Throsby and Kenny.

Figure 4.3 shows mapping from Action Plan 27 (ACT Gov't, 2004a) which provides a regional context to the distribution of box gum woodland in Gungahlin. Action Plan 27 highlights the Gungahlin Complex of woodland as one of the largest areas of contiguous woodland in the ACT region. Updated mapping has been used in **Figures 5.1** and **5.2**.

Identification Guidelines

The EPBC Act policy statement for 'white box – yellow box – Blakely's red gum grassy woodlands and derived native grasslands' (box gum woodland) provides identification guidelines to determine if an area of vegetation meets the definition of the box gum woodland critically endangered ecological community under the EPBC Act (Australian Gov't, 2006b)⁸⁵. For a potential patch of box gum woodland to be considered as being consistent with the listed definition under the EPBC Act the following criteria must be met:

- must be or have previously been dominated by white box (*Eucalyptus albens*), yellow box (*E. melliodora*) or Blakely's red gum (*E. blakelyi*) in the overstorey;
- must have a predominantly native understorey where at least 50 per cent of the perennial vegetation cover in the ground layer is made up of native species; and
- must be 0.1 hectare or greater in size contain an understorey with at least 12 native understorey species other than grasses, as well as at least one listed important species.

In addition, a potential patch of box gum woodland may still meet the criteria of the listed community even if it does not support 12 or more native understorey species (previous criteria), if it is 2 hectares or greater in size, has an average of 20 or more mature trees per hectare and displays evidence of natural regeneration of mature trees. Mature trees are defined as those with a height of at least 130 centimetres and circumference of 125 centimetres. Regeneration must consist of naturally occurring juveniles of dominant overstorey species with a height of 130 centimetres above ground and circumference of at least 15 centimetres.

⁸⁵ Australian Government (2006b) *EPBC White Box - Yellow Box - Blakely's Red Gum Grassy Woodlands and Derived Native Grasslands Policy Statement*, Department of Sustainability, Environment, Water, Population and Communities, Canberra (May, 2006)

The guidelines suggest criteria are applied to the 0.1 hectares of the patch that contains the most native species in the ground layer.

Definition of a patch

In determining patch size it is important to understand what is and is not included in the patch. A patch is defined by the following characteristics: a continuous area of greater than 0.1 hectares over which the understorey is predominantly native within which the ecological community also occurs.

There are further criteria that determine what constitutes the listed community; these must also be considered concurrently to determining the size of a patch. The extent of box gum woodland has been extensively mapped within the Gungahlin district (Mulvaney, 2012) using the following information sources:

- results of vegetation surveys undertaken in various reserves between 2006 and 2011;
- ecological reports and site inspection notes prepared as part of development application processes; and
- re-interpretation of data collected in 2003 – 2004 lowland woodland mapping.

The Gungahlin district also contains box gum woodland that no longer meets the criteria under the EPBC Act. Mulvaney (2012) describes these woodlands as ‘those including situations where a tree canopy exists over exotic grassland, or native pasture, largely cleared of trees and only supporting a low level of plant diversity’.

Current Distribution of Box Gum Woodland

Table 5.1 provides a summary of the historical and current extent of EPBC listed box gum woodland in Gungahlin, compared to the wider ACT Region. The table shows that within Gungahlin, 62% of the EPBC listed woodland present is within protected areas. This is represented in **Figure 5.1**, which shows the majority of high quality box gum woodland is located within the Mulligan’s Flat and Goorooyaroo Nature Reserves in East Gungahlin. The values in **Table 5.1** are provided to give a regional context to the distribution of the community in Gungahlin.

Table 5.1 - Historical and Current Extent of Box Gum Woodland in the ACT’s Conservation Reserves

Reproduced from Mulvaney, 2012

Location	Estimated Pre-European Extent (ha)	Area Remaining (EPBC Listed) (ha)	Area in Reserves (ha)*	Percentage of Remaining EPBC Listed Woodland in Reserves
Total ACT	32,000	7,980	3,246	41%
Gungahlin	5,745	1,875	1,160	62%

* Does not include areas of woodland under Hills, Ridges and Buffers Zoning.

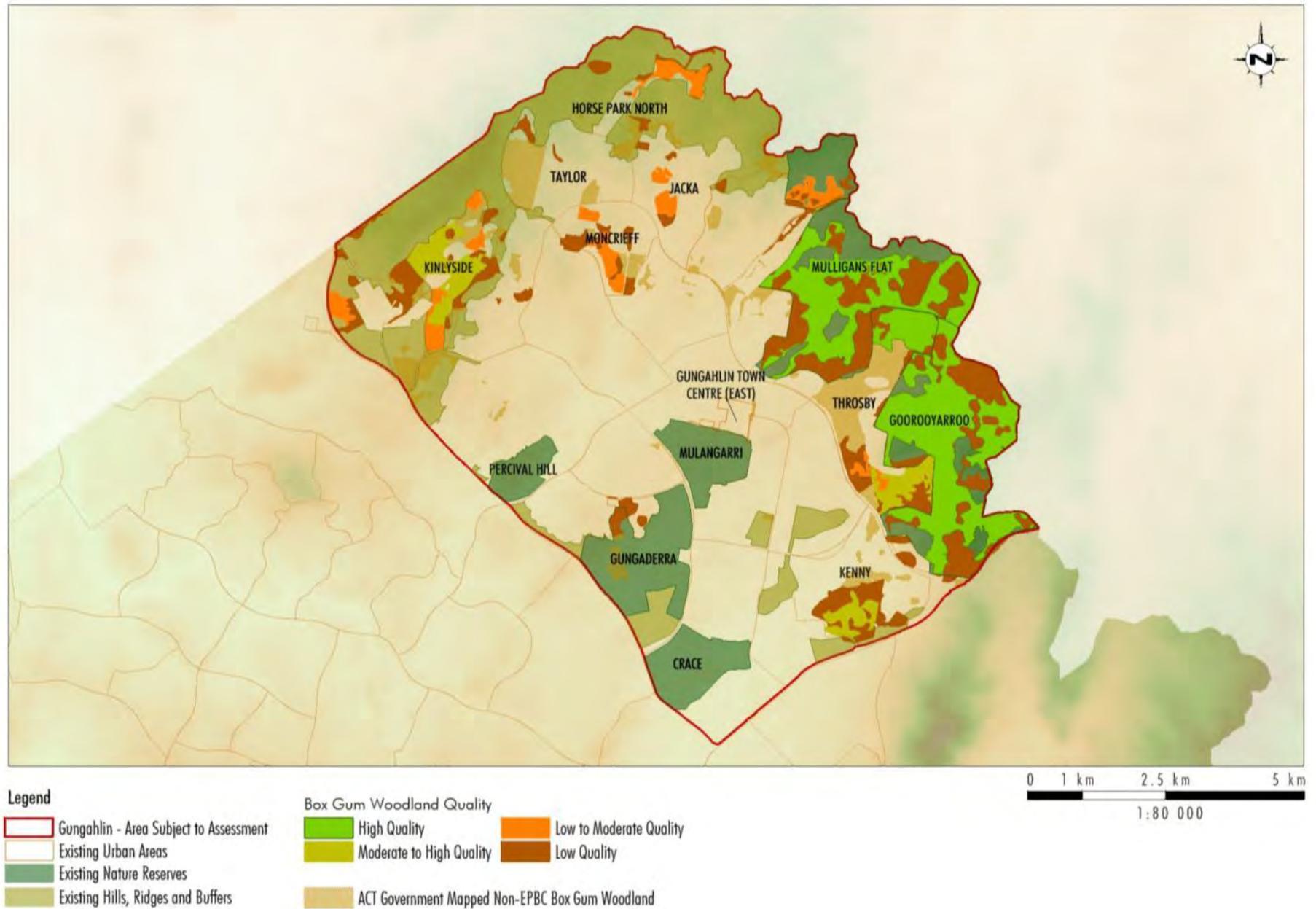


Figure 5.1 - Current Distribution of Box Gum Woodland in Gungahlin

Threats to the Community

The EPBC policy statement (Australian Gov't, 2006) for box gum woodland outlines various threats to the community. Known threats include:

- clearing for agriculture;
- clearing for urban development;
- grazing and pasture pressure which have destroyed the understorey;
- weed invasion;
- salinity, nutrient enrichment; and
- altered fire regimes.

Clearing for agricultural and urban uses are the main threats to the box gum woodland CEEC. A history of grazing and pasture improvement has resulted in weed invasion, soil disturbance and an altered understorey vegetation composition. Altered fire regimes have also affected vegetation structure and species presence.

Impacts, Avoidance and Mitigation

The direct impact to box gum woodland is summarised in **Table 5.2**. This is considered the unavoidable impact to the community as a consequence of the need to provide adequate land for meeting infrastructure and housing needs for projected population growth in Gungahlin.

Quality has been determined based on a range of variables, including metrics such as patch size and connectivity in the landscape (refer **Section 6**) as well as structural condition such as understorey diversity, shrub and tree layers based on large scale surveys by the ACT Government (e.g. Action Plan 27) and small scale site surveys by various consultants.

Table 5.2 - Impacts to Box Gum Woodland as a Result of the Plan (by Habitat Quality)

Quality	Impact (ha)	Avoidance (ha)
High	0	64
Moderate – High	0	181
Low – Moderate	60	77
Low	66	118
Total	126	439

The construction of a stormwater detention basin is a potential requirement within the protected area of Throsby East. This would be required to address existing flooding and erosion issues that occur along the existing creek line, and would not necessarily be linked to development within Kenny. The exact location and footprint of this impact is currently unknown, however would be designed and constructed in consultation with the PIT to minimise impact to any protected matter in the area.

The total impact to box gum woodland has been reduced substantially from the original plan for development proposed in the Territory Plan (ACT Gov't, 2008c), by avoiding 439 hectares of the community. The avoidance strategy avoids all remaining high and moderate-high quality occurrences of the community. This is shown in **Figure 5.2**.

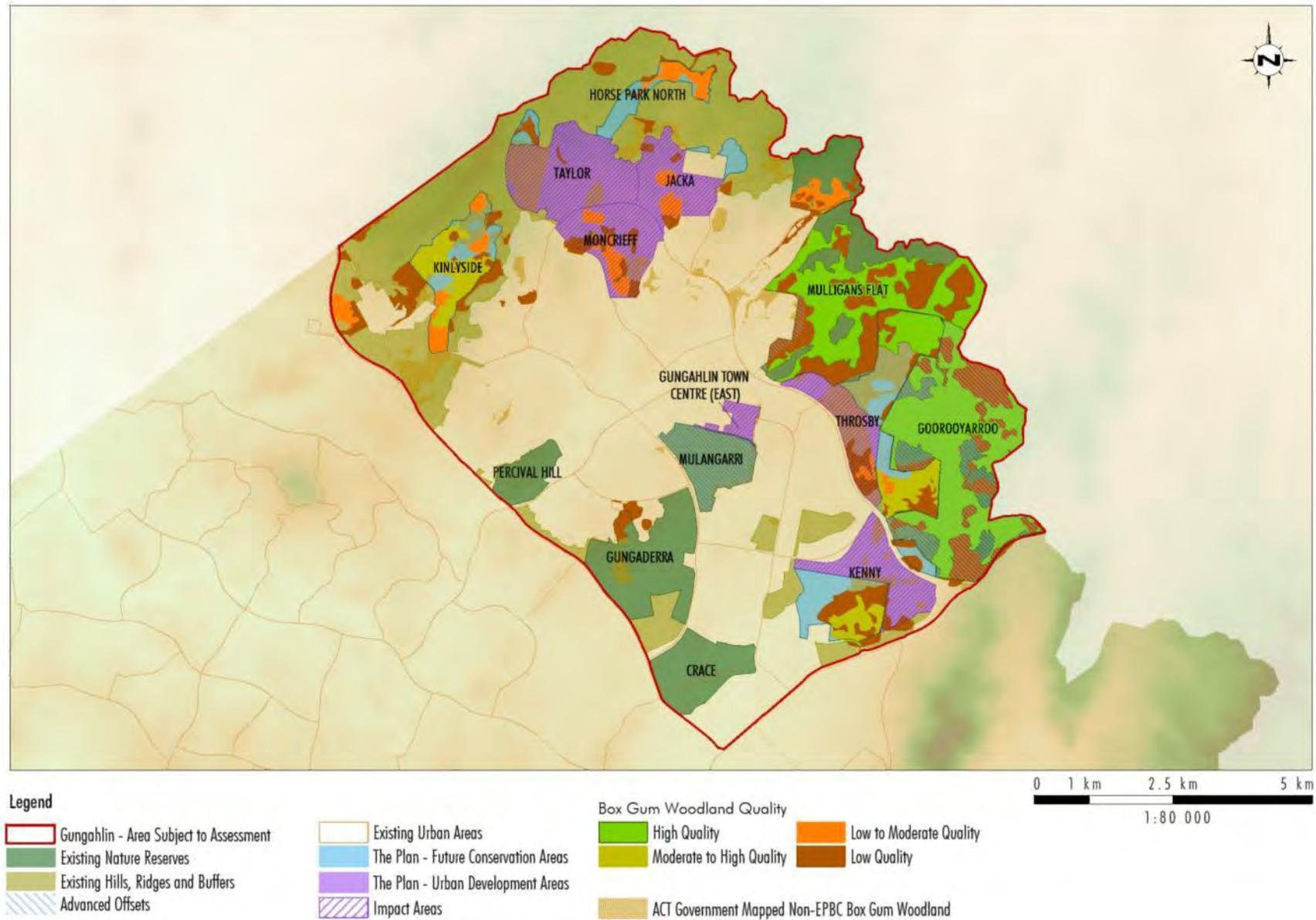


Figure 5.2 - Box Gum Woodland Impacts, Avoidance and Offsets

Indirect impacts to the community may include edge effects such as weed invasion, changes in hydrological conditions, run off etc. Mitigation actions will be implemented in order to address the indirect impacts likely as a result of construction and occupation of the area. With regard to construction stage impacts, these will be mitigated through the development and implementation of a Construction Environment Management Plan (CEMP). The CEMP will specify controls, including erosion and sediment management, clearing procedures, boundaries and rehabilitation activities, to minimise impact to retained and adjacent areas of value, as well as specifying monitoring and reporting requirements for the development. Of particular significance to box gum woodland, the CEMP would include the following requirements:

- Pre-construction surveys to determine clearing boundaries and identify rehabilitation actions, such as for woody debris relocation;
- Geotechnical, surface water and groundwater assessment to minimise impact to local hydrological systems;
- Clearing outside breeding seasons of threatened bird species and fauna rescue procedures in place during clearing of hollow bearing trees;
- Weed management; and
- Sediment and erosion control to prevent site run-off.

The CEMP would be prepared prior to construction commencing in accordance with ACT Government guidelines.

Operational stage impacts will be managed through management plans developed and implemented by various ACT Government agencies including the Territory and Municipal Services Directorate (TaMS), Land Development Agency (LDA), Conservation Planning and Research (CPR) and the Emergency Services Agency (ESA). This is detailed in **Section 5** of the *Biodiversity Plan*. In accordance with the Significant Impact Guidelines 1.1 (Australian Gov't, 2009b)⁸⁶ an action is likely to have a significant impact on a critically endangered ecological community if there is a real chance or possibility that it will meet any of the criteria discussed in **Table 5.3**.

⁸⁶ Australian Government (2009b) Matters of National Environmental Significance: Significant Impact Guidelines 1.1. Environment Protection and Biodiversity Conservation Act 1999, Department of the Environment, Water, Heritage and the Arts. Online <http://www.environment.gov.au/epbc/publications/pubs/nes-guidelines.pdf>

Table 5.3 - Significant Impact Criteria for Box Gum Woodland

Significant Impact Criteria	Response
reduce the extent of an ecological community	The proposed action will reduce the extent of the community by a total of 126 hectares. This would constitute a significant impact.
fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines	The proposed action is unlikely to lead to an increase in fragmentation of the listed community as known important linkages (refer to Manning et al., 2010) ⁸⁷ will be retained as a result of the avoidance strategy (in the Plan). Notwithstanding this, the proposed action will result in a reduction in the total area occupied by the community in the ACT, by removing a number of low quality or isolated remnants.
adversely affect habitat critical to the survival of an ecological community	The proposed action will not adversely affect habitat critical to the survival of the ecological community.
modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns	The proposed action will not modify or destroy abiotic factors necessary for the community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns. Potential impacts to ground water, particularly in Kenny where there is a substantial network of groundwater discharge areas associated with the community have been avoided.
cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting	<p>The proposed action will result in the management of a variable width zone along the periphery of future urban areas according to the requirements of bushfire hazard management prescriptions. This will primarily involve the management of biomass to ensure bushfire hazards are maintained at acceptable levels. In many of the areas where these prescriptions would apply, the community exists as derived native grassland and supports other protected matters, particularly golden sun moth which is reliant on the grassland community structure. Further to this, the majority of future urban interface areas exist as secondary edges⁸⁸ and as such would not be subject to management for fuel reduction in an Outer Asset Protection Zone (OAPZ).</p> <p>The need for fuel management zones could also be further reduced through the mitigation strategy proposed for the design phase with placement of lower intensity and lower risk infrastructure on the urban fringes.</p> <p>Beyond the potential requirement for bushfire hazard</p>

⁸⁷ Manning AD, Shorthouse DJ, Stein JL and Stein JA (2010) *Ecological Connectivity for Climate Change in the ACT and surrounding region, Technical Report 21*. A report prepared for the ACT Government.

⁸⁸ The Strategic Bushfire Management Plan for the ACT (ACT Gov't, 2009b) notes in respect of defining risk along the urban interfaces:

Bushfire management zoning applied in the Ember Zone and Inner and Outer Asset Protection Zones is determined by the Asset Interface Classification (AI C). This classification of primary, secondary and lee edges along the rural-urban interface is based on the level of bushfire risk the interface is exposed to. It is defined by:

- the maximum fire size an asset may be subject to;
- the part of the fire (head, flank, back) an asset may be subject to, recognizing the major fire threat from the north and west; and
- the length of potential fire run.

	management activities in areas occupied by the community adjoining future urban areas, the proposed action would not result in any effect that would change the species composition of an occurrence of the community. The residual impact of the action in this regard after consideration of the avoidance and mitigation strategies is not considered likely to be significant.
<p>cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to:</p> <p>assisting invasive species, that are harmful to the listed ecological community, to become established, or</p> <p>causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community, or</p> <p>interfere with the recovery of an ecological community.</p>	The proposed action avoids the majority of higher quality box gum woodland remnants as part of the strategy to maintain connectivity and enhance the integrity of the existing woodland nature reserve system. The mitigation strategy to be employed as a range of management actions and design considerations during all stages of the proposal would also seek to eliminate or substantially reduce the risk that indirect impacts would affect the resilience and viability of the community.

Proposed Offset Strategy

Due to the unavoidable impacts on box gum woodland, an offset is considered to be necessary. Offsets have the potential to provide significant long term benefits, by improving the quality of the community and invest in knowledge about its conservation.

As the Plan has focused on the avoidance of high quality areas, the offset component is in the form of a financial package targeted at enhancing high conservation areas within Gungahlin through improvement in condition and extent of the community within avoided areas and the existing reserve network. **Table 5.4** below replicates the relevant part of the direct offset strategy detailed in **Section 5** in the *Biodiversity Plan*.

Table 5.4 - Box Gum Woodland Direct Offset Strategy

Protected Matter	Offset Description
White box – yellow box – Blakely's red gum woodland and derived native grassland	<p>Habitat improvement through assisted natural regeneration of areas that presently do not meet the definition of the listed community. These areas are currently mapped by ACTMAPi (ACT Gov't, 2012d)⁸⁹ as 'box gum woodland' (as opposed to EPBC woodland) in the areas of Kinlyside, Kenny and Throsby (approximately 104 hectares) which under this Plan would be transferred to nature reserve.</p> <p>Improvement in the understorey diversity and hence overall quality of woodlands that presently meet the definition of the listed community. This action will focus on woodland areas that are currently in a moderate to poor condition for areas that are presently in nature reserves in addition to areas that will become nature reserve as a result of implementing the Plan.</p>

⁸⁹ ACT Government (2012d) *ACTMAPi: ACT Government Online Interactive Maps*, Environment and Sustainable Development Directorate, Canberra. <http://www.actmapi.act.gov.au>

Implementation of the Plan is detailed in the *Biodiversity Plan*.

Conservation Outcomes for Box Gum Woodland

The following conservation outcomes for the CEEC box gum woodland are summarised from **Table 5.4** as:

- Avoidance of areas in **Table 5.2**;
- Improvement in woodland quality for existing reserves and additional areas added to nature reserve as measured by:
 - Increased diversity of understorey species for vegetation conforming to the community definition currently in moderate to poor quality;
 - Increased extent of vegetation that conforms to the definition of the listed community whether in the woodland form or derived native grassland form.
- Management of regeneration in a way that does not compromise the viability of populations of protected matters which rely on derived native grasslands (e.g. golden sun moth and striped legless lizard).

Further details on the offsets proposed for box gum woodland are included in **Section 5** of the *Biodiversity Plan*

Information Sources and Confidence Levels

Information utilised in this assessment has included the following data sources:

- Government Resources:
 - ACT Government (2012d) *ACTMAPi: ACT Government Online Interactive Maps*, Environment and Sustainable Development Directorate, Canberra;
 - Australian Government (2006b) *EPBC White Box - Yellow Box - Blakely's Red Gum Grassy Woodlands and Derived Native Grasslands Policy Statement*, Department of Sustainability, Environment, Water, Population and Communities, Canberra (May, 2006);
 - Australian Government (2012c) *EPBC Act Protected Matters Search Tool*, Department of Sustainability, Environment, Water, Population and Communities;
 - Australian Government (2012f) Department of Sustainability, Environment, Water, Population and Communities' Species Profile and Threats Database (SPRAT);
 - ACT Government (2004a) Action Plan No. 27 Woodlands for Wildlife, ACT Lowland Woodland Conservation Strategy, Environment ACT, Canberra (2004);
 - CPR (Conservation Planning and Research) ACT wildlife atlas data. Information comprised of relevant historical and recent survey results from a range of consultants and work undertaken by the Directorate; and
 - Mulvaney, M. (2012) *The Extent and Significance of Gungahlin's Biodiversity Values. Technical Report 24*. Environment and Sustainable Development Directorate, Canberra.

- Consultant Reports:
 - Eco Logical Australia (2011a) *Gungahlin vegetation survey and mapping report – Ecological communities and threatened species within the Gungahlin strategic assessment area*, prepared for ACT Government Conservation Planning and Research (August, 2011);

In addition to the spatial datasets that were accessed, significant consultation was also conducted across a range of agencies in order to gauge the reliability, age, comprehensiveness, compatibility, coverage and general useability of the data. Particular assistance was provided by CPR through Dr Michael Mulvaney in advising on the appropriateness of the various datasets, especially the vegetation.

5.1.2 Natural Temperate Grassland

Natural temperate grassland of the southern tablelands of New South Wales and the Australian Capital Territory (natural temperate grassland) is listed as an endangered ecological community under the EPBC Act.

Community Description

Natural temperate grassland is described as 'grassy vegetation dominated by dense to open tussock grasses in the genera *Austrodanthonia*, *Austrostipa*, *Bothriochloa*, *Poa* and *Themeda*'. About 70% of species present consist of a diverse range of native herbaceous species including daisies, lilies, rushes, orchids and native legumes growing in inter tussock spaces. The community is naturally treeless, or has only a sparse scattering of shrubs and trees due to cold air drainage and low ground temperatures often below 10°C. The ecological community is defined by the vegetation structure thought to be present at the time of European settlement.

Present and Past Distribution of the Community

Natural temperate grassland is distinguishable from other natural temperate grassland communities as it is geographically and climatically isolated from natural temperate grassland elsewhere in south-eastern Australia (ACT Gov't 2005).

The community is located in the 'Southern Tablelands' region of south-eastern NSW and ACT and is bounded by the Snowy Mountains and Brindabella Range in the south-west, coastal ranges (including the Kybayan and Budawang Ranges and the escarpments to the east) and extends north to the Abercrombie River. The north-western boundary extends from Burrinjuck Dam to Boorowa, then east to the Lachlan River and north to Wyangala Dam" (ACT Gov't 2005).

There are three sub-regions in the Southern Tablelands with associated species which reflect the differences in temperature and rainfall. Different climatic factors influence the composition and structure of natural temperate grassland. The ACT is regarded as a sub-region in itself, based on significant differences in levels of disturbance, land use, management and threats. The ACT region is defined further by the political boundary.

Prior to European settlement of the ACT region natural temperate grassland distribution was influenced by a combination of environmental factors including temperate, cold air drainage, low rainfall, low soil moisture and heavy clay soils. Natural temperate grassland was a widespread part of the woodland – grassland mosaic. It is difficult to determine exactly the distribution and extent of natural temperate grassland prior to European settlement, however estimates range from approximately 360 000 hectares or less, to 480 000 hectares or more. The community was common on open plains at lower altitude (500 m – 1000 m) subject to

cold air drainage including the Monaro, Bungendore, Gundary, Yass and Limestone Plains (Canberra area) (ACT Gov't 2005).

Natural temperate grasslands and temperate woodlands formed the backbone of the development of the Australian pastoral industry from the early 1800s. By the mid-nineteenth century, 30 million sheep, 1.7 million cattle and 32 000 horses were grazing on the grassy plains and lower open slopes of NSW and Victoria (ACT Gov't 2005). These impacts have almost completely modified and degraded the condition and extent of natural temperate grassland in the region. As a result, the community is now considered to be one of Australia's most endangered ecological communities. It is estimated that less than 3% of the original natural temperate grassland ecological community remains that still retains a level of ecological integrity (ACT Gov't 2005).

Remnants of natural temperate grassland with varying degrees of conservation value are all that remain of the ecological community and these occur as isolated and disconnected fragments.

Lowland native grassland sites have been comprehensively surveyed in the ACT, and data collected utilised in the preparation of several ACT Government documents including:

- ACT Lowland Native Grassland Conservation Strategy (ACT Gov't 2005);
- Recovery Plan for Natural Temperate Grasslands (Environment ACT 2005); and
- Action Plan No. 28 under the NC Act (ACT Gov't 2005).

In the ACT, natural temperate grassland was the dominant ecological community in lower elevation areas such as the Molonglo Valley in the Canberra central area and adjacent Jerrabomberra and Majura Valleys. In the north of the ACT, natural temperate grassland also dominated parts of Gungahlin district (ACT Gov't 2005).

About 180 hectares of natural temperate grassland and a further 166 hectares of native pasture (which may regenerate to the state where it might meet the criteria of natural temperate grassland) remain in the Gungahlin district. This constitutes around 18% of the total remaining area of the grassland community within the ACT (Mulvaney, 2012). Over 162 hectares (90%) of the remaining natural temperate grassland is protected within three nature reserves (Crace, Gungaderra and Mulanggari), less than 2 hectares occurs within a development zone and no mapped natural temperate grassland occurs within proposed urban development areas. **Figure 5.3** shows the estimated pre European settlement extent of the community and present distribution across the Gungahlin district.

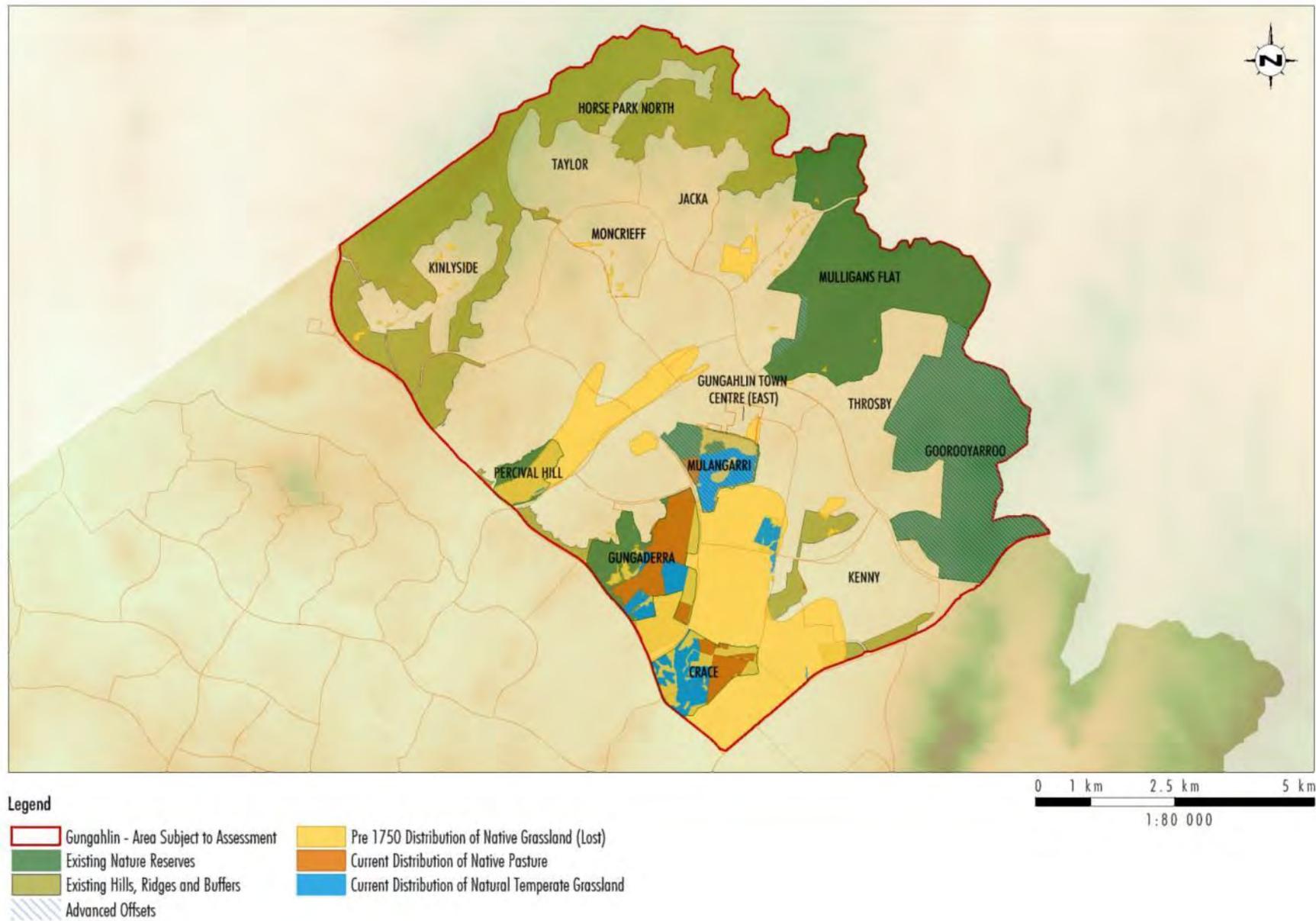


Figure 5.3 - Historical and Current Extent of Natural Grasslands in Gungahlin

Threats to the Community

Following European settlement in the region, natural temperate grasslands have been modified and degraded by a variety of land uses and agricultural practices. Ongoing threats to the EEC include:

- Intensive grazing;
- pasture improvement;
- cropping;
- introduction of exotic species (including pasture species);
- altered fire regimes;
- urban development and infrastructure;
- soil disturbance, altered salinity and acidity; and
- altered hydrology.

Impacts, Avoidance and Mitigation

Natural temperate grassland would not be impacted directly by the implementation of the Plan. No areas of this community occur with the proposed development footprint identified by the Plan.

The community is also not expected to be subject to any indirect impacts, as it is not located in proximity to any development areas.

On this basis, natural temperate grassland is not considered further in this assessment.

Information Sources and Confidence Levels

Natural temperate grassland has been extensively mapped and assessed within the ACT. It is considered that the distribution of the community within the ACT is well known and understood.

Information utilised in this assessment has included the following data sources:

- Government Resources:
 - ACT Government (2012a) *ACTMAPi Online interactive maps*, Environment and Sustainable Development Directorate, Canberra;
 - ACT Government, (2005) *A Vision Splendid of the Grassy Plains Extended: ACT Lowland Native Grassland Conservation Strategy. Action Plan No. 28 Arts, Heritage and Environment*, Canberra.
 - CPR (Conservation Planning and Research) *ACT Wildlife Atlas*, data comprised of relevant historical and recent survey results from a range of consultants and work undertaken by the Directorate;

- Environment ACT (2005) National Recovery Plan for Natural Temperate Grassland of the Southern Tablelands (NSW and ACT): an endangered ecological community Environment ACT Canberra⁹⁰;
- Mulvaney, M. (2012). *The Extent and Significance of Gungahlin's Biodiversity Values. Technical Report 24*. Environment and Sustainable Development Directorate, Canberra; and
- Australian Government, (2012) *Species Profile and Threats Database (SPRAT)*, Department of Sustainability, Environment, Water, Population and Communities.

Further detail on data limitations is provided in **Section 5.4**.

5.2 Threatened Flora

While a number of flora species listed as threatened under the EPBC Act are known to occur within the Gungahlin District, none of these are considered likely to be impacted by the implementation of the Plan. This is based on several factors as follows:

- No listed flora species are known to occur within any of the proposed impact areas;
- Listed flora species are not known to occur in any areas adjacent to the proposed impact areas and hence would not be subjected to indirect impacts; and
- The proposed action would not result in the isolation of any known populations of listed species or otherwise contribute to a decline in population viability.

Potential impacts to threatened flora were discussed in detail in **Section 4.3.3**.

On this basis, flora listed as threatened under the EPBC Act are not considered further in this assessment.

5.3 Threatened Fauna

This section provides a detailed assessment of the presence and potential impacts of development on the species considered likely to be impacted by the proposed action, based on **Section 4**. Migratory species are also discussed within this section.

5.3.1 Golden Sun Moth

Known and Potential Habitat

Golden sun moth is a critically endangered species which occurs in natural temperate grasslands and open grassy woodlands dominated by wallaby grass (*Austrodanthonia* spp.) (NSW Gov't, 2007). Once considered to be restricted to only natural temperate grasslands dominated by more than 40% coverage of wallaby grass, the species is now found to have a broader tolerance for other species compositions and has been recorded in exotic grasslands displaying a particular preference for Chilean needle-grass (*Nassella neesiana*)

⁹⁰ ACT Government (2005c) National Recovery Plan for Natural Temperate Grassland of the Southern Tablelands (NSW and ACT): An Endangered Ecological Community, Environment ACT, Canberra (2005)

(Australian Gov't, 2012). The species is also recorded in secondary grasslands derived from box gum woodland that has been extensively cleared.

Within the Gungahlin district, golden sun moth is known to occur in secondary grasslands and exotic pastures in Ngunnawal, Amaroo, Forde, Bonner and the future urban areas of Jacka, Kenny, Kinlyside, Moncrieff, Taylor and Throsby.

Golden sun moth populations occurring in natural temperate grassland are protected within the grassland nature reserves of Mulanggari and Crace, and large areas of secondary grassland within Mulligan's Flat and Goorooyaroo Nature Reserves.

Hogg (2010b)⁹¹ ranks golden sun moth habitat in decreasing importance depending on whether it is:

- Natural Temperate Grassland/high quality native pasture – large area (Habitat type A)
- Natural Temperate Grassland/high quality native pasture – smaller remnant (Habitat type B)
- Mixed native and exotic grasses in former Natural Temperate Grassland (Habitat type C)
- Secondary grassland (box – gum woodland community) (Habitat type D)
- Chilean needle grass or other exotic grasses (Habitat type E).

Figure 5.4 below from Hogg (2010b) provides an indicative overview of the values of golden sun moth populations in Canberra. While noting that additional populations have been identified since the production of this map e.g. in west Taylor, it highlights that the populations within the Plan area in Gungahlin are characterised by low to moderate population sizes and habitat type 'D' – secondary grassland. These populations are considered less significant than those within natural temperate grassland, as found in the grassland reserves of Gungahlin, and within Majura and Jerrabomberra; and have a likelihood of reverting back into woodland following the cessation of grazing.

⁹¹ David Hogg Pty Ltd (2010b) A Strategic Approach to the Conservation and Environmental Assessment of Golden Sun Moth Sites in the Canberra Area, Report prepared for the Land Development Agency, Canberra (December, 2010)

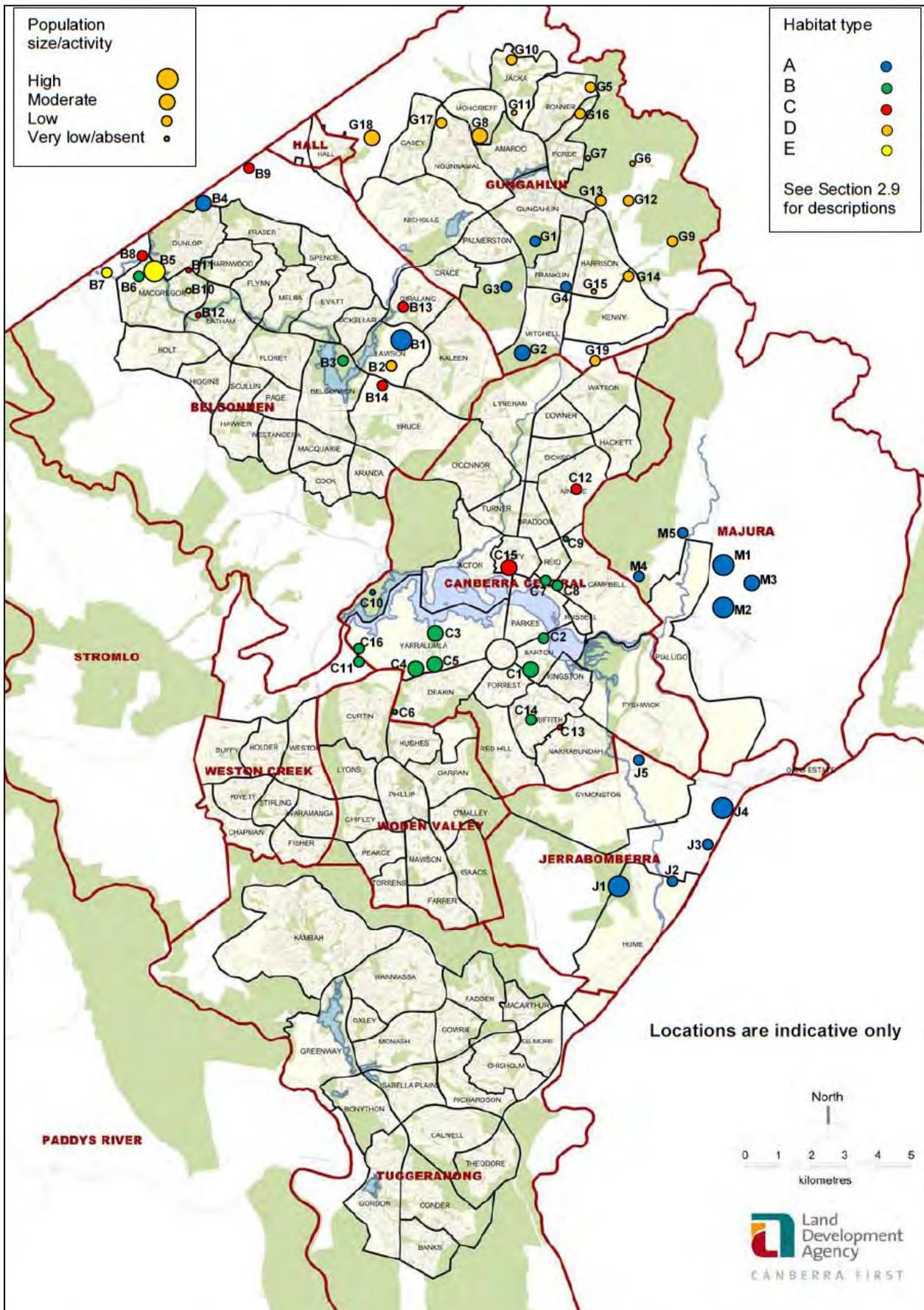


Figure 5.4 - Habitat Sites and Indicative Sizes of Golden Sun Moth Populations in Canberra

Source: Figure 2.1, Hogg (2010b)

Known Threats

The golden sun moth draft recovery plan (NSW Gov't, 2007) outlines various threats to the species. Known threats include:

- loss and degradation of wallaby grass-dominated native temperate grasslands and open grassy woodlands within the species range;
- weed invasion;
- soil disturbance;
- limited dispersal ability of the species;
- fire; and
- predation.

Impacts, Avoidance and Mitigation

The Plan would impact on 180 hectares of varying quality golden sun moth habitat in Kenny, Throsby, Moncrieff, Taylor and Jacka as shown in **Table 5.5**. This would constitute the removal of some or all of up to five spatially distinct populations. No impact will occur in natural temperate grassland ('high quality' habitat), with impacted populations generally co-occurring with low quality grassy woodland.

While development may not necessarily remove the entire extent of habitat within a suburb, potential indirect impacts on retained fragments have been considered and included within the area of impact in **Table 5.5** to ensure potential impact is not underestimated.

This is considered the unavoidable impact to the species required to provide adequate land to accommodate population growth in Gungahlin, as detailed in **Section 2.4**.

This total impact has been reduced significantly from the original plan for development proposed in the Territory Plan, by avoiding 148 hectares of golden sun moth habitat, primarily in Kinlyside and north Throsby, as shown in **Figure 5.5**.

Table 5.5 - Impacts to Golden Sun Moth as a Result of the Plan (by Habitat Quality)

Quality	Impact (ha)	Avoidance (ha)	Previous Conservation Measures (ha)
High	0	0	0
Moderate – High	55	0	160
Low – Moderate	35	137	0
Low	90	11	8
Total	180	148	168

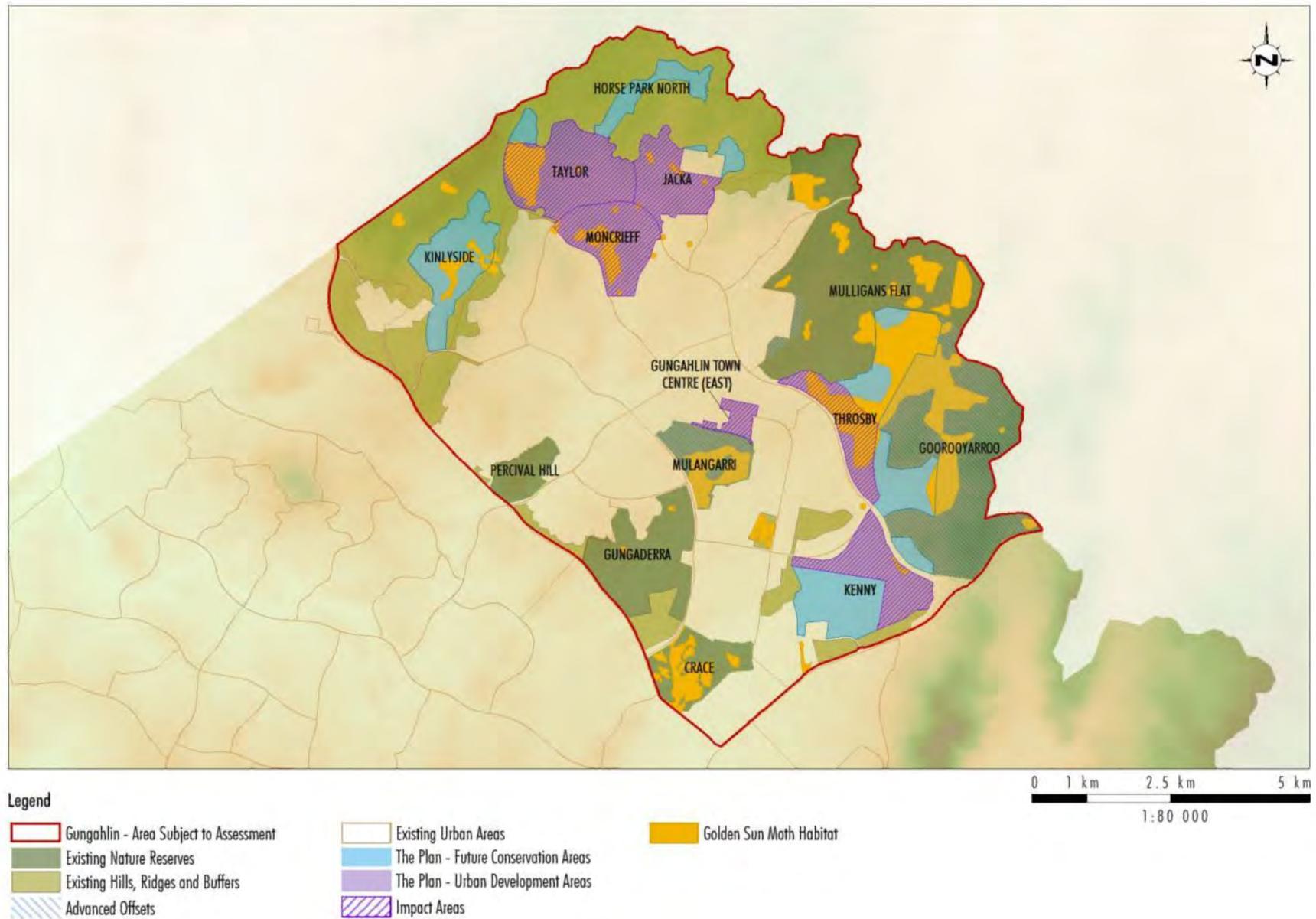


Figure 5.5 - Golden Sun Moth Impacts, Avoidance and Offsets

Mitigation actions will be implemented in order to minimise the indirect impacts likely as a result of construction and occupation of the area. With regard to construction stage impacts, these will be mitigated through the development and implementation of a Construction Environment Management Plan (CEMP). The CEMP will specify controls, including erosion and sediment management, clearing procedures, boundaries and rehabilitation activities, to minimise impact to retained and adjacent areas of value, as well as specifying monitoring and reporting requirements for the development. Of particular importance to golden sun moth, the CEMP would include the following requirements:

- Pre-construction surveys to determine clearing boundaries;
- Geotechnical, surface water and groundwater assessment to minimise impact to local hydrological systems;
- Weed management; and
- Sediment and erosion control to prevent site run-off.

The CEMP would be prepared prior to construction commencing in accordance with ACT Government guidelines.

Operational stage impacts will be managed through management plans developed and implemented by various ACT Government agencies including the Territory and Municipal Services Directorate (TaMS), Land Development Agency (LDA), Conservation Planning and Research (CPR) and the Emergency Services Agency (ESA). This is detailed in **Section 4** and **5** of the *Biodiversity Plan*. Management plans will state how MNES will be protected on the ground with similar controls to the CEMP, including:

- Weed management;
- Habitat improvement activities; and
- Management of the asset protection zones.

In accordance with the Significant Impact Guidelines 1.1 (Australian Gov't, 2009b) an action is likely to have a significant impact on a critically endangered species if there is a real chance or possibility that it will result in any of the following criteria.

Table 5.6 - Significant Impact Criteria for Golden Sun Moth

Significant Impact Criteria	Response
lead to a long-term decrease in the size of a population	The proposed action would result in a decrease of the Gungahlin golden sun moth population. When measured in terms of habitat extent, this equates to approximately 180 hectares across several instances of the species current distribution. The proposed action would result in the removal of a large occurrence of the species in Taylor and a reduction in the occurrences in Moncrieff and Throsby. Smaller occurrences of the species in other parts of Moncrieff, Taylor and Jacka would also be removed as a result of the proposed action.
reduce the area of occupancy of the species	The proposed action would result in a reduction of the area occupied by golden sun moth.
fragment an existing population into two or more populations	The proposed action would potentially increase the extent of isolation for known occurrences of the species in Kinlyside and for any remnants created as a result of smaller scale avoidance as a result of design stage

	<p>optimisation of development layout. Despite this, the largest contiguous extent of known habitat for the species in the Mulligan's Flat and Gorooyarroo Nature Reserves and adjoining areas would not be fragmented as a result of the proposed action.</p>
<p>adversely affect habitat critical to the survival of a species</p>	<p>All areas of habitat for golden sun moth affected by the proposed action are derived native grasslands which although provide suitable habitat are subject to potential regeneration over time of the overstorey component of the box gum woodland community that prevailed originally. While the population that does occur in Gungahlin would appear to be viable, it is likely that its present extent with the development area is a function of landscape modification through human occupation and in particular tree clearance.</p> <p>Relatively large golden sun moth populations and areas of habitat would be protected in the existing, expanded or new reserves of Kinlyside, Mulligan's Flat, Gorooyarroo, Crace and Mulanggari. The extent of reserved habitat would be about 600 hectares. Smaller populations and areas of habitat would be also retained within Gungaderra Nature Reserve. The Kinlyside, Mulligan's Flat and Gorooyarroo populations are within open box gum woodland. Regeneration of this woodland may shade and thereby degrade the habitat for the species. The reserves will require specific and focused management of regeneration to prevent increased sapling and shrub growth from having a significant impact on the occurrence and viability of the moth. The Throsby East area is a large area of land that is proposed to be added to Gorooyarroo Nature Reserve. Currently only a few scattered moths have been observed in this area, it is possible that with better conservation management the population of moths may expand in this area.</p> <p>While viability of the population is not considered to be an immediate concern, with reduced agricultural intensity across Gungahlin and the likely regeneration of the woodland form of the vegetation, the extent of golden sun moth in the long term is likely to reduce without management to actively maintain the grassland vegetation structure. Due to the susceptibility of this species to vegetation structure change, even as a natural process, the affected areas of habitat for golden sun moth are not considered to be critical to the long term survival of the species in Gungahlin. That is, as golden sun moth are occurring within secondary grassland / grassy woodland communities, the likelihood of habitat reverting back to woodland and becoming unsuitable for golden sun moth is considered high. Other areas of golden sun moth habitat that are already reserved in the grassland nature reserves of Crace and Mulanggari are more likely to be critical to the species survival in Gungahlin due to the vegetation community being natural grasslands.</p> <p>While the loss of 180 ha of golden sun moth habitat in Gungahlin will compromise the viability of the population, the areas to be retained together with the proposed reserves should be sufficient to ensure the persistence of the moth in the local area.</p>
<p>disrupt the breeding cycle of a population</p>	<p>Similarly to the considerations raised in relation to box gum woodland with respect to bushfire hazard management, the proposed action represents the potential to affect the breeding cycle of golden sun moth in locations where it occurs concurrently with areas subject to hazard management activities. The potential for these activities to adversely affect golden sun moth can be mitigated however through the mitigation strategy which would seek to conduct hazard management such as slashing outside the November-December peak flying and breeding period of the species.</p> <p>In the event that such activities do coincide with breeding activities, the maximum extent to which it would affect the golden sun moth population would be limited to within a 100 metre swathe directly adjoining the urban edge. As the majority of urban edge areas adjacent to where golden sun moths occur are not primary edges for the purpose of fire management, the 100 metre prescription is unlikely. Given this and the implementation</p>

	of the proposed mitigation strategy, it is unlikely that the proposed action would result in a disruption to golden sun moth breeding such that the Gungahlin population would be significantly impacted.
modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The proposed action would result in the removal and modification of habitat for golden sun moth effectively reducing the area occupied by the species. This will result in a reduction of the overall Gungahlin population. Despite this, the avoidance strategy (in the Plan) ensures that the largest known contiguous area of occupation is not significantly affected to the extent that the species will decline.
result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat	The mitigation strategy calls for consideration in the design phase for appropriate plant selection in landscaping and ensuring that management activities are undertaken in accordance with the statutory duty of care to which the ACT Government is subject to. For golden sun moth, rehabilitation would include active weed management. Given this, the proposed action is unlikely to result in the establishment of invasive species harmful to golden sun moth.
introduce disease that may cause the species to decline	The proposed action will result in no known disease or other pathogen likely to impact golden sun moth.
interfere with the recovery of the species.	The proposed action will not interfere with recovery of the species.

Proposed Offset Strategy

Due to the unavoidable impacts on golden sun moth, an offset is considered to be appropriate. Offsets have the potential to provide significant long term benefits, by improving the quality of habitat for the species and invest in knowledge about its conservation. The plan provides for a financial offsets package to protect high conservation areas within Gungahlin. The financial component will be determined based on a range of calculations, including cost of reserve management activities, weed management, fencing and previous offsets approved by the Commonwealth. **Table 5.7** below replicates the relevant part of the direct offset strategy detailed in **Section 5** of the *Biodiversity Plan*.

Table 5.7 - Golden Sun Moth Direct Offset Strategy

Protected Matter	Offset Description
Golden sun moth	Habitat improvement of areas likely to be suitable for golden sun moth in the long term given likely regeneration of box gum woodland in some locations where the species also presently occurs. Research into the potential compatibility of bushfire hazard management requirements with habitat requirements of the species, particularly when managed in a sympathetic manner. This measure will take advantage of the management regime requirements for bushfire hazard purposes by ensuring derived native grasslands in these locations do not return to a woodland form while still catering for golden sun moth.

Implementation of the Plan is detailed in the *Biodiversity Plan*.

Conservation Outcomes for Golden Sun Moth

The following conservation outcomes for golden sun moth are summarised from **Section 5** of the *Biodiversity Plan* as:

- Persistence of a viable local population of golden sun moth in northern ACT.

- No net reduction over the life of the Plan in areas occupied by golden sun moth for retained and reserved populations.
- Management of secondary grassland where the species occurs within a matrix of regenerating box gum woodland.
- Encouragement of golden sun moth colonisation of areas along the proposed unreserved urban fringe where appropriate and practicable.

Information Sources and Confidence Levels

Information utilised in this assessment has included the following data sources:

- Government Resources:
 - NSW Government (2007) *Draft NSW and National Recovery Plan for the Golden Sun Moth –Synemon plana*, Department of Environment and Conservation, Queanbeyan NSW (2007)
 - Department of Sustainability, Environment, Water, Population and Communities' Species Profile and Threats Database (SPRAT): *Synemon plana - Golden Sun Moth*;
 - Mulvaney, M. (2012) *The Extent and Significance of Gungahlin's Biodiversity Values. Technical Report 24*. Environment and Sustainable Development Directorate, Canberra; and
 - Environment Protection and Biodiversity Conservation Act (1999) (EPBC Act) Protected Matters search tool.
- Consultant Reports:
 - Aurecon (2013) *Kenny Golden Sun Moth Population Assessment*, draft report to Land Development Agency, Canberra (February 2013);
 - David Hogg Pty Ltd (2009) *Moncrieff Residential Estate Golden Sun Moth Study*, Prepared for ACT Planning and Land Authority, Canberra (September, 2009);
 - David Hogg Pty Ltd (2010a) *Assessing the Significance of Impacts on the Golden Sun Moth in Relation to the EPBC ACT*, David Hogg Pty Ltd, Canberra (February, 2010);
 - David Hogg Pty Ltd (2010b) *A Strategic Approach to the Conservation and Environmental Assessment of Golden Sun Moth Sites in the Canberra Area*, Report prepared for the Land Development Agency, Canberra (December, 2010);
 - David Hogg Pty Ltd (2010b) *Moncrieff South Golden Sun Moth Study*, prepared for the ACT Land Development Agency, Canberra (January, 2010);
 - David Hogg Pty Ltd (2010c). *A Strategic Approach to the Conservation and Environmental Assessment of Golden Sun Moth Sites in the Canberra Area: Interim Revised Report*, prepared for the ACT Land Development Agency, Canberra (December, 2010);
 - David Hogg Pty Ltd (2011a) *Moncrieff Ecological Assessment Review*, prepared for the ACT Land Development Agency, Canberra (February, 2011);

- David Hogg Pty Ltd (2011b) *Moncrieff Golden Sun Moth Survey 2010*, prepared for Conservation, Planning and Research, Canberra (January, 2011);
- David Hogg Pty Ltd (2012) *Taylor Golden Sun Moth Survey*, Report to Conservation Planning and Research, Canberra (February, 2012);
- Eco Logical Australia (2011b) *Golden Sun Moth Surveys at One Tree Hill, Kinleyside and Throsby*, report to Conservation Planning and Research (2011);
- Eco Logical Australia (2012) *Accelerated Land Development 2011 Golden Sun Moth Surveys*, Conservation Planning and Research, Canberra (2012);
- Geoff Butler & Assoc. and Vertego Environmental Consultancy (2011) *Golden Sun Moth (Synemon plana) survey of proposed suburb of Jacka, Gungahlin*;
- Robert Jessop Pty Ltd (2013) *Jacka Golden Sun Moth Survey 2012*, draft report to Land Development Agency, Canberra (January 2013);
- Robert Jessop Pty Ltd (2013) *Kinleyside Golden Sun Moth Survey 2012*, draft report to Land Development Agency, Canberra (January 2013); and
- Robert Jessop Pty Ltd (2013) *Taylor Golden Sun Moth Survey 2012*, draft report to Land Development Agency, Canberra (January 2013).

There is a level of uncertainty about the potential efficacy of managing golden sun moth along the periphery of proposed urban areas given the conflicting timing of critical life cycle stages of the species and the need to control bushfire hazard at the peak of the summer grass growth and associated fire risk. Opportunities for research into the management of such species would improve the response to addressing bushfire risk in ecologically sensitive areas throughout the Territory with potential benefits not only for golden sun moth but also for other MNES and species of conservation significance to the ACT. Any research proposal to consider the management of golden sun moth in this context would be subject to scoping and guidance by the PIT prior to approval by SEWPaC.

5.3.2 Striped Legless Lizard

Known and Potential Habitat

Prior to European settlement, striped legless lizard probably occurred across about 20 000 hectares of natural temperate grassland (Mulvaney, 2012). The former range of striped legless lizards in the ACT was throughout temperate, native, lowland grasslands. Due to habitat degradation and fragmentation, the distribution of striped legless lizards has declined. Many sites no longer support populations and those remaining populations are probably small and isolated (Australian Gov't, 2012f). Striped legless lizards usually inhabit lowland native grasslands dominated by native tussock grasses such as Kangaroo grass (*Themeda australis*), spear grasses (*Austrostipa* spp.) and wallaby grasses (*Austrodanthonia* spp.).

In the ACT the species is found in both primary (natural temperate grassland) and secondary grasslands (native grassland that results after clearing woodland). The species has also been recorded in areas of exotic pasture grasses and the availability of defined tussock structure is considered to be a more important habitat feature than floristic composition (Biosis, 2011).

Within Gungahlin, striped legless lizard is known to occur within Gungaderra, Crace and Mulanggari Grassland Reserves, north Mitchell open space area, Gungahlin Town Centre (east) and the western half of the future urban area of Kenny.

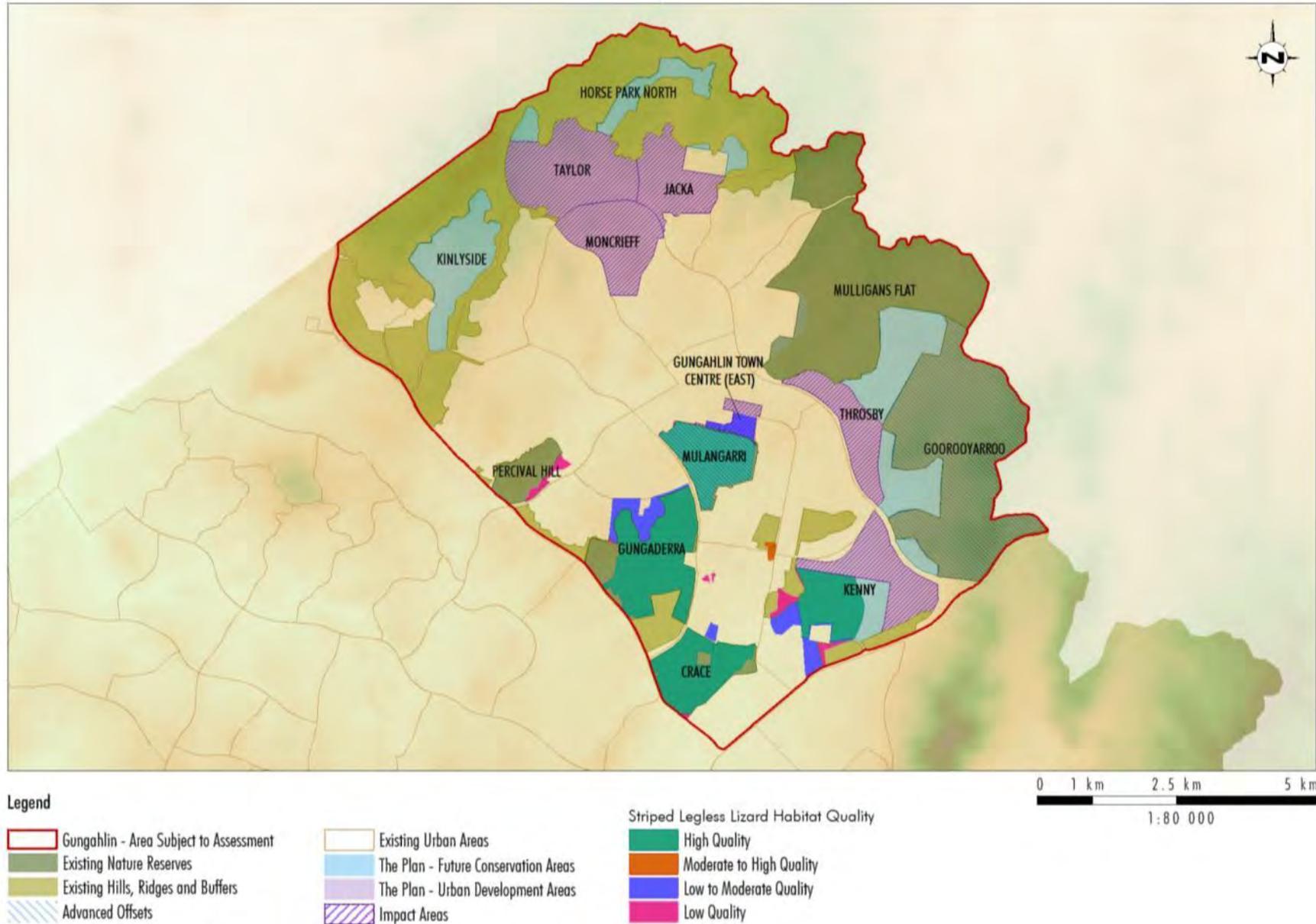


Figure 5.6 - Striped Legless Lizard Impacts, Avoidance and Offsets

Known Threats

The striped legless lizard recovery plan outlines various threats to the species. Major threats include:

- habitat loss including clearing for agriculture and urban development and rock removal;
- habitat modification by extended intense grazing, pasture improvement, ploughing and drought;
- barriers to dispersal such as buildings, roads and fences, causing fragmented and isolated populations;
- inappropriate fire regimes or slashing too often and or too low in order to reduce fuel load, thereby destroying required grassland structure;
- weed invasion; and
- predation.

Impacts, Avoidance and Mitigation

The boundary of the future urban area of Kenny has been amended to avoid all direct impact to striped legless lizard habitat from residential development (**Figure 5.6** and **Section 4.3.3**). Up to 3 hectares of less favourable habitat along Sullivan's Creek may be impacted by stormwater management works and possible construction of a sewer line. A former quarry filled with shipping containers of asbestos which were then covered with dirt and the dirt seeded with pasture species in the later 1980s, in nearby Crace, now supports a high density of striped legless lizards, Thus there is experience that the lizard can recolonise disturbed areas, hence the laying of a sewer line may not permanently destroy habitat if carefully undertaken.

The development of Gungahlin Town Centre (east) would directly impact on 14 hectares of low to moderate quality habitat. An assessment of significance for this impact has been included in **Table 5.9**.

Table 5.8 - Impacts to Striped Legless Lizard as a Result of the Plan (by Habitat Quality)

Quality	Impact (ha)	Avoidance (ha)
High	0	0
Moderate – High	0	118
Low – Moderate	20*	0
Low	0	0
Total	20*	112

* A value of 20 hectares has been provided as a conservative estimate of impact to cover proposed stormwater management works in Kenny.

The majority of other known striped legless lizard habitat within the Gungahlin is already protected within nature reserves and there are no other significant known instances of striped legless lizard habitat within the development area subject to the Plan. The three grassland reserves supporting the majority of ACT's striped legless lizard population were surveyed in 2012. All support large populations estimated to be of similar size as that when they were declared reserves in 1995. The new Kenny reserve will be a similar size and urban position as the other reserves so there is a degree of confidence that Kenny's population of striped

legless lizard can be maintained, and an ongoing management plan will be developed and implemented to help maintain the quality and viability of the population.

Potential indirect offsite impacts would be managed during construction and operation with management plans developed and implemented by contractors, and various ACT Government agencies. The CEMP will manage offsite impacts including run-off, clearing limits and vehicle movement. Key activities to manage potential indirect impacts to striped legless lizard to be included in the CEMP will be:

- appropriate management of asset protection zones i.e. maintenance of grass at appropriate height and structure for lizards;
- establishment of clearing boundaries and restrictions to construction vehicle movements;
- hydrological assessment for construction of ponds in Kenny in terms of altering groundwater and adjacent systems;
- weed management activities; and
- domestic pet containment policies.

The CEMP would be prepared prior to construction commencing in accordance with ACT Government guidelines.

Table 5.9 - Significant Impact Criteria for Striped Legless Lizard

Significant Impact Criteria	Response
lead to a long-term decrease in the size of an important population of a species	The proposed action would lead to a permanent decrease in the size of the population of striped legless lizard in the broader Mulanggari Nature Reserve area.
reduce the area of occupancy of an important population	The proposed action would reduce the area of occupancy of the important population in the broader Mulanggari Nature Reserve area by approximately 14 hectares.
fragment an existing important population into two or more populations	The proposed action would not fragment the existing population. It would remove habitat at the northernmost extent of the population, leaving the majority of the habitat unaffected.
adversely affect habitat critical to the survival of a species	The proposed action would not impact on habitat within Mulanggari Nature Reserve, which is considered to constitute important habitat for the species. The proposed action is not expected to impact on habitat critical to the survival of the species.
disrupt the breeding cycle of an important population	The proposed action would disrupt the breeding cycle of the directly impacted individuals within the affected area, however it is unlikely to directly adversely affect the broader Mulanggari Nature Reserve population. The proportion of the population likely to be affected by the proposed action is unlikely to affect long term population viability for the residual striped legless lizard population.
modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The past establishment of three large grassland reserves in Gungahlin by the ACT Government were a measure to maintain viable, wild populations of striped legless lizard in the long term. While the proposed action would reduce the extent of habitat available at a local scale, it is not expected to decrease the availability or quality of habitat to the extent that the species is likely to decline significantly.
result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	The proposed action area currently contains the noxious weed Serrated Tussock (<i>Nassella trichotoma</i>), which could impact on the broader habitat if it spread. This weed would need to be managed during construction with vehicle hygiene and weed management measures to prevent spread into adjacent areas. Beyond this, the

	proposed action would not result in the dispersal or establishment of invasive species.
introduce disease that may cause the species to decline, or	The proposed action is unlikely to introduce a disease that could result in the decline of the species. The introduction of disease in striped legless lizard populations has not been identified as a result of development activities (Biosis, 2013) ⁹² .
interfere substantially with the recovery of the species.	The primary conservation goal of the Draft National Recovery Plan of the Striped Legless Lizard is to 'ensure the long-term survival of <i>D. impar</i> and maintain its potential for evolutionary development in the wild across its natural geographic range'. The proposed action is unlikely to interfere substantially with the recovery of the species. Conservation of the species in the ACT has been focussed on protecting viable populations, and this has been achieved with the establishment of Mulanggari, Gungaderra and Crace nature reserves.

On the basis of the Significant Impact Guidelines 1.1, as the population is considered likely to form 'part' of an important population, the proposed action has the potential to result in a significant impact to striped legless lizard.

The actions taken to establish grassland reserves in Gungahlin that protect the viability of striped legless lizards and their habitat has ensured long term resilience and persistence of the species in the ACT. This has included the establishment of three grassland reserves totally an area of approximately 593 hectares. This is comprised of:

- Mulanggari Grassland Nature Reserve (148 hectares);
- Gungaderra grassland Nature Reserve (280 hectares);
- Crace Grassland Nature Reserve (165 hectares).

Given the scale of avoidance actions taken in 1995 (Variation No. 53), well in advance of the requirements for consideration of this species under Commonwealth legislation (on non-Commonwealth land), in addition to the subsequent investment in habitat management, monitoring, research and reporting by the ACT Government, it is concluded that despite the apparent impact of the proposed action, conservation management and investment over a long period of time (17 years), targeted to striped legless lizard has more than adequately accounted for the anticipated, reduced impacts to this species. Accordingly, the proposed action is not considered likely to constitute a significant impact in this context.

Regardless, the *Biodiversity Plan* identifies a direct offset to ensure population viability of the species within the newly created west Kenny Reserve. **Table 5.10** below replicates the relevant part of the direct offset strategy detailed in **Section 5** of the *Biodiversity Plan*.

Table 5.10 - Striped Legless Lizard Direct Offset Strategy

Protected Matter	Offset Description
Striped legless lizard	Establishment of a nature in west Kenny to protect a fourth important population of striped legless lizard in Gungahlin. Habitat improvement through conservation grazing, weed control and other measures.

⁹² Biosis (2013) *Gungahlin Town Centre (East) – Advice regarding impacts upon the Striped Legless Lizard (*Delma impar*)*, draft letter to the Land Development Agency, Canberra (January, 2013)

Conservation Outcomes

The following conservation outcomes for striped legless lizard are summarised from the *Biodiversity Plan* as:

- Persistence of a viable population at Kenny
- No net reduction over the life of the Plan in areas occupied by striped legless lizard in reserved populations.

Information Sources and Confidence Levels

Information utilised in this assessment has included the following data sources:

- Government Resources:
 - Australian Government (2012g) Species Profile and Threats Database (SPRAT): *Delma impar* — Striped Legless Lizard, Department of Sustainability, Environment, Water, Population and Communities, Canberra, Accessed online;
 - Smith, W.J.S. & P. Robertson (1999) *National Recovery Plan for the Striped Legless Lizard (Delma impar): (1999-2003)* unpublished report to Environment Australia, Canberra (1999);
 - Mulvaney, M. (2012) *The Extent and Significance of Gungahlin's Biodiversity Values. Technical Report 24.* Environment and Sustainable Development Directorate, Canberra; and
 - Environment Protection and Biodiversity Conservation Act (1999) (EPBC Act) Protected Matters search tool.
- Consultant Reports:
 - Biosis Research (2011) *Moncrieff Threatened Reptile Survey Report*, Prepared for the ACT Land Development Agency, Canberra (March, 2011)
 - Biosis Research (2012) *Striped Legless Lizard (Delma impar) Survey and Vegetation Assessment Report*, Unpublished report to the ACT Government

5.3.3 Superb Parrot

Known and Potential Habitat

Superb parrots are a vulnerable species which inhabit forests and woodlands including yellow box, red gum woodlands in the riverina, western slopes and plains and extending onto the southern tablelands in the Canberra region. In the ACT, box gum grassy woodlands form the major breeding habitat for the species, with Blakely's red gum being the main source of nesting hollows. Critical habitat features for superb parrots include large living and dead trees for nesting sites (ACT Gov't, 2005b). In the ACT region the co-occurrence of favoured forage such as grass seeds and the seeds of certain wattle species is presumed to be the

likely indicator of potential habitat for superb parrots as they are also associated with river red gum (*Eucalyptus camaldulensis*) in the Riverina (Davey, 1997)⁹³.

Outside of the ACT, superb parrots typically forage within 10 kilometres of a nesting site in woodlands, feeding on the fruits and flowers of eucalypts, the seeds of wallaby grasses and cereal crops such as wheat and oats, the seed pods of many understorey species of wattles and the berries of mistletoes (*Amyema* spp.). Movement is usually determined by flowering times of eucalypts, ripening of grasses and grains and periods of drought. Local foraging movements usually occur along wooded corridors and the species rarely crosses large areas of open land (Australian Gov't, 2012f). In the ACT, superb parrots forage primarily in and adjacent to the urban areas of northern Canberra.

In 2005-06 there were an unprecedented number of parrots in the northern Belconnen Suburbs, and since then, increasing numbers have been reported from the northern suburbs of Canberra, the Goorooyarroo/ Mulligan's Flat Nature Reserves and in the Gungahlin suburb of Harrison. Occasional reports are now received from as far south as Hoskinstown, NSW (Davey, 2011)⁹⁴.

Since the summer of 2005-2006 superb parrots have been breeding within woodland at Throsby Ridge in Gungahlin and in the central Molonglo valley. Breeding birds mainly feed in the ovals, street trees and gardens of Belconnen. Parrots tend to follow wooded links such as that along Gungaderra Creek when moving from breeding to foraging sites.

Targeted surveys for superb parrots in Throsby, Kenny, Kinlyside, Jacka and Moncrieff were undertaken by COG (Davey, 2010)⁹⁵ on three occasions during the nesting period between September and December of 2009 and again in 2010. In Jacka, Moncrieff and Kinlyside there were no observations of superb parrots during any of the bird or tree surveys. Surveys in the nearby suburb of Throsby however, recorded 116 observations and one superb parrot was recorded flying over Kenny (Davey, 2010). A possible breeding pair was also observed near a hollow at the 'Big Dam' in Mulligan's Flat Nature Reserve. Of 38 recorded nest trees in the Gungahlin area 22 are within the Throsby reserve addition areas; 12 within the adjoining Goorooyarroo and Mulligan's Flat nature reserves with two records in Harrison and two in Franklin (all in the vicinity of Gungaderra Creek).

Survey of nesting during the 2012 survey has again confirmed a concentration of breeding in the scribbly gums high on Throsby Ridge. Results of this work and future monitoring events will be incorporated into the mitigation strategy to be employed during the design stage such that the potential for indirect impacts can be taken into account with the intended result being a reduction of the scale and nature of any potential impacts.

Known Threats

The superb parrot recovery plan (Baker-Gabb, 2001)⁹⁶ outlines various threats to the species including:

⁹³ Davey, C. (1997) *Observations on the superb parrot within the Canberra district*, Canberra Bird Notes, 22(1) pp. 1-14, Canberra Ornithologists Group, Canberra (March, 1997)

⁹⁴ Davey C (2011) Distribution, abundance and breeding status of the Superb Parrot (*Polytelis swainsonii*) during the 2010-2011 breeding season, Gungahlin, ACT

⁹⁵ Davey C (2010) Report on the distribution, abundance and breeding status of the Superb Parrot (*Polytelis swainsonii*) during the 2009-10 breeding season, Gungahlin, ACT, Report prepared for Canberra Ornithologists Group, Canberra (April, 2010)

⁹⁶ Baker-Gabb, D. (2001) *National Recovery Plan for the Superb Parrot (Polytelis swainsonii)*, Victorian Government Department of Sustainability and Environment, Melbourne, (2011) Accessed online: November 2012

- widespread clearing, degradation and fragmentation of box gum woodland throughout the species' range, especially in breeding and foraging habitats. Due to the close proximity of breeding and foraging, the destruction of either habitat reduces the suitability of other habitat as a direct result. The threat abatement and recovery plan (Baker-Gabb, 2001) recommends protecting and conserving areas of known breeding and foraging habitat, and corridors for seasonal movement;
- clearing of woodland corridors on which the species relies for transit between foraging and breeding habitats. Expansion of urban areas of Canberra has resulted in clearing of large areas of woodland and hollow bearing trees which were previously suitable for breeding;
- grazing by stock reduces the amount of food available to parrots especially in drought periods;
- competition for nest hollows by introduced species such as common starling (*Sturnus vulgaris*), common myna (*Acridotheres tristis*) and honey bees (*Apis mellifera*);
- inappropriate fire regimes which degrade breeding and foraging habitat; and
- poisoning by insecticides or other poisons used to eradicate pest animals.

Impacts, Avoidance and Mitigation

The majority of records of superb parrot in Gungahlin occur in Goorooyaroo and Mulligan's Flat Nature reserves which are within formal nature reserves. Superb parrot is considered a generalist species which would have the ability to utilise a range of suburban, woodland and forest habitat while moving through the landscape (Mulvaney, 2012).

Direct impact to all known superb parrot nesting trees will be avoided by the Plan; however a number of potential nesting trees would be impacted by the action, as shown in **Figure 5.7**. These potential nesting trees to be impacted are all located within Throsby Ridge and are adjacent to known nesting trees. Despite the avoidance of direct impacts of clearing, there remains the potential for edge effects to adversely affect superb parrots, particularly during the breeding season. Potential indirect impacts to superb parrot may include impact to breeding success due to encroachment of the urban area, and restrictions to movement corridors impacting foraging habitat access. A 100 metre buffer will be maintained between the majority of known nesting trees, and the edge of any development (i.e. the shoulder of the edge road). The type of development (e.g. low density residential, urban open space) considered to be appropriate adjacent to this buffer would be determined during detailed design in consultation with the PIT. The buffer zone would be managed to minimise edge effects. To maintain the superb parrot movement corridor, currently scattered paddock trees along the section of Gungaderra Creek that passes through Throsby will be retained, while supplementary planting along the creek would be undertaken. No existing wooded links utilised by the species would be removed as a result of the Plan.

<http://www.environment.gov.au/biodiversity/threatened/publications/recovery/pubs/polytelis-swainsonii-recovery-plan.pdf>

Table 5.11 - Location of Superb Parrot Nesting Trees

Distance from Urban Edge	Number of Nest Trees
Within 100 m	2
100 – 150 m	0
150 – 200 m	2
200 – 250 m	6
> 250 m	43

As described in **Section 4** of the *Biodiversity Plan*, master planning and materials selection for construction will also be considered for the design stage of all developments. Such considerations will include, master planning and design of estate development plans to ensure appropriate uses adjacent to areas where there is the potential to interact with important environmental values including MNES. This will recognise potential sensitivity of species such as superb parrots and allow for the inclusion of design features or other solutions that further minimise potentially adverse indirect and facilitated impacts.

Mitigation actions will be implemented in order to minimise the indirect impacts likely as a result of construction and occupation of the area. With regard to construction stage impacts, these will be mitigated through the development and implementation of a Construction Environment Management Plan (CEMP). The CEMP will specify controls, including erosion and sediment management, clearing procedures, boundaries and rehabilitation activities, to minimise impact to retained and adjacent areas of value, as well as specifying monitoring and reporting requirements for the development. Of particular importance to superb parrot, the CEMP would include the following requirements:

- Pre-construction surveys to determine clearing boundaries and location of nesting trees to be protected;
- Pre-construction inspection of tree hollows and identification of hollows to be salvaged;
- Recovery and beneficial use for the purpose of fauna habitat enhancement, of fallen timber including logs and tree sections containing hollows;
- Ongoing monitoring of hollows for use, and if necessary, control of non-target species.
- Domestic pet containment policies.

The CEMP would be prepared prior to construction commencing in accordance with ACT Government guidelines.

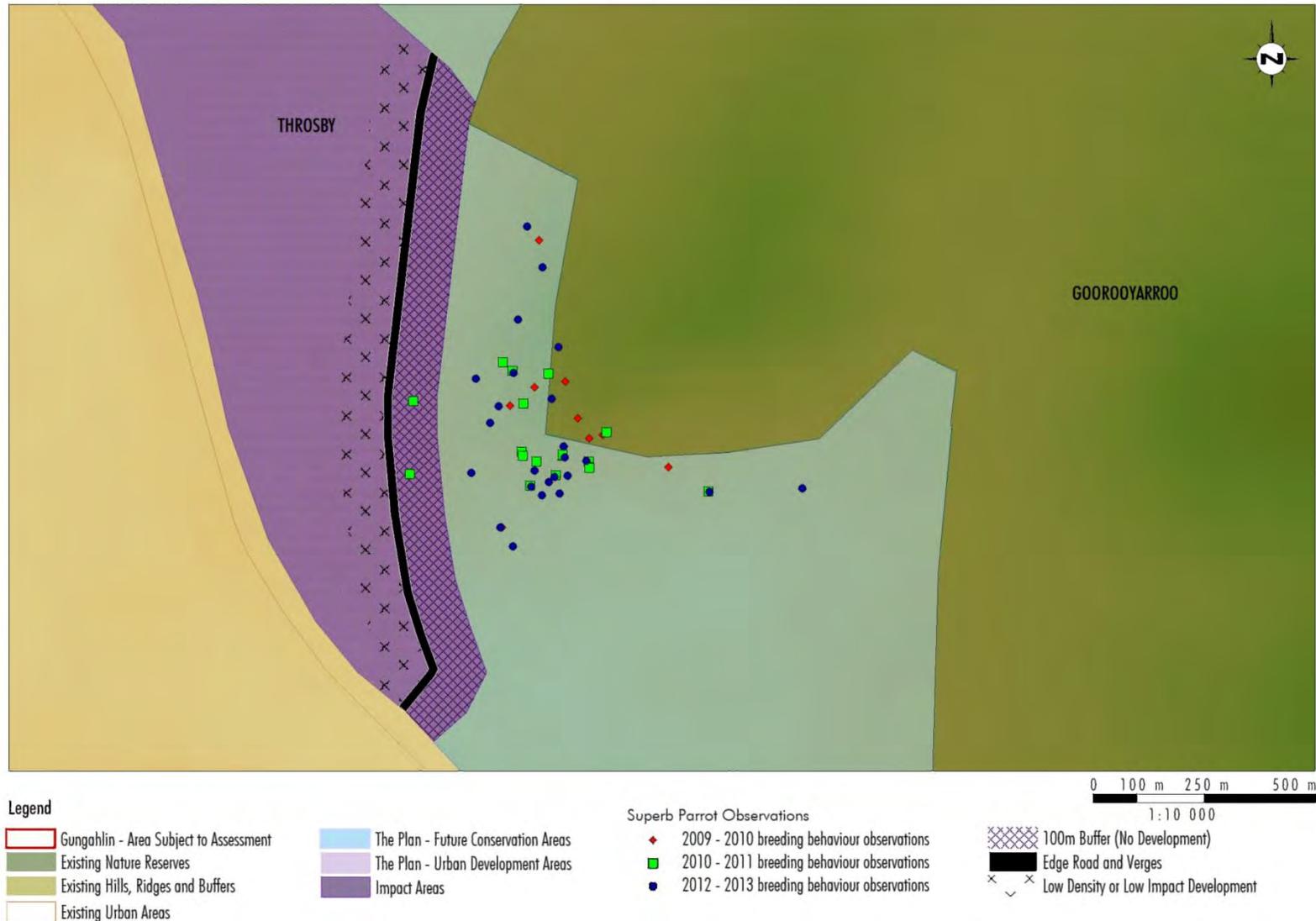


Figure 5.7 - Superb Parrot Nesting Trees

In accordance with the Significant Impact Guidelines 1.1 (Australian Gov't, 2009b) an action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will result in any of the following significant impact criteria.

Table 5.12 - Significant Impact Criteria for Superb Parrot

Significant Impact Criteria	Response
lead to a long-term decrease in the size of an important population of a species	<p>The component of the national superb parrot population that breeds in Canberra could be considered an 'important population' within the meaning of the significant impact guidelines (Australian Gov't, 2009) as it represents the south-eastern extent of regular breeding for the species. This is supported by the SPRAT database (Australian Gov't, 2012f) which notes:</p> <p>The breeding range of the Superb Parrot is divided into three main areas: the first, along the Murray and Edward Rivers; the second, along the Murrumbidgee River; and the third, in a triangle bounded by Molong, Yass and Young.</p> <p>The Canberra breeding population, is split between the central Molonglo valley area and the Throsby – Goorooyaroo area and would be considered a component of the third breeding area described by the SPRAT database.</p> <p>For the proposed action to lead to a long term decline in the size of the Canberra breeding population, impacts would need to affect either the attractiveness of current breeding locations for future breeding attempts or directly remove breeding habitat. The primary area of superb parrot breeding in Gungahlin is along the 'Throsby ridge' as indicated in Figure 5.7. With the current understanding of superb parrot occupation of this area, the proposed action would result in the removal of less than 20 potential breeding trees. All breeding trees known at the point of preparing this assessment would be avoided by 100 metres from the edge of any future urban interface. This direct impact is not considered likely to be significant.</p> <p>The potential for indirect impacts of the proposed action to adversely affect the attractiveness of Throsby ridge to breeding superb parrots would be dependent on a range of factors including the nature and intensity of development along the urban edge most closely associated with the superb parrot breeding area. While the mitigation measures proposed for the design, construction and operation stages are likely to reduce the overall indirect impacts, by managing edge effects, restoring habitat features, and incursion of domestic animals into breeding areas, there is a high degree of uncertainty as to the tolerance of this species to adjacent urban development particularly where breeding habitat is concerned. On this basis, the precautionary approach would suggest that a potentially significant impact is likely as a result of indirect impacts that have the potential to lead to a decrease in the size of an important population through interfering with breeding success.</p>
reduce the area of occupancy of an important population	The proposed action is unlikely to result in a permanent reduction in size of the area occupied by the superb parrot population occurring in Gungahlin, as development would avoid all nesting trees.
fragment an existing important population into two or more populations	The proposed action will not result in a fragmentation of the Gungahlin superb parrot population.
adversely affect habitat critical to the survival of a species	Key breeding populations of superb parrot occur in the Riverina and South-west Slopes of NSW (Australian Gov't, 2012f). These key breeding areas are considered critical to the survival of the species. The area of habitat in Gungahlin is regionally significant, however is unlikely to be critical to the survival of the species as a whole.

disrupt the breeding cycle of an important population	As discussed under the first point for consideration of significance, a precautionary approach would suggest that with the current level of knowledge relating to superb parrot breeding and tolerances for adjacent urban development a significant impact under this category is likely. Disruption would most likely occur as a result of indirect impacts of development including increased human activity, noise, light, human related increases in the local populations of competing nest hollow species such as common myna and crimson rosella and potentially other factors.
modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The proposed action is unlikely to modify, destroy, remove or isolate or decrease the availability or quality of habitat such that it would result in a decline in superb parrots.
result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	The proposed action is unlikely to result in the establishment of an invasive species harmful to superb parrots. The mitigation strategy also addresses the need to control pest plants and animals in addition to the containment of domestic animals, which will be implemented in site specific construction management plans and nature reserve management plans.
introduce disease that may cause the species to decline, or	The proposed action will result in no known disease or other pathogen likely to impact superb parrot.
interfere substantially with the recovery of the species.	The proposed action will not interfere with recovery of the species.

Proposed Offset Strategy

Due to potential impacts to superb parrot habitat, an offset is considered necessary. **Table 5.13** below replicates the relevant part of the direct offset strategy detailed in **Section 5** in the *Biodiversity Plan*.

Table 5.13 - Superb Parrot Direct Offset Strategy

Protected Matter	Offset Description
Superb parrot	<p>Avoidance of all known breeding locations within Gungahlin will be reserved, the majority of which are more than 100 metres from the edge of urban development. Some asset protection activities may occur within this buffer zone.</p> <p>Research and monitoring on the nesting, connectivity and foraging habitat requirements of the superb parrot population in the ACT, and how it reacts to nearby urban development.</p> <p>Applying this research to habitat improvement for superb parrot in Gorooyarroo and Mulligan's Flat nature reserves (including the new reserve areas established under this plan)</p> <ul style="list-style-type: none"> • Research is likely to focus on nest site selection, nest site fidelity, fecundity, population dynamics and methods of reducing or eliminating nest hollow competition from aggressive native species or exotic pests such as common myna and European honeybee. • Assisted natural regeneration that may eventually form hollow trees will be undertaken in areas likely to be suitable as future nesting sites.

Implementation of the Plan is detailed in the *Biodiversity Plan*.

Indirect offsets including investment in knowledge and environmental management are included in **Section 5** of the *Biodiversity Plan*. A number of these are particularly relevant to superb parrot.

Conservation Outcomes for Superb Parrot

The following conservation outcomes for superb parrot are summarised from the *Biodiversity Plan*.

- Persistence of a breeding population in northern ACT in the long term.
- Improved management of potential habitat in order to support recovery of superb parrots.
- Improved understanding of habitat requirements for foraging and dispersing superb parrots within peri-urban and urban environments.
- Improved understanding of the superb parrot population which occurs in the northern ACT in terms of nest site fidelity and breeding success
- Habitat improvement for superb parrot in Throsby north and east and in Gorooyarroo and Mulligan's Flat Nature Reserves comprising:
 - Assisted natural regeneration of hollow forming trees in areas likely to be suitable as future nesting sites; and/or
 - Removal of stock leading to a reduction in localised compaction and concentration of nutrients, improving long term tree survival.

In addition a population viability analysis will be undertaken of the ACT breeding population, with particular reference to and monitoring of the birds breeding in the Throsby area.

The objective of these actions will be to ensure the persistence of a breeding population in northern ACT in the long term by minimising the impacts of urban development in proximity to breeding habitat.

Information Sources and Confidence Levels

Historical records of listed threatened species and species of local conservation significance were provided by Conservation Planning and Research (CPR) in a GIS format. The records provided were compiled by CPR and its predecessor organisations through a variety of sources including commissioned studies, opportunistic observations by ACT Government officers and other sources (eg. Canberra Ornithologists Group records). While there is a likelihood that the accuracy and precision of some records may be questioned as a consequence of either observer experience or collection method, the primary limitation to this data is that it indicates presence only and not absence. It is also limited by the fact that much of the data collection has focussed on select areas and hence there is a patchy distribution of records within the Gungahlin area, as with the rest of the ACT. However systematic surveys across all of the development and avoidance areas were undertaken by the Canberra Ornithologist Group in 2009 and 2010 (Davey 2010, 2011). The central Molonglo area was also surveyed in 2011. Canberra Ornithologists Group also surveyed the nesting use of Throsby by superb parrot in 2012, including competitive interactions with other birds. The nesting use, location and behaviour was consistent with that observed previously. The data on competitive interaction would provide a benchmark for comparison following implementation of the Plan (pers. comm. M Mulvaney, 2013).

It is also noted that the process of natural hollow formation in eucalypts is a very long process and as such the creation of natural hollows suitable for superb parrot nesting will not occur over the 20 year life of the Plan. Despite this, as the objective of implementing the Plan is to allow for in-perpetuity management of MNES and matters of conservation significance to the ACT, it is appropriate to provide for long term solutions which in the case of superb parrots include ensuring there is recruitment of suitable hollow-forming trees within areas that are known to support the species.

Given the limited available information on the use of artificial hollows by superb parrots in a natural setting, this represents an opportunity for knowledge improvement. This is the basis for the proposed indirect offsets which would be subject to scoping and guidance by the PIT prior to approval by SEWPaC.

Information utilised in this assessment has included the following data sources:

- Government Resources

- Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) Protected Matters search tool;
- ACT Government (2012) *ACTMAPi: ACT Government Online Interactive Maps 'Significant Plants and Animals Mapping'*, Environment and Sustainable Development Directorate, Canberra;
- ACT Government (2005b) *Threatened Species and Communities of the ACT Information Sheet: Superb Parrot (Polytelis swainsonii) A vulnerable species*, Environment ACT, Canberra;
- Australian Government (2012f) *Species Profile and Threats Database (SPRAT)*, Department of Sustainability, Environment, Water, Population and Communities, Canberra, Accessed online;
- Mulvaney, M. (2012) *The Extent and Significance of Gungahlin's Biodiversity Values. Technical Report 24*. Environment and Sustainable Development Directorate, Canberra; and
- Baker-Gabb, D. (2001) *National Recovery Plan for the Superb Parrot (Polytelis swainsonii)*, Victorian Government Department of Sustainability and Environment, Melbourne, (2011) Accessed online November 2012.

- Consultant Reports:

- Davey, C. (2010) *Report on the distribution, abundance and breeding status of the Superb Parrot (Polytelis swainsonii) during the 2009-10 breeding season, Gungahlin, ACT*. Report prepared for Canberra Ornithologists Group, Canberra (April, 2010); and
- Davey, C (2011), *Distribution, abundance and breeding status of the Superb Parrot (Polytelis swainsonii) during the 2010-11 breeding season, Gungahlin ACT*. prepared for the Canberra Ornithologists Group, Canberra (May, 2011).
- Davey, C. (1997) *'Observations on the superb parrot within the Canberra district'*, Canberra Bird Notes, 22(1) pp. 1-14, Canberra Ornithologists Group, Canberra (March, 1997);

5.3.4 Regent Honeyeater

Known and Potential Habitat

In the Canberra region, regent honeyeaters are known to occur primarily in woodlands with an abundance of mature trees, high canopy cover and a large number of mistletoe. The species feeds on nectar from flowering yellow box and Blakely's red gum and associated mistletoe.

The species is a partially migratory bird which moves north in autumn and winter and returns south for breeding in the spring. Breeding is recorded with some regularity in the ACT, but this tends to involve individual pairs (Australian Gov't, 2012f).

In 1995, many sightings were made of regent honeyeaters from five different sites in and around Canberra, with an estimated 15 adult birds in the Canberra area at sites which had flowering yellow box or cultivated mugga Ironbark (*Eucalyptus sideroxylon*) and in one case, red box (*E. polyanthemos*). During this period, Bounds *et al.* (1996)⁹⁷ describe breeding attempts by four pairs of regent honeyeaters.

Historical observations for the species in Gungahlin have been made at Mulligan's Flat and Gorooyarroo Nature Reserves, CSIRO in Gungahlin, and within the urban areas of Mitchell and in the nearby suburb of Watson. Regent honeyeaters have been present in Gungahlin between 1986 and 1998 however despite more recent occurrences of regent honeyeater elsewhere in Canberra there have been no observations of this species in Gungahlin in the past 14 years.

The woodlands in Mulligan's Flat and Gorooyarroo and the connection of these woodlands to the Mt Majura and Mt Ainslie woodland complex are probably of importance to the continued visits and breeding of this species in the ACT. Successful breeding requires locally abundant nectar and insect resources. Where food is scarce, competition with other honeyeaters such as red wattlebirds or noisy friar birds may disrupt the breeding of regent honeyeaters. As breeding occurs in spring/early summer at a time when yellow box is flowering, large productive yellow box trees are likely to be a key resource (Mulvaney, 2012).

Known Threats

Regent honeyeater recovery plan outlines various threats to the species. Known threats include:

- loss of woodland habitat due to agriculture, clearing and urbanisation;
- grazing by livestock and rabbits, which prevents native vegetation from regenerating;
- species' nomadic lifestyle and preference for small areas of favoured habitat within remnants; and
- firewood collection and removal of dead trees and fallen timber, altering forest ecosystem.

⁹⁷ Bounds J, Brookfield M and Delahoy M (1996) 'Observations of a breeding colony of four pairs of regent honeyeaters at north Watson, Canberra in 1995-96' *Canberra Bird Notes*, 21(3) pp. 41-55, Canberra Ornithologists Group, Canberra (September 1996)

Impacts, Avoidance and Mitigation

Endangered Species Assessment

In accordance with the Significant Impact Guidelines 1.1 (Australian Gov't, 2009b) an action is likely to have a significant impact on an endangered species if there is a real chance or possibility that it will result in any of the following criteria. While specifically referring to the regent honeyeater, the following criteria were used to assess the likely impact of the Plan on all migratory species discussed in **Section 4**.

Table 5.14 - Significant Impact Criteria for Regent Honeyeater (Endangered Species Criteria)

Significant Impact Criteria	Response
lead to a long-term decrease in the size of a population	Due to the intermittent and potentially vagrant occurrence of regent honeyeater in the ACT and Gungahlin in particular, the proposed action is unlikely to result in a long term decrease in the size of the species population.
reduce the area of occupancy of the species	The proposed action is unlikely to result in a reduction of the area of occupancy of regent honeyeater.
fragment an existing population into two or more populations	The proposed action will not result in the isolation or fragmentation of an existing population of regent honeyeaters.
adversely affect habitat critical to the survival of a species	There is no habitat in Gungahlin which could be considered critical to the survival of regent honeyeaters.
disrupt the breeding cycle of a population	The proposed action is unlikely to result in any disruption to the breeding cycle of any population of regent honeyeater.
modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The proposed action is unlikely to result in a decline in regent honeyeaters as a result of modification, destruction, removal, isolation or reduction decrease the availability or quality of habitat.
result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat	The proposed action is unlikely to result in the establishment of an invasive species harmful to regent honeyeaters. The mitigation strategy also addresses the need to control pest plants and animals in addition to the containment of domestic animals.
introduce disease that may cause the species to decline, or	The proposed action will result in no known disease or other pathogen likely to impact regent honeyeaters.
interfere with the recovery of the species.	The proposed ACTION will not interfere with recovery of the species.

The action is considered unlikely to result in any significant direct impacts to regent honeyeaters despite the removal of limited and opportunistic potential foraging habitat in the form of woodland. Indirectly, the removal of woodland in future urban areas may reduce the total area of potential habitat for the species if it were to visit the area, however, the enlargement and improvement of quality of the Mulligan's Flat / Goorooyarroo woodland complex would improve available resources as a consequence of a structurally more functional reserve system with greater core areas and proportionally fewer potential edge effects from development or human activity that would occur currently or under the development scenario posed by the current Territory Plan (ACT Gov't, 2008c).

Migratory Species Assessment

Regent honeyeater is also listed on the schedules of the Japan-Australia Migratory Bird Agreement (JAMBA) as a consequence of it being listed as an endangered species in Australia. Accordingly, it needs to be considered in the context of the Significant Impact

Guidelines 1.1 (Australian Gov't, 2009b) under the migratory species category for which, an action is considered likely to have a significant impact on a migratory species if there is a real chance or possibility that it will:

Table 5.15 - Significant Impact Criteria for Regent Honeyeater (Migratory Species Criteria)

Significant Impact Criteria	Response
substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species	The proposed action will not substantially modify, destroy or isolate an area of important habitat for regent honeyeater.
result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species, or	The proposed action is unlikely to result in the establishment of an invasive species harmful to regent honeyeaters. The mitigation strategy also addresses the need to control pest plants and animals in addition to the containment of domestic animals.
seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.	The proposed action is unlikely to result in any disruption to the breeding cycle of any population of regent honeyeater.

Consideration of both the endangered species and migratory species assessment criteria did not determine that a potentially significant impact would result from implementation of the plan in Gungahlin on regent honeyeater.

Information Sources and Confidence Levels

Information utilised in this assessment has included the following data sources:

- COG (2012b) *Regent honeyeater*. Accessed online (10/09/12): <http://cog.linkdigital.com.au/find-a-bird/honeyeaters/regent-honeyeater/>;
- Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) Protected Matters search tool;
- Australian Government (2012f) *Species Profile and Threats Database (SPRAT)*, Department of Sustainability, Environment, Water, Population and Communities, Canberra;
- Bounds J, Brookfield M and Delahoy M (1996) 'Observations of a breeding colony of four pairs of regent honeyeaters at north Watson, Canberra in 1995-96' *Canberra Bird Notes*, 21(3) pp. 41-55, Canberra Ornithologists Group, Canberra;
- Mulvaney, M. (2012) *The Extent and Significance of Gungahlin's Biodiversity Values. Technical Report 24*. Environment and Sustainable Development Directorate, Canberra; and
- Menkhorst, P., Schedvin, N., and Geering, D. (1999) *Regent Honeyeater Recovery Plan 1999-2003*, Parks, Flora and Fauna Division, Department of Natural Resources and Environment. Victoria.

5.4 Data Sources and Limitations

Data sources relied upon for this assessment has included the results of work undertaken by a wide variety of professionals and individuals. Much of the survey work and data gathering, particularly that of more recent years has been targeted towards MNES and as a result across Gungahlin there has been:

- Comprehensive mapping of EPBC vegetation;
- Comprehensive collection of plant species records from 310 vegetation polygons and 213 plots, which cover virtually all remaining native vegetation within Gungahlin;
- In addition to this polygon and plot based vegetation survey, there has been targeted survey for EPBC listed species including hoary sunray, button wrinklewort, tarengo leek orchid, austral toadflax and *Swainsona recta* within proposed development sites and much of the proposed offset and existing reserve areas;
- Comprehensive bird data from the records of the Canberra Ornithologists Group (COG), supplemented by targeted surveys for Latham's snipe at Horse Park Wetlands, superb parrot nest trees across Gungahlin and an extensive and repeated bird survey across the Mulligan's Flat – Gorooyaroo reserves;
- Striped legless lizard and pink-tailed worm-lizard surveys across virtually all potential habitat (some of these surveys are currently being undertaken);
- Comprehensive survey for golden sun moth across potential habitat within proposed development areas and within proposed offset areas and existing reserves (some of these surveys will be undertaken during the 2011 flying season).

From these diverse and detailed datasets, information provided for this project included data across a range of themes but can be summarised as follows:

- **Flora:**
 - INCP (Integrated Conservation Nature Plan) vegetation mapping (ACT Gov't, 2007);
 - CPR (Conservation Planning and Research) data comprised of relevant historical and recent survey results from a range of consultants and work undertaken by the Directorate;
 - Vegetation mapping undertaken by Eco Logical Australia (2011) across Gungahlin;
 - Regional scale mapping by Falding (2002); and
 - Unpublished consultants reports as provided by ESDD, ACT Land Development Agency (LDA) and EDD.
- **Fauna:**
 - Avifauna records of all species as provided by Canberra Ornithologists Group (COG);

- ACT Wildlife Atlas records as provided by CPR;
 - A report on the distribution, abundance and breeding status of superb parrots during the 2010-2011 breeding season (Davey, 2011); and
 - Unpublished consultants reports as provided by ACT Planning and Land Authority (ACTPLA), ACT Land Development Agency (LDA) and ACT Land and Property Services (LaPS).
- **Management and administrative:**
 - ACT Territory Plan, reserve boundaries, cadastre and general base mapping was provided by ACTPLA; and
 - ACT bushfire management zones were provided by ACT Emergency Services Agency.

In addition to the spatial datasets that were accessed, significant consultation was also conducted across a range of agencies in order to gauge the reliability, age, comprehensiveness, compatibility, coverage and generally useability of the data. Particular assistance was provided by CPR through Dr Michael Mulvaney in advising on the appropriateness of the various datasets, especially the vegetation.

What was apparent through the datasets was a level of bias or other limitations such as scale that are a consideration in recognising the limitations to this study. Overall, the limitations can be described as follows:

- **Scale:** Under this limitation, most datasets are either limited to:
 - A very specific site (e.g. Consultants reports), in which case the comparability of results and methods of different studies is a limitation;
 - The ACT (e.g. INCP), in which case relevance to regional considerations such as under the EPBC Act may not be adequately apparent; and
 - Too broad a region (e.g. Fallding, 2002), in which case the information is at too small a scale to be of value at the site specific level needed for considering the independent value of a given parcel of land.
- **Timing and Climate:** Many of the datasets available are comprised of a significant amount of data that was collected over the last 10 years, a period during which a significant and protracted drought affected the ACT. The extreme weather conditions during these years is highly likely to have affected flora and fauna records, for example crimson chats, a species not previously recorded in the ACT and generally associated with drier woodlands and saltbush/bluebush plains, were recorded in Gungahlin in 2003 (COG, 2005) around Yerrabi Pond. This and other unusual species' presence and absence during the period covered by the datasets are highly likely to be an artefact of climatic conditions and may be indicative of other bias in the data that is less apparent.
- **Methods:** The majority of datasets, even within a common theme, were generated using different methods. The potential limitations presented by this factor may include an under or over representation of particular taxa giving an unrealistic indication of rarity or distribution.
- **Reliability:** As with all datasets that are the synthesis of the work of many, there is inevitably observer bias as a result of many factors but primarily related to experience of

the observer with particular taxa. Limitations introduced by observer experience include false-positives and false-negatives where an observation is either not recorded or dismissed/misidentified. It was also noted throughout the conduct of GIS work that the topology of base cadastral data was of variable consistency and in many instances found to have gaps and overlap slivers which independently are not significant however do affect overall accuracy and reliability.

- **Location:** Much of the data that has been generated in detail is either focussed on areas of conservation value and recreational interest (e.g. Mulligan's Flat Nature Reserve and Gungahlin Pond) or is associated with detailed investigations for environmental impact assessments conducted for recent and current development proposals. Such data is not evenly distributed and accordingly some areas that are likely to be ecologically significant are under-represented due to access (or interest) limitations. The corollary is that areas of comparatively mediocre ecological value but which are easily accessible are over-represented and accorded undue recognition in terms of their significance.
- **Presence vs Absence:** For the majority of areas while some information exists that confirms whether a particular species is known to occur, there is not information available that can confirm where a species is absent. Accordingly, it must be remembered for much of the study area that the absence of proof is not proof of absence unless in the case of certain species (e.g. Golden Sun Moth) where very specific habitat requirements provide a reliable guide for where they will not occur. This limitation affects the ability to tailor the current study to individual species and MNES and supports the increasing trend in conservation planning to target community conservation over individual species. This is also recognised by the ACT Woodland Restoration Implementation Plan (ACT Gov't, 2010)

For the majority of these limitations, there is little ability to avoid them without completely avoiding the dataset. This would be impractical and hence the importance of the consultation that was conducted across the ACT agencies and in particular with CPR. Regardless, these limitations are not unique to the information available to this study and are addressed through the consideration of biodiversity at the community level. This is an appropriate response to the limitations and scale of this study and a broadly accepted approach. Notwithstanding, the limitations in available data create challenges for decision makers and as a recommendation of this assessment, an alternate model for data management has been proposed as an indirect offset.

5.4.1 Climate Change

Beyond extremes in seasonal weather, the phenomenon of climate change also introduces an element of uncertainty in the extent that climate change may affect the conservation outcomes envisaged under the Plan. Given the long time frames involved and the uncertainty associated with climate change predictions, it is difficult to determine how climate change may further impact (either positively or negatively) or increase pressure on issues associated with enhancement of the preserved vegetation communities or individual species/habitats.

In a 2010 presentation to the NCCARF Biodiversity Workshop, Bob Webb of the ANU Climate Change Institute⁹⁸ noted that climate change projections relevant to the ACT region included:

⁹⁸ Webb B (2010) *Climate Change, Biodiversity and the Australian Capital Region* a presentation to the NCCARF workshop, Canberra, 8 December 2010.
http://nccarf.jcu.edu.au/terrestrialbiodiversity/documents/roadshow/act/act_se_nsw_presentation_bob_webb.pdf

- increases in:
 - temperature;
 - incidence of heatwaves;
 - evaporation and dryness;
 - storms; and
 - bushfire weather.
- less snow, but average rainfall changes are less well understood;
- seasonal patterns of rainfall are very likely to change including:
 - increase in rainfall intensity;
 - risk of decline in long term average – but this is the area of greatest uncertainty especially at regional/ local levels

Implications of these changes for biodiversity are summarised by Webb (2010) as being significant for the ACT and surrounding region with impacts likely across woodland, grassland, forest and alpine environments. In general the consequences described by Webb (2010) as they relate to Gungahlin would include:

- Water stress and subsequent increased incidence of insect attack and disease on trees;
- Increase fire frequency;
- Changes to the timing, frequency and success of breeding attempts by flora and fauna due to altered conditions and available resources;
- Increased threat of feral and other opportunistic or invasive species;
- increase in extent of summer growing 'C4 grasses' such as kangaroo grass and many weeds, replacing the winter growing native 'C3 grasses', spring annuals and perennials; and
- reduction in the productivity of temperate grassland productivity with consequential impacts to grassland dependant fauna including grassland earless dragon, striped legless lizard and golden sun moth.

In response to these predicted changes and the inherent uncertainty in other aspects of what climate change represents, Webb (2010) identifies three key aspects to an adaptation strategy for biodiversity. These are as follows:

- Maintaining fundamental ecosystem processes and services:
 - reducing pressures / disturbances and restoration.
- Enhancing resilience for self adaptation via multiple pathways:
 - including habitat variety and connectivity;

- responding dynamically over time; and
- changing conservation goals.
- Knowledge development and adaptive management:
 - Cumulative knowledge access and sharing.

The Plan addresses each of these key aspects through the proposed measures to avoid, mitigate and offset the expected impacts resulting from the development of Gungahlin. These are discussed in detail in **Section 5** of the *Biodiversity Plan*.

5.4.2 Bushfire Management Zones

The bushfire asset protection zones as discussed in the *Biodiversity Plan* and the *Assessment Report* have been developed based on the ACT Government's Strategic Bushfire Management Plan (SBMP) (ACT Gov't, 2009b)⁹⁹. The following fuel management standards are replicated from Schedule C of the SBMP.

Table 5.16 - Default Widths Applied to Determine the Inner and Outer Asset Protection Zones

Vegetation Type	Asset Interface Classification	Ember Zone Width (m)	Inner APZ Width (m)	Outer APZ Width (m)
Forest and Shrubland	Primary	400	30	Target 300; Minimum 200
	Secondary	200	20	100
	Lee	50	10	0
Grass and Woodland	Primary	200	30	100
	Secondary	50	20	0
	Lee	50	10	0

The location and width of the Ember Zone and the Inner and Outer Asset Protection Zones is determined by the Asset Interface Classification. This classification of primary, secondary and lee edges along the rural-urban interface is based on the level of bushfire risk the interface is exposed to. It considers:

- the maximum fire size an asset may be subject to;
- the part of the fire (head, flank, back) an asset may be subject to recognising the major fire threat from the north and west; and
- the length of potential fire run.

Further detail on the Asset Interface Classification is found in Chapter 3 of the SBMP (ACT Gov't, 2009b)

Table 5.17 - Fuel Management Standards for Fire Management Zoning

Zone	Treatment Standards
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⁹⁹ ACT Government (2009b) *Strategic Bushfire Management Plan for the ACT, Version Two*, Emergency Services Agency, Canberra (October 2009)

	Vegetation Type	Fuel Management Standards
Inner Asset Protection Zone Default standards to be applied over at least 80% of the zones as mapped. Where default standards cannot be achieved, the responsible land manager may identify alternative treatments to meet the overall objectives for the zone. Any significant variation on the default standards shall be approved by the ESA.	Forest and shrubland	Maintained at an overall fuel hazard \leq low 3-5 m canopy separation or fuel gap to crown >3 m maintained
	Grass and woodland	Grassland maintained at less than 200 mm height when grassland curing $\geq 70\%$.
Outer Asset Protection Zone Default standards to be applied over at least 70% of the zones as mapped. Where default standards cannot be achieved, the responsible land manager may identify alternative treatments to meet the overall objectives for the zone. Any significant variation on the default standards shall be approved by the ESA.	Forest and shrubland	Overall fuel hazard \leq moderate
	Grass and woodland	Grassland fire hazard ¹⁰⁰ ≤ 35 when grassland curing $\geq 70\%$

Fuel management activities in these asset protection zones include a range of activities that modify fuel characteristics (including fuel load, vertical and horizontal arrangement and continuity, and live to dead fuel ratio) including prescribed burning, slashing, physical removal and/or grazing (ACT Gov't, 2009b).

Further discussion on bushfire management has been provided in the Supplementary Report.

¹⁰⁰ A combination of height and cover is currently used to determine triggers for short to medium term treatments when grasses are sufficiently cured to carry free burning fires (approximately 70% cured). Although significant variation exists, grass height (m) and cover (%) are related to fuel load and visibility, which are important factors affecting the ability to suppress grassfires (See Schedule C, ACT Gov't, 2009b)

6.0 ACT Items for Assessment

The following considerations relate specifically to the ACT planning and assessment process. They are considered as part of the strategic assessment despite having no relevance to Part 10 of the EPBC Act. Inclusion of these factors allows for concurrent consideration of alternatives and other responses to potential impacts in a manner that not only addresses the need to minimise impacts to MNES but also with respect to biodiversity in general and the broader environment. Consideration of these factors also assists the impact assessment and approval process under Territory legislation such that measures for locally important and ACT listed species in addition to other triggers under the PD Act are understood in the context of measures that target MNES.

6.1 Nature Conservation Act 1980

The NC Act is the ACT's key piece legislation for the protection and conservation of native animals and plants, and for the reservation of areas for those purposes. Relevant to the Strategic Assessment, the Act provides for declarations of species and ecological communities at risk; requires action plans for declared threatened species or ecological communities; provides a regime of offences, licences and penalties; and provides for monitoring, compliance and enforcement activities.

The NC Act defines 'native vegetation', the clearing of which is listed in Schedule 4 of the PD Act (Item 2 in **Table 6.1**); as well as declaring threatened species and ecological communities that are the subject of Item 1 (**Table 6.1**).

6.2 Planning and Development Act 2007

The PD Act provides the statutory process for development approvals, and environmental impact assessment. Under the PD Act, there are a number of 'tracks' for assessment. Impact track applies for developments that are likely to have a significant impact on the environment, and require the preparation of an EIS, unless granted exemption (Section 211 Exemption, or Environmental Significance Opinion).

There are a number of triggers for impact track assessment under Schedule 4 of the PD Act. Based on the known impacts of the Plan, the following triggers relating to types of impacts are considered to be potentially relevant to the project. **Table 6.1** identifies those triggers which relate to impacts.

Table 6.1 - Triggers for Impact Track Assessment under the PD Act (Schedule 4, Part 4.3)

Part	Item	Development Type
4.3	1	<p>proposal that is likely to have a significant adverse environmental impact on 1 or more of the following, unless the conservator of flora and fauna produces an environmental significance opinion that the proposal is not likely to have a significant adverse environmental impact:</p> <ul style="list-style-type: none"> a. a species or ecological community that is endangered; b. a species that is vulnerable; c. a species that is protected; d. a species with special protection status; e. a species or ecological community if a threatening process has been declared under the Nature Conservation Act 1980, s 38 (4) in relation to the species or community;

Part	Item	Development Type
		<p>f. a species or ecological community if the flora and fauna committee has stated criteria for assessing whether the committee should recommend the making of a declaration under the Nature Conservation Act 1980, s 38 (Declaration of species, community or process) in relation to the species or community;</p> <p>Note: Criteria are specified under the Nature Conservation Act 1980, s 35. An instrument under that Act, s 35 is a disallowable instrument and must be notified, and presented to the Legislative Assembly, under the Legislation Act.</p> <p>g. an endangered species, an endangered population, an endangered ecological community, a critically endangered species, a critically endangered ecological community or species presumed extinct under the Threatened Species Conservation Act 1995 (NSW), if the potential impact of the proposal will be on the species or community in New South Wales</p>
	2	<p>proposal involving—</p> <p>a. the clearing of more than 0.5ha of native vegetation other than on land that is designated as a future urban area under the territory plan unless the conservator of flora and fauna produces an environmental significance opinion that the clearing is not likely to have a significant adverse environmental impact;</p> <p>or</p> <p>b. the clearing of more than 5.0ha of native vegetation on land that is designated as a future urban area under the territory plan unless the conservator of flora and fauna produces an environmental significance opinion that the clearing is not likely to have a significant adverse environmental impact</p>
	6	proposal that is likely to have a significant adverse impact on the heritage significance of a place or object registered under the Heritage Act 2004, unless the heritage council produces an environmental significance opinion that the proposal is not likely to have a significant adverse impact
	7	proposal involving land included on the register of contaminated sites under the Environment Protection Act 1997*

* Note: Contamination assessments have been identified as an information gap for a number of the Future Urban Areas in the PRA. Until the presence of contaminated sites has been confirmed, this remains a potential trigger for impact track assessment.

Further to the impact based triggers for approval under the PD Act, Part 4.2 of Schedule 4 also identifies types of development that would require assessment by environmental impact statement (EIS) under the impact track, However, no items in Part 4.2 are considered relevant to the development. If any trigger for impact track assessment is met for a project, an application must be made for a scoping document for an EIS, an environmental significance opinion (ESO) or exemption to provide an EIS (under Section 211 of the PD Act), to the planning authority (ESDD), using Form 1M¹⁰¹.

6.2.1 Section 211 Information Requirements

The Minister for Planning can grant an exemption under Section 211 of the PD Act, on the basis that sufficient levels of investigation have already been completed for the site, and an EIS is unlikely to provide any further information about potential impacts. Based on the levels of investigation for the future urban areas of Gungahlin, and the assessment undertaken for this Strategic Assessment, it is considered that adequate levels of information already exist for the area to support an application for Section 211 exemption.

The requirements of Form 1M (page 5, information requirements for all application types) are included below.

¹⁰¹ Approved form AF2012-159 approved by David Papps Planning and Land Authority on 27 July 2012 under section 425 of The *Planning and Development Act 2007*

Table 6.2 - Required Information

Required information under Form 1M	Location in this report
A statement outlining the objectives of the project and why it is needed.	Section 2 - Purpose and Description of the Project
Description of the nature/type of project proposed by providing location maps(s) of the project site(s), preliminary design drawings and satellite/aerial photographs:	Section 2 and Figure 2.3 – Summary of the Plan
A preliminary risk assessment (PRA)	Appendix 2 (PRA)
Description of the nature conservation values of the site based on the considerations listed in the “Preparation of an application for scoping and Preparation of an ESO” guidelines available from ACTPLA website.	Section 4 - Existing Environment Section 5 – Impacts on MNES
Description of measures within the proposal that seek to avoid and minimise (and as a last offset) impact on identifying conservation values (for ESO and Section 211)	–Supplementary Report: Section 1.1 and Biodiversity Plan: Section 5
Any decision made under the EPBC Act in relation to this proposal.	N/A
For s211 applications only, the following additional information is required:	
Details of qualifications, expertise and experience of the person(s) who conducted previous studies supporting the application;	Appendix 2 (PRA)
Details of public consultation undertaken, as part of statutory requirement, for projects or previous studies included as supporting documentation undertaken. Details of public consultation not required for a statutory process should also be included;	Will be provided following public consultation period.
Verification from a qualified person that the information in the previous studies supporting the application is still current.	Appendix 2 (PRA)

6.3 Locally Important and ACT Listed Species

6.3.1 Threatened, Regionally Rare and Uncommon Flora Species

The ACT Flora and Fauna Committee is a statutory advisory committee, comprised of expert wildlife ecologists. This committee recently recommended a list of rare, uncommon and or endemic plant species to be given protected species status under the *Nature Conservation Act*. The list is yet to be passed into regulation, but is however a comprehensive list of plants of local conservation importance. The following 29 locally rare or uncommon plant species have been recorded over a total of 91 occurrences within Gungahlin.

1. <i>Aristida behriana</i>	11. <i>Hydrocotyle peduncularis</i>	21. <i>Polygala japonica</i>
2. <i>Austrostipa setacea</i>	12. <i>Hypoxis hygrometrica</i>	22. <i>Polygonium plebium</i>
3. <i>Bossiaea prostrata</i>	13. <i>Gonocarpus elatus</i>	23. <i>Ranunculus inudatus</i>
4. <i>Burchardia umbellata</i>	14. <i>Gratiola pumilio</i>	24. <i>Rutidosis leptorhychoides</i>
5. <i>Caesia calliantha</i>	15. <i>Indigofera adesmiifolia</i>	25. <i>Senecio hispidulus</i>
6. <i>Carex tereticaulis</i>	16. <i>Leucochrysum albicans</i>	26. <i>Swainsona recta</i>
7. <i>Cheiranthra linearis</i>	17. <i>Limosella australis</i>	27. <i>Thelymitra arenaria</i>
8. <i>Cullen tenax</i>	18. <i>Lotus australis</i>	28. <i>Thesium australe</i>
9. <i>Desmodium brachypodium</i>	19. <i>Microseris lanceolata</i>	29. <i>Thysanotus patersonii</i>
10. <i>Dianella longifolia</i>	20. <i>Plantago gaudichaudii</i>	

Most of the 91 occurrences are within existing or proposed reserve areas. Only two of the occurrences are within proposed development areas. *Bossiaea prostrata* and emu-foot (*Cullen tenax*) both occur within Moncrieff. The Moncrieff population of *B. prostrata* is small relative to the total amount of plants elsewhere within Gungahlin and the wider area. A population of over 200 emu-foot plants occurs within Moncrieff. This plant has only been recorded in nine other locations in the ACT, four of which have since been destroyed by roads and urban development. Of the remaining five sites, one population has not been seen for more than 60 years and two others have not been recorded for the last 13 years. Bonner Stage 2, Mulanggari Nature Reserve and Campbell Park are the only other locations in the ACT where this plant has been recorded in the past 10 years, and populations at each of these sites are less than a dozen plants. In addition, NSW DECC has recorded emu-foot on the Southern Tablelands north of the Monaro on only two occasions during extensive floristic surveys over the past decade (M. Mulvaney, pers comm.).

The emu-foot population at Moncrieff is by far the largest known population in the Region, and while much of the population is located within proposed open space, but it may be subject to adverse indirect impacts. Emu-foot is widespread and common in the western districts of NSW and occurs elsewhere in Queensland and Victoria.

Figure 6.1 provides an indication of the location of significant plant species within Gungahlin. The map illustrates the highest concentration of significant plants in Mulligan's Flat, with some found in Goorooyarroo, Bonner East, north-east of Jacka, north-west of Taylor, Moncrieff and the Hall – Kinlyside area.

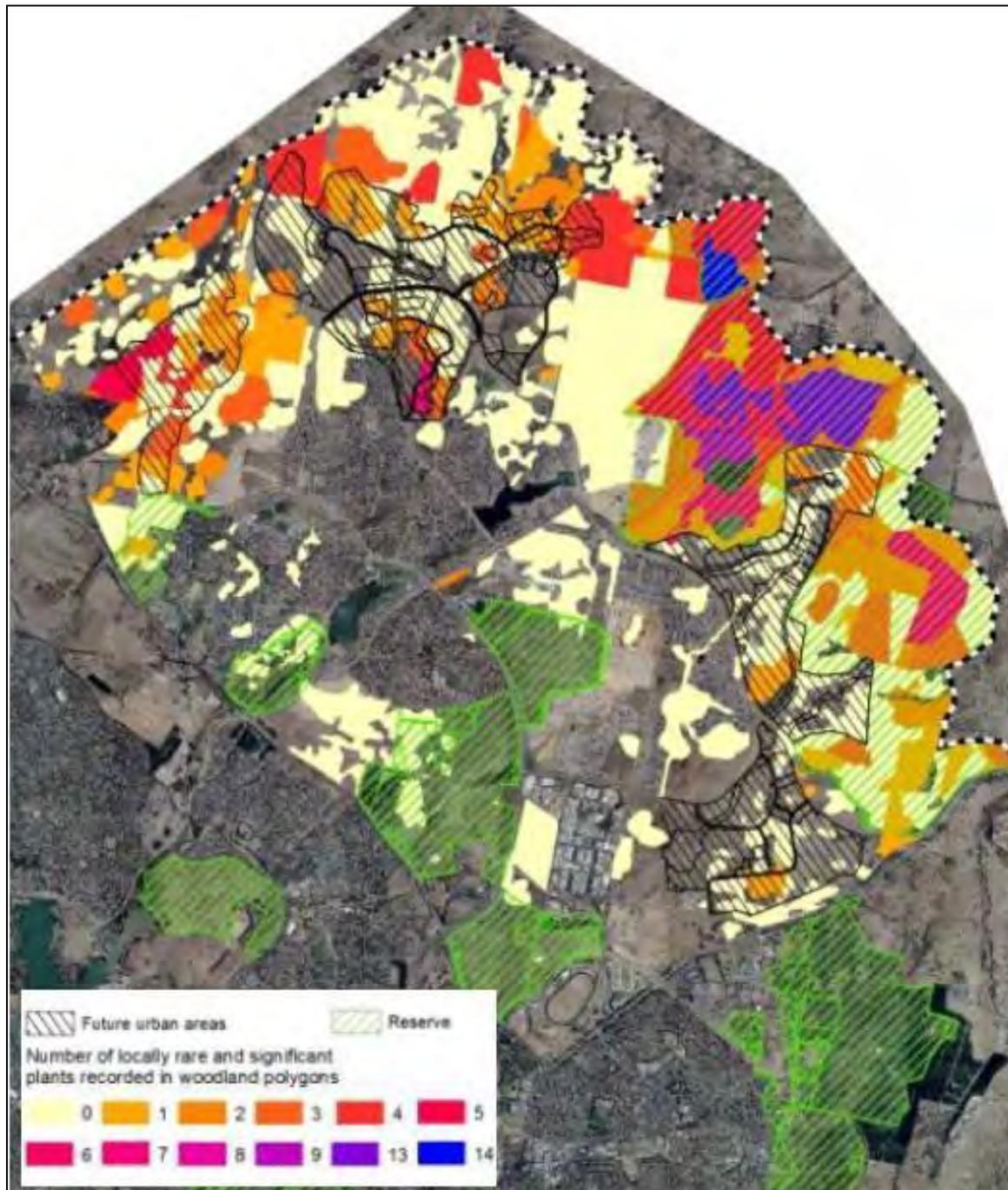


Figure 6.1 - Significant Plants in Gungahlin
Source: reproduced from Figure 6 from Mulvaney (2012)

6.3.2 Threatened Birds

The following bird species are listed as threatened under the ACT's NC Act; are not also listed under the EPBC Act; and are either known from or have the potential to occur within the Gungahlin region.

Table 6.3 - Threatened, Rare or Uncommon Bird Species

Common Name	Scientific Name	NC Act Status
Brown treecreeper	<i>Climacteris picumnus</i>	V
Glossy black cockatoo	<i>Calyptorhynchus lathami</i>	V
Hooded robin	<i>Melanodryas cucullata</i>	V
Little eagle	<i>Hieraaetus morphnoides</i>	V
Painted honeyeater	<i>Grantiella picta</i>	V
Varied sittella	<i>Daphoenositta chrysoptera</i>	V
White-winged triller	<i>Lalage sueurii</i>	V

Brown Treecreeper

Brown treecreeper (*Climacteris picumnus*) is listed as vulnerable under the NC Act. It inhabits dry forests and woodland, but may also utilise paddocks and grasslands, where there are sufficient logs, stumps and dead trees nearby.

In the ACT, the species prefers relatively undisturbed woodland and dry open forest where the native understorey, especially grasses, has been preserved (ACT Gov't, 1999c)¹⁰².

A translocation program for brown treecreepers was undertaken between October 2009 and December 2011 with the reintroductions occurring in Mulligan's Flat and Gorooyarroo Nature Reserves. The Foundation for National Parks & Wildlife funded the first experimental reintroductions in for a project undertaken by the Fenner School of Environment & Society at the Australian National University (Foundation for National Parks and Wildlife, 2012)¹⁰³. While the project resulted in a lower number of survivors than was hoped, a number of findings have come from the study which will assist with future translocation projects. Although brown treecreepers may now occur in Gungahlin, Bennett *et al.* (2013)¹⁰⁴ describe the reintroduction project as a failure due to high mortality among the reintroduced birds. While the outcome of that project was poor from the perspective of brown treecreepers, the knowledge gained as a result of the project will assist future projects where such activities are planned.

The proposed action would result in the removal of poor quality woodland adjacent to Mulligan's Flat and Gorooyarroo Nature Reserves however is unlikely to result in any direct impacts to the areas of habitat of importance to brown treecreepers. Application of the

¹⁰² ACT Government (1999c) Brown Treecreeper (*Climacteris picumnus*): A vulnerable species. Action Plan No. 18. Environment ACT, Canberra (1999)

¹⁰³ Foundation for National Parks and Wildlife (2012) *Brown Treecreeper Reintroductions: Return of the Fauna: Brown Treecreeper Reintroductions in Eucalypt Woodland*, accessed online:

<http://www.fnw.org.au/plants-a-wildlife/birds/brown-treecreeper/brown-treecreeper-reintroductions>

¹⁰⁴ Bennett VA, Doerr VAJ, Doerr ED, Manning AD, Lindenmayer DB and Yoon HJ (2013) 'Causes of reintroduction failure of the brown treecreeper: Implications for ecosystem restoration' *Austral Ecology* doi: 10.1111/aec.12017

avoidance and mitigation strategies would ensure potentially adverse impacts are minimised or avoided entirely.

Glossy Black-Cockatoo

Glossy black-cockatoo (*Calyptorhynchus lathamii*) is listed as vulnerable under the NC Act. This species has a highly specialised requirement to forage in she-oaks, mostly of the genus *Allocasuarina* and also nests in large hollows. While there is limited habitat for glossy black cockatoos in Gungahlin, it is unlikely that the proposed action would affect this species.

Hooded Robin

Hooded robin (*Melanodryas cucullata*) is listed as vulnerable under the NC Act. While it occurs throughout Australia, in the ACT, the species has been observed in grassy woodlands in the north and in the open areas in valleys in the south (ACT Government, 1999d)¹⁰⁵.

The species utilises dry eucalypt forest, woodland and scrub, grasses and low shrubs, as well as cleared paddocks with regrowth or stumps. Avoidance and enhancement of the higher quality woodland remnants in Gungahlin would effectively mitigate potentially adverse effects to hooded robins.

Little Eagle

Little eagle (*Hieraaetus morphnoides*) is listed as vulnerable under the NC Act. The draft action plan for little eagle in the ACT (ACT Gov't, 2011b)¹⁰⁶ notes the following with respect to habitat requirements of the species:

'Typical habitat for the little eagle includes woodland or open forest. Higher abundance of the species is associated with hillsides where there is a mosaic of wooded and open areas such as riparian woodlands, forest margins and wooded farmland. Little eagles usually avoid large areas of dense forest, preferring to hunt in open woodland, where the birds use trees for lookouts (Marchant and Higgins 1993; Ferguson-Lees and Christie 2001). In the ACT, little eagles frequent open woodland and riparian areas (Olsen and Fuentes 2004)'.

Threatening processes of significance to little eagles that may have some relevance to the Gungahlin project is the use of poisons for the control of pest animals, in particular the chemicals pindone and potentially 1080 as used for rabbit control. The National Registration Authority (NRA, 2002)¹⁰⁷ describe pindone as a 'first generation' bait which typically must be consumed many times before mortality occurs. For this reason pindone is considered safer to use for rabbit control in populated areas where the alternative, single dose poison 1080, is either impractical or unsuitable. While there is a risk of potential secondary poisoning to little eagle as a result of pindone use, there is a lack of data and few reported incidents where this link can be demonstrated (NRA, 2002). This point is further noted in the draft action plan no. 31 relating to little eagles (ACT Gov't, 2011b).

The draft action plan no. 31 (Act Gov't, 2011b) also notes that little eagles historically have occurred mainly in the northern half of the ACT with the highest concentrations found in the Murrumbidgee and the Molonglo river corridors. This would suggest that the Gungahlin area represents potential habitat for this species. However as the present area of critical

¹⁰⁵ ACT Government (1999d) Hooded Robin (*Melanodryas cucullata*): A vulnerable species. Action Plan No. 15. Environment ACT, Canberra (1999)

¹⁰⁶ ACT Government (2011b) *Draft Action Plan No. 31 (2011)*, accessed online: http://www.environment.act.gov.au/_data/assets/pdf_file/0005/236840/Little_Eagle_Action_Plan_Final.pdf

¹⁰⁷ National Registration Authority (2002) *The NRA Review of Pindone*, Canberra ACT (May 2002) online: <http://www.apvma.gov.au/products/review/docs/pindone.pdf>

significance to this species as a breeding location is the Molonglo River corridor (ACT Gov't, 2011b), it is likely that north Gungahlin represents opportunistic foraging habitat.

Notwithstanding an apparent lack of evidence, where pest animal control activities are required to be undertaken in association with implementing the Plan, consideration should be given to the potential for chemical control to have a secondary impact on native species such as little eagles. This would be a consideration for the mitigation strategy as implemented for avoided areas including those which would be transferred to nature reserve. Beyond this measure, as there are no known breeding pairs of little eagle in the Gungahlin area the proposed action is unlikely to result in a significant adverse impact to little eagles.

Painted Honeyeater

Painted honeyeater (*Grantiella picta*) is listed as vulnerable under the NC Act.

Similarly to species such as regent honeyeater, painted honeyeaters are infrequent visitors to the ACT despite being dependent on woodland habitat in particular where there is an abundance of mistletoe. While the proposed action would result in the removal of low quality potential habitat, the avoidance and proposed enhancement of higher quality areas of habitat in association with the existing nature reserve system would effectively mitigate potentially adverse effects to this species.

Varied Sittella

Varied sittella (*Daphoenositta chrysoptera*) is listed as vulnerable under the NC Act. The species is distributed across much of continental Australia, and in the ACT has been recorded in Aranda bushland, O'Connor and Bruce Ridges, Black Mountain, the Pinnacle Stringybark forest, Mt Ainslie–Campbell Park, Bluett's Eucalypt forest, Naas and Orroral valleys, Shepherd's Lookout and the Murrumbidgee River Corridor. In Gungahlin, it has been recorded in Mulligan's Flat (ACT Gov't, 2005d)¹⁰⁸.

Varied sittella is a climbing species which actively hunts for invertebrate prey on tree trunks, branches, crevices and under bark. Due to this, critical habitat features for the species includes large living and dead trees, particularly rough barked eucalypts, which are essential for foraging, roosting and nesting, and well-treed habitats. In the ACT region the species has a preference for areas with red stringybark (*Eucalyptus macrorhyncha*) (ACT Gov't, 2005d). The species habitat preferences indicate that areas of high quality woodland within Mulligan's Flat and Goorooyaroo Nature Reserves would provide key habitat values for the species. The proposed action would result in the removal of poor quality woodland adjacent to Mulligan's Flat and Goorooyaroo Nature Reserves however is unlikely to result in any direct impacts to the areas of habitat of importance to varied sittellas. Application of the avoidance and mitigation strategies would ensure potentially adverse impacts are minimised or avoided entirely.

White-Winged Triller

White-winged triller (*Lalage sueurii*) is listed as vulnerable under the NC Act. The species is found across Australia, but is nomadic, and seasonally migratory through central and southern Australia. In the ACT region, the species is an uncommon, breeding, summer migrant and numbers vary year to year. In the ACT, records for the species are widespread,

¹⁰⁸ ACT Government (2005d) Threatened Species and Communities of the ACT Information Sheet: Varied sittella (*Daphoenositta chrysoptera*) A vulnerable species, Environment ACT, Canberra (March, 2005)

however the majority come from Hall, Mulligan's Flat, Gorooyaroo, the Pinnacle, Campbell Park and the Gigerline-Tharwa area (ACT Gov't, 2005e)¹⁰⁹.

White-winged trillers eat insects, including winged termites, ants, grasshoppers and caterpillars, and feed both on the ground and in the air. Critical habitat features for the species include large living and dead trees for perching, roosting, nesting and foraging, and foraging areas of grass and fallen timber. In the ACT, the species is found in and around grassy woodland areas such as box gum woodland (ACT Gov't, 2005e).

Based on the species habitat and foraging requirements, key habitat in Gungahlin would be the grassy woodlands of Mulligan's Flat, Gorooyaroo and the Hall – Kinlyside area. The proposed action would result in the removal of poor quality woodland adjacent to Mulligan's Flat and Gorooyaroo Nature Reserves however is unlikely to result in any direct impacts to the areas of habitat of importance to white-winged trillers. Application of the avoidance and mitigation strategies would ensure potentially adverse impacts are minimised or avoided entirely.

6.3.3 Threatened, Regionally Rare and Uncommon Invertebrate Species

The following invertebrate species listed as threatened under the ACT's NC Act, or considered regionally rare or uncommon, have the potential to occur within the Gungahlin region.

Table 6.4 - Threatened, Rare or Uncommon Invertebrate Species

Common Name	Scientific Name	NC Act Status
Perunga Grasshopper	Perunga ochracea	V
Canberra raspy cricket	Cooraboorama canberrae	-
Key's matchstick grasshopper	Keyacris scurra	-

Perunga Grasshopper

Perunga grasshopper is a flightless grasshopper listed as vulnerable under the NC Act and is associated with natural temperate grassland dominated by wallaby, kangaroo and spear grasses; native pasture; and open woodland with grassy understorey, including the box gum woodland and derived secondary grasslands (ACT Gov't, 2006).

The species is likely to occur in parts of Gungahlin that support native grassland or woody vegetation, including most of Throsby and Kinlyside and parts of Kenny, Jacka, Taylor and Moncrieff. Perunga grasshopper is a cryptic species which is often difficult to survey and is usually only observed incidentally by bushwalkers. The species has been recorded in Gungahlin district in Mulanggari, Crace, Gungaderra and Gorooyaroo Nature Reserves as well as at East Bonner. All recorded locations are designated conservation areas (Mulvaney, 2012).

No targeted surveys have been undertaken for the species, nor is there a reliable survey method for this cryptic species. Thus the significance of the proposed action on perunga grasshopper cannot be fully understood in the absence of evidence to determine presence or

¹⁰⁹ ACT Government (2005e) Threatened Species and Communities of the ACT Information Sheet: White-winged triller (*Lalage sueurii*) A vulnerable species, Environment ACT, Canberra (March, 2005)

absence. Nevertheless protection of natural temperate grassland and large woodland remnants should protect the majority of the potential habitat of this species.

Canberra Raspy Cricket

The cricket is known only from natural temperate grassland within the ACT, with most records from Majura Valley and Belconnen. One observation from the Gungahlin area has been recorded in the ACT Wildlife Atlas but the location is now part of the Gungahlin town centre development. There are unconfirmed reports of the species in Gungahlin grassland reserves and potential habitat also exists outside these reserves. Of the proposed action areas in Gungahlin, only Kenny is likely to be within the former natural range of the species. Degraded grassland that has occurred in the vicinity may have also destroyed suitable habitat (Mulvaney, 2012). Canberra raspy cricket is not protected by legislation but is considered a species of conservation concern. The species has only received incidental observational recording and it is recommended that status be monitored over time and threats minimised (Mulvaney, 2012).

Key's Matchstick Grasshopper

Key's matchstick grasshopper is a flightless invertebrate that was once common in grasslands and grassy woodlands in south-eastern Australia. The species has suffered decline due to habitat loss by agricultural regimes such as overgrazing by sheep and cattle. Now considered uncommon in the ACT, the species has been recorded in the Nation Transmission authority land at Crace, in Mulligan's Flat Nature Reserve and Crace Nature Reserve and at Hall Cemetery. The largest population of the species is thought to occur at the Transmission Station grasslands. All of the known locations are under conservation management. Other areas in Gungahlin where the species may occur include the base of One Tree Hill, Kinlyside, at Moncrieff and to the north of Bonner (Mulvaney, 2012).

Key's matchstick grasshopper is not protected by legislation but systematic surveys have been conducted for the species, with key habitat in Gungahlin protected (Mulvaney, 2012).

6.3.4 Reptiles

There are no additional reptile species listed on the NC Act which are not also listed under the EPBC Act and for which an assessment has already been conducted in **Sections 4** and / or **5**. However, Mulvaney (2012) provides the following discussion on locally uncommon reptile fauna within Gungahlin:

'The Mulligan's Flat – Goorooyaroo woodland complex is a stronghold both within a Gungahlin and ACT context for several species of woodland lizards; including the spotted-back skink (*Ctenopus uber orientalis*, only known from a few scattered populations in the ACT), stone gecko (*Diplodactylus vittatus*), and shingleback (*Trachydosaurus rugosus*). It is also the area of highest recorded lizard diversity in Gungahlin, but there is yet to be a systematic reptile survey across the area.

Harcourt Hill Nature Reserve is the only recorded location of the marbled gecko (*Christinus marmoratus*) in Gungahlin, while Percival Hill Nature Reserve is the only recorded location of the blind snake (*Ramphotyphlops nigrescens*).

There are three records of the black-headed snake (*Suta spectabilis dwyeri*) in Gungahlin, one from Mulligan's Flat, one from a rural lease on the eastern boundary of Jacka, and one from a rural lease on the north-western side of Taylor. This last site is the only recorded location of the three-lined skink (*Bassiana duperreyi*) in Gungahlin.'

While a number of locally or regionally uncommon reptile species may occur within the Gungahlin Region, the information from Mulvaney (2012) identifies the key areas of important habitat as being the Mulligan's Flat – Goorooyaroo woodland complex. Based on

this, the avoidance strategy proposed under the Plan would ensure that areas of the greatest existing and potential ecological value for reptile fauna will be retained and enhanced.

On this basis it is considered unlikely that reptile species protected under ACT legislation, or considered rare or uncommon in the Territory would be significantly adversely affected by the proposed action.

6.3.5 Mammals

There are no additional mammal species considered for assessment however the following information on mammal distribution in Gungahlin has been obtained from Mulvaney (2012).

‘Very few mammal surveys have been conducted in Gungahlin. Records are either from Mulligan’s Flat Nature Reserve or are of small mammals captured in a 1990 pitfall survey of Gungahlin Hills. Seven species of bat have been recorded in Mulligan’s Flat of which one, white-striped freetail bat (*Astrononus australis*) is considered a species of concern in the ACT. A key habitat requirement of this species is tree-hollows in which it nests and roosts.

Small mammals that were once regularly recorded in surveys of Black Mountain and Mt Ainslie Nature Reserves are now considered extinct or very rare in these areas. Pitfall surveys of Gungahlin Hills in 1990 and 1992 located common dunnart (*Smithopsis murina*) in Mulligan’s Flat, Harcourt Hill and Percival Hill Nature Reserves. Yellow-footed antechinus (*Antechinus flavipes*) was also recorded on the One Tree hill rural lease and at Mulligan’s Flat.’

Current research and surveys have recorded a good population of common dunnart and yellow-footed antechinus in Mulligan’s Flat and Goorooyaroo Nature Reserves. Manipulation experiments are being conducted to try and improve habitat for these species. Cat and fox exclusion fences have also provided suitable conditions for reintroduction of locally extinct species such as Tasmanian bettong (*Bettongia gaimardi*).

Notwithstanding the limited amount of data pertaining to mammals in Gungahlin, on the basis of habitat quality as determined from mapping of box gum woodland, it is apparent that the areas of greatest potential to support a diversity of small mammals are the already reserved areas of Mulligan’s Flat and Goorooyaroo. Much the same as with woodland birds, wooded areas with a structured understorey with higher degrees of habitat complexity (as provided by fallen timber, live and dead hollow bearing trees, mixed age trees, logs, rocks, vegetation structure, etc.) are likely to support native mammals. The avoidance strategy proposed under the Plan will ensure that areas of the greatest existing and potential ecological value will be retained and enhanced.

On this basis it is considered unlikely that mammal species protected under ACT legislation, or considered rare or uncommon in the Territory would be significantly adversely affected by the proposed action.

6.3.6 Aquatic Species

There are no further aquatic species that have not already been considered under EPBC Act criteria likely to occur in or be influenced by the Gungahlin development.

7.0 Strategic Benefits of the Plan

The Plan has been designed to optimise benefits for MNES at a strategic, landscape scale. The Plan has taken the principles presented in a recent report (Rutherford 2011a¹¹⁰) on strategic biodiversity conservation in Gungahlin as a guide to the establishment of an overarching approach to land planning, and extends this to propose a detailed strategy designed to lead to significant improvements to the ACT nature reserve system both in terms of total land area and also configuration, viability and connectivity. The Plan also seeks to contribute to the continued development of a comprehensive, adequate and representative reserve network in the ACT.

7.1 General Approach

The hierarchy of mitigation, as defined by the Business and Biodiversity Offsets Program (BBOP)¹¹¹ is as follows:

Avoidance → Minimisation → Rehabilitation/Restoration → Offset

The Plan has taken the overarching aim of avoidance of MNES and protecting the avoided areas through a change of land tenure, with an additional aim of improvement of the landscape and function of the existing reserve system (with a financial 'offset' component). The landscape benefits of the Plan have been assessed using a range of data analysis tools as described below.

To date in the planning of Gungahlin, the urban – rural interface has been dynamic and something that has been largely undetermined. During the course of this assessment it was necessary to give greater consideration to where the ultimate edge would be and what management regime would be applied to those edge areas. This is of particular importance in places where the interface affects conservation areas such as the already established nature reserves of Mulligan's Flat and Goorooyaroo, but also the areas that are potentially suitable for use as reserves under the Plan. The concern is that the potential values of an "offset area" are not diminished once the ultimate urban edge is established and a regime of management is implemented either explicitly or indirectly. Edge effects of particular ecological importance include:

- Management for bushfire risk, including:
 - Inappropriate fire regime (hazard reduction burns);
 - Regular slashing, crash grazing;
 - Removal of regrowth (trees and other biomass).
- Weed incursion, from:
 - Maintenance activities (eg. slashing, grazing stock, etc.);

¹¹⁰ Rutherford P (2011a) *Strategic Biodiversity Conservation – Gungahlin District, ACT*, unpublished report to the ACT Department of Land and Property Services (April 2011)

¹¹¹ <http://bbop.forest-trends.org/>

- Adjacent domestic gardens;
- Post construction soil stabilisation measures;
- Reduced community resilience;
- Predation by domestic predators;
- Invasion of exotic herbivores and predators;
- Noise and light pollution;
- Noise, dust, light and other disturbances of construction; and
- Presence of humans and domestic animals.

In some instances it is possible to more accurately determine the likely impact of edge activities and indirect effects of development such as is the case for fire hazard management owing to the prescriptive requirements for bushfire hazard management (ACT Gov't, 2009b). Other impacts are less predictable and as a result an approximation has been used in the analyses to account for the extent to which remnant vegetation might be affected by peripheral human activities.

In considering how to determine the contribution of discrete areas to the overall robustness of the conservation reserve network in Gungahlin, a range of landscape conservation metrics were used to provide a comparative basis. Analyses conducted under this component of the project were not intended to replicate the work of Manning *et al.* (2010)¹¹² or derivative publications of the ACT Government, however were intended to demonstrate the potential benefits of including certain defined areas into the reserve system. Accordingly, the intent was to demonstrate the potential for enhancement of the reserve system from the range of actions included in the Plan, consistent with the strategic direction of conservation management in the ACT and Gungahlin specifically.

McGarigal and Marks (1994)¹¹³ describe the process adopted by the analyses in the software package "FragStats" (McGarigal *et al.*, 2002)¹¹⁴. Selected metrics and concepts presented by McGarigal and Marks (1994) were used in this assessment for the purpose of defining the general contribution of alternate scenarios in developing the ultimate urban-rural interface under an offset driven conservation program. It was decided not to employ the software to the project as the range of species specific data was not available and besides, this work has been done to some extent by others (e.g. Manning *et al.*, 2010). The value of these metrics to the current project was in terms of seeking to quantify the effects of reserve design and associated conservation benefits in a strategic sense to landscape functionality.

¹¹² Manning AD, Shorthouse D J, Stein JL and Stein J A (2010) *Technical Report 21: Ecological Connectivity for Climate Change in the ACT and surrounding region*. A report prepared for the ACT Government.

¹¹³ McGarigal K and Marks BJ (1994) *FragStats: Spatial Pattern Analysis Program for Quantifying Landscape Structure*. Version 2.0 [online: <http://www.umass.edu/landeco/pubs/mcgarigal.marks.1995.pdf>]

¹¹⁴ McGarigal K, Cushman SA, Neel MC, and Ene E (2002) *FRAGSTATS: Spatial Pattern Analysis Program for Categorical Maps*. Computer software program produced by the authors at the University of Massachusetts, Amherst [online: <http://www.umass.edu/landeco/research/fragstats/fragstats.html>]

Concepts discussed by Drielsma *et al.* (2007)¹¹⁵ were also considered and incorporated into the overall assessment however were not directly employed as the purpose of this study was not to define the optimum corridor location but to enhance it. Further, the approach of Drielsma *et al.* (2007) was implemented by Manning *et al.* (2010) and accordingly also provides the basis for justification of the conceptual reserve system to be developed as a result of implementing the Plan.

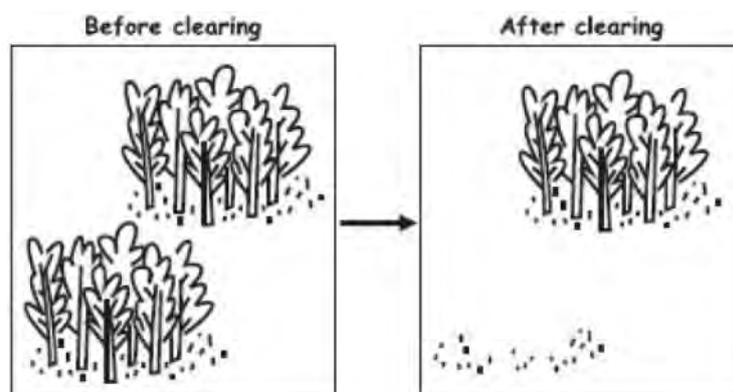
7.1.1 Offset Concepts

A recent report titled 'Investigating potential biodiversity offset actions and sites for the Australian Capital Territory' (Gibbons, 2011) considered opportunities within the ACT with a focus on nature reserve in Canberra Nature Park and along the Molonglo River Corridor, in addition to the Googong Foreshores. Gibbons (2011) identifies a range of management actions with accompanying guidance as to the scenario and tenures for which their use would be beneficial in addition to two criteria that should guide the selection of sites that might be proposed as direct offsets.

Gibbons (2011) categorises management actions in terms of their feasibility of implementation, probability of success and the potential to be able to measure outcomes from their implementation. Notably, the use of targeted actions to address the intensity or extent of key threatening processes to biodiversity in the ACT is demonstrated by Gibbons (2011) to be of equal if not greater importance as the establishment of direct offsets by way of land transfer into nature reserve. The example provided is described thus:

'...it is not sufficient on its own to convert an existing remnant to nature reserve as an offset, even if it can be demonstrated that this is above normal government commitments. Converting a site to a nature reserve does not automatically confer on that site greater biodiversity conservation values. There must be actions also undertaken on the site that yield gains above the existing duty of care to that site that are sufficient to compensate losses as a result of development'.

This example is also accompanied by 'an illustration of a simple offset strategy in which an area is cleared provided an equivalent area of existing vegetation is set aside as an offset. This strategy will lead to a net loss equivalent to the area cleared unless there are sufficient gains on the offset site and is therefore not an appropriate offset activity'. **Figure 7.1** is a reproduction of this example as described above.



Source: Gibbons and Lindenmayer (2007)¹¹⁶ in Gibbons (2011)

¹¹⁵ Drielsma M, Manion G, Ferrier S (2007) "The spatial links tool: Automated mapping of habitat linkages in variegated landscapes" in *Ecological Modelling* 200, pp. 403-411.

¹¹⁶ Gibbons P and D B Lindenmayer (2007) "Offsets for land clearing: No net loss or the tail wagging the dog?" *Ecological Management and Restoration* 8:26-31.

Figure 7.1 - Initial effect of a simple offset strategy that does not include management actions

This illustration, while simplistic in its appearance, serves to highlight the need for an offset strategy to include additional benefits that account for the loss of total habitat. The means by which this initial imbalance is typically addressed in offset strategies is with the application of a range of measures such as the protection and enhancement of a larger area than had been impacted in addition to management activities that improve the quality of habitat or other relevant conditions for the affected matters.

The criteria proposed by Gibbons (2011) against which direct offsets should be measured is also consistent with the offset policy statement of the Australian Government (2012a). As noted by Gibbons (2011), the criteria are that an area proposed to be converted to nature reserve as an offset should:

- be located in the same bioregional areas as the proposed activity; and
- deliver conservation outcomes that would not otherwise occur.

7.2 Analysis Method

Following collection of all spatial data and consultation as to their reliability, the datasets were combined by theme giving precedence to the most recent, reliable sets such that where acceptable, where recent information existed, it superseded the old. The resulting spatial layers were a composite of all data available but which preferentially relied on the best information wherever it was available. The resulting datasets were comprised of:

- Vegetation communities;
- Fauna occurrences and other point-based records;
- Fauna habitat; and
- Fire asset protection zones.

In determining the overall value of the avoidance sites, and their strategic contribution to the ACT conservation reserve system a series of spatial analyses were undertaken. The basic elements of the analyses were split against each other in order to generate for each MNES a series of unique polygons according to which land use policy under the Territory Plan that they coincided with. The result was a series of spatial layers that defined the known extent of MNES:

- Within nature reserves;
- Within the identified avoidance areas; and
- Within the remaining greenfield development areas.

7.3 Comparison of Landscape Metrics

McGarigal *et al.* (2002) describe a range of landscape metrics that are used by their software. Selected metrics are described in the following sections in relation to their application and expression in Gungahlin. This assessment has not employed these metrics

in an attempt to replicate the landscape ecology studies of others, only to explain the relative benefits of the Plan. Accordingly, the use of these metrics should not be interpreted as an attempt to define or design the optimal reserve network only within the ACT and specifically, Gungahlin. The intent of these metrics is to confirm the functional benefits of implementing the structural changes proposed by the Plan.

The Territory Plan, being the principal land use planning document of relevance to much of Gungahlin, has been used as one of the bases for distinction between different areas of land as discussed in the following sections. This is due to the statutory protections afforded to land under different land use policies and the associated obligation by the Territory to manage land appropriately. Land use policies of interest to this study include:

- **Hills, Ridges and Buffers:** This zone represents non-urban land for which there is a mandate for management for environmental, cultural, recreational and aesthetic values. Objectives of the Hills, Ridges and Buffers zone (NUZ3) are to:
 - Conserve the environmental integrity of the hill system as a visual backdrop and a unified landscape setting for Canberra;
 - Provide opportunities for appropriate recreational uses;
 - Conserve the significant cultural and natural heritage resources and a diversity of natural habitats and wildlife corridors;
 - Provide predominantly open buffer spaces for the visual separation of towns and to provide residents with easy access to hills, ridges and buffer areas and associated recreation facilities; and
 - Provide opportunities for appropriate environmental education and scientific research activities.
- **Nature Reserve overlay:** Land that is identified within the Nature Reserve overlay (Pc) is also non-urban land within the broad NUZ3 zone but with the specific designation as Public land that has been gazetted with the objectives (as defined by Schedule 3 of the PD Act) to:
 - Conserve the natural environment; and
 - Provide for public use of the area for recreation, education and research.
- **Broadacre:** Land zoned as broadacre (NUZ1) has a primarily agricultural purpose under the Territory Plan and within the context of Gungahlin would represent areas potentially available to be developed albeit at a lower intensity than the Future Urban areas. This would indicate broadacre areas are generally incompatible with purely conservation oriented objectives and are a potential source of conflict between development interests and MNES. Objectives of the broadacre (NUZ1) zone are described by the Territory Plan as follows:
 - Make provision in a predominantly rural landscape setting for a range of uses which require larger sites and/or a location outside urban areas;
 - Make provision for activities requiring clearance zones or protection from conflicting development;
 - Ensure that development does not adversely impact or visually intrude on the landscape and environmental quality of the locality; and

- Ensure, where appropriate, that development and the use of land does not undermine the future use of land which may be required for urban and other purposes.
- **Future Urban:** Land identified within the Future Urban overlay (FUA) is zoned RZ1 – Suburban and is subject to the principles and policies for development of the land as set out in separate documents referred to as a structure plan, which are part of the Territory Plan. Within the existing scenario, lands within the Future Urban overlay are likely to retain a range of natural values and are where the greatest conflict between conservation and development occurs.

While the broad objectives of the Hills, Ridges and Buffers zone are largely consistent with that of land which is subject to the Nature Reserve overlay, one of the primary differences between these zones is that activities such as extensive agriculture could persist, albeit with approval. This would represent the primary difference between these zones and justification for separating them in the subsequent analyses given this essential difference in land management regime. Despite that, the Hills, Ridges and Buffers zone provides for a relatively a high level of protection for environmental values and is accordingly considered from the perspective of land that would be managed in a way that is not inconsistent with the requirements for environmental protection and conservation of biodiversity. The Hills, Ridges and Buffers zone (NUZ3) is largely equivalent to the “E3 – Environmental Management” zone under the NSW *Standard Instrument – Principal Local Environmental Plan 2006*.

Following this, the land use policies of the Territory Plan are divided on the basis of their conformity to a statutory objective that includes biodiversity conservation. For the purposes of this report, Hills, Ridges and Buffers (NUZ3) and lands subject to the Nature Reserve overlay (Pc) are considered to be consistent with the objectives of management for biodiversity offsets. By comparison, the Future Urban (FUA) and Broadacre (NUZ1) areas are not considered to be consistent with a biodiversity conservation objective.

7.3.1 Patch Size and Distribution

This metric is discussed by McGarigal et al. (2002) as:

‘The simplest measure of configuration is patch size, which represents a fundamental attribute of the spatial character of a patch. Most landscape metrics either directly incorporate patch size information or are affected by patch size. Patch size distribution can be summarized at the class and landscape levels in a variety of ways (e.g., mean, median, max, variance, etc.), or, alternatively, represented as patch density, which is simply the number of patches per unit area’.

The definition of a patch in this instance is taken to represent discrete areas of native vegetation or habitat for an MNES, principally as defined by the Territory Plan. Consequently a patch could contain the habitat of golden sun moth (grassland), superb parrot (woodland and grassland) and box-gum woodland endangered ecological community provided these all occurred within a contiguous area under the same land use policy in the Territory Plan.

Territory Plan

Following the above definition of a patch, there are six nature reserve patches under the current Territory Plan as indicated in the following table in terms of their Patch Size and Patch Distribution metrics. The Northern Hills, Ridges and Buffers area has also been included.

Table 7.1 - Nature Reserve Patch Size and Distribution

Patch (Nature Reserves)	Area (ha)	Metric
Percival Hill	79	Patch Size
Mulligan's Flat north	130	
Crace Grasslands	166	
Mulanggari	148	
Gungaderra	287	
Northern Hills, Ridges & Buffers	1,122	
Mulligan's Flat – Gorooyarroo	1,394	
Average	475	Patch Distribution
Standard Deviation	544	
Median	166	
Total	3,326	

The current Gungahlin nature reserves are dominated by the Mulligan's Flat and Gorooyarroo patch in terms of size. The next largest contiguous area is the Hills, Ridges and Buffers zone that characterises the north western boundary between NSW and the ACT. Despite the majority of reserves being relatively small, following Gibbons (2011)¹¹⁷ the size and configuration of the reserves is probably a secondary consideration to their ecological values.

The Plan

The Plan would result in increased patch sizes primarily for the Mulligan's Flat – Gorooyarroo Complex, and the Northern Hills, Ridges and Buffers / Kinlyside Complex. This would create a continuous area of habitat across the northern border of the ACT.

Table 7.2 - Proposed Nature Reserve Patch Size and Distribution

Patch (Nature Reserves)	Area (ha)	Metric
Percival Hill	79	Patch Size
Mulligan's Flat north	130	
Crace Grasslands	166	
Mulanggari	148	
Gungaderra	287	
Northern Hills, Ridges & Buffers / Kinlyside	1,545	
Mulligan's Flat – Gorooyarroo	1,695	
Kenny	154	Patch Distribution
Average	526	
Standard Deviation	679	
Median	160	
Total	4204	

¹¹⁷ Gibbons P (2011) *Potential biodiversity offset actions and sites for the Australian Capital Territory*, unpublished report for the ACT Office of the Commissioner for Sustainability and the Environment, Dr Philip Gibbons, The Fenner School of Environment and Society, The Australian National University, Canberra (March 2011)

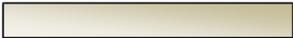
The overall effect of the Plan is an increase in the patch size for the Mulligan's Flat – Goorooyarroo Nature Reserves and also for the northern Hills, Ridges and Buffers area. All other reserves remain constant principally due to their position in the landscape and being effectively disconnected from adjoining areas that may be suitable for inclusion into the reserve network.

7.3.2 Patch Shape Complexity

This metric is discussed by McGarigal *et al.* (2002) as:

'Shape complexity relates to the geometry of patches – whether they tend to be simple and compact, or irregular and convoluted. Shape is an extremely difficult spatial attribute to capture in a metric because of the infinite number of possible patch shapes. Hence, shape metrics generally index overall shape complexity rather than attempt to assign a value to each unique shape. The most common measures of shape complexity are based on the relative amount of perimeter per unit area, usually indexed in terms of a perimeter-to-area ratio, or as a fractal dimension, and often standardized to a simple Euclidean shape (e.g., circle or square). The interpretation varies among the various shape metrics, but in general, higher values mean greater shape complexity or greater departure from simple Euclidean geometry'.

As a guide to interpretation of what Shape Index represents, the following list describes the scores that would be achieved for familiar shapes.

	A circle will return a Shape Index (SI) of 1
	A square (1w:1h) will return an SI of approximately 1.128
	A rectangle (2w:1h) will return an SI of approximately 1.197
	A rectangle (8w:1h) will return an SI of approximately 1.795

Shape Index has been calculated using the following formula:

$$SI = \frac{Perimeter(m)}{2\sqrt{\pi} \times Area(sq m)}$$

Territory Plan

By comparison to the above standard shapes the following table presents the shape index for each of the six existing nature reserve patches in Gungahlin, sorted by the most regular patch in terms of its geometry.

Table 7.3 - Nature Reserve Patch Shape Complexity

Patch (Nature Reserves)	Shape Index
Crace Grasslands	1.244
Percival Hill	1.266
Mulligan's Flat north	1.242
Mulanggari	1.324
Gungaderra	1.724
Mulligan's Flat – Gorooyarroo	2.265
Northern Hills, Ridges & Buffers	3.846

All of these Shape Index scores suggest the patches are approximately linear, at least in terms of the relationship of perimeter to area. As with size, complexity of the patch's shape is potentially a subordinate consideration to the ecological values (Gibbons, 2011) that are contained within it. Together with size however, the complexity of a patch's shape can influence the quality of the habitat and degree to which it is affected by external influences known as edge effects. This is considered in the next metric 'Core Area'.

The Plan

The Plan would reduce the shape index of the Mulligan's Flat – Gorooyarroo Complex and the Northern Hills, Ridges and Buffers / Kinlyside Complex.

Table 7.4 - Proposed Nature Reserve Patch Shape Complexity under the Plan

Patch (Nature Reserves)	Shape Index
Mulligan's Flat – Gorooyarroo	1.596
Northern Hills, Ridges & Buffers / Kinlyside	2.480
Kenny west	1.257

7.3.3 Core Area

This metric is discussed by McGarigal et al. (2002) as:

'Core area represents the interior area of patches after a user-specified edge buffer is eliminated ... Core area integrates patch size, shape, and edge effect distance into a single measure. All other things equal, smaller patches with greater shape complexity have less core area'.

For the purpose of this study Core Area was defined as the area of a patch that was more than 100 metres from the edge of a bushfire management asset protection zone or any edge, whether that be the ACT-NSW border, a road or an alternate land use policy under the Territory Plan. The edge area was defined as the extent of a patch within 100 metres of the edge of an actively managed area, inclusive of that managed area as well. The importance of this metric is in determining potential weak points in the overall connectivity and resilience of the reserve system.

Territory Plan

The following **Figure 7.1** illustrates the combined effects of shape and size on the basis of the assumptions described above. What is most evident is that while the Northern Hills, Ridges and Buffers area is the second largest contiguous patch, it has a very poor Edge:Core ratio that is the consequence of being a very irregular shape and also subject to

very prescriptive bushfire hazard management requirements. In this figure representing the current situation, green areas are the core habitat while the purple are the edge, further to this; the darker colours represent gazetted nature reserves while the lighter tones represent the Hills, Ridges and Buffers areas.

The following table describes the edge and core areas for each of the current nature reserve patches in Gungahlin as illustrated by **Figure 7.1**.

Table 7.5 - Nature Reserve Patch Edge and Core Areas (current)

Patch (Nature Reserves)	Edge Area	Core Area	Edge : Core
Crace Grasslands	95	71	1.3 : 1
Percival Hill	62	17	3.6 : 1
Mulanggari	91	58	1.6 : 1
Mulligan's Flat north	68	62	1.1 : 1
Gungaderra	175	111	1.6 : 1
Mulligan's Flat – Gorooyarroo	451	944	0.5 : 1
Northern Hills, Ridges & Buffers	695	427	1.6 : 1

The Plan

The Plan would greatly reduce the edge: core ratio of the Mulligan's Flat – Gorooyarroo Complex and the Northern Hills, Ridges and Buffers / Kinlyside Complex, as shown in **Figure 7.2**.

Table 7.6 - Proposed Nature Reserve Patch Edge and Core Areas

Patch (Nature Reserves)	Edge Area	Core Area	Edge : Core
Mulligan's Flat – Gorooyarroo	308	1,387	0.2 : 1
Northern Hills, Ridges & Buffers	494	1,016	0.5 : 1
Kenny west	90	65	1.38:1

The avoidance areas proposed in the eastern part of Gungahlin directly adjoin the existing Mulligan's Flat and Gorooyarroo Nature Reserves and hence the logical conclusion is that incorporation into the reserve system would result in myriad benefits not only for conservation purposes but also for land management. For example it would be expected that management costs on a per hectare basis would reduce over time as community resilience improves, but also from the outset that there is substantially less perimeter that needs to be fenced. The benefits from a conservation management perspective are illustrated in **Figure 7.2** as a result of the improvements to habitat connectivity and the ratio of Edge to Core habitat.

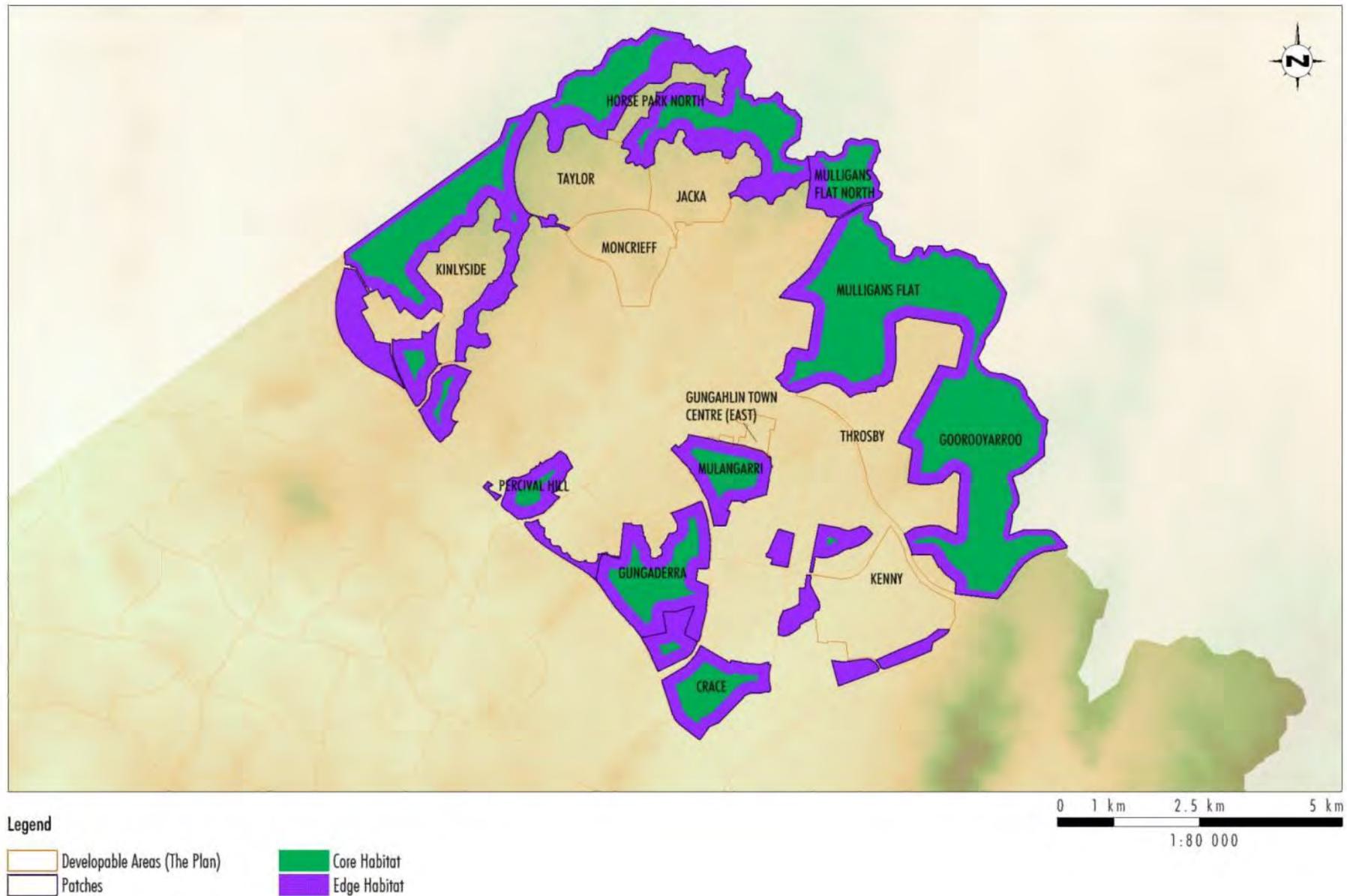


Figure 7.2 - Indicative Edge: Core Habitat Comparison under the current Territory Plan

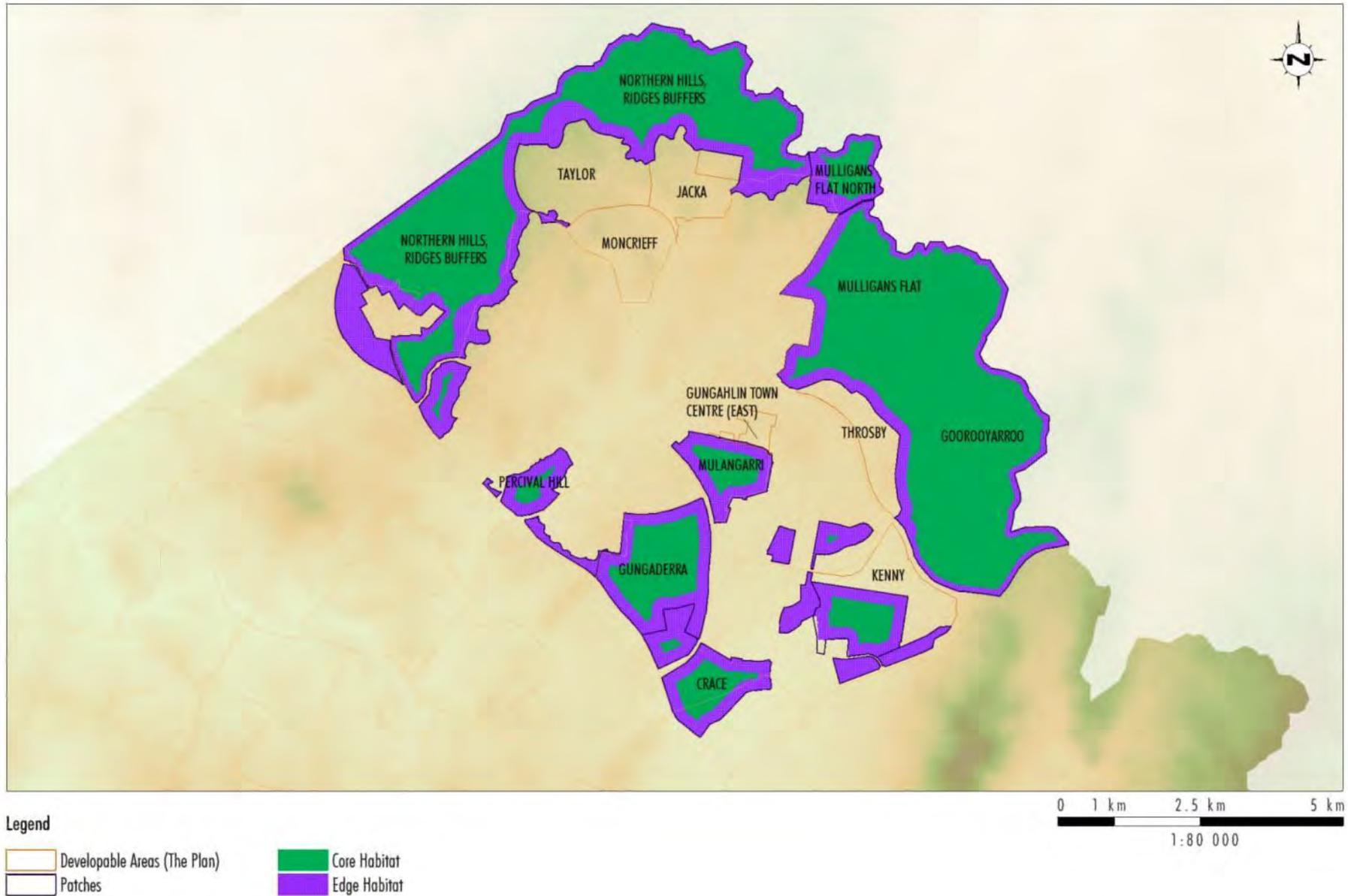


Figure 7.3 - Effect on Edge : Core habitat from The Plan

7.3.4 Isolation/Proximity

This metric is discussed by McGarigal et al. (2002) as:

'Isolation/proximity refers to the tendency for patches to be relatively isolated in space (i.e., distant) from other patches of the same or similar (ecologically friendly) class. Because the notion of 'isolation' is vague, there are many possible measures depending on how distance is defined and how patches of the same class and those of other classes are treated'.

While McGarigal *et al.* (2002) provide means to calculate this metric, in the current assessment it would be largely uninformative given the small area and generally linear design for conservation reserves in the Gungahlin area. This metric is best illustrated through maps and explained in relation to other studies and opportunities that might be represented by apparent weaknesses in the interconnecting habitat networks. Should the option to pursue opportunities for land offsets outside the ACT be a consideration in the future, an appreciation for the relative isolation of the selected site(s) would be necessary.

The effects of isolation are considered further under the landscape metric for connectivity.

7.3.5 Contrast

This metric is discussed by McGarigal et al. (2002) as:

'Contrast refers to the relative difference among patch types. For example, mature forest next to younger forest might have a lower-contrast edge than mature forest adjacent to open field, depending on how the notion of contrast is defined'.

Contrast is determined on the basis of land use policy under the Territory Plan. This captures not only the contrast in extant features but also an indication of the land management regime. The following figures have been prepared to illustrate contrast in terms of both generic habitat/land use in addition the extent of shared boundary between the ACT and NSW.

Perimeter is considered in one of the previously discussed landscape metrics under shape complexity in **Section 7.3.2**. What separates this metric is the nature of the adjoining land use and subsequently the degree to which it is compatible with biodiversity conservation objective. This metric is also a consideration as to what the ecological values of a patch may be in the long term. Edge effects from adjoining land according to the scale and intensity of its uses could result in relatively proximate patches being functionally isolated due to land uses that affect the ability for certain taxa to disperse into or from the habitat patches.

While the entire length of the NSW-ACT border in Gungahlin is of a rural nature where either 'grassland' or 'forest' adjoins the defined patches, the Yass Valley Local Environment Plan (LEP) identifies this as rural and accordingly it is subject to rural land management practices. The only exception is the small area of nature reserve in NSW adjoining Mulligan's Flat Nature Reserve. **Figure 7.3** depicts this and other contrast categories selected for this study for current reserve areas in Gungahlin.

What is illustrated in the following figures, is the reduction in length of the urban edge meeting Mulligan's Flat / Goorooyarroo in the scenario of the Plan.

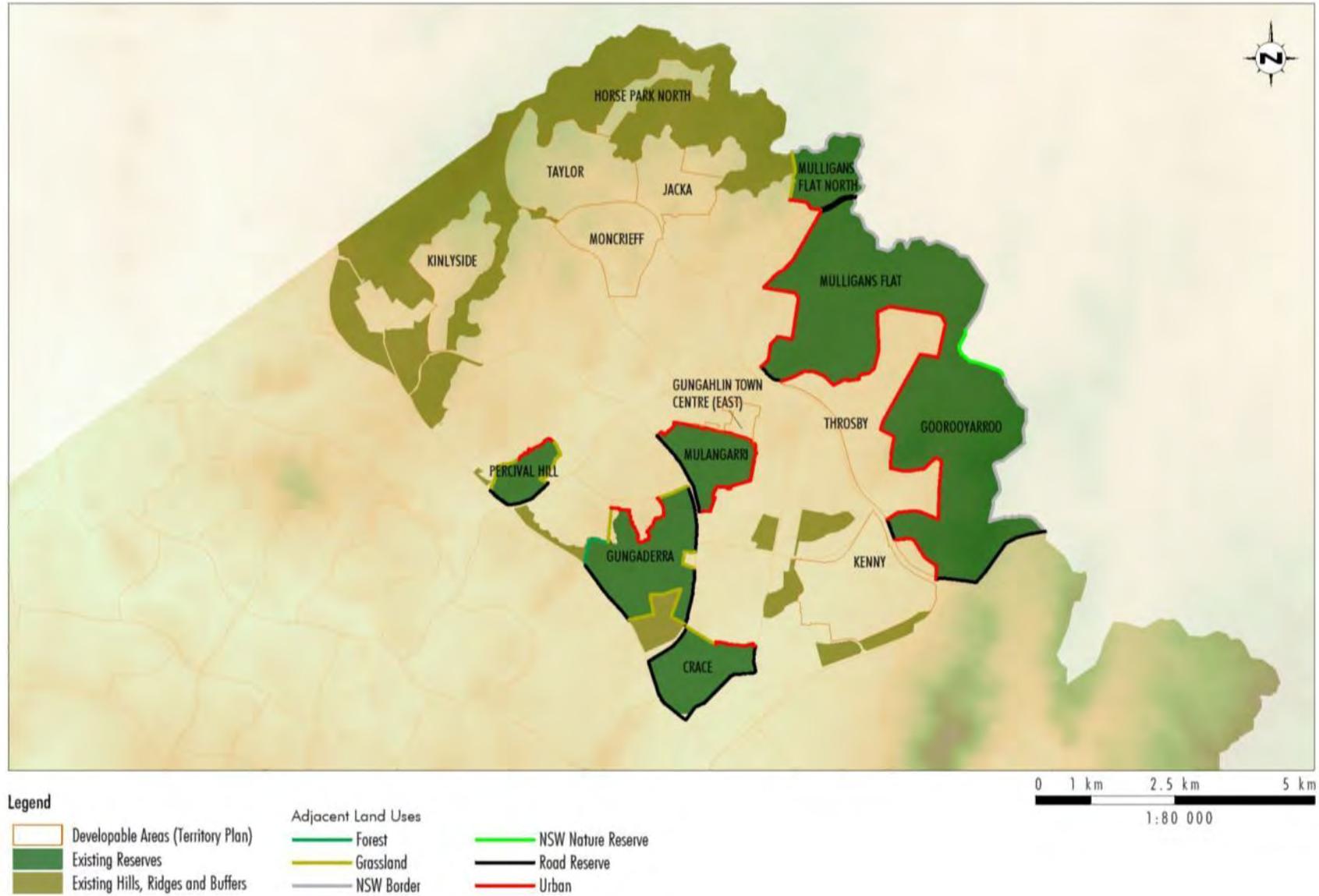


Figure 7.4 - Land Use Contrast with Nature Reserves in Gungahlin

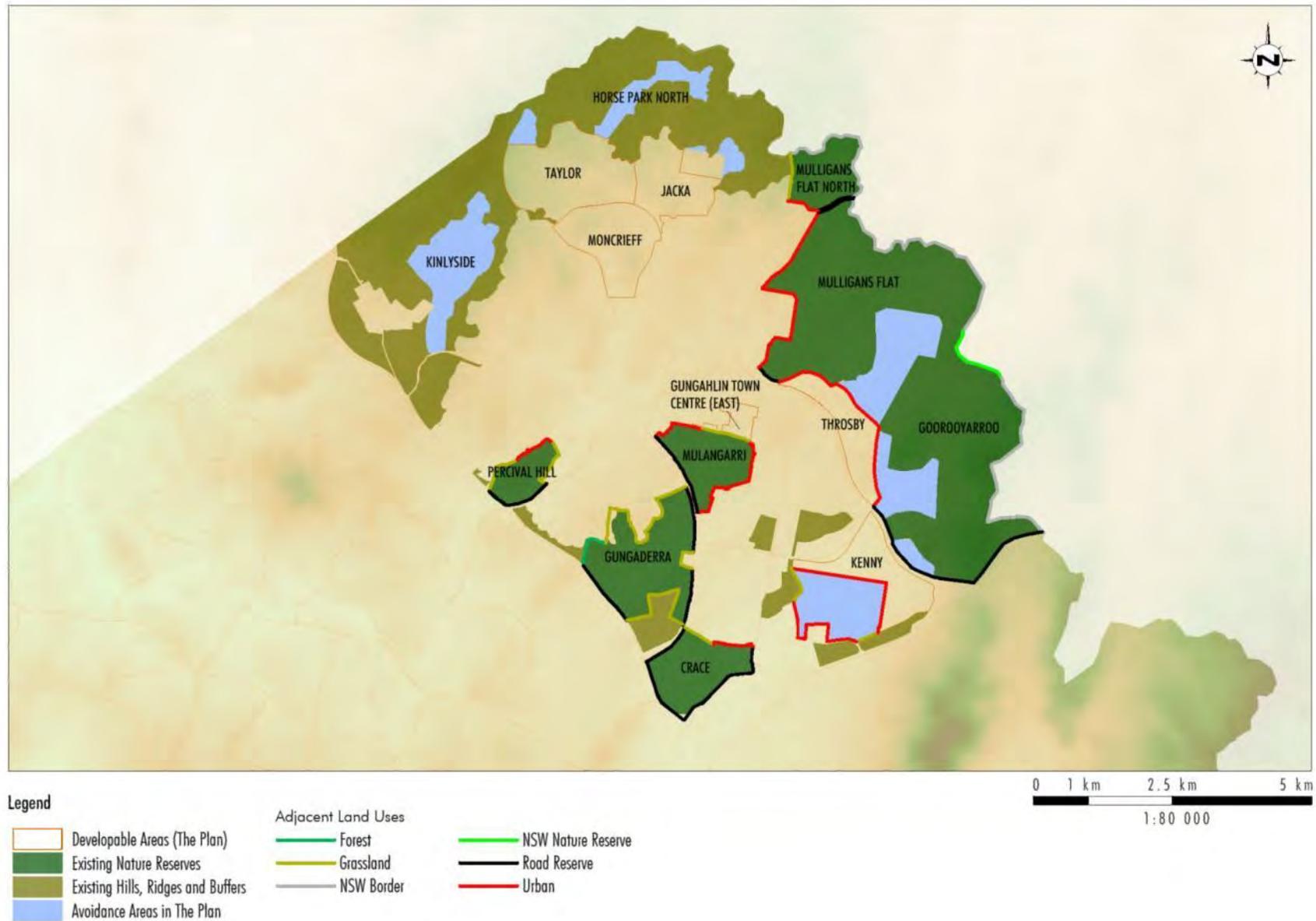


Figure 7.5 - Proposed Land Use Contrast with Nature Reserves in Gungahlin

7.3.6 Connectivity

This metric is discussed by McGarigal et al. (2002) as:

‘Connectivity generally refers to the functional connections among patches. What constitutes a ‘functional connection’ between patches clearly depends on the application or process of interest; patches that are connected for bird dispersal might not be connected for salamanders, seed dispersal, fire spread, or hydrologic flow’.

As discussed in relation to the isolation/proximity metric, calculation of a connectivity metric for this project is unlikely to be informative as a result of the scale and available data. It also represents an opportunity for further refinement of the work of others (e.g. Manning *et al.* 2010) to the species level such that the level of connectedness within the landscape can be determined for species as diverse as golden sun moth, Canberra raspy cricket, striped legless lizard and superb parrot. Reconsideration of landscape connectivity would be appropriate as a means to assess the potential benefits from habitat restoration projects that were not associated with existing remnant native vegetation already considered as providing important landscape functionality.

To illustrate the relative connectivity and in turn highlight areas of landscape significance from the perspective of ecological processes, **Figure 7.5** represents habitat connectivity through the ACT for small woodland birds (Manning *et al.* 2010, in ACT Gov’t, 2011a). This analysis was conducted using a least-cost method that seeks to connect remnants that comply to a set of pre-defined criteria depending on the taxa being considered. In the case of woodland birds, this includes a maximum distance between patches of vegetation with certain characteristics that are consistent with their habitat requirements.

What is immediately apparent (for this fauna group) is the importance of connections through the ‘neck’ of Throsby and through the northern parts of the ACT that are zoned as Hills, Ridges and Buffers. This includes the firewood plantation around Horse Park North, Kinlyside and parts of the northern sections of Jacka and Taylor. There is also a more tenuous link identified through the Gungahlin town centre that connects Mulligan’s Flat to Mulanggari and Gungaderra Nature Reserves. This analysis, if conducted for other species with different habitat requirements would result in linkages of different values occurring in different places according to the species’ habitat requirements and dispersal ability.

Recent work undertaken for the ACT Gov’t (Barrett & Love, 2012)¹¹⁸ that further develops the work illustrated in **Figure 7.5** also supports these conclusions.

¹¹⁸ Barrett, T and Love, J (2012) *DRAFT Fine Scale Modelling Of Fauna Habitat And Connectivity Values In The ACT Region*, Unpublished report by NSW Office of Environment and Heritage, prepared for Conservation Planning and Research, ACT Government, Canberra (August, 2012)



Figure 7.6 - Link value (red gradient), between key habitat areas and neighbourhood connectivity (green gradient) model for small woodland bird species
 Source: Adapted from Map 1 in ACT Gov't (2011a)

7.3.7 Summary of Strategic Benefits

A summary of selected landscape metrics is presented in **Table 7.7**. As with the previous sections, the table is focussed on the Mulligan's Flat – Gorooyarroo Complex, and the Northern Hills, Ridges and Buffers / Kinlyside Complex.

Table 7.7 - Summary of changes in metrics

Patch	Area	Shape index	Edge Area	Core Area	Edge : Core
Mulligan's Flat – Gorooyarroo	+22%	-30%	-32%	+47%	+118%
Northern Hills, Ridges & Buffers	+38%	-35%	-29%	+138%	+233%

For both patches listed in **Table 7.7**, it can be seen that with a relatively modest increase in area, all metrics respond indicating an improvement well in excess of the apparent benefit derived simply from the area alone. In both instances, the reduction in shape complexity and areas affected by edges, results in substantial gains in the landscape context for these patches. This summarises the strategic benefit of incorporating the identified land into the conservation network in Gungahlin and results in an enhanced opportunity to address threatening processes through management actions.

It also would have the result of strengthening regional connectivity such as that identified by Manning *et al.* (2010). This is an outcome that would not necessarily be realised if a policy were to be followed that resulted in the investment in direct land offsets outside of the ACT and is a justification criteria proposed by Gibbons (2011) which in part support implementation of the *Biodiversity Plan*.

The strategic benefits as detailed above will benefit the key MNES; golden sun moth, striped legless lizard, box gum woodland, and superb parrot; by avoiding and protecting key areas of high quality, well connected habitat; increasing the size of reserves, thereby reducing edge impacts such as weed invasion; and improving the overall function of reserves which will result in more efficient and effective management of values within.

7.4 Consistency with Current Offsets Policy

The Commonwealth's recently released Environmental Offsets Policy¹¹⁹ outlines the Australian Government's approach to the use of environmental offsets under the EPBC Act. The policy is accompanied by the *Offsets Assessment Guide*, which utilises a balance sheet approach to measure impacts and offsets.

The policy applies to both project-by-project assessments and approvals under Parts 8 and 9 of the EPBC Act and to strategic assessments under Part 10 of the EPBC Act. However, "strategic assessments may consider alternative metrics other than the *Offset Assessment Guide* provided the principles of the policy are met".

The principles of the policy are as follows:

¹¹⁹ Australian Government (2012g) *Environment Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy*, Department of Sustainability, Environment, Water, Population and Communities (October 2012)

1. *deliver an overall conservation outcome that improves or maintains the viability of the aspect of the environment that is protected by national environment law and affected by the proposed action*

Dedication of an additional 781 hectares of supporting numerous MNES to protected areas, and funding on-ground management and improvements would deliver an overall positive conservation outcome.

2. *be built around direct offsets but may include other compensatory measures*

The Plan is built around avoidance, which is the first level in the hierarchy of mitigation, and is a preferable outcome to offsetting. The avoidance measures will be supported by direct financial offsets which will result in positive outcomes for MNES.

3. *be in proportion to the level of statutory protection that applies to the protected matter*

The performance of the package proposed by the Plan has been considered against the 'guide to the use of offsets under the EPBC Act' which determines the appropriateness of an offset or avoidance action against the species' annual probability of extinction (based on IUCN category definitions) (**Section 7.5**).

The critically endangered box gum woodland and golden sun moth were assessed using a 6.8% annual probability of extinction. Conservation outcomes for these MNES are significant, protecting substantial areas of additional land to ensure long term viability, and increased quality and connectivity of remaining habitat.

The vulnerable striped legless lizard was assessed using a 0.2% annual probability of extinction. Conservation outcomes for striped legless lizard are substantial, with a fourth reserve being established in Gungahlin to preserve a previously unprotected population to ensure viability of the species in the region in the long term.

Use of the guide confirmed that avoidance and offset measures proposed for the key MNES were proportionate to the level of statutory protection that applied to them.

This Assessment Report considers the level of protection of each MNES impacted by the Plan and considers that the proposed avoidance strategy and offset measures are appropriate.

4. *be of a size and scale proportionate to the residual impacts on the protected matter*

The performance of the package proposed by the Plan has been considered against the 'guide to the use of offsets under the EPBC Act' which determines the appropriateness of an offset or avoidance action against an impacted MNES (**Section 7.5**). While this was not the primary methodology for determining the strategy, it confirmed that the package was proportionate to the impacts proposed:

- The Plan would directly offset 153% of the impact for box gum woodland, well exceeding the 90% target.
- The Plan would offset 51% of the impact for golden sun moth.
- The Plan would offset >500% of the impact for striped legless lizard, well exceeding the 90% target.

The Plan would result in conservation gains for key MNES; golden sun moth, striped legless lizard, box gum woodland, and superb parrot; by avoiding and protecting key

areas of high quality, well connected habitat; increasing the size of reserves, thereby reducing edge impacts such as weed invasion; and improving the overall function of reserves which will result in more efficient and effective management of values within.

It is considered that the avoidance strategy and proposed offset measures are of a size and scale proportionate to the residual impacts on the affected MNES.

5. *effectively account for and manage the risks of the offset not succeeding*

The monitoring and reporting structure proposed for the Plan is in place to manage the risks of the offset not succeeding. The adaptive management framework as detailed in **Section 6** of the *Biodiversity Plan* will be in place to deal with uncertainty in the management of the Plan.

6. *be additional to what is already required, determined by law or planning regulations or agreed to under other schemes or programs*

All financial contributions to habitat improvement and management will be above what is required by the statutory duty of care of the ACT Government. In addition, subsequent to finalisation of the 1989 EIS under the now repealed EPIP Act, the detailed design of Gungahlin has resulted in the dedication of extensive areas of ecological value to nature reserve. As the process was completed for assessment of development for Gungahlin in accordance with the 1989 EIS, it is considered that the creation of additional reservation of areas is beyond the statutory obligations of the ACT Government. The Plan proposes further reductions in the overall development footprint with the creation of new nature reserves in Kinlyside and Kenny, expansion of the Mulligan's Flat / Goorooyarroo nature reserve complex and avoidance of other land with ecological values in the Hills, Ridges and Buffers zone. Together with the proposed direct and indirect offset actions, these are additional to any existing requirement.

7. *be efficient, effective, timely, transparent, scientifically robust and reasonable*

The Plan would be delivered in a timely manner. Transfer of land into the reserve system would occur prior to commencement of development in adjacent suburbs. The establishment of the PIT would help to ensure management, monitoring and reporting were transparent, robust and reasonable.

The notional delivery timeframe for creation of new reserves would be as follows in **Table 7.8**.

Table 7.8 - Timeframe for delivery of additional reserves

Action	Timeframe
Variation to the Territory Plan and amendment to the National Capital Plan for all proposed land use changes.	Commence variation prior to commencement of construction of any new urban areas.
Creation of new nature reserves in Kinlyside, Goorooyarroo and Mulligan's Flat	Upon completion of variation to Territory Plan
Creation of nature reserve in Kenny	Prior to commencement of construction in Kenny
Commence management of a nature reserve in Kenny (160 hectares).	Prior to commencement of construction in Kenny
Commence management of a nature reserve in Kinlyside (201 hectares)	Within 2 years of Plan endorsement
Commence management of additional 300 hectares to the	Prior to commencement of

Action	Timeframe
Mulligan's Flat – Goorooyaroo nature reserve complex.	construction in Throsby
Commence management of additional 120 hectares to the north-western Hills, Ridges and buffers zone from the urban areas of Taylor and Jacka in addition to the entire area of the north Horse Park broadacre area.	Prior to commencement of construction in Taylor

Further details on commitments are presented in **Section 5** and **6** of the Biodiversity Plan.

8. *have transparent governance arrangements including being able to be readily measured, monitored, audited and enforced.*

As with the majority of land in the ACT, the proposed avoidance areas are already under the management of the ACT Government. The governance of the land would not be changed, however the management responsibilities of the land would be transferred from the proponent to the PIT, which would be funded as a component of the Plan. This team will have responsibility for undertaking monitoring and reporting, and will ensure a transparent governance of the Offsets.

Statutory management plans would be developed for the avoidance areas, or existing management plans will be amended to incorporate additional areas. An adaptive approach will be taken to monitoring and management, whereby if the desired result is not being achieved and is identified during monitoring, alternative approaches to management aimed at achieving the desired result would be triggered.

Evaluation and monitoring of the Plan are detailed in **Section 6** of the *Biodiversity Plan*.

The actions described in the Plan have been tested against the current policy for the use of offsets under the EPBC Act and have been found to be generally consistent. Where there is a discrepancy, the broader, strategic benefits of the Plan have been discussed in terms of metrics appropriate to landscape scale biodiversity conservation. The Plan also considers previous conservation areas that have been implemented in Gungahlin since commencement of the EPBC Act. Despite this limited timeframe, the ACT Government has been involved in proactive environmental management and through the continual review of environmental conditions and has been delivering improved environmental outcomes for Gungahlin since early 1994 with creation of Mulligan's Flat Nature Reserve and others subsequently. Most recently, the ACT Government in partnership with tertiary institutions has undertaken further investment in ecosystem restoration with the construction of the Mulligan's Flat Woodland Sanctuary in 2008 and re-introduction of 43 brown treecreepers (*Climacteris picumnus*) in 2009 and eastern (syn. Tasmanian) bettong (*Bettongia gaimardi*) into the sanctuary in 2012.

7.5 Consistency with Offsets Assessment Guide

The performance of the package proposed by the Plan was also considered against the 'guide to the use of offsets under the EPBC Act' which accompanies the Australian Government's offset policy (Australian Gov't, 2012g). Information used as the basis for this assessment was sourced from Mulvaney (2012) and the ACT Government's online mapping application 'ACTMAPi' (ACT Gov't, 2012d).

The guide to the offset policy relies on a range of values in order to determine the magnitude of an impact and the corresponding offset required to compensate. One value in particular, 'quality' as it relates to habitat requires consideration of a number of factors including site condition and context as determined by an understanding of the key ecological attributes

associated with a MNES. The following discussion summarises the factors that were considered in arriving at values representing habitat quality.

Section 7.3 detailed a series of landscape metrics which were adopted to consider the relative value of the proposed package from a landscape ecology and conservation reserve planning perspective. While each of these metrics independently communicates an aspect of the landscape context of each habitat patch, when combined a more comprehensive understanding is possible. Each of the metrics result in a range of values that are not immediately comparable and so in order to allow for consideration in the guide, all values were normalised, averaged and combined in order to arrive at a quality score out of 10. For example, site context for box gum woodland was calculated on the basis:

- **Area:** a normalised score based on habitat patch size range such that the smallest patch received a score of 1 while the largest received a score of 10.
- **Vegetation Condition:** a relative score based on an understanding that the Mulligan's Flat and Gorooyarroo nature reserves support some of the largest and best quality areas of this community in the country. Vegetation mapped by ACTMAPi as high quality received a score of 9, while vegetation mapped as low quality, but still consistent with the definition of the community received a score of 1.
- **Isolation / Proximity:** a relative score based on the distance between patches. This score was assigned qualitatively.
- **Contrast:** a relative score based on the nature of adjacent land uses.

A similar set of criteria was used to consider habitat quality for golden sun moth and striped legless lizard, however in the case of these species, the calculation also considered species stocking rate where an indication of that was able to be estimated from the available data. In the case of both golden sun moth and box gum woodland, all values across the Gungahlin district were averaged in order to assess the relative performance of the package in a single scenario. This approach was taken after initially assessing both MNES at a higher level of detail which divided the assessment by habitat quality groupings. This earlier calculation was disregarded after perversities in the calculations were identified that affected the reliability of the answers. Perversities arose due to the focus of the guide being on assessment of impacts to MNES on a case by case basis as opposed to the broader scale as considered in a strategic assessment.

To account for the averaging and to ensure values were not unduly influenced by individual patches where this was not warranted, the averaging process also allowed for a weighting. The calculation used the mapping polygons described by Mulvaney (2012) in addition to the patches as defined in **Section 7.3**¹²⁰. This definition allows for the aggregation of many polygons that together are functionally part of the same area of habitat despite likely differences in quality between polygons. It also recognises that non-MNES habitat which is contiguous also supports community resilience, biodiversity and connectivity. The weighting considered the amount to which each polygon contributes to overall value of the patch within which it occurs with respect to the MNES being assessed.

¹²⁰ From **Section 7.3.1** of the Assessment report: 'The definition of a patch in this instance is taken to represent discrete areas of native vegetation or habitat for an MNES, principally as defined by the Territory Plan. Consequently a patch could contain the habitat of golden sun moth (grassland), superb parrot (woodland and grassland) and box-gum woodland endangered ecological community provided these all occurred within a contiguous area under the same land use policy in the Territory Plan'.

8.0 Terms of Reference and Endorsement Criteria

8.1 Consistency of SAR with Terms of Reference

This section outlines how the *Assessment Report* and *Biodiversity Plan* address the Terms of Reference and Endorsement Criteria.

8.1.1 Terms of Reference

The Terms of Reference (ToR) establish the scope for the strategic assessment (refer to **Appendix 1**). They form part of the Strategic Assessment Agreement between the ACT and Commonwealth Governments. **Table 8.1** lists the ToR and relates them to the relevant sections within this report.

Table 8.1 - Summary of proposed avoidance and direct offsets and known values

AR = Assessment Report (this report); BP = Biodiversity Plan

Terms of Reference	Report and Section(s)	
	AR	BP
1 Purpose and Description The Plan must describe:		
The geographic extent and description of the area to which the Plan applies, including tenures, identification of current protected lands and the location of developable and non-developable land.	2	2 & 3
The Territory context (environmental, social and economic) in which the Plan operates.	2	2 & 3
Component legislation, plans, statutes, planning instruments and policies that underpin the Plan and its implementation.	2	3
Specific outcomes and commitments to protect matters of national environmental significance (MNES) listed under the EPBC Act, as well as any additional threatened ecological communities and species protected under the ACT Nature Conservation Act 1980 ¹²¹ .	5 & 6	5 & 6
Key studies and investigations that have informed the Plan and Strategic Assessment Report.	5	2
Description and justification for methodologies used to identify and prioritise desirable conservation outcomes for the area to which the Plan applies.	7	4 & 5
Mechanisms, including avoidance, mitigation and offset arrangements, to achieve the identified conservation outcomes.	5	3
Identification of the relevant authorities responsible for implementation of the Plan, particularly in relation to conservation commitments, adaptive management approaches, monitoring, auditing, reporting and compliance arrangements.		4, 5 & 6

¹²¹ For the purposes of these ToR, a reference to MNES should be read as also including ACT-listed threatened ecological communities and species to which the strategic assessment also applies.

Table 8.1 (cont.) - Summary of proposed avoidance and direct offsets and known values

AR = Assessment Report (this report); BP = Biodiversity Plan

Terms of Reference	Report and Section(s)	
	AR	BP
Matters of National Environmental Significance (MNES)		
2.1 Identification of affected MNES		
The Strategic Assessment Report must describe MNES likely to be impacted by actions envisaged in the Plan. The following matters must be addressed:		
Listed threatened species and communities (sections 18 and 18A); Listed migratory species (sections 20 and 20A); and The environment on Commonwealth land (sections 26 and 27A).	4 & 5	4
The Strategic Assessment Report must describe the MNES within the geographic extent of the Plan. This includes the MNES likely to be directly or indirectly impacted. The assessment must:		
Describe the current condition of MNES, and past and projected trends and existing threats;	4 & 5	4
Identify those aspects of the environment, including landscape-scale ecosystem functions and connectivity corridors, considered critical to the continued presence and functioning of MNES identified as potentially at risk;		
Describe the methodology for identifying MNES and supporting landscape ecosystem functions and connectivity, and for identifying priority areas for conservation, together with an analysis of the strengths, limitations and expected effectiveness of methodologies used; and		
Identify any key information gaps, further studies needed and any proposals to address critical information needs.		
2.2 Identification and Analysis of Potential Impacts		
The Strategic Assessment Report must identify and analyse the likely direct and indirect impacts of development on biodiversity and MNES within the strategic assessment area, and against the desired conservation outcomes identified in the Plan. The report should include analysis of the:		
Nature of potential development and description of the types of impacts considered, including cumulative impacts;	5	4
Potential impacts on MNES and those aspects of the environment considered critical to the continued presence and functioning of MNES;		
Sensitivity analysis of different development scenarios on achieving the desired conservation outcomes identified in the Plan; and		
Consideration of climate change and other long term influences on MNES and supporting landscape ecosystems in assessing likely risks and impacts to biodiversity from development.		

Table 8.1 (cont.) - Summary of proposed avoidance and direct offsets and known values

AR = Assessment Report (this report); BP = Biodiversity Plan

Terms of Reference	Report and Section(s)	
	AR	BP
<p>2.3 Measures to Avoid, Mitigate, Offset and Adaptively Manage Impacts</p> <p>The Plan and Strategic Assessment Report must identify specific measures that have been, or will be, implemented to avoid, mitigate and offset impacts on MNES, including:</p>		
Measures to identify and avoid areas of high conservation or biodiversity value;	5	4 & 5
Requirements for mitigation of impacts where direct or indirect impacts are expected or likely;		
Offset mechanisms and approaches to be applied where clearing of native vegetation is proposed within development area, and to direct offsets to priority conservation areas identified in the Plan; and		
The agencies responsible for undertaking the proposed measures.		
The Strategic Assessment Report must include an analysis of the likely effectiveness of the Plan in protecting MNES and in achieving good conservation outcomes at the regional landscape scale, including associated regulatory and policy arrangements to implement commitments.		
<p>3 Promoting Ecologically Sustainable Development</p> <p>The Strategic Assessment Report must describe how the principles of ecologically sustainable development (section 3A of the EPBC Act) have been applied in developing the Plan and how these will be implemented.</p>	3 & 8	3
<p>4 Adaptive Management: Addressing Uncertainty and Managing Risk</p> <p>The Plan and Strategic Assessment Report must identify key adaptive management measures addressing uncertainties and inherent risks. Uncertainties could, for example, include knowledge gaps in scientific understanding and the timing, effectiveness, or capacity to implement, maintain, operate and enforce management measures.</p> <p>The Plan must describe how the adaptive management strategies will be implemented to ensure MNES are effectively protected over the life of The Plan. This includes:</p>		
How monitoring of MNES will occur, including monitoring of progress in achieving the desired conservation outcomes identified in The Plan, how the monitoring will be analysed throughout the life of The Plan and how the results of the monitoring will influence the Plan; and	8	5, 6, 7 & 8
How new information relating to MNES or the Plan is to be assessed and accounted for in management of the area affected by the Plan.		
<p>5 Auditing and Reporting</p> <p>The Plan must set out:</p>		
Monitoring, public reporting and independent or third party auditing to be undertaken;	8	8
A process that will incorporate these findings into ongoing management;		
Who is responsible for overseeing and taking these actions; and		
Record keeping and review processes under the Plan.		

Table 8.1 (cont.) - Summary of proposed avoidance and direct offsets and known values

AR = Assessment Report (this report); BP = Biodiversity Plan

Terms of Reference	Report and Section(s)	
	AR	BP
6 Review, Modification or Abandonment The Plan must identify and analyse the likely circumstances and procedures that may result in the review, modification or abandonment of the Plan. This is to include a discussion of how any commitments under the Plan will continue to be met.	8	8
7 Endorsement Criteria In determining whether or not to endorse the Plan, the Minister will have regard to the extent to which the Plan meets the objectives of the EPBC Act including how the Plan:		
protects the environment, especially MNES;	8	Entire Plan
promotes ecologically sustainable development;		
promotes the conservation of biodiversity;		
promotes a cooperative approach to the protection and management of biodiversity and MNES; and		
assists in the co-operative implementation of Australia's international environmental responsibilities.		
Commitments for the protection and management of MNES must be enforceable and achievable over the life of the Plan. The Plan must demonstrate an effective system of adaptive management that addresses uncertainty and contingency management as well as procedures for monitoring, auditing and public reporting on implementation.		
8 Information Sources For information and data used in the assessment, the Strategic Assessment Report must state:		
The source and currency (date) of the information; and	5 & 9	9
The reliability and limitations of the information.		

8.2 Consistency of the Plan with the Endorsement Criteria

This section of the report provides information on the how the Plan meets the relevant objectives of the EPBC Act. Each objective is addressed with reference to information provided in the Plan.

8.2.1 Protection of the Environment and MNES

The Plan seeks to protect the existing environmental attributes of the Gungahlin area and relevant MNES identified in this report by proposing a detailed strategy designed to lead to significant improvements to the ACT Nature Reserve system both in terms of total land area and also configuration, viability and connectivity. This will be achieved through:

- creation of direct land offsets to ameliorate potential impacts on MNES identified in this report;
- placing an additional 781 hectares of land supporting Commonwealth listed threatened species and ecological communities into protected areas, of which 657 hectares will be incorporated into formal nature reserves;
- significantly enhancing the viability and functional importance of the Mulligan's Flat/Goorooyarroo Nature Reserve complex, which already forms a continuous woodland

reserve of approximately 1400 hectares and is already the largest box gum woodland reserve in Australia;

8.2.2 Promotion of Ecologically Sustainable Development

The Plan proposes a significant amendment to the Territory Plan that would result in a revision to the total area of future urban development in Gungahlin such that:

- Kinlyside would be not developed;
- the Horse Park north broadacre land would not be developed;
- the Kenny broadacre area would not be developed;
- development potential in Taylor would be reduced by 7%;
- development potential in Jacka would be reduced by 16%;
- development potential in Throsby would be reduced by 68%;
- development potential in Kenny would be reduced by 48%; and
- development in Moncrieff would avoid areas of high quality woodland.

It provides a balance between conservation and development outcomes for the area that are consistent with guiding principles of ecologically sustainable development. A summary is provided below.

The precautionary principle – namely, that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.

The adoption of a precautionary principle has been a hallmark of this project, evidenced by the reduction in developable area from that proposed in the Territory Plan, in addition to the creation of larger areas of offset lands as opposed to smaller fragmented pockets of habitat. The identification of the extent of developable land is underpinned by a comprehensive understanding of the bio-physical constraints of the Gungahlin area.

In the application of the precautionary principle, public and private decisions should be guided by:

i. Careful evaluation to avoid, whenever practicable, serious or irreversible damage to the environment;

There are no unmanageable 'risks' that have been identified in relation to the development area. Important fauna habitats have been preserved, comprehensive landscape embellishment of retained areas is further proposed and no irreversible damage to the environment is anticipated by proposed action in Gungahlin.

ii. An assessment of the risk-weighted consequences of various options;

There has been no necessity for any 'risk weighted' analysis of various options. The development option proposed in the Plan is low risk with respect to environmental impact.

Inter-generational equity – namely, that the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations;

The development option proposed in the Plan provides for the maintenance of key environmental assets including existing fauna habitats and vegetation communities. Those elements of the site will be preserved in perpetuity for future generations.

Conservation of biological diversity and ecological integrity—namely, that conservation of biological diversity and ecological integrity should be a fundamental consideration;

Conservation of the biological and ecological integrity of subject site has underpinned the entire decision making process to determine the most appropriate development outcome for Gungahlin. All important site vegetation and Commonwealth-listed threatened species habitat has been identified and key elements preserved by the proposed long-term conservation mechanisms.

Improved valuation, pricing and incentive mechanisms—namely, that environmental factors should be included in the valuation of assets and services, such as;

- i. Polluter pays—that is, those who generate pollution and waste should bear the cost of containment, avoidance or abatement.***

The proposed Plan will generate minimal pollution that will not adversely affect the surrounding environment.

- ii. The users of goods and services should pay prices based on the full life cycle of costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste.***

The proposed Plan respects this ESD goal. In particular, this issue is addressed through the recognition that an offset needs to result in a net improvement in biodiversity values over time and beyond what might otherwise be expected under the ACT Government's statutory obligations.

- iii. Environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structures, including market mechanisms that enable those best placed to maximise benefits or minimise costs to develop their own solutions and responses to environmental problems.***

The proposed Plan respects this ESD goal. In particular, this issue is addressed through the recognition that an offset needs to result in a net improvement in biodiversity values over time and beyond what might otherwise be expected under the ACT Government's statutory obligations.

The proposed Plan is therefore considered to be consistent with the above ESD considerations.

8.2.3 Promotion of Conservation of Biodiversity

As detailed above, this objective has underpinned the approach of the Plan and is demonstrated by the placing an additional 781 hectares of land supporting Commonwealth-listed threatened species and ecological communities into protected areas, of which 459

hectares will be incorporated into formal nature reserves. This approach will enable the long term conservation of biodiversity values, in particular the identified MNES.

8.2.4 Promotion of a cooperative approach to the protection and management of biodiversity and MNES

The conservation strategy proposed in the Plan draws on recent work commissioned by Land Development Agency (LDA), Conservation, Planning and Research (CPR), the Commissioner for the Environment and other ACT Government agencies both from the perspective of strategic land planning and environmental impact assessment.

Analyses undertaken for the strategy are based on the most up-to-date GIS information available at the time of preparation, and incorporate datasets gathered from consultant's reports, extensive data provided by CPR and woodland bird data provided by Canberra Ornithologists Group (COG). The strategy in turn has been reviewed and supported by a range of ACT Government stakeholders (including CPR, LDA, EED, ESDD and TaMS).

In addition, the proposed management structure of a PIT encourages collaboration with research institutions regarding the monitoring and management of the offset and reserve areas to facilitate an adaptive approach to the ongoing management of these areas. This collaborative approach would include:

- Management and enhancement of offset lands for the MNES affected by the planned development of Gungahlin;
- Improved knowledge for environment protection and biodiversity conservation in Gungahlin, but with potential regional applicability; and
- Enhancement of regional conservation values and connectivity.

8.2.5 Assists in the co-operative implementation of Australia's international environmental responsibilities

The assessment considers Australia's obligations with respect to international obligations under the Bonn Convention and JAMBA, CAMBA and ROKAMBA conventions in addition to the Ramsar Convention. It has been determined through this assessment that there is unlikely to be any significant impacts to matters listed under those agreements as a consequence of the proposed action in Gungahlin.

8.2.6 Enforceability of Commitments

The commitments made in the Plan regarding the protection and management of MNES will be achieved through development of a program of implementation. The program will be developed by the PIT and put into action following approval by SEWPaC. It will be developed within two (2) months of the Team's establishment and include a schedule for implementation of all of the commitments in the Plan.

8.2.7 Adaptive Management

Details regarding a system of adaptive management for the plan which addresses uncertainty and contingency management are provided in **Section 6** of the *Biodiversity Plan*. Information on procedures for auditing and public reporting on implementation is provided in **Section 8** of this report, while details of monitoring procedures are provided in **Section 6** of the *Biodiversity Plan*.

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