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Flora and Fauna Assessment

Proposed New Armidale Landfill Facility

Report Number 22678.31292

Prepared for

AECOM

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Document Status Record

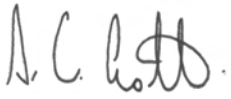
Report Type: Flora and Fauna Assessment

Project Title: Proposed New Armidale Landfill Facility

Client: AECOM

Project.Document Number: 22678.31292

File Name: 22678.31292.100211_AECOM_Armidale Landfill_Flora & Fauna Final Report_v7.2.doc

Issue No.	Date of Issue	Author	Checked	Approved
7	17th Feb 2010	Martin Dillon, Sally Egan, Stephen Debus, Lachlan Copeland, Elizabeth Broese, Lisa Doucette	Robert Cork Steve Debus	Simon Lott
Signatures				

Notes:

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This document provides information to address the intent of Project Number 22678 as agreed to by AECOM.

Executive Summary

E.A. Systems was engaged by AECOM on behalf of the Armidale Dumaresq Council to conduct a flora and fauna and habitat assessment over an area of approximately 315 ha for the proposed development of a new regional putrescible landfill facility to be located 12 km east of Armidale on Waterfall Way. This facility is expected to have an operational life of 50 years. The proposed landfill site will be developed on portions of two rural properties, *Sherraloy* and *Edington*, and a small strip of the adjacent *Gara Travelling Stock Reserve* (TSR) for site access. The development application for this proposal will be assessed under Part 3A – Major Projects of the Environmental Planning and Assessment Act (EP&A Act 1979). The format for this assessment is in accordance with the working draft Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities, November 2004 (Table A).

The aims of the flora and fauna assessment for the Armidale Regional Landfill proposal were to consider: i) the character and conservation value of existing flora and fauna which may be impacted either directly or indirectly by the proposal; ii) the significance of all potential impacts in the regional context; and iii) measures required to minimize impacts to natural and biological values on the proposed landfill site.

The significance of impacts of the proposed new landfill on threatened species, endangered populations or endangered ecological communities listed under the NSW *Threatened Species Conservation Act* 1995 (TSC Act) were assessed in accordance with guidelines set out in the *TSC Amendment Act 2002*. The assessment also considers the impact of the proposed development on matters of national environmental significance listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). An assessment of potential Koala habitat was undertaken to address the requirements for *State Environmental Planning Policy 44 - Koala Habitat Protection.*

Threatened species databases and information sources, such as the Department of Environment, Climate Change and Water (DECCW) Threatened Species Profiles, NSW NPWS Wildlife Atlas, Birds Australia records and the EPBC Protected Matters Search Tool, were reviewed to identify the listed threatened species, endangered populations, endangered ecological communities and key threatening processes relevant to the survey area. The habitat requirements for each of the species listed were considered during the survey and habitat assessment.

The flora and fauna survey and habitat assessment of the study area was conducted during autumn (29-30 March 2005) and spring (18-19 October 2005). An additional survey was undertaken on 18 September 2006 to assess the impacts of the proposed access route through the Gara TSR adjacent to Waterfall Way. A final fauna survey was conducted on 23-24 November 2009 to search for any signs of Koalas in the TSR or at the landfill site. The current location of the Little Eagle nest observed in 2005 was also targeted in November 2009, in addition to a search for five species of birds for which a final determination under the TSC Act is currently pending (2009).

The fauna surveys recorded 80 bird species (1 exotic; 2 threatened, 3 provisionally listed as vulnerable), 15 mammal species (4 exotic; 2 threatened), 9 lizard species, 1 turtle and 8 frog species. The flora surveys recorded 11 trees (1 threatened), 29 shrubs (3 exotic), 3 climbers/vines, 2 mistletoes, 35 grasses (7 exotic), 98 herbs (24 exotic) and 2 aquatic plants. Five distinct vegetation communities occur on land that will be directly impacted by the proposed development: Box Gum Woodland, cleared grassland; sedgeland (drainage areas); wetland (farm dams); and Stringybark Woodland.

A 200 m strip of the proposed access route passes through a partially cleared section of the endangered ecological community (EEC) Box Gum Woodland on the Gara TSR. The remainder of the access route (1 km) passes through the cleared grassland and sedgeland. The area required

for construction of infrastructure and retention ponds includes cleared grassland and sedgeland. The area required for the construction of the landfill operational area is predominantly within Stringybark Woodland and also includes a portion of cleared grassland and wetland (two small farm dams).

A number of potential impacts of the proposal on native flora and fauna have been identified. These include vegetation clearing, habitat loss, fire, fragmentation and reduced connectivity, weed invasion, pest animals, and consequences arising from traffic, dust, noise, pollution, litter and illegal dumping. The proposed development will result in the loss of 12.7 ha of Stringybark Woodland, 0.6 ha of Box Gum Woodland in the TSR, 6.5 ha of grassland, two small farm dams and 0.5 ha of sedgeland draining into the Gara River. Such disturbances reduce the habitat quality of the affected land and may threaten viable populations of threatened species found on the subject site.

No groundwater dependent ecosystems have been identified in the study area or in the Oxley Wild Rivers National Park downstream of the proposed new landfill (DNR 2002). Thus, the proposed new landfill is not likely to have any impacts on groundwater dependant ecosystems in the study area or further downstream in Oxley Wild Rivers National Park.

Proposed mitigation measures which address direct and indirect impacts on native flora and fauna are outlined in the report. These measures include traffic control, erosion and drainage control, plans for the management of weeds and pests, bushfire, landscaping and rehabilitation, groundwater and surface water quality and a number of other conservation management actions undertaken to enhance the biodiversity value of remnant native flora and fauna in the study area.

Five threatened species (Narrow-Leaved Black Peppermint *Eucalyptus nicholii*, Speckled Warbler *Pyrrholaemus sagittata*, Diamond Firetail Finch *Stagonopleura guttata*, Eastern Bent-Wing Bat *Miniopterus schreibersii oceanensis* and Koala *Phascolarctos cinereus*) were found on the study area. Two threatened species, Hooded Robin *Melanodryas cucullata cucullata* and Little Lorikeet (*Glossopsitta pusilla*), have previously been recorded adjacent to the study area. Three species for which preliminary determination exist and final determinations are pending under the TSC Act were recorded: Little Eagle *Hieraaetus morphnoides* (landfill), Scarlet Robin *Petroica boodang* (TSR & landfill), and Varied Sittella *Daphoenositta chrysoptera* (TSR & landfill). One Rare or Threatened Australian Plant (ROTAP) tree species, Bendemeer White Gum *E. elliptica* was recorded in the TSR. One EEC occurs on the Gara TSR: *White Box Yellow Box Blakely's Red Gum Woodland (Box Gum Woodland).*

The numbers of Narrow-Leaved Black Peppermint and Bendemeer White Gum on the site are small and confined to areas of the TSR that will not be directly impacted by the development. Foraging habitat for the Eastern Bent-Wing Bat occurs on the study area. This bat roosts in caves or man-made structures. However, there is currently no roosting habitat suitable for this species available on the site. Thus the proposed development will not have a significant impact on local populations of Narrow-Leaved Black Peppermint, Bendemeer White Gum and Eastern Bent-Wing Bat.

The location of the proposed access road through the TSR does not contain core Koala habitat. The location of the proposed landfill operational area does not contain core or potential Koala habitat. In March 2005, one Koala was recorded on the TSR, but was not observed in 2009. Evidence of Koala presence (scats and scratches) was recorded in the landfill footprint area in 2009, but the site is not primary habitat for Koalas.

It is concluded that the loss of habitat due to the proposed development will have a significant impact on local populations of two threatened woodland birds (Diamond Firetail Finch and Speckled Warbler) and two provisionally listed birds (Scarlet Robin and varied sittella) that have been observed on the proposed landfill footprint area. Habitat lost to development on the site will be offset by setting aside adjacent areas of similar vegetation type that are likely to respond to conservation measures which will permanently improve biodiversity values of the offset area (see Offset Management Plan). DECCW has stated that an offset ratio of 3:1 is

required. Therefore, the proposed development will include an area of 40 ha of Stringybark Woodland that will be set aside and managed for conservation to compensate for woodland lost to development. An offset of 21 ha of cleared grassland will be set aside for conservation and will be revegetated with locally sourced woodland tree and shrub species. The details of the Offset Management are presented in a separate report.

Stringent controls will be put in place to ensure that there is no discharge of contaminated waters to the surrounding environment. These controls will be in accordance with the NSW DECCW Environmental Guidelines for Solid Waste Landfills. Management plans will be implemented for on-site control of weeds and pests and to prevent their spread off-site. Rehabilitation, landscaping and vegetation management plans will also be put in place to maintain and enhance biodiversity values of the site and to minimise adverse impacts on threatened flora and fauna. Implementation of the proposed mitigation measures will minimise onsite and offsite impacts on threatened biodiversity and will prevent any significant impacts on the World Heritage listed Oxley Wild Rivers National Park (4 km downstream of the proposed new landfill).

In order to ensure effective implementation of the proposed mitigation measures it is recommended specific management plans be developed to address key potential impacts. The recommended management plans are listed below (issues dealt with in other sections of the Environment Assessment are marked with an*):

- Vegetation Clearing Protocol
- Native Fauna Management Plan
- Fire Management Plan
- Weed Management Plan
- Pest Management Plan
- Disease Monitoring Protocol
- Dust Management Plan*
- Noise Abatement Plan*
- Pollution and Litter Management Plan*

Table A. Format of the Flora and Fauna Assessment report following the guidelines set out in the DECCW draft survey and assessment guidelines (DEC, 2004)

Section	Content
Executive Summary	A brief description of the study and its findings.
Definitions	Explanation of technical terms used throughout the report, including acronyms and abbreviations.
1 Introduction	An outline of the the legislative requirements, aims and objectives; a description of the proposal; details: regional context; location, geology, soils, landforms, climate and disturbance history.
2. Methods	Details the desktop and field survey methods employed for the assessment: outlining the consultation process, data sources, the selection of stratification units, flora and fauna survey methods, habitat assessment, and data analysis methods.
3. Results	Summarises the findings of the study, including: baseline surveys of the site and targeted surveys to detect species, populations and ecological communities listed under the TSC Act and the EPBC Act, and describes the type and condition of habitats in and adjacent to the land to be affected by the proposal.
4. Impacts & Mitigation Measures	Assesses impacts of the proposal on flora and fauna and discusses measures to minimise impacts.
5. Habitat Assessment	Assesses the value of vegetation communities occurring on the site.
6. Threatened Species Evaluation	An evaluation of the likelihood of threatened species occurring on the site.
7. Offsets	An outline of agreed offsets and mitigation measures including proposed size of offset area, vegetation type, and management actions in offset areas.
8. Conclusion	Discusses the results, including a summary of the information collected, and an outline of agreed mitigation measures and compensatory habitat offsets.
9. References	Cites publications used in the report
10. Appendices **- Assessments of Significance** **- Survey Data** **- Desktop search results** **- Additional information**	Detailed information used in the report: - assesses whether the proposal is likely to have a significant effect on threatened biodiversity under the TSC and EPBC Act - field survey species lists; - NPWS Wildlife Atlas, Protected Matters Search Tool - Other information and guidelines referred to in the report.

Abbreviations

ADC	Armidale Dumaresq Council
CAMBA	China-Australia Migratory Bird Agreement
CE	Critically Endangered
CERRA	Central Eastern Rainforest Reserves
DEC	Department of Environment and Conservation (historic)
DECC	Department of Environment and Climate Change (historic)
DECCW	Department of Environment, Climate Change and Water (current)
DEH	Department of the Environment and Heritage (historic)
DEWHA	Department of the Environment, Heritage, Water and the Arts (current)
DNR	Department of Natural Resources (not current)
DWE	Department of Water and Energy (current)
DoP	Department of Planning
EA	Environmental Assessment
EEC	Endangered Ecological Community
EIS	Environmental Impact Statement
EP&A Act	*Environmental Planning and Assessment Act* 1979
EPBC Act	*Environment Protection and Biodiversity Conservation Act* 1999
EPBC 2000	*Environmental Protection and Biodiversity Conservation Regulations* 2000
GIS	Geographic Information System
GPS	Global Positioning System
IUCN	International Union for the Conservation of Nature
JAMBA	Japan-Australia Migratory Bird Agreement
LGA	Local Government Area
MNES	Matters of National Environmental Significance
NPWS	National Parks and Wildlife Service (now DECCW)
ROTAP	Rare or Threatened Australian Plant (after Briggs and Leigh 1996)
SEPP 44	State Environmental Planning Policy Number 44: Protection of Koala Habitat
SIS	Species Impact Statement
sp.	Species (singular)
spp.	Species (plural)
subsp.	subspecies
TSC Act	*Threatened Species Conservation Act* 1995
TSR	Travelling Stock Reserve
var.	variety

Definitions

Abundance – means a quantification of the population of the species or community.

Activity - has the same meaning as in the *Environmental Planning and Assessment Act 1979.*

Affected species – means subject species likely to be affected by the proposal.

Biodiversity values – composition, structure and function of ecosystems and includes (but is not limited to) threatened species, populations and ecological communities, and their habitats.

Conservation status – is regarded as the degree of representation for a species or community in formal conservation reserves.

Development - has the same meaning as in the *Environmental Planning and Assessment Act 1979.*

Director-General – means the Director-General of the Department of Planning.

Groundwater dependent ecosystems are ecosystems which have their species composition and natural ecological processes wholly or partially determined by groundwater.

Locality - means the area within a 10 km radius of the study area.

Offsets - agreed actions that are undertaken to counter-balance the adverse impacts of approved development. In relation to biodiversity, offset actions provide a mechanism to compensate for loss of biodiversity values in one area by action elsewhere

Putrescible waste - general solid waste .that do not contain free liquid. (e.g. organic waste from household, council litter bins, manure, night soil, disposable nappies, incontinence pads, sanitary napkins, food waste, animal waste, dewatered grit or screenings from sewage treatment systems).

Region – means the same meaning as that contained in the TSC Act, which is a bioregion defined in a national system of bioregionalisation.

Study area - is the subject site and any additional areas that are likely to be affected by the proposal, either directly or indirectly.

Subject site - means the area that is proposed for development/activity.

Subject species – means those threatened and significant species, populations and ecological communities that are known or considered likely to occur in the study area.

Threatening process – has the same meaning as that contained in the TSC Act; however is not limited to key threatening processes.

Threatened species – For the purposes of this report the term 'threatened species' refers to species, populations and ecological communities listed in the TSC Act and EPBC Act.

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1. Introduction

E.A. Systems was engaged by AECOM on behalf of Armidale for Armidale Dumaresq Council to conduct a flora and fauna and habitat assessment of the proposed new regional putrescible landfill site, 12 km east of Armidale (Figures 1-3).

1.1 Legislative Context

The proposed new landfill development will be assessed under Part 3A of the NSW *Environmental Planning and Assessment Act* (EP&A Act 1979) for major infrastructure. The Environmental Assessment (EA) for the Armidale Regional Landfill is being prepared to comply with the original Director General's Requirements (DGRs) under Section 75 of the EP&A Act 1979 issued on the 25th October 2005 (DoP 2005) and the revised DGRs issued on the 20th November 2008 (DoP 2008). The revised DGRs set out a number of policies, guidelines and plans to be considered for the biodiversity assessment process:

- *Environmental Protection and Biodiversity Conservation Act 1999 – Guide to implementation in NSW* (DoP 2000);
- *Environmental Protection and Biodiversity Conservation Regulation 2000 Schedule 4* (Austlii 2000a);
- *Draft Guidelines for Threatened Species Assessment* (DEC 2004);
- *NSW Groundwater Dependent Ecosystem Policy* (DNR 2002);
- *Policy and Guidelines for Fish Friendly Waterway Crossings* (DPI 2003); and
- *State Environmental Planning Policy No. 44 – Koala Habitat Protectio*n (Austlii 2000b).

1.2 Aims and Objectives

The primary aims of the flora and fauna assessment study for the Armidale Regional Landfill proposal, as it relates to biodiversity assessment, were developed after consultation with the Department of Environment and Conservation (DEC now DECCW) following a planning focus meeting on 9th June 2005.

The five main aims of the biodiversity assessment are set out below:

1. Establish the area, character and conservation value of existing ecosystems and dependent species to be impacted either directly or indirectly by the proposal;
2. Consider the significance of all potential impacts in the regional context;
3. Provide detailed information regarding the measures required to minimize impacts to natural and biological values on the proposed landfill site;
4. Ensure that any revegetation activities to be undertaken on the site involve the use of locally prevalent species. Stock should be grown from seed collected on site or in the immediate vicinity of the site, in the case of species that may have occurred in vegetation communities found on the site; and
5. Provide as much initial detail as possible of the sort of compensatory offset area envisaged by the proponent. The final parameters and details of appropriate offset to be negotiated following discussion with DECC, the proponent and its consultants during the EA process.

The revised DGRs (DOP 2008) for the key issue of biodiversity include addressing:

- Impacts on threatened species, populations, and ecological communities and their habitats;
- Impacts on aquatic habitats and groundwater dependent ecosystems;

- Proposed biodiversity offsets and management; and
- Weed management, including potential risks to the Oxley Wild Rivers National Park.

In addition, the assessment considered the impact of the proposed development on matters of national environmental significance listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

An assessment of potential Koala habitat was undertaken to satisfy the requirements for State Environmental Planning Policy (SEPP) 44 - Koala Habitat Protection.

In order to address these aims and objectives a desktop review and on-site field investigations were undertaken to assess direct and indirect impacts of the proposed landfill on threatened species and other significant biodiversity values.

The flora and fauna survey included:

- Baseline surveys of the site to detect species, populations and ecological communities listed under the *Threatened Species Conservation Act 1995* (TSC Act) and the *Environment Protection and Biodiversity Conservation Act* (EPBC Act); and
- Description of the types and conditions of habitats in and adjacent to the land to be affected by the proposal.

The flora and fauna assessment included:

- Preparation of a list of threatened species, populations or ecological communities, or their habitats, that may occur on the site;
- Application of the "Assessment of Significance" (seven part test), to any threatened species, populations or ecological communities found, or with potential habitat, on the study area, in accordance with *Draft Guidelines for Threatened Species Assessment* (DEC 2004), the *Threatened Species Assessment Guidelines* (DECC 2007) and the *Significant Impact Guidelines and Matters of National Significance* (DEH 2006b); and
- An assessment of the impact of the proposed development on matters of national environmental significance listed under the EPBC Act 1999.

The format for this assessment follows the suggested structure outlined in the working draft Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities (DEC 2004).

1.3 Proposed Development

Armidale Dumaresq Council (ADC) is planning to construct a new regional putrescible landfill facility to replace the existing facility on Long Swamp Road, which is almost at capacity. The existing Waste Transfer Station at Long Swamp Road will continue to operate as the receiving and recycling station for the new facility. The new landfill will have the capacity to accept approximately 15,000 tonnes per annum of solid waste from the Armidale Dumaresq, Uralla, Walcha and Guyra Local Government Areas. The landfill will accept waste for approximately 50 years.

There will be no direct public access to the proposed new landfill site. Waste will continue to be received and processed at the existing waste transfer station on Long Swamp Road, with non-recyclable wastes being compacted and transported to the new facility.

The concept design of the landfill will be prepared in accordance with the DECCW Environmental Guidelines for Solid Waste Landfills (1996) and new guidelines on Waste Immobilisation (Waste Classification Guidelines 2008). A preliminary indicative concept layout of the facility is shown in Figure 3.

The estimated total area for the operational landfill site including buffers and access routes is approximately 86 hectares. The landfill will be developed in stages to minimise the area of land disturbed by land filling at any one time. The landfill will be divided into five cells which will each take approximately 10 years to fill with waste.

The following works will be undertaken as part of the initial construction phase of the landfill:

- Construction of the access road, to enable access to the site from Waterfall Way approximately 1 km south of the highway;
- Installation of services, such as power and communications;
- Construction of amenities such as a site office, toilets and shed;
- Construction of a temporary leachate pond, to allow for the storage of contaminated water;
- Construction of a temporary sedimentation pond, to prevent rainwater containing sediments from contaminating the surrounding environment, in particular the Gara River;
- Preparation of the first landfill cell; and
- Fencing, landscaping and planting of trees and shrubs.

During the operation of the landfill, the waste will be placed in layers and compacted to minimise the space used and to stabilise the landfill. The placement of waste will be monitored at all times to ensure that no liquid, hazardous or medical waste is placed in the landfill. At the end of each day, the waste will be covered by a layer of material to reduce pests and vermin, suppress odour, decrease litter being generated, minimise the risk of fire and reduce the amount of rain water contained in the landfill. A truck wheel wash will be installed to remove dirt from trucks before they leave the landfill site.

Prevention of water pollution is one of the key environmental goals of the proposed landfill. No contaminated water, such as water which has come into contact with waste (leachate), will be discharged to the surrounding environment. To prevent groundwater pollution a barrier system will be installed at the base of the landfill. Bunding will be used to prevent surface water from entering the landfill.

Leachate will be collected from the landfill and managed using a strategy which may include a combination of a) evaporation in the leachate pond; and b) re-injection into the landfill.

Once land filling of waste has ceased within each landfill cell, it will be closed and rehabilitated. The surface of the landfill will be covered by a capping layer, which will act to prevent rainwater from entering the landfill and control landfill odour and gas. The surface of the closed landfill will be rehabilitated and monitoring of the landfill will continue in accordance with conditions set by the DECCW. The landfill will involve the filling of part of a natural valley to form a final landform which blends in with the existing environment.

1.4 Location

The study area is located approximately 12 km east of the Armidale CBD along the Waterfall Way within the New England Tablelands Bioregion and in the Macleay River catchment. The study area consists of portions of two properties *Sherraloy* (approximately 33 ha) and *Edington* (approximately 310 ha) and a 30 ha portion of the Gara Travelling Stock Reserve (TSR). It is proposed to develop approximately 86 ha of the study area for the new landfill facility. Of these 86 ha, the footprint area of the landfill and associated infrastructure will occupy approximately 20 ha and the remaining area will be used as an offset area to mitigate the effects of the necessary clearing (see Offset Management Plan).

The approximate centre of the study area is located at E 30° 33' 30" and N 151°47' 30" (383400E 6619000N AGD 1966 AMG Zone 56J) on the Hillgrove 1:25,000 Topographic Map sheet 9236-1N (Figure 1). Summary details of the location of the study area are presented in Table 1.

Table 1. Study Area Details

Attribute	Description
Bioregion	New England Tablelands
Catchment	Northern Rivers (Gara and Macleay Rivers)
L.G.A	Armidale Dumaresq
Parish / County	Gara / Sandon
Property name, Lot and DP	'*Sherraloy*' Lot 2 DP 253346, Lot 1 DP 820271 '*Edington*' Lot 1 DP253346 '*Gara TSR*' Lots 7003 and 7004 DP 1060201
Zoning	Rural 1(A)

1.5 Local Context

The local context of the proposed new landfill site is presented in Figure 1 and Figure 2. The proposed landfill site is on portions of two rural holdings, *Sherraloy* and *Edington* that are primarily used for sheep and cattle production and is bounded on three sides by other rural properties and on the fourth (northern) side by the Gara TSR along Waterfall Way. The general area for the proposed footprint of the landfill site is located on the northern portion of *Sherraloy*, amongst a stand of Stringybark regrowth (Figure 3) and northwestern boundary of *Edington* through pasture. The proposed footprint is located approximately 1.0 km west of the Gara River, and approximately 4 km north-north-west (i.e. upstream) of the Oxley Wild Rivers National Park. The Oxley Wild Rivers National Park is listed on the Register of World Heritage sites. It is part of the Gondwana Rainforests of Australia NSW CERRA (Central Eastern Rainforest Reserves Hastings-Macleay group) in recognition of the extensive dry rainforest that occurs within gorges in the park. The gorge country and associated habitats support a high level of biodiversity that includes many threatened or rare species of plants and animals.

1.6 Site History

The properties of *Sherraloy* and *Edington* are used primarily as grazing enterprises. Both properties have been substantially cleared for grazing apart from a patch of Stringybark Woodland that occupies the northern section of *Sherraloy* and extends east into *Edington*. Dead timber from past thinning of the Stringybark Woodland has been pushed into piles on *Sherraloy*. Pasture on the study area is dominated by native grasses. There has been some pasture improvement on the land around the dams which has been sown to clover.

The portion of the Gara TSR between the old highway and the re-alignment of Waterfall Way is a well vegetated roadside strip. Since early last century (and possibly earlier) this land has been reserved for travelling stock and has been protected from severe forms of disturbance such as broadscale clearing and set stocking rates. It has been subject to occasional grazing by travelling domestic stock but remains relatively undisturbed. The remains of the old highway road-base have been ripped a number of years ago and now support some regrowth of shrubs and herbs, but few trees. The vegetation community within the TSR is an excellent example of the endangered ecological community (EEC) listed under the TSC Act 1995 as *White Box-Yellow Box-Blakely's Red Gum Woodland (Box Gum Woodland)*. It is also listed as a critically endangered (CE) community *White Box-Yellow Box-Blakely's Red grassy woodland and derived native grasslands (Box Gum Woodland)* under the Commonwealth EPBC Act 1999.

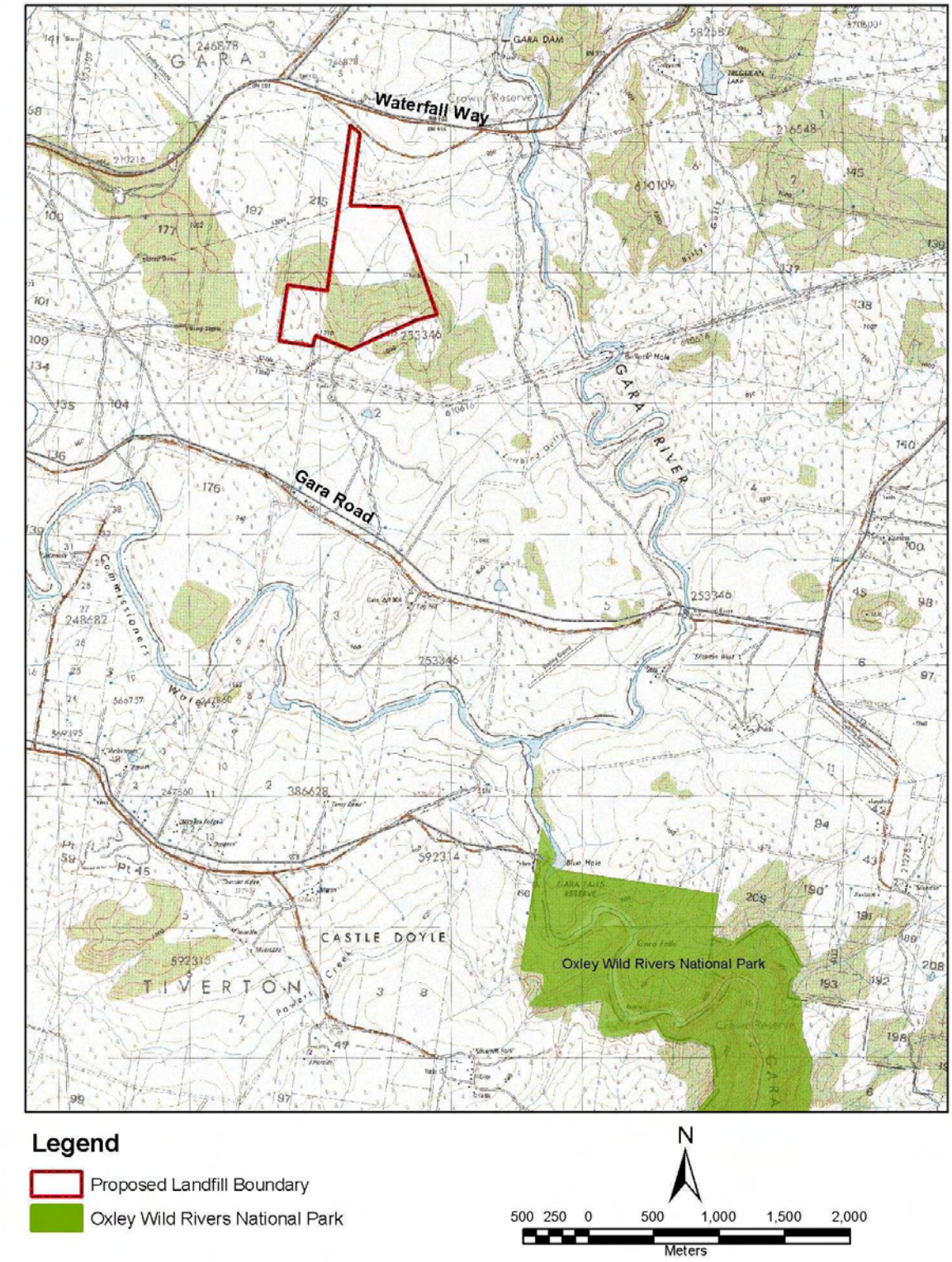

Figure 1. Location of proposed new landfill site showing Waterfall Way, Gara River and Oxley Wild Rivers National Park

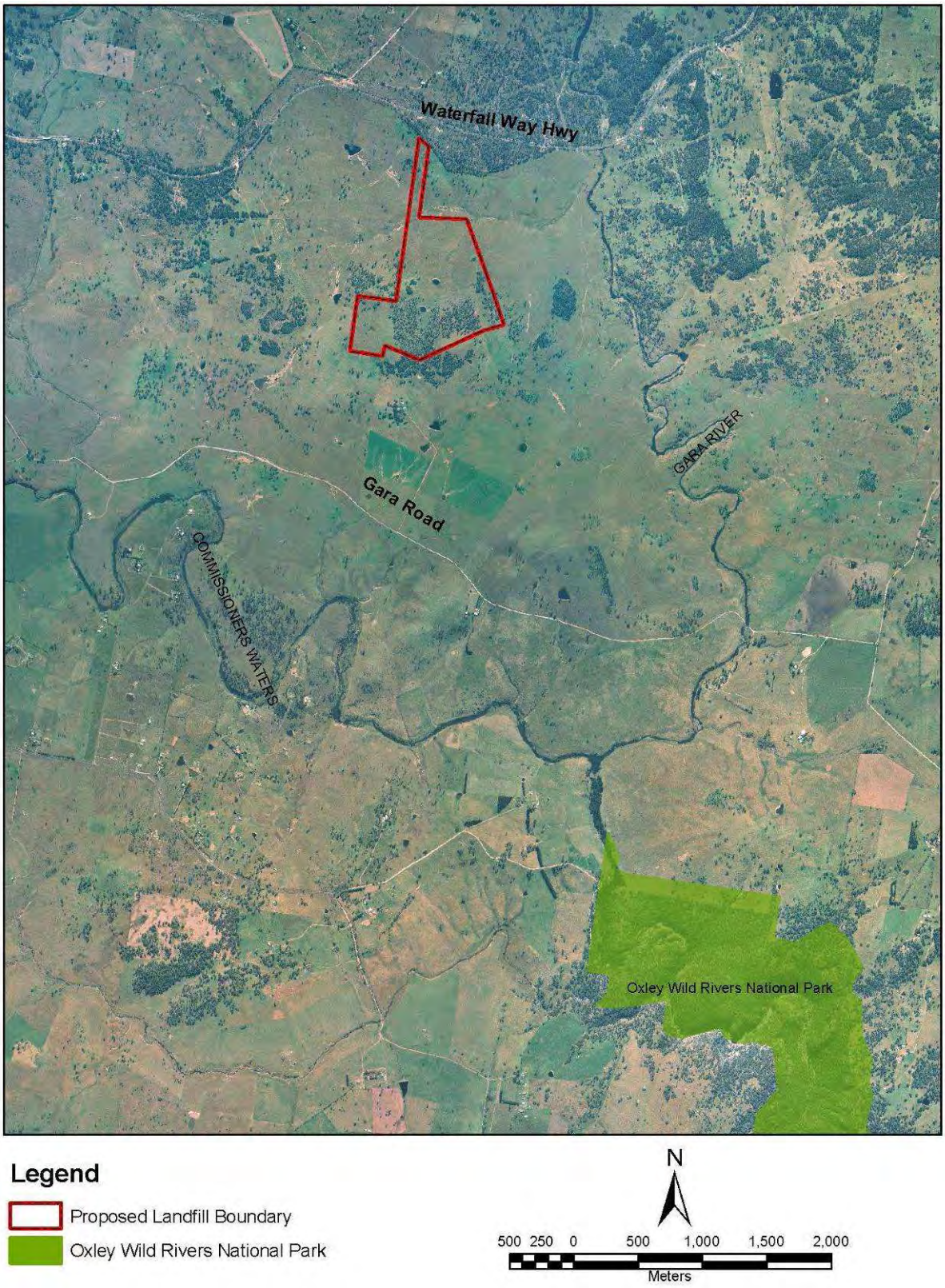

Figure 2. Aerial photograph showing the local context of the proposed new landfill site

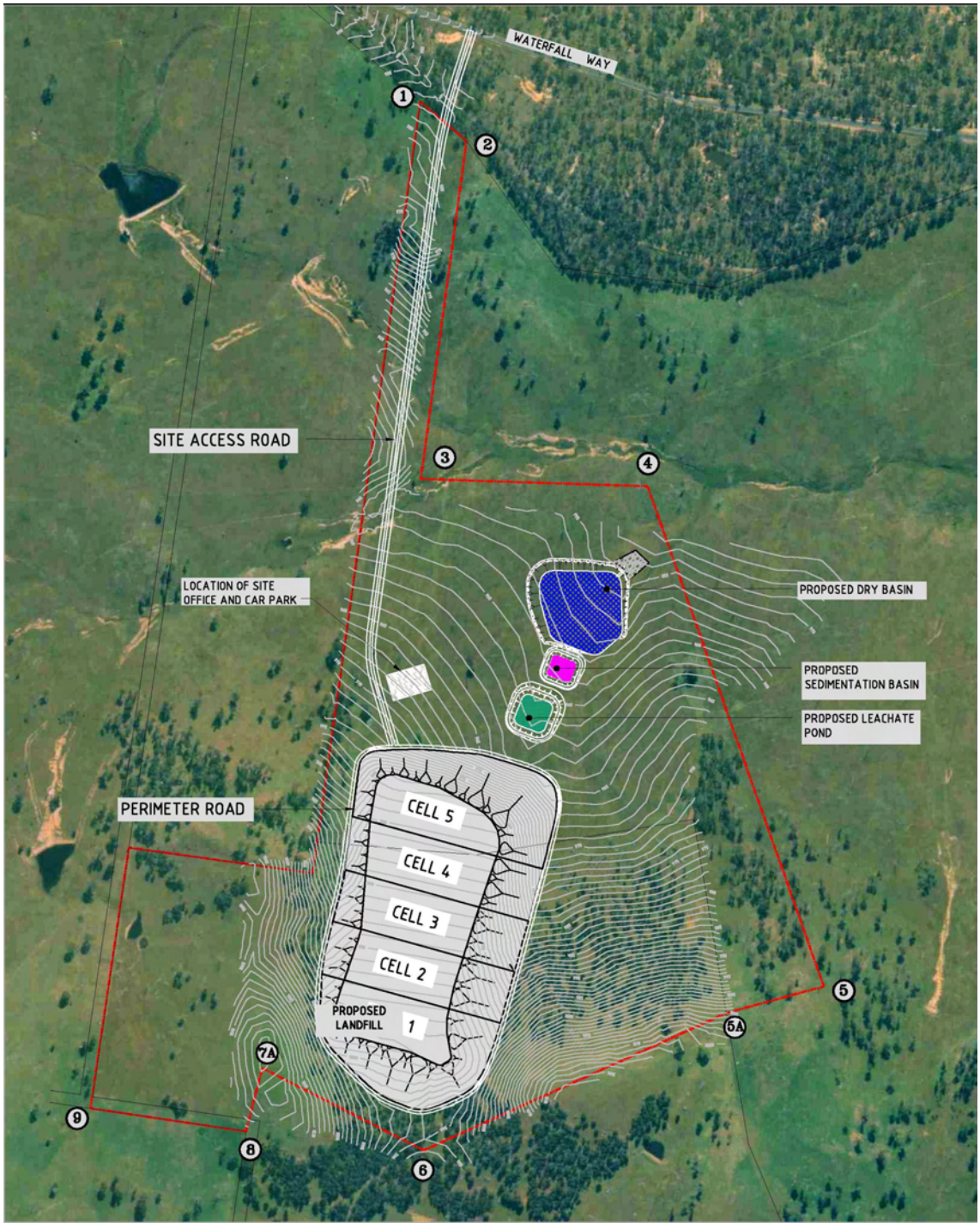

Figure 3. Indicative concept layout and landfill footprint of the proposed development (provided by AECOM)

1.7 Site Description

1.7.1 Landform

The study area spans a number of landforms. The Waterfall Way highway runs east-west and down an east facing simple slope towards the Gara River. Access to the proposed landfill site will leave the Waterfall Way at some point mid slope, and cross a ridge top in the Gara TSR before descending down a simple slope to the south. At the base of this south facing slope are two gullies that merge to form a single, easterly flowing drainage that joins the Gara River approximately 1.0 km to the east. An area of flats extends to the south of these gullies for approximately 500 m before rising into a north facing slope. The footprint of the proposed void

and fill area for the landfill is likely to primarily occupy the mid to upper reaches of the north facing slope.

The study area ranges between 950 and 1,020 m above sea level. The gradient of the south facing slope down which the access route must pass ranges from 6% to 21%. The gradient across the gullies and flats (measured in a downstream direction to the junction with the Gara River) is between 1 and 2%. The gradient of the north facing slope upon which the actual landfill operational area will potentially be placed is approximately 11%. The proposed location of the landfill area is likely to be placed in the upper part of the slope. This will minimise the volume of run-on that may otherwise flow onto the landfill operational area. Local relief and contour heights in the vicinity are shown in Figure 1.

1.7.2 Climate

Climate data have been obtained from the Bureau of Meteorology (Armidale Airport: Station No. 562238; and University of New England: Station No. 056037).

- Average annual rainfall is 832 mm per annum.
- Mean monthly minimum temperatures range from 0.5°C (July) to 14°C (June).
- Mean monthly maximum temperatures range from 13°C (July) to 27°C (January).
- Average number of frost days is 97 per annum.

1.7.3 Hydrology

The Gara River flows from north to south along the eastern boundary of *Edington*. The river frontage extends approximately 2,500 m along the property boundary. The minimum distance between the Gara River and the potential site footprint for the landfill is 1,060 m.

Two intermittent drainage lines flow onto *Edington* from the western neighbouring property *Strathaven*. These drainage lines flow onto the site from westerly and south westerly directions for approximately 300 m before they merge to form a single gully that intermittently flows east a further 1,300 m across *Edington* until it joins the Gara River at the north-western corner of the property.

Seven small farm dams are scattered across *Sherraloy*, and two small farm dams are present on *Edington*. The preliminary footprint area for the landfill and associated buffers contains two of these dams.

The Gara catchment is a major catchment in the local area. The Gara River runs into the Macleay River that eventually reaches the ocean at Trial Bay near South West Rocks and Kempsey in northern NSW. The mid and lower reaches of the Gara and Macleay rivers are characterised by deep and extensive gorge systems that form part of the Oxley Wild Rivers National Park and the Central Eastern Rainforest Reserves World Heritage Area. The Gara River descends into a gorge approximately 4.3 km south-south-east of the landfill site in Oxley Wild Rivers National Park. The distance along the riverbed between the closest point to the landfill site and the Oxley Wild Rivers National Park is 8.8 km. Commissioners Waters flows into the Gara River from the east at a point 800 metres upstream of the Oxley Wild Rivers National Park (Figure 2).

1.7.4 Geology and Soils

The most recent and comprehensive soil survey of the area is that undertaken by the Department of Natural Resources and is currently in draft copy by King, D.P. (in prep 2006), Soil Landscapes of the Armidale 1:100 000 Sheet Report, Department of Natural Resources, Sydney. The proposed landfill site occurs predominantly within two soil landscape groups; *Argyle* and *Middle Earth*. A small section of the site, located along the drainage gullies, is classified as *Commissioners Waters*. A description of the soil types present on the study area is given in Appendix K.

1.7.5 Vegetation

The vegetation survey identified five distinct communities on the study area, as shown in Figure 4.

Community 1 –Stringybark Woodland advanced regrowth

This partially cleared woodland occurs in the southern section of the site and is dominated by re-growth New England Stringybark (*Eucalyptus caliginosa*) and occasional Yellow Box (*E. melliodora*). Most of the trees are less than 16 m high and less than 50 cm diameter at breast height (DBH) The shrub layer is sparse and despite heavy grazing, the ground layer is relatively diverse with a number of native grasses and herbaceous species (Plates 1 and 2). This Stringybark community is common and widespread in the New England region, although endemic to the region.

Community 2 – Cleared grasslands

Cleared grassland occurs in the northern half of the proposed development dominated by native grasses such as Slender Rats Tail Grass (*Sporobolus creber*), Blown Grass (*Lachnagrostis avenaceus*), Red-Leg Grass (*Bothriochloa macra*), Couch (*Cynodon dactylon*) and Small Lovegrass (*Eragrostis leptostachya*) (Plates 3 and 4). This community is common and widespread on private land, but generally in a heavily grazed condition.

Community 3 – Sedgeland

Sedgelands occupy the shallow drainage lines running through the grassland. This community is dominated by Tall Sedge (*Carex appressa*), Umbrella Sedge (*Cyperus eragrostis*), Paspalum (*Paspalum dilatatum*) and Pinrush (*Juncus usitatus*). The sedgeland intergrades with the grassland forming areas of grassy sedgeland on the lower lying land (Plates 5 and 6). This community is common and widespread in low-lying damp areas, but on private land is generally in a heavily grazed condition.

Community 4 – Wetland (dams)

The farm dams on the site support an artificial assemblage of wetland plants. Around the waters edge are moisture loving species such as Tall Sedge, Umbrella Sedge, Water Couch (*Paspalum distichum*) and Spreading Knotweed (*Persicaria prostrata*), while in the water itself are Ribbonweed (*Vallisneria gigantea*) and Swamp Lily (*Ottelia ovalifolia*) (Plates 7 and 8).

Community 5 Box Gum Woodland

Box Gum Woodland occurs on the Gara TSR that adjoins the northern boundary of Edington. This community is classed as an EEC under the TSC Act 1995 (*White Box-Yellow Box-Blakely's Red Gum Woodland)*. It also meets the definition of the EPBC Act listed CE Box Gum Woodland community.

Vegetation on the Gara TSR is in good condition with many species sensitive to grazing pressure present which were absent from the grazed blocks. The TSR vegetation consists of New England Stringybark (*Eucalyptus caliginosa*), Yellow Box (*E. melliodora*), Blakely's Red Gum (*E. blakelyi*), Apple-Topped Box (*E. bridgesiana*), Bendemeer White Gum (*E. elliptica*) and Narrow-Leaved Black Peppermint (*E. nicholli*). The shrub layer is mostly sparse with occasional plants of Spiny Parrot Pea (*Dillwynia sieberi*), Chinese Lespedeza *(Lespedeza juncea*) and Peach Heath (*Lissanthe strigosa*). The ground layer is dominated by native grasses such as Kangaroo Grass (*Themeda australis*) (Plates 9 and 10).

1.7.6 Disturbance History

The site has been disturbed by clearing, grazing, weed invasion and the impact of introduced animals, particularly Rabbits, which were present in the southern section of the site in very high numbers.

Apart from the area within the TSR, the site has been completely cleared over time, with some areas returning to advanced regrowth of New England Stringybark and Yellow Box. On *Sherraloy*, and *Edington*, 83% of the land is cleared pasture and 17% supports patches of light to medium dense woodland. A few large Blakely's Red Gum (*Eucalyptus blakelyi*) trees remain in the south west corner of *Edington*, but these trees are in generally poor health, showing evidence of dieback, and do not appear to provide high habitat value. There are some standing stags across the cleared areas of the site. By contrast, vegetation on the TSR appears to be relatively intact and disturbance from clearing is minimal. However, a small area of the eastern section of the TSR has been partially cleared and appears to be a disused access area. Other recurring disturbance factors observed in the TSR during the field surveys include dumping of rubbish (building materials, etc), removal of dead wood for firewood collection, and cutting of green timber for fence posts.

A total 28 introduced plant species were recorded on pasture and partially cleared woodlands on *Sherraloy* and *Edington*. More than half (16) of these species were also recorded on the TSR. The majority of the study area was showing impacts from heavy grazing at the time of the survey, with many bare and eroded areas scattered amongst the grassland. The pasture remains mostly native and reasonably diverse. There has been some pasture improvement around the dams with clover sown a few years ago. The grassland areas of *Edington* have historically been treated with super-phosphate fertilizer, but this has not occurred on *Sherraloy*. Grazing impacts from domestic stock were notably absent from the TSR section of the study area.

Felled timber in the Stringybark Woodland on *Sherraloy* in the southern section of the study area had been pushed up into piles between 10 and 20 years ago (see Plate 2). The density of log piles in the Stringybark Woodland ranged from 11 to 17 piles per hectare. These log piles were providing refuge to an extremely high population of Rabbits. Rabbits are likely to contribute significantly to the heavy grazing pressure being experienced on the study area. Fox numbers are likely to be high as a result of the abundant Rabbit population. A number of log piles are also infested with large Blackberry bushes.

1.7.7 Habitat Overview

The overall habitat value of the site is moderate. The habitat value of the TSR is high while the habitat value of the grazed areas of *Edington* and *Sherraloy* is low to moderate. The ground cover had a moderate diversity of species, however it had been heavily grazed and there was an almost complete lack of shrub cover. Little surface biomass remains as habitat for native fauna species. Parts of the study area have comparatively good tree cover, however diversity of tree species is low, consisting mainly of fragmented stands of advanced New England Stringybark regrowth. The wooded area is utilised by two species of threatened woodland birds, the

Speckled Warbler (*Pyrrolaemus saggitata*) and the Diamond Firetail Finch (*Stagonopleura guttata*). A Little Eagle nest was also observed in the Stringybark Woodland.

The wooded area of the subject site also contains numerous log piles resulting from clearing 10 and 20 years ago (Plate 2). Although these log piles provide potential habitat for ground dwelling native fauna, particularly reptiles, they also provide shelter for high densities of Rabbits, Foxes, feral Cats and Blackberries.

There are few hollow bearing trees on the subject site (not including the TSR) but some isolated living and dead trees containing hollows remain in parts of the cleared area of the grazed site. Scattered rock outcrops occur on the northern portion of the grazed area. There are two small intermittent water courses entering the site from the west that converge to form a gully that flows to the east until it joins the Gara River. The gully has generally low habitat value due to the paucity of riparian vegetation and lack of permanent pools of water. Dams provide permanent – semipermanent water however the lack of fringe vegetation and impacts of grazing and trampling up to the water's edge reduce their habitat value.

On the TSR, mature trees, some bearing hollows and a healthy shrub and understorey are present. The area contains scattered rock outcrops that are likely to provide habitat for reptiles. Beside the old portion of the highway and along some of the dirt tracks in the TSR there is a scattering of debris and rubbish such as old tiles and tins that are also likely to provide habitat for ground dwelling fauna.

1.7.8 Habitat Connectivity

The study area is located 5.5 km east-north-east of the Imbota Nature Reserve, 4.2 km south-east of the Yina Nature Reserve, and 4 km north-north west of Oxley Wild Rivers National Park. The land between the study site and these nature reserves and the national park is largely cleared and used for grazing livestock, however there are scattered fragments and patches of woodland that, taken together, form a network of connectivity. Some of these fragments are visible in the aerial photo shown in Figure 2.

Species that require continuous forested areas are likely to disappear from areas that are severely fragmented. These isolated remnants of woodland provide potential habitat to enhance connectivity of wildlife populations and help some species to overcome the consequences of habitat fragmentation (Wilson & Lindenmayer 1995). Thus every patch of woodland in this area potentially plays an important role in facilitating dissemination of propagules and genetic material of native fauna and flora that helps to maintain viable populations within the local area.

The study area is close to two major corridors (Figure 5) identified by the NPWS Key Habitat and Corridor mapping project (NPWS 2006). The "Gara Remnant Sub-regional Corridor" that links Gara River and Midas Gully passes 2.7 km to the east of the study area. The "Mt Killalee Regional Corridor" that links Booroolong Nature Reserve and Tilbuster Ponds passes 7.6 km to the north-west of the study area. The area of Box Gum Woodland in the TSR beside Waterfall Way is identified as "key habitat" by the NPWS Key Habitat and Corridor mapping project.

The fragments of Stringybark Woodland on the southern section of the study area form part of an intermittent east-west band of similar woodland patches in the local area. The nearest sizable remnants of woodland are located 350 m to the east, and 350 m to the west of woodland patches on the study area. The Box Gum Woodland on the northern part of the study area is located approximately 900 m north of the Stringybark fragments. The nearest woodlands south of the site, not within the subject site, include narrow riparian woodland along parts of the Gara River and Commissioners Waters. These patches of woodland may provide potential habitat to enhance connectivity of wildlife populations in the local area and possibly connecting to Oxley Wild Rivers National Park 4.3 km to the south of the study area.

Low woodland of New England Stringybark (*E. caliginosa*) and Bendemeer White Gum (*E. elliptica*) is recognised as a significant community in the Oxley Wild Rivers National Park management plan. Bendemeer White Gum is locally abundant in parts of the Northern Tablelands but restricted to higher altitudes. Both New England Stringybark and Bendemeer White Gum occur on the TSR in the study area. No Bendemeer White Gum was recorded in the Stringybark Woodland in the southern section of the study area. New England Stringybark and Bendemeer White Gum occurring in the study area may contribute to genetic diversity to this significant community via habitat corridor linkages to similar communities in Oxley Wild Rivers National Park.