

APPENDIX | B



Offset Strategy



Report

Integra Open Cut Project Biodiversity Offset Strategy

OCTOBER 2009

Prepared for
Integra Coal Operations Pty Ltd

43177678

URS

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Introduction

The Biodiversity Offset identified in the Integra Open Cut Project Environmental Assessment (EA) (Appendix E of the EA) recognised the scale and importance of the Project's impact on native vegetation and adopted the DECCW principles for offsetting (DECC 2007). The strategy comprised three key components, namely:

- Woodland Offset Area;
- Riparian Rehabilitation Zone; and
- Revegetation of the Open Cut Area.

The details of these key components are described in full in the Biodiversity Assessment provided in Appendix E of the EA and are summarised below.

Since the preparation and exhibition of the EA Integra has been advised verbally that the owners of a property identified as "subject to acquisition on request" in Schedule 3, Condition 1 of PA 06_0073, propose to exercise their rights to acquisition. The property (identified as property 55 on EA Figure 3.2 and reproduced as **Figure 1-1**) has been investigated and assessed to meet the requirements of the 'woodland offset area'. This report describes the ecological value of the property (Study Area), compares it to those that will be lost as part of the Open Cut Project and clearly demonstrates that the property would satisfy offset requirements outlined in the EA and detailed by DECCW.

In the unlikely event that the current owners of the identified parcel do not ultimately exercise their right to acquisition, Integra would acquire a suitable alternative offset to the satisfaction of DECCW and the Director General.

Woodland Offset Area

To address DECCW offsetting principals and ensure that that component of the Integra Open Cut Project requiring the removal of native vegetation is satisfied by the 'maintain and improve' test, the EA identifies that the offset strategy would be based around a 'woodland offset area' having the following specific features.

- Contain Ironbark woodland or similar shrubby woodland vegetation, which has equivalent or greater conservation value to that identified within the Open Cut Project.
- Be at least 30 ha in area and contain suitable habitat features and resources for the suite of threatened fauna potentially affected by the Open Cut Project, including the Grey-crowned Babbler, Squirrel Glider and microbats.
- Be identified, purchased and secured within 3 years from the date of project approval. In the absence of an ability to identify a specific offset area in the EA, in the interim Integra identified that it would provide a bond or security to DECCW which could be used in the event of a default in satisfying the offset.
- Biodiversity values of the woodland area would be permanently conserved. Land would be re-titled (VCA or equivalent) for this purpose in perpetuity.

Riparian Rehabilitation Zone

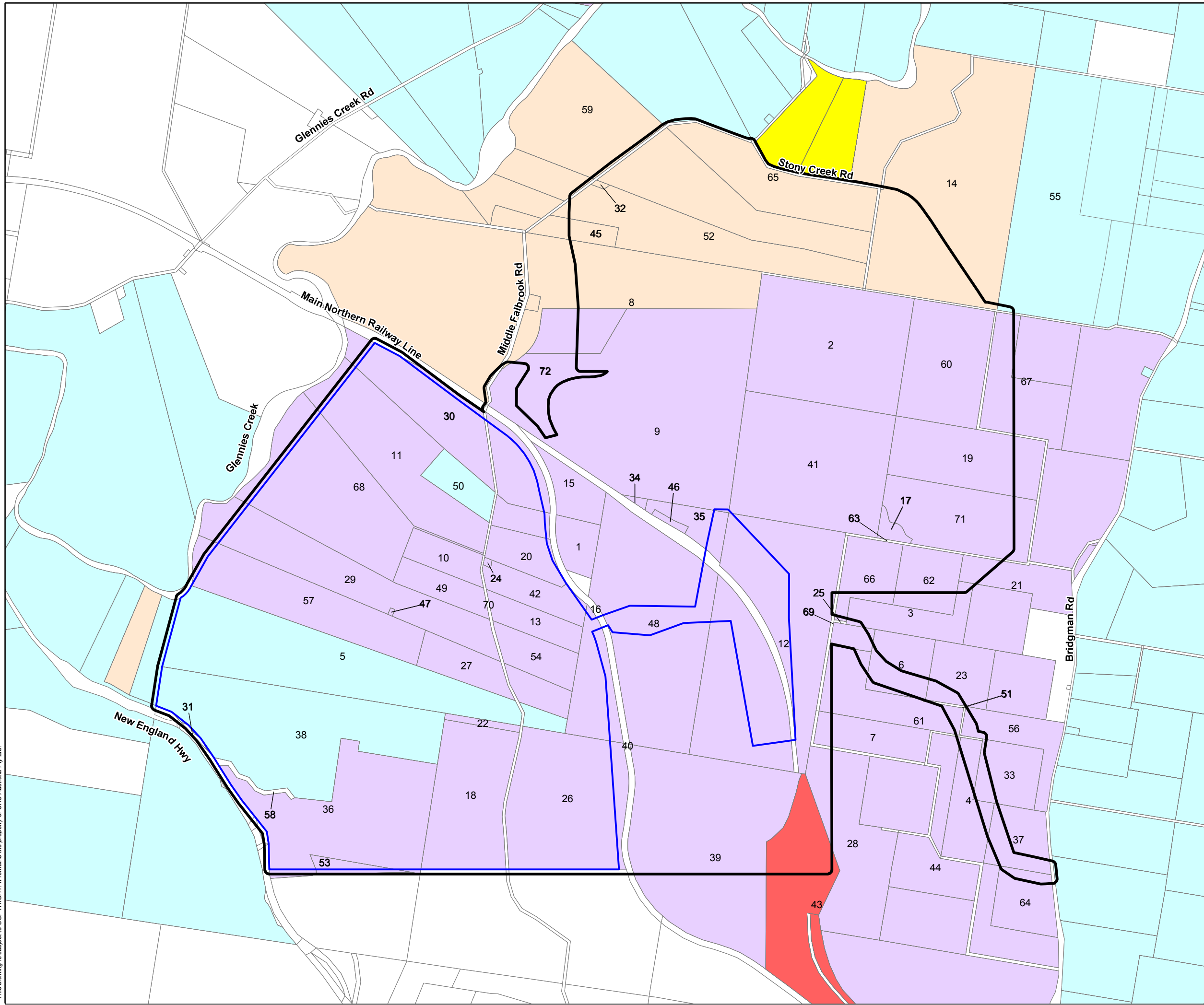
The offset strategy proposed in the EA also includes the conservation and rehabilitation of degraded riparian and forest habitat along Station and Glennies Creek. This work, which would be in addition to rehabilitation of the Open Cut Project, would focus on restoration of riparian and woodland habitat and improving connectivity within the area (Appendix J of the EA).

1 Introduction

Rehabilitation of the Open Cut Area

The third key component of the offset strategy proposed in the EA was the rehabilitation of suitable components of the Open Cut Area with species representative of the Ironbark woodland that is being removed (Appendix J of the EA).

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Legend:

- Open Cut Project Area
- Open Cut Extension Area
- VALE Australia (GC) P/L, Maitland Main Collieries P/L, NS Glennies Creek P/L, POS-GC P/L, JS Glennies Creek P/L, JFE Steel Aus. P/L
- RHA Pastoral Company Pty Limited
- Freehold Land
- Four Mile Pty Ltd
- Under Purchase by Integra
- Land Ownership ID Number

Note: Project Area
Boundary Offset for Clarity



0 400 800
metres

Source: URS/Integra Coal
Datum: GDA64, Projection: UTM, Grid: MGA Zone 56

Drawn: AO Approved: RO Date: 06/11/2009

Job No: **43177507** File: 43177507.084.wor

Client
INTEGRA COAL OPERATIONS PTY LTD

Project
INTEGRA OPEN CUT PROJECT

Title
LAND OWNERSHIP

Figure: **1-1**

URS

Ecological Values of the Study Area (incorporating the Proposed Woodland Offset Area)

2.1.1 Background

The proposed woodland offset area is located to the north east of the Open Cut Project Area off Thomas Lane and lies within a property approximately 86 ha in area (Study Area) (**Figure 2-1**). Following the assessment of flora and fauna assemblages, habitat features and overall biodiversity values and a comparison with those aspects of the woodland to be cleared for the extended South Pit, it is proposed that 35 ha of Narrow-leaf Ironbark – Grey Box Community within a 47 ha area of the property be offered to offset the proposed Project (**see Figure 5-1**). The remaining 12 ha within the 47 ha area is comprised of Swamp Oak Forest and cleared land and will not form part of the proposed offset.

The property incorporating the proposed offset area also abuts the eastern boundary of a 154 ha component of the North Open Cut Biodiversity offset area and lies to the west of other vegetated properties (**Figure 2-1**).

From both a biodiversity conservation and management point of view the incorporation of a component of this property to create a larger overall offset area also has a number of obvious advantages.

The property incorporating the proposed offset area (the Study Area – **Figure 2-1**) and vegetation communities to be cleared within the Open Cut Project Area were inspected on 31st August, 2009 and 16th September, 2009 to assess the suitability of the Study Area in total (or part) as the woodland offset area. Geoff Cunningham (Geoff Cunningham Natural Resource Consultants Pty Ltd) conducted detailed vegetation assessments and Lauren Branson (URS) conducted fauna habitat assessments. The results of these field surveys are detailed below. The full vegetation report prepared by Geoff Cunningham is provided in **Appendix A**.

2.1.2 Vegetation Communities

The Study Area comprises approximately 16 ha of previously cleared land and 70 ha of remnant native vegetation. Two major drainage lines dissect the property in an east - west direction. These two drainage lines join within the Glennies Creek Northern and supplementary Biodiversity Areas and then link with Glennies Creek itself.

Vegetation across the Study Area comprises three vegetation communities (**Figure 2-2**).

- Cleared Land.
- Swamp Oak Forest.
- Narrow-leaf Ironbark – Grey Box Forest.

These communities are described below. **Appendix A** provides the full list of species recorded on the property.

Cleared Land

Part of the Study Area has been cleared in the past and currently carries a ground cover comprising a mix of native and introduced species (**Figure 2-2**). Some of this cleared area is currently being recolonised by native tree and shrub species – particularly *Allocasuarina luehmanniana* (Bull Oak) but also by eucalypt seedlings establishing around single trees or clumps of Narrow-leaf Ironbark or Grey Box. The cleared areas have no particular biodiversity value in their present state but have the

potential to be recolonised by eucalypts, Bull Oak and native shrubs and to re-establish the Narrow-leaf Ironbark – Grey Box Woodland or Forest. Cleared land accounts for 16 ha of the property.

Swamp Oak Forest

This community equates to the Central Hunter Swamp Oak Forest (MU 28) of Peake (2006) and covers 9 ha of the Study Area.

The vegetation of this community is dominated by *Casuarina glauca* (Swamp Oak) with many areas showing dense regeneration.

Associated species include *Angophora floribunda* (Rough-barked Apple) that occurs on the margins of the community, *Eucalyptus tereticornis* (Forest Red Gum) and a small occurrence of *Eucalyptus globoidea* (White Stringybark).

Shrubs are limited to occasional occurrences of the introduced, noxious weed *Rosa rubiginosa* (Briar Rose). A native vine, *Clematis glycinoides* (Headache Vine) occurs in this community.

Ground cover species include *Austrostipa verticillata* (Slender Bamboo Grass), *Lomandra longifolia* (Many-headed Matrush), *Dichondra repens* (Kidney Weed), *Senecio madagascariensis* (Fireweed) and *Aristida ramosa* (Purple Wiregrass). In many areas the density of the Swamp Oak precludes ground cover growth.

The overall assessment of the biodiversity value of this remnant shows that it is of high ecological value and the remnant would be a good example for an offset. Factors contributing to the high ecological value of the remnant are:

- connectivity between similar communities in the Northern Biodiversity Area (**Figure 2-1**) and the lands further east and Glennies Creek;
- the general lack of invasion by exotic species;
- the stable ground cover provided by Oak needles or native ground cover species;
- the aquatic habitat that appears from these and earlier nearby inspections to last for some considerable time after flows in the creeks; and
- the food production in terms of seeds that are used by native wildlife.

Narrow-leaf Ironbark – Grey Box Forest (Ironbark Woodland)

This community equates to the Central Hunter Box - Ironbark Woodland (MU 10) of Peake (2006) that is listed as being poorly conserved by Peake. It covers 61 hectares of the Study Area.

This community is currently subject of a Preliminary Determination to list it in the Schedules of the NSW Threatened Species Conservation Act as an endangered ecological community.

The main tree species within this community are *Eucalyptus crebra* (Narrow-leaf Ironbark) and *Eucalyptus moluccana* (Grey Box). *Eucalyptus tereticornis* (Forest Red Gum) tends to occur in patches as does *Angophora floribunda* (Rough-barked Apple).

Allocasuarina luehmanniana (Bull Oak) is present through much of the community as regeneration and a few older trees. The density of this species is high in many parts of the community.

Shrub species include *Acacia amblygona* (Fan Wattle), *Acacia dealbata* (Silver Wattle), *Eremophila debile* (Amulla), *Maireana microphylla* (Eastern Cottonbush), *Hibbertia linearis* (Showy Guinea-flower), *Daviesia genistifolia* (Broom Bitter-pea), *Myoporum montanum* (Western Boobialla), *Cassinia laevis*

(Cough Bush), *Jacksonia scoparia* (Dogwood), *Cryptandra amara* var. *longiflora* (Spiny Cryptandra), *Hardenbergia violacea* (False Sarsaparilla), *Notelaea microcarpa* (Native Olive) and *Pultenaea microphylla* (Spreading Bush-pea).

Lycium ferocissimum (African Boxthorn) (a noxious weed) is present as scattered plants, mainly in cleared areas in northern sections of the Study Area.

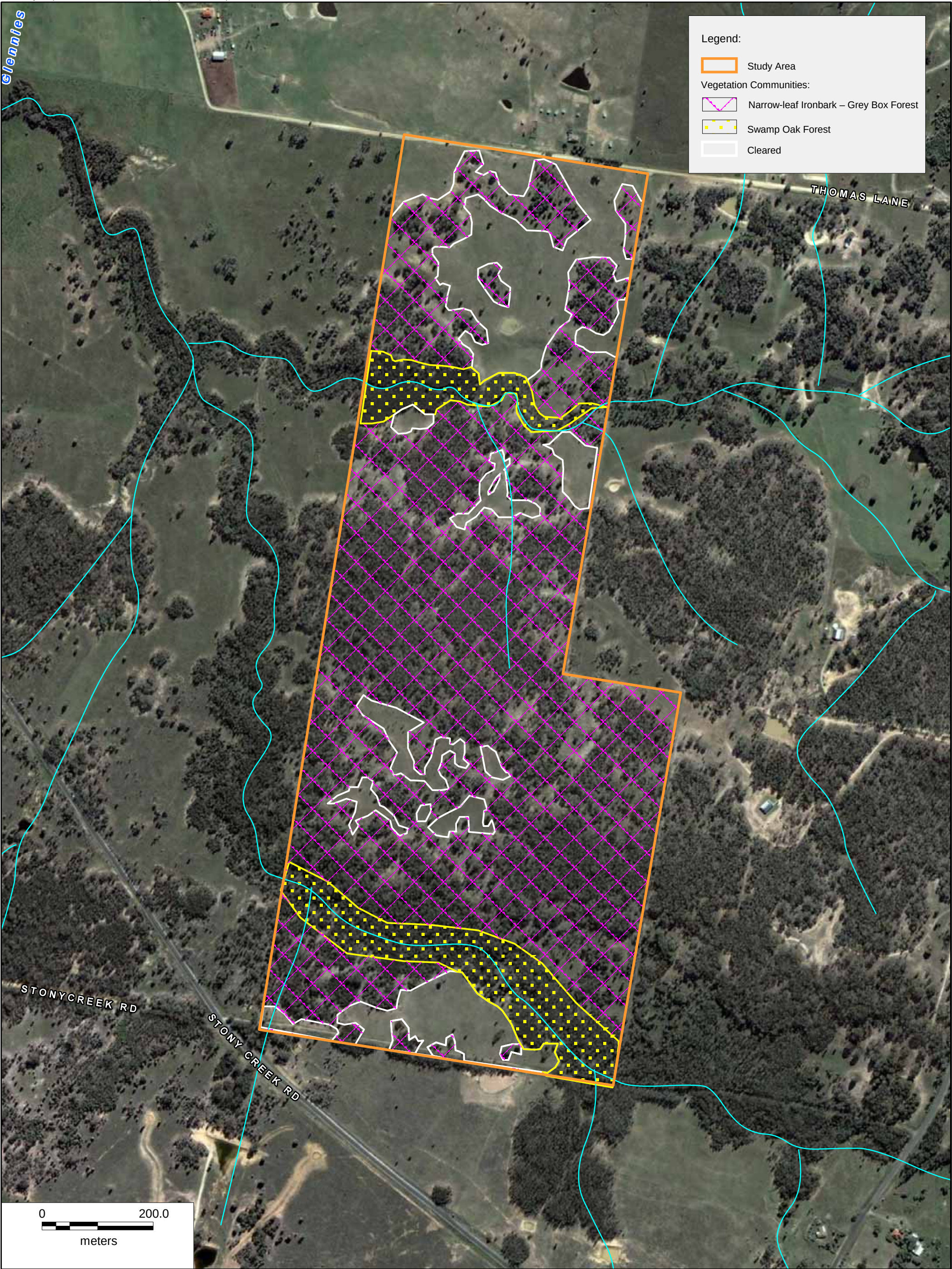
Ground cover is generally good (up to 90-100% in places). Recorded species include *Austrostipa verticillata* (Slender Bamboo Grass), *Aristida ramosa* (Purple Wiregrass), *Calotis cuniefolia* ((Purple Burr-daisy), *Austrostipa* sp. (Speargrass), *Senecio madagascariensis* (Fireweed), *Sporobolus* sp. (Ratstail Grass), *Dichondra repens* (Kidney Weed), *Hypochaeris radicata* (Flatweed), *Wahlenbergia* sp. (Bluebell), *Veronica plebeia*, *Cymbopogon refractus* (Barbed Wire Grass), *Cheilanthes sieberi* (Rock Fern), *Desmodium* sp. (Tick-trefoil), *Austrodanthonia* sp. (Wallaby Grass), *Eragrostis* sp. (Lovegrass), *Anagallis arvensis* (Blue Pimpernell), *Chrysocephalum apiculatum* (Yellow Buttons), *Triptilodiscus pygmaeus* (Common Sunray), *Dianella revoluta* (Spreading Flax-lily), *Pratia* sp., *Lomandra* sp. (Matrush), *Opuntia* sp. (Prickly Pear) and *Goodenia hederacea* (Ivy Goodenia)

The overall assessment of the biodiversity value of this remnant shows that it is of high ecological value and the remnant would be a good example for an offset. Factors contributing to the high ecological value of the remnant are:

- connectivity with similar remnant communities within the adjacent Northern Biodiversity Area as shown on **Figure 2-1**;
- old trees with hollows are present and hollow logs on the ground provide fauna habitat;
- a good variety of native shrubs are present;
- the high diversity of native ground cover species present and the high ground cover levels;
- the relative lack of weed species; and
- the general lack of soil erosion.



Client	Project			Title
INTEGRA COAL OPERATIONS PTY LTD	INTEGRA			SITE LOCALITY MAP
	Drawn: AO		Approved: LB	Figure: 2-1
	Job No: 43177678		Date: 10/11/2009	
	File No: 43177678.001.wor			



Client INTEGRA COAL OPERATIONS PTY LTD	Project INTEGRA			Title VEGETATION COMMUNITIES	
	Drawn: AO Approved: LB Date: 01/10/2009			Figure: 2-2	
	Job No: 43177678 File No: 43177678.003.wor				

2.1.3 Habitat Features

A preliminary habitat assessment was conducted across the property to evaluate habitat quality and to assess the potential presence of threatened species. Biophysical features considered in the assessment included:

- diversity of native ground species;
- structural and floristic diversity of vegetation layers, particularly the presence or absence of midstorey (shrubs and juvenile canopy species);
- level of shelter, breeding, roosting and nesting resources available;
- presence and quality of leaf litter and fallen dead timber;
- presence of stem hollows and quality of mature hollow bearing trees;
- exfoliated bark, feed trees and shrubs;
- fauna movement corridors;
- position in the landscape, connectivity or value as a habitat corridor;
- presence of rocky outcrops or partially buried rocks; and
- presence, size and ecological integrity of remnant communities.

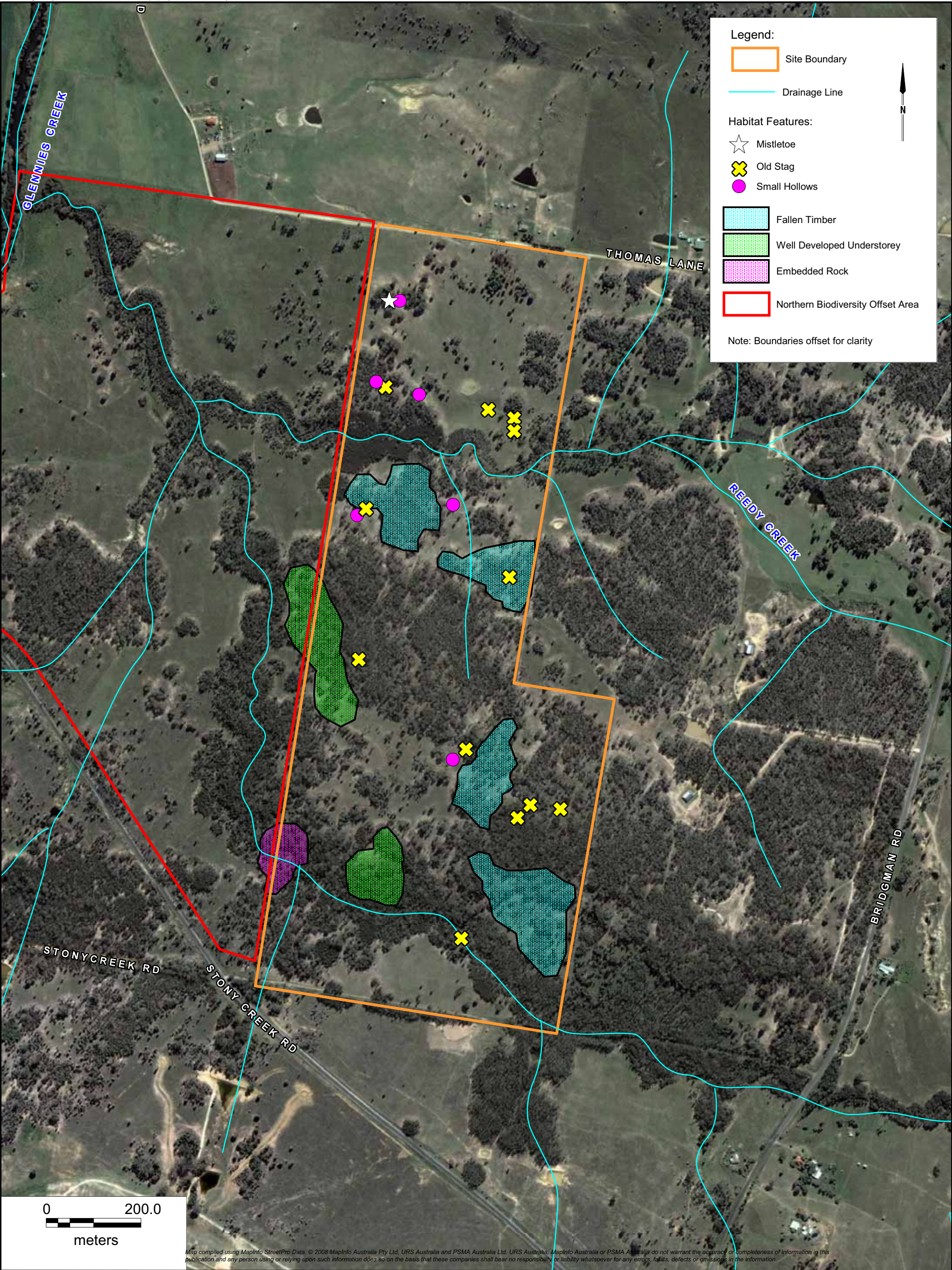
Habitat features recorded across the Study Area are shown on **Figure 2-3**. In addition to this, 26 bird species were observed during habitat assessments, including the Grey-crowned Babbler, which is listed as threatened under the *NSW Threatened Species Conservation Act 1995* (TSC Act) (a full species list is provided in **Appendix B**). The Grey-crowned Babbler was a species identified in the area to be cleared as part of the Open Cut Project (see **Section 4** of this report).

Narrow-leaf Ironbark – Grey Box Forest (Ironbark Woodland)

The Ironbark woodland within the Study Area is mature regrowth with scattered remnants (comprised mainly of single trees), with moderate to high structural diversity (**Plate 2-1**). This community is relatively undisturbed, showing evidence of low intensity grazing.

Mature canopy trees and/or significant habitat trees are present in low densities as a result of past clearing (**Plate 2-2**). These stands provide potential roosting habitat for forest owls that forage in open woodlands and on forest margins including the *Tyto novaeollandiae* (threatened masked Owl) and *Ninox connivens* (Barking Owl).

The midstorey is sparse, mainly comprising regenerating canopy species while the shrub layer comprises scattered shrubs and can be sparse (**Plate 2-1**). The removal of stock would significantly improve ground and shrub layer regeneration.



Client INTEGRA COAL OPERATIONS PTY LTD	Project INTEGRA			Title HABITAT FEATURES	
	Drawn: AO Approved: LB Date: 10/11/2009 Job No: 43177678 File No: 43177678.002.wor			Figure: 2-3	

Plate 2-1 Ironbark woodland



Plate 2-2 Isolated mature trees within the Ironbark woodland



The community contains nectar-bearing trees including *Eucalyptus moluccana* (Grey Box), *E. tereticornis* (Forest Red Gum), and *E. globoidea* (Stringy Bark). These species provide potential food resources for threatened nectivorous mammals and birds including the *Petaurus norfolcensis* (Squirrel Glider), *Pteropus poliocephalus* (Grey-headed Flying Fox), *Lathamus discolor* (Swift Parrot) and *Xanthomyza phrygia* (Regent Honeyeater).

The woodland community is likely to provide suitable foraging and roosting habitat for a number of micro bat species including the threatened *Chalinolobus dwyeri* (Large-eared pied bat), *Miniopterus orianae oceanensis* (Eastern bentwing bat), *Micronomus norfolkensis* (East-coast freetail bat) and *Saccolaimus flaviventris* (Yellow-bellied sheath-tail bat). There are a number of small and large hollows and stags throughout this community that would provide suitable roosting habitat for a number of these threatened species and other more common microbats (**Figure 2-3**).

The understory has a reasonable diversity and abundance of native grasses and herbs. Native regeneration would be significantly improved with the removal of stock. Native grasses and herbs are an important food source for many native species. The woodland community is likely to provide good quality foraging habitat for ground foragers including the TSC Act listed *Stagonopleura guttata* (Diamond Firetail) and *Pyrrholaemus sagittatus* (Speckled Warbler).

The substrate is of good quality with erosion limited to parts of the creek line. There are large areas of embedded rock in the western section of the Study Area and a moderate amount of fallen timber and leaf litter throughout the community – particularly in the Swamp Oak and Bull Oak dominated areas (**Figure 2-3, Plate 2-1**). These components provide important habitat for a number of reptiles, invertebrates and small mammals.

Allocasuarina luehmanniana (Bull Oak) is present throughout much of this community (**Section 2.1.2**) and provides a limited food source for the threatened *Calyptorhynchus lathami* (Glossy Black Cockatoo), although this species usually favours larger, mature Casuarinaceae species.

Importantly, the woodland community forms part of a continuous habitat corridor with properties to the east, and the Integra owned property to the west comprising the Northern and supplementary Biodiversity Offset Areas (PA06_0073) and significant riparian corridors to the east and west (**Figure 2-3**). As a result it not only provides significant habitat resources for sedentary species, but provides important habitat linkage on a regional scale.

Swamp Oak Forest

The riparian community in the north and south of the Study Area (**Figure 2-2, Plate 2-3**) provides suitable shelter and roosting habitat for a number of native birds, including wetland species such as the threatened *Ephippiorhynchus asiaticus* (Black-necked Stork) and *Rostratula australis* (Australian Painted Snipe).

The Swamp Oaks provide a limited food source for the threatened *C. lathami* (Glossy Black Cockatoo), although this species usually favours larger, mature Casuarinaceae species.

The shrub and ground layer within this community is dominated by regenerating Swamp Oaks and provides a structurally diverse foraging habitat for native birds and mammals. In addition to this, the community is likely to support foraging habitat for a number of micro bat species including the threatened *Nyctophilus species 2* (South-eastern long-eared bat) and *Miniopterus orianae oceanensis* (Eastern bentwing bat).

The substrate is in good condition and there is a moderate amount of leaf litter and fallen timber, providing habitat for a diverse assemblage of native invertebrates, reptiles and amphibians.

Plate 2-3 Swamp Oak community



Cleared Grassland

There are small areas of cleared grassland within the Study Area (**Figure 2-2**). These areas provide suitable foraging habitat for larger macropods and many native bird species. These areas are also likely to be used by open country generalists such as the birds *Manorina melanocephala* (Noisy Miner), *Eolophus roseicapillus* (Galah) and *Vanellus miles* (Masked Lapwing) and the native mammals including the *Macropus giganteus* (Eastern Grey Kangaroo).

The cleared grassland is likely to provide foraging habitat for granivorous native birds, including the threatened *Stagonopleura guttata* (Diamond Firetail). Grassland margins (**Plate 2-4**) would also provide foraging habitat for woodland birds including the threatened *Melanodryas cucullata cucullata* (Hooded Robin) and *Pyrrholaemus sagittatus* (Speckled Warbler).

Plate 2-4 Grassland margins

Aquatic and Wetland Habitats

Freshwater wetlands are an important habitat for fish, amphibians, invertebrates, plants and birds. They provide feeding spawning and/or nursery areas for many species of freshwater fish, invertebrates and birds. Wetlands support a high diversity of plant communities including trees, rushes, reeds and floating and submerged aquatic plants. They absorb and recycle nutrients and act as filters for improving water quality.

The Study Area contains two small creeklines (**Figure 2-2 and 2-3, Plate 2-5, 2-6**). These creeks are likely to support a range of native and exotic aquatic and terrestrial species. They support slow flowing, water with moderately degraded riparian vegetation and exotic pasture covering the banks. Erosion is limited to track crossings and where there is no bank vegetation. Based on these habitat features the site is unlikely to support threatened frog species known from the region.

Creeks and waterways across the site are likely to support habitat for common and threatened micro bats including the *Myotis macropus* (Large-footed Myotis).

Plate 2-5 Riparian habitat



Plate 2-6 Creek line



Other Habitat Resources

The DECCW guidelines for threatened species surveys identify a number of habitat features (e.g. water bodies, embedded rock, tree hollows) that are likely to support specific fauna assemblages (DECC 2004). These resources may be particularly significant for threatened species.

Tree hollows are of particular significance for a number of common and threatened bird and mammal species. Availability of hollows is often the limiting factor in population growth for a number of hollow dependant species and the loss of hollows is listed as a Key Threatening Process under the TSC Act. There is a moderate density of hollows across the Study Area (**Figure 2-3**), but they are restricted to the Ironbark woodland and its sub communities and are dependent on the age of regenerating vegetation within individual patches. Large mature hollows and stags are only found in isolated remnants due to past land clearing.

The south western corner of the Study Area supports a substantial area of embedded rock providing significant habitat for common and threatened reptiles, amphibians and invertebrates.

Management of the Woodland Offset Area

Ongoing management of any offset area will be required to comply with the DECC (2007) guidelines and to maintain or improve biodiversity values. Management actions to be adopted for the prepared woodland offset area would include, as a minimum:

- exclusion of grazing through fencing;
- control of feral animals, where appropriate and practical;
- weed removal and control;
- erosion control;
- maintenance and monitoring of natural surface water quality and flows; and
- annual monitoring and reporting on biodiversity, results of management actions undertaken and general condition of the site.

Full details of the proposed management regime would be developed as part of the ongoing Environmental Management System in place at Integra. As a component of this system a series of detailed management and monitoring programs will be developed (these are discussed in Chapter 2 of the EA), including the Landscape Management Plan that will detail Rehabilitation, Offset Management and Mine Closure procedures.

The detailed Rehabilitation Plan would include triggers and thresholds for the management of groundwater as discussed in the updated groundwater commitments provided in the Response to Submissions Report.

Comparison of Ecological Values

The property incorporating the proposed woodland offset area identified by Integra supports a diversity of ecological values as discussed in **Section 2**, and is typical of regenerating Ironbark woodland communities within the region. To ensure the proposed offset meets DECCW offset requirements, a comparison of ecological values between the offset area and woodland that will be lost in development of the Open Cut Project Area is provided below.

4.1.1 Vegetation Communities

To provide a comparison of ecological values between the proposed offset area and the vegetation that will be cleared as a result of the Open Cut Project the areas of remnant vegetation within the Open Cut Project Area to be cleared were surveyed on 16th September, 2009 to ascertain their species composition and condition.

The areas inspected are designated as follows and shown on **Figure 4-1**.

- **Southern Remnant** – outside the boundary of the Full Pit Extent.
- **Topsoil Dump Remnant** – within the proposed Full Pit Extent.
- **Western Remnant** - outside the boundary of the Full Pit Extent.

The Southern Remnant

This is by far the largest remnant and comprises some 43.2 ha of what has been described in the Environmental Assessment for the Integra Open Cut Project for the proposed Extension to the South Pit as 'Ironbark Woodland'.

The main tree species are *Eucalyptus crebra* (Narrow-leaf Ironbark) and *Eucalyptus moluccana* (Grey Box) with occasional occurrences of *Eucalyptus tereticornis* (Forest Red Gum). Most of the occurrences of the Narrow-leaf Ironbark and Grey Box comprise immature stands of regeneration with diameter breast height (dbh) values between 5cm and 15cm. Occasional larger mature trees are present as well.

Mature trees of *Allocasuarina luehmanniana* (Bull Oak) are relatively uncommon but areas of regeneration of this species are dense and widespread.

Few native shrub species are present with very scattered plants of *Notelaea microcarpa* (Native Olive), *Acacia amblygona* (Fan Wattle), *Acacia* sp. (long leaf), *Maireana microphylla* (Eastern Cottonbush), *Cassinia laevis* (Cough Bush), *Eremophila debile* (Amulla), *Daviesia genistifolia* (Broom Bitter-pea) and *Acacia decora* (Western Golden Wattle) being recorded. The introduced shrubby weed *Gomphocarpus fruticosus* (Swan Plant) is also present and should be eradicated.

Ground cover within the remnant is generally quite poor (less than 20-30% cover) and some areas are completely bare and show signs of sheet and rill erosion.

Ground cover species include *Aristida ramosa* (Purple Wiregrass), *Austrodanthonia* sp. (Wallaby Grass), *Calotis lappulacea* (Yellow Burr-daisy), *Calotis cuneifolia* (Purple Burr-daisy), *Cymbopogon refractus* (Barbed Wire Grass), *Eragrostis* sp. (Lovegrass), *Lomandra* sp. (Matrush), *Dianella revoluta* (Spreading Flax-lily), *Senecio madagascariensis* (Fireweed), *Opuntia* sp. (Prickly Pear), *Plantago lanceolata* (Ribwort), *Verbena bonariensis* (Wild Statice), *Solanum* sp. and *Austrostipa* sp. (Speargrass).

This remnant has comparatively low biodiversity values because:

- the remnant will become isolated in the near future as the Rix's Creek Open Cut Coal Mine extends into the area to the south. Earthworks had occurred in this vicinity at the time of inspection and the vegetation cover had been removed from a significant area adjacent to the remnant;
- the trees are generally young. There are few mature trees and these generally are lacking in hollows of use to native fauna;
- shrub cover is poorly represented. While a number of native shrub species were recorded, these were mainly isolated individuals;
- the ground cover is poor and soil erosion was evident across the remnant;
- while there were a number of native ground cover species recorded, with the exception of Purple Wiregrass these species are not common in the ground cover; and
- there is a lack of logs on the ground and few, if any, hollow logs that might provide habitat for native fauna.

Topsoil Dump Remnant

This is a 16.4 ha remnant of *Eucalyptus moluccana* (Grey Box) and *Eucalyptus crebra* (Narrow-leaf Ironbark) that has had loads of topsoil dumped between the trees some years ago. Native shrub species are absent but *Lycium ferocissimum* (African Boxthorn) (a noxious weed) is prevalent and should be eradicated.

Individuals of *Melia azederach* (White Cedar) trees are also present as a weed element.

The eucalypt trees have now grown and generally have a dbh of 10-30cm. Reclaiming the topsoil would physically damage the tree trunks and probably their root systems and would devalue the remnant considerably.

Ground cover species recorded include *Salsola kali* (Buckbush), *Galenia pubescens* (Galenia), *Calotis lappulacea* (Yellow Burr-daisy), *Cynodon dactylon* (Couch Grass), *Cirsium vulgare* (Spear Thistle), *Plantago lanceolata* (Ribwort), *Anagallis arvensis* (Blue Pimpernell), *Chloris gayana* (Rhodes Grass), *Senecio madagascariensis* (Fireweed) and *Solanum cinereum* (Narrawa Burr).

This remnant is heavily infested with weeds and rabbits and the extensive topsoil dumping has significantly compromised the community's resilience and biodiversity value. There are very little habitat resources such as woody debris and leaf litter and rehabilitation of the community, including the removal of dumped topsoil is likely to damage mature canopy trees, further degrading the value of the community.

The Western Remnant

This 2.7 ha remnant comprises a monospecific stand of *Eucalyptus moluccana* (Grey Box) trees spaced between 1 and 10m apart. All of this will be cleared during expansion of the proposed mine.

Shrub cover is limited to a few *Maireana microphylla* (Eastern Cottonbush) plants.

Groundcover is dominated by weed species including *Echium plantagineum* (Paterson's Curse), *Galenia pubescens* (Galenia), *Cynodon dactylon* (Couch), *Senecio madagascariensis* (Fireweed) and *Lepidium africanum* (Peppercress).

This remnant has comparatively low biodiversity value because it has low structural complexity, is not connected to vegetation within the locality, the groundstorey is dominated by exotic species and there are very few habitat resources.

Comparison

As outlined above, the woodland remnants within the Open Cut Project Area are isolated remnants, dominated by weeds and introduced fauna and have a low structural complexity, significantly reducing their long-term biodiversity value. By comparison the Narrow-leaf Ironbark – Grey Box Woodland and Swamp Oak Forest communities in the proposed offset area are well connected within the surrounding landscape, have a greater structural complexity and have very few weed problems (**Section 2.1.2**). Specific biodiversity values of the proposed offset area that are not found in remnant vegetation in the Open Cut Project Area are:

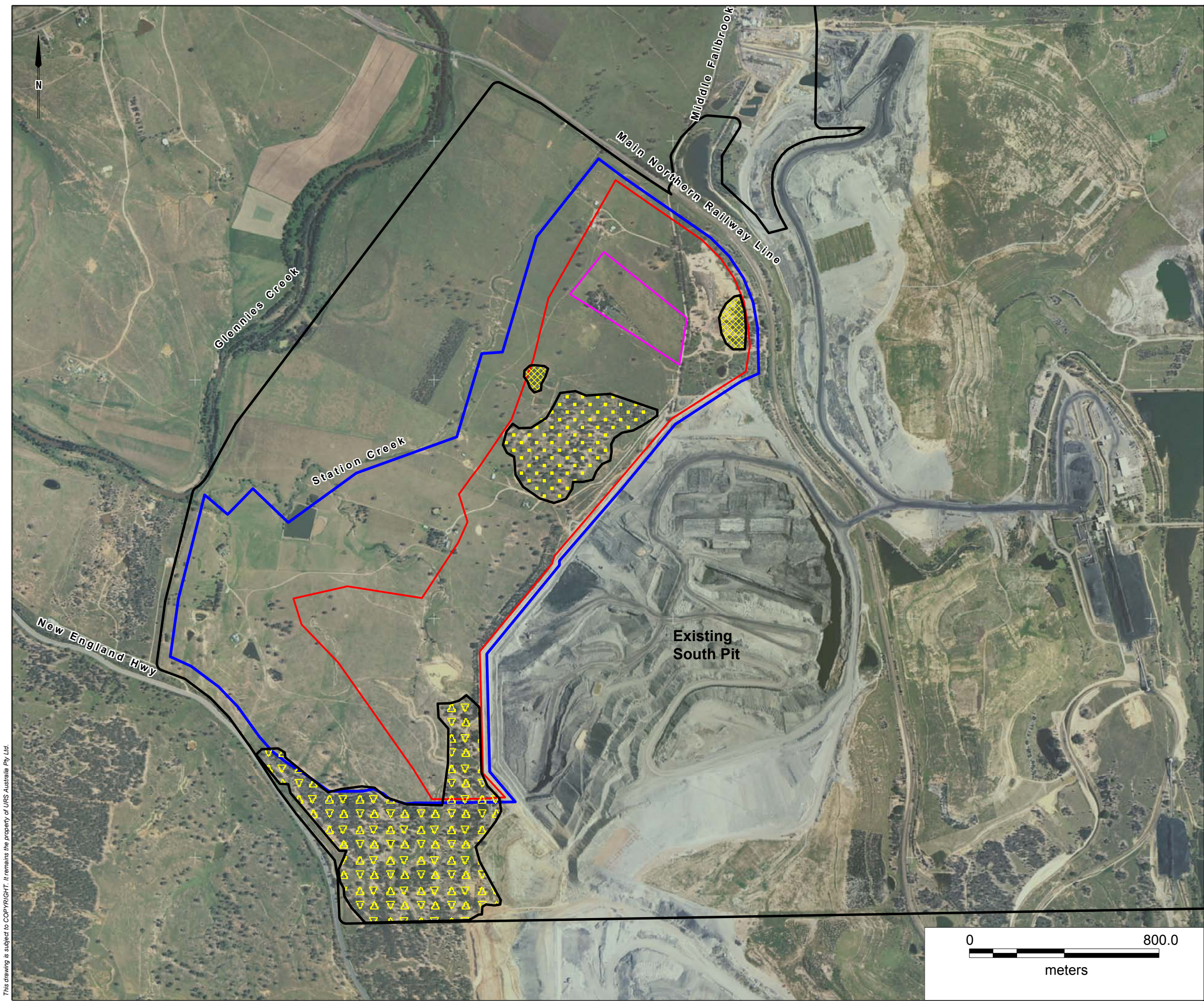
- connectivity between similar communities in the Northern Biodiversity Area and the lands further east and Glennies Creek;
- the general lack of invasion by exotic species;
- a good variety of native shrubs is present;
- the stable ground cover provided by well developed understoreys;
- relatively intact aquatic habitats;
- old trees with hollows are present and hollow logs on the ground provide fauna habitat;
- the high diversity of native ground cover species present and the high ground cover levels;
- the relative lack of weed species; and
- the general lack of soil erosion.

4.1.2 Habitat Features

The Integra Open Cut EA identifies a number of fauna habitats that will be affected by the proposed mine Project (Appendix E, Section 5.3.2 of the EA). These habitats provide foraging and roosting resources for common and threatened fauna and include:

- nectar bearing trees;
- secondary feed trees for the Glossy Black Cockatoo;
- a grassy understorey;
- riparian communities;
- a restricted shrub layer;
- cleared grassland;
- wetland and aquatic habitats; and
- limited hollows.

Based on these habitat resources and species requirements, twenty two threatened species listed under the TSC Act or *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) were identified as potentially occurring within the Open Cut Project Area (Appendix E, Section 5.3.2 of the EA).



Legend:

- Open Cut Project Area
- Mine Area: Full Pit Extent
- Open Cut Area
- Dulwich Property

Remnant Vegetation:

- Topsoil Dump
- Western Remnant
- Southern Remnant

Note: Coincident Boundaries
Offset for Clarity

Drawn: AO	Approved: LB	Date: 06/11/2009
Job No: 43177507	File: 43177678.004.wor	
Client		
INTEGRA COAL OPERATIONS PTY LTD		
Project		
INTEGRA OPEN CUT PROJECT		
Title		
REMNANT VEGETATION WITHIN THE OPEN CUT PROJECT AREA		
Figure: 4-1		

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Based on habitat mapping of the Study Area and proposed offset area identified by Integra (**Section 2.1.3, Figure 2-2**) and species requirements, the proposed offset area supports habitat for all twenty two species potentially affected by the Open Cut Project (**Section 4.1.1**). Similarly the proposed offset area provides all of the habitat resources identified in the Open Cut Project (listed above) and a number of additional habitat features not found within these components of the Open Cut Project Area to be disturbed. These are discussed in detail below.

Limited Topsoil Disturbance

Large areas of Ironbark woodland within the Open Cut Project area have been used to store topsoil/subsoil from the prior mine operation (**Plate 4-1**). As a result, the existing soil seed bank has been compromised and is showing no signs of regeneration. Furthermore, and the topsoil/subsoil that has been stockpiled on the site has supported the germination of a number of noxious and environmental weeds (**Section 4.1.1**). This soil disturbance and the current grazing regime has also significantly limited the ecological value of this area that now supports a sparse ground layer dominated by weeds and any regeneration within the community, including overstorey regeneration, is limited. As a result the area is unlikely to provide habitat for a number of threatened species that require a developed ground layer, shrub layer or woody debris and leaf litter. By comparison, no areas of the proposed offset area have been used for topsoil stockpiling and the retention of a predominantly native pasture has limited erosion and loss of topsoil across the site. Regeneration of both overstorey, midstorey and understorey vegetation was observed during the recent site visit suggesting that the soil seed bank is largely intact.

Limited topsoil disturbance within the proposed offset area has also facilitated the retention of a significant amount of fallen timber and leaf litter. Both these habitat features are critical components of healthy ecosystems and provide habitat for a number of reptiles, amphibians and invertebrates.

Well Developed Understorey

Understorey within the woodland community in the proposed Mine Area is sparse due to past and current land use. There is little regeneration of native ground cover species and very little accumulation of leaf litter or woody debris (Appendix E, Section 5.2.2 of the EA, **Plate 4-2**). By comparison due to a low intensity grazing regime, limited clearing and large areas of natural regeneration, the woodland community within the offset area supports a well established understorey and regenerating midstorey and overstorey. Establishment of a well developed understorey provides improved structural complexity and habitat diversity and would provide habitat for a larger range of specialist and generalist open woodland fauna species.

Habitat Connectivity

Most significantly, the proposed offset area identified by Integra forms part of a habitat corridor connecting large patches of woodland and riparian vegetation. The property is adjacent to the biodiversity offset for the North Open Cut and a wooded private holding (**Figure 2-1**). This habitat connectivity significantly improves the value of the site for a number of species that are dependent on patch size including the threatened Hooded Robin. The proposed offset area provides significant habitat connectivity through the local area and provides foraging and roosting habitat for resident and migratory species.

In comparison, the woodland vegetation communities to be cleared within the Open Cut Extension Area component of the Open Cut Project represent isolated patches of poor condition regenerating woodland that are significantly affected by edge effects and provide no habitat connectivity within the region.

Plate 4-1 Top soil stockpiling within woodland communities in the Open Cut Project Area



Plate 4-2 Typically sparse understorey within woodland communities in the Open Cut Project Area



Conclusions

Based on the outcomes of field investigations and assuming the acquisition of the Study Area, Integra will offer 35 ha of Narrow-leaf Ironbark-Grey Box Forest within a 47 ha area of the Study Area to protect and conserve, in perpetuity, threatened species habitats, vegetation types, habitat types and landscape features similar to, or better than, those found within the Open Cut Project area (**Figure 5-1**). The remaining 12 ha within the 47 ha area is comprised of cleared land and Swamp Oak and will not form part of the offset, although it occurs within the overall offset area.

The proposed offset area (**Figure 5-1**) was identified to satisfy a number of requirements outlined in the EA (Appendix E, Section 7.3.2), as detailed below.

1. *It should contain woodland or a similar shrubby woodland vegetation community, which has equivalent or greater conservation value* – the proposed offset area contains 35 ha of high quality woodland to offset the loss of 19 ha of similar, low quality woodland vegetation (**Section 2 and 4**).
2. *That the woodland area must be at least 30 ha and contain suitable habitat features and resources for the suite of threatened species potentially impacted by the proposed works* – Integra is offering a proposed offset area of 35 ha. The vegetation communities within the proposed offset area provide similar and better habitat resources compared to vegetation that will be impacted by the proposed works (**Section 2 and 4**).
3. *The offset area must be identified, purchased and secured within 3 years from the date of project approval* – In the absence of an ability to identify a specific offset area in the EA, in the interim Integra identified that it would provide a bond or security to DECCW which could be used in the event of a default in satisfying the offset.

On examination of the Study Area, it was determined that the proposed offset area identified in **Figure 5-1** would satisfy these criteria. The proposed woodland offset incorporates 35 ha of good quality Narrow-leaf Ironbark – Grey Box Forest and contains the habitat resources detailed in **Section 2.1.3**, including:

- high structural complexity;
- a well developed small tree shrub layer;
- mature canopy trees and significant habitat trees;
- nectar bearing trees;
- suitable foraging and roosting habitat for threatened micro bats; and
- a native grass understorey.

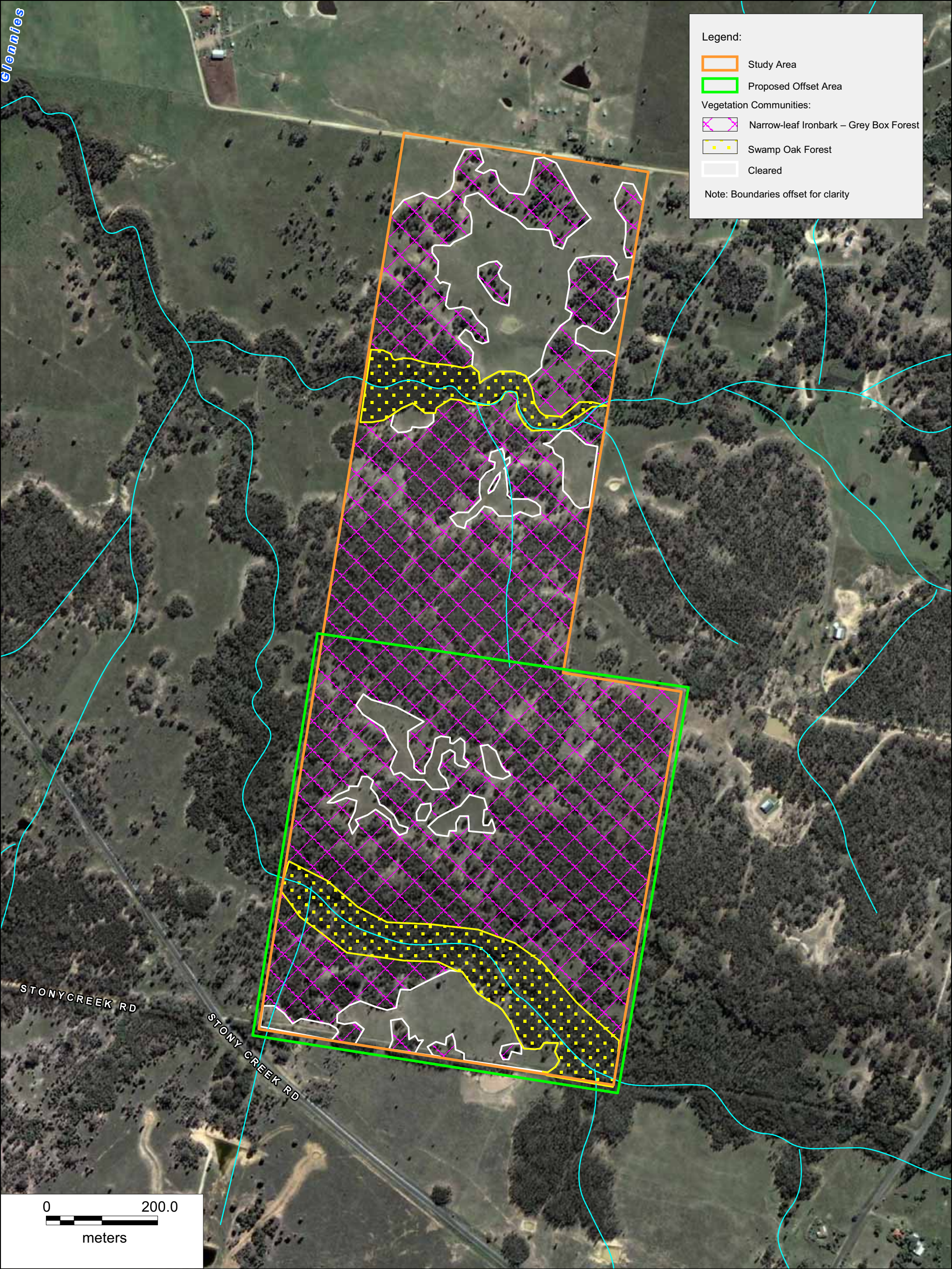
Moreover, the proposed offset will improve biodiversity values within the locality due to the following.

- Offsetting the loss of a highly disturbed woodland community with low ecological value with an area of woodland vegetation that is of higher ecological value at a nominal ratio of 1:1.8 (19 ha of Ironbark woodland will be cleared as a result of the Open Cut Project).
- Offsetting the loss of 4 ha of planted scrub that provide habitat for threatened species including the Grey Crowned Babbler.
- Providing connectivity for woodland and riparian habitats.
- Providing a greater diversity and complexity of habitat resources.
- Protecting regionally significant woodland communities in perpetuity.
- Ongoing management of the offset area will improve its condition and biodiversity values.

Thirty-five hectares of good quality Ironbark woodland is considered sufficient to offset the impacts of the proposed development on degraded woodland communities found within the Open Cut Project Area. As detailed in **Section 4** of this report, woodland communities within the proposed offset area

have a higher species diversity, provide a greater richness and diversity of habitat resources and are well connected within the landscape when compared to the degraded, isolated remnants of woodland vegetation within the Open Cut Project Area.

On the basis of the above assessment, the proposed offset is consistent with the DECCW guidelines for offsets and meets the key criterion for like-for-like trade-offs of biodiversity values. Adoption of the offset would adequately compensate for the loss of threatened species habitat associated with the proposed Open Cut Project and improve biodiversity values.



Client	Project			Title
INTEGRA COAL OPERATIONS PTY LTD	INTEGRA			PROPOSED OFFSET AREA
	Drawn: AO	Approved: LB	Date: 10/11/2009	Figure: 5-1
	Job No: 43177678	File No: 43177678.005.wor		

References

DECC (2004) *Draft Guidelines for threatened species Assessment*, Department of Environment and Climate Change NSW, Sydney, NSW.

DECC (2007) *Guidelines for Biodiversity Certification of Environmental Planning Instruments Working draft*, Department of Environment and Climate Change NSW, Sydney, NSW.

Appendix A Vegetation Assessment Report

**FLORA STUDY OF THE VEGETATION REMNANTS ON
THE LANDS ASSOCIATED WITH THE PROPOSED
WESTERN PIT EXTENSION AT THE
CAMBERWELL OPEN CUT COAL MINE
AND
ON THE ALLISON AND LEGGATT PROPERTY
ADJACENT TO THE GLENNIES CREEK COAL MINE
NORTHERN BIODIVERSITY AREA**

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October, 2009

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FLORA STUDY OF THE VEGETATION REMNANTS ON THE LANDS ASSOCIATED WITH THE PROPOSED WESTERN PIT EXTENSION AT THE CAMBERWELL OPEN CUT COAL MINE AND ON THE ALLISON AND LEGGATT PROPERTY ADJACENT TO THE GLENNIES CREEK COAL MINE NORTHERN BIODIVERSITY AREA

1 INTRODUCTION

1.1 The Integra Lands

The remnant vegetation clumps on the lands to the west of the existing South Pit at the Integra Open Cut Coal Mine near Singleton were inspected on 16th September, 2009 to ascertain their species composition and condition.

The areas inspected are designated as follows:

- **Southern Remnant** – outside the boundary of the proposed western pit extension
- **Topsoil Dump Remnant** – within the proposed western pit extension area
- **Western Remnant** - outside the boundary of the proposed western pit extension

The location of these remnants is shown in **Figure 4-1** of the main report.

1.2 The Allison and Leggatt Property Lands

These lands were inspected on 31st August, 2009 and 16th September, 2009. They are located between Stoney Creek Road, Bridgman Road, Thomas Lane and the Glennies Creek Open Cut Coal Mine Northern Biodiversity Area

These lands adjoin the Glennies Creek Open Cut Coal Mine Northern Biodiversity Area on its eastern boundary as shown in **Figure 2-1** of the main report and provide

additional linkages between outlying remnant native vegetation and the Glennies Creek riparian vegetation.

2 FLORA OF THE INTEGRA LANDS

* denotes introduced species

A complete list of recorded species is contained in **Appendix 1**.

2.1 The Southern Remnant

This is by far the largest remnant and comprises some 43.20 ha of what has been described in the Environmental Assessment for the Integra Open Cut Project that was prepared by URS for the proposed pit extension as 'Ironbark Woodland'..

The main tree species are *Eucalyptus crebra* [Narrow-leaf Ironbark] and *Eucalyptus moluccana* [Grey Box] with occasional occurrences of *Eucalyptus tereticornis* [Forest Red Gum]. Most of the occurrences of the Narrow-leaf Ironbark and Grey Box comprise immature stands of regeneration with diameter breast height [dbh] values between 5cm and 15cm. Occasional larger mature trees are present as well.

Mature trees of *Allocasuarina luehmanniana* [Bull Oak] are relatively uncommon but areas of regeneration of this species are dense and widespread.

Few native shrub species are present with very scattered plants of *Notelaea microcarpa* [Native Olive], *Acacia amblygona* [Fan Wattle], *Acacia* sp. [long leaf], *Maireana microphylla* [Eastern Cottonbush], *Cassinia laevis* [Cough Bush], *Eremophila debile* [Amulla], *Daviesia genistifolia* [Broom Bitter-pea] and *Acacia decora* [Western Golden Wattle] being recorded. The introduced shrubby weed *Gomphocarpus fruticosus** [Swan Plant] is also present and should be eradicated.

Ground cover within the remnant is generally quite poor [less than 20-30% cover] and some areas are completely bare and show signs of sheet and rill erosion.

Ground cover species included *Aristida ramosa* [Purple Wiregrass], *Austrodanthonia* sp. [Wallaby Grass], *Calotis lappulacea* [Yellow Burr-daisy], *Calotis cuneifolia* [Purple Burr-daisy], *Cymbopogon refractus* [Barbed Wire Grass], *Eragrostis* sp. [Lovegrass], *Lomandra* sp. [Matrush], *Dianella revoluta* [Spreading Flax-lily], *Senecio madagascariensis** [Fireweed], *Opuntia* sp.* [Prickly Pear], *Plantago lanceolata** [Ribwort], *Verbena bonariensis** [Wild Stattice], *Solanum* sp. and *Austrostipa* sp. [Speargrass].

Condition and Biodiversity Value

Issues relevant to assessing the condition or biodiversity value of this remnant are:

- The remnant will become isolated in the near future as the Rix's Creek Open Cut Coal Mine extends into the area to the south. Earthworks had occurred in this vicinity at the time of inspection and the vegetation cover had been removed from a significant area adjacent to the remnant.

- The trees are generally young and there are few mature trees and these generally are lacking in hollows of use to native fauna.
- Shrub cover is poorly represented. While a number of native shrub species were recorded these were mainly isolated individuals.
- The ground cover is poor and soil erosion was noted to have occurred in a number of places.
- While there were a number of native ground cover species recorded, with the exception of Purple Wiregrass these species are not common in the ground cover
- There is a lack of logs on the ground and few, if any hollow logs that might provide habitat for native fauna.

An overall assessment of the biodiversity value of this remnant is that it is LOW and the remnant would be a poor example of an offset.

2.2 The Topsoil Dump Remnant

This is a 16.43 ha remnant of *Eucalyptus moluccana* [Grey Box] and *Eucalyptus crebra* [Narrow-leaf Ironbark] that has had loads of topsoil dumped between the trees some years ago. Native shrub species are absent but *Lycium ferocissimum** [African Boxthorn] [a noxious weed] is prevalent and should be eradicated.

Individuals of *Melia azederach* [White Cedar] trees are also present as a weed element.

The eucalypt trees have now grown and generally have a dbh of 10-30cm. Reclaiming the topsoil would physically damage the tree trunks and probably their root systems and would devalue the remnant considerably.

Ground cover species recorded include *Salsola kali* [Buckbush], *Galenia pubescens** [Galenia], *Calotis lappulacea* [Yellow Burr-daisy], *Cynodon dactylon** [Couch Grass], *Cirsium vulgare** [Spear Thistle], *Plantago lanceolata** [Ribwort], *Anagallis arvensis** [Blue Pimpernell], *Chloris gayana** [Rhodes Grass], *Senecio madagascariensis** [Fireweed] and *Solanum cinereum* [Narrawa Burr].

Condition and Biodiversity Value

Issues relevant to assessing the condition or biodiversity value of this remnant are:

- As can be seen from the list of ground cover species, the remnant is heavily weed infested.
- The remnant is a haven for rabbits.
- There are few if any logs on the ground and hollows are lacking.

- The attempted removal of the dumped topsoil can only have a debilitating impact on the remnant
- The remnant is isolated from other native vegetation occurrences

An overall assessment of the biodiversity value of this remnant is that it is VERY LOW.

Its inclusion in the proposed pit extension is probably the most suitable land use outcome for this seriously degraded area.

2.3 The Western Remnant

This 2.71 ha remnant is comprised of a monospecific stand of *Eucalyptus moluccana* [Grey Box] trees spaced between 1 and 10m apart.

Shrub cover is limited to a few *Maireana microphylla* [Eastern Cottonbush] plants.

Groundcover is dominated by weed species including *Echium plantagineum** [Paterson's Curse], *Galenia pubescens** [Galenia], *Cynodon dactylon** [Couch], *Senecio madagascariensis** [Fireweed] and *Lepidium africanum** [Peppercress].

Condition and Biodiversity Value

Issues relevant to assessing the condition or biodiversity value of this remnant are:

- The remnant is isolated from other native vegetation occurrences
- There are few shrubs present.
- The ground flora is almost exclusively comprised of introduced species
- There are few hollows and logs / branches on the ground to provide habitat for native fauna.

An overall assessment of the biodiversity value of this remnant is that it is LOW and the remnant would be a poor example of an offset.

3 FLORA OF THE ALLISON / LEGGATT PROPERTY

This block of land is 87 ha in area and comprises approximately 17 ha of previously cleared land and 70 ha of remnant native vegetation

Two major drainage lines dissect the property in an east west direction. These two drainage lines join within the Glennies Creek Northern Biodiversity Area and then link with Glennies Creek itself.

Part of the property has been cleared in the past and currently carries a ground cover comprising a mix of native and introduced species. Some of this cleared area is

currently being recolonised by native tree and shrub species – particularly *Allocasuarina luehmanniana* [Bull Oak] but also by eucalypt seedlings establishing around single trees or clumps of Narrow-leaf Ironbark or Grey Box. This cleared area is shown by the symbol 'c' in **Figure 2-1** of the main report.

The cleared areas have no particular biodiversity value in their present state but have the potential to be recolonised by eucalypts, Bull Oak and native shrubs and to re-establish the Narrow-leaf Ironbark – Grey Box Woodland or Forest.

Two remnant native vegetation communities are recognized on this property –

- Swamp Oak Forest, and
- Narrow-leaf Ironbark – Grey Box Forest.

Descriptions of these communities are set out below.

Appendix 2 lists the species recorded for the property.

3.1 Swamp Oak Forest Community

This community equates to the Central Hunter Swamp Oak Forest [MU 28] of Peake [2006] and covers 9 hectares.

The vegetation community of this community is dominated by *Casuarina glauca* [Swamp Oak] with many areas showing dense regeneration of this species.

Associated species include *Angophora floribunda* [Rough-barked Apple] that occurs on the margins of the community, *Eucalyptus tereticornis* [Forest Red Gum] and a small occurrence of *Eucalyptus globoidea* [White Stringybark].

Shrubs are limited to occurrences of the introduced *Rosa rubiginosa** [Briar Rose] which is a noxious weed. A native vine, *Clematis glycinoides* [Headache Vine] occurs in this community.

Ground cover species include *Austrostipa verticillata* [Slender Bamboo Grass], *Lomandra longifolia* [Many-headed Matrush], *Dichondra repens* [Kidney Weed], *Senecio madagascariensis** [Fireweed] and *Aristida ramosa* [Purple Wiregrass]. In many areas the density of the Swamp Oak precludes ground cover growth.

Swamp Oak produces few, if any, tree hollows and the fallen trunks usually do not contain hollows that benefit native fauna.

Condition and Biodiversity Value

Issues relevant to assessing the condition or biodiversity value of this remnant are:

- The connectivity that these two remnants provide between the similar communities in the Northern Biodiversity Area and the lands further east and Glennies Creek.

- The general lack of invasion by exotic species
- The stable ground cover provided by Oak needles or native ground cover species
- The aquatic habitat that appears from these and earlier nearby inspections to last for some considerable time after flows in the creeks.
- The food production in terms of seeds that are used by native wildlife

An overall assessment of the biodiversity value of this remnant is that it is HIGH and the remnant would be a good example of an offset.

3.2 Narrow-leaf Ironbark – Grey Box Forest.

This community equates to the Central Hunter Box - Ironbark Woodland [MU 10] of Peake [2006] that is listed as being poorly conserved by Peake. It covers 61 hectares.

This community is currently subject of a Preliminary Determination to list it in the Schedules of the NSW Threatened Species Conservation Act as an endangered ecological community.

The main tree species within this community are *Eucalyptus crebra* [Narrow-leaf Ironbark] and *Eucalyptus moluccana* [Grey Box]. *Eucalyptus tereticornis* [Forest Red Gum] tends to occur in patches as does *Angophora floribunda* [Rough-barked Apple].

Allocasuarina luehmanniana [Bull Oak] is present through much of the community as regeneration and a few older trees. The density of this species is high in many parts of the overall community

Shrub species include *Acacia amblygona* [Fan Wattle], *Acacia dealbata* [Silver Wattle], *Eremophila debile* [Amulla], *Maireana microphylla* [Eastern Cottonbush], *Hibbertia linearis* [Showy Guinea-flower], *Daviesia genistifolia* [Broom Bitter-pea], *Myoporum montanum* [Western Boobialla], *Cassinia laevis* [Cough Bush], *Jacksonia scoparia* [Dogwood], *Cryptandra amara* var. *longiflora* [Spiny Cryptandra], *Hardenbergia violacea* [False Sarsaparilla], *Notelaea microcarpa* [Native Olive] and *Pultenaea microphylla* [Spreading Bush-pea].

*Lycium ferocissimum** [African Boxthorn] [a noxious weed] is present as scattered plants, mainly in the northern, largely cleared, section of the property.

Ground cover is generally good [up to 90-100% in places]. Recorded species include *Austrostipa verticillata* [Slender Bamboo Grass], *Aristida ramosa* [Purple Wiregrass], *Calotis cuniefolia* [Purple Burr-daisy], *Austrostipa* sp. [Speargrass], *Senecio madagascariensis** [Fireweed], *Sporobolus* sp. [Rat'stail Grass], *Dichondra repens* [Kidney Weed], *Hypochaeris radicata** [Flatweed], *Wahlenbergia* sp. [Bluebell], *Veronica plebeia*, *Cymbopogon refractus* [Barbed Wire Grass], *Cheilanthes sieberi* [Rock Fern], *Desmodium* sp. [Tick-trefoil], *Austrodanthonia* sp.

[Wallaby Grass], *Eragrostis* sp. [Lovegrass], *Anagallis arvensis** [Blue Pimpernell], *Chrysocephalum apiculatum* [Yellow Buttons], *Triptilodiscus pygmaeus* [Common Sunray], *Dianella revoluta* [Spreading Flax-lily], *Pratia* sp. , *Lomandra* sp, [Matrush], *Opuntia* sp.* [Prickly Pear], *Goodenia hederacea* [Ivy Goodenia]

Condition and Biodiversity Value

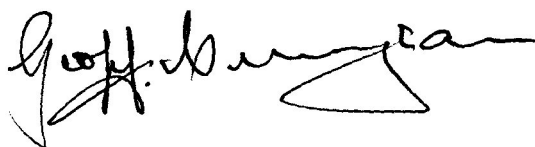
Issues relevant to assessing the condition or biodiversity value of this remnant are:

- The connectivity with similar remnant communities within the adjacent Northern Biodiversity Area.
- Old trees with hollows are present and hollow logs on the ground provide fauna habitat.
- The wide range of native ground cover species present and the high ground cover levels.
- The relative lack of weed species.
- The general lack of soil erosion.

An overall assessment of the biodiversity value of this remnant is that it is HIGH and the remnant would be a good example of an offset.

4 REFERENCES

Peake, T.C. [2006] – The Vegetation of the Central Hunter Valley, New South Wales. A Report on the Findings of the Hunter Remnant Vegetation Project. Volumes 1 and 2. Hunter Central Rivers Catchment Management Authority, Paterson.



Geoff Cunningham B.Sc.Agr.[Hons]:FAIAST
Managing Director and Principal Ecologist
Geoff Cunningham Natural Resource Consultants Pty Ltd
1st October, 2009

Appendix 1 – Flora Species List – Integra Lands

Acacia amblygona [Fan Wattle],
Acacia decora [Western Golden Wattle]
Acacia sp. [long leaf],
Allocasuarina luehmanniana [Bull Oak]
*Anagallis arvensis** [Blue Pimpernell],
Aristida ramosa [Purple Wiregrass],
Austrodanthonia sp. [Wallaby Grass],
Austrostipa sp. [Speargrass].
Calotis cuneifolia [Purple Burr-daisy],
Calotis lappulacea [Yellow Burr-daisy],
Cassinia laevis [Cough Bush],
*Chloris gayana** [Rhodes Grass],
*Cirsium vulgare** [Spear Thistle],
Cymbopogon refractus [Barbed Wire Grass],
*Cynodon dactylon** [Couch],
Daviesia genistifolia [Broom Bitter-pea] and
Dianella revoluta [Spreading Flax-lily],
*Echium plantagineum** [Paterson's Curse],
Eragrostis sp. [Lovegrass],
Eremophila debile [Amulla],
Eucalptus crebra [Narrow-leaf Ironbark]
Eucalyptus moluccana [Grey Box]
Eucalyptus tereticornis [Forest Red Gum].
*Galenia pubescens** [Galenia],
*Gomphocarpus fruticosus** [Swan Plant]
*Lepidium africanum** [Peppercress].
Lomandra sp. [Matrush],
*Lycium ferocissimum** [African Boxthorn]
Maireana microphylla [Eastern Cottonbush],
Melia azederach [White Cedar]
Notelaea microcarpa [Native Olive],
Opuntia sp.* [Prickly Pear],
*Plantago lanceolata** [Ribwort],
Salsola kali [Buckbush],
*Senecio madagascariensis** [Fireweed]
Solanum cinereum [Narrawa Burr].
Solanum sp.
*Verbena bonariensis** [Wild Stattice],

Appendix 2 – Flora Species List – Allison / Leggatt Property

Acacia amblygona [Fan Wattle]
Acacia dealbata [Silver Wattle]
Allocasuarina luehmanniana [Bull Oak]
*Anagallis arvensis** [Blue Pimpernell]
Angophora floribunda [Rough-barked Apple]
Aristida ramosa [Purple Wiregrass]
Austrodanthonia sp. [Wallaby Grass]
Austrostipa sp. [Speargrass]
Austrostipa verticillata [Slender Bamboo Grass],
Calotis cuniefolia [[Purple Burr-daisy]
Cassinia laevis [Cough Bush]
Casuarina glauca [Swamp Oak]
Cheilanthes sieberi [Rock Fern]
Chrysocephalum apiculatum [Yellow Buttons]
Clematis glycinoides [Headache Vine]
Cryptandra amara var. *longiflora* [Spiny Cryptandra]
Cymbopogon refractus [Barbed Wire Grass]
Daviesia genistifolia [Broom Bitter-pea]
Desmodium sp. [Tick-trefoil]
Dianella revoluta [Spreading Flax-lily]
Dichondra repens [Kidney Weed]
Eragrostis sp. [Lovegrass]
Eremophila debile [Amulla]
Eucalyptus crebra [Narrow-leaf Ironbark]
Eucalyptus globoidea [White Stringybark]
Eucalyptus moluccana [Grey Box].
Eucalyptus tereticornis [Forest Red Gum]
Goodenia hederacea [Ivy Goodenia]
Hardenbergia violacea [False Sarsaparilla]
Hibbertia linearis [Showy Guinea-flower]
*Hypochaeris radicata** [Flatweed]
Jacksonia scoparia [Dogwood]
Lomandra longifolia [Many-headed Matrush],
Lomandra sp. [Matrush]
*Lycium ferocissimum** [African Boxthorn]
Maireana microphylla [Eastern Cottonbush]
Myoporum montanum [Western Boobialla]
Notelaea microcarpa [Native Olive]
Opuntia sp.* [Prickly Pear]
Pratia sp.
Pultenaea microphylla [Spreading Bush-pea]
*Rosa rubiginosa** [Briar Rose]
*Senecio madagascariensis** [Fireweed]
Sporobolus sp. [Rat'stail Grass]
Triptilodiscus pygmaeus [Common Sunray]
Veronica plebeia [Creeping Speedwell]
Wahlenbergia sp. [Bluebell]

Appendix B Bird Species List

Appendix B

The following species were recorded during habitat searches and targeted morning bird surveys on 15 September 2009.

Species Name	Common Name
<i>Acanthiza chrysorrah</i>	Yellow Rumped Thornbill
<i>Acanthiza pusilla</i>	Brown Thornbill
<i>Acanthiza uropygialis</i>	Chestnut Rumped Thornbill
<i>Chalcites (Chrysococcyx) basalis</i>	Horsfield's Bronze-Cuckoo
<i>Chenonetta jubata</i>	Wood Duck
<i>Colluricincla harmonica</i>	Grey Shrike-thrush
<i>Coracina novae-hollandiae</i>	Black faced Cuckoo-shrike
<i>Corcorax melanorhamphos</i>	White Winged Cough
<i>Corvus coronoides</i>	Australian Raven
<i>Cracticus nigrogularis</i>	Pied Butcher Bird
<i>Eolophus (Cacatua)</i>	Galah
<i>Epthianura albifrons</i>	White Fronted Chat
<i>Grallina cyanoleuca</i>	Magpie Lark
<i>Gymnorhina tibicen</i>	Australian Magpie
<i>Malurus cyaneus</i>	Superb Fairy Wren
<i>Manorina melanocephala</i>	Noisy Miner
<i>Ocyphaps lophotes</i>	Crested Pigeon
<i>Pachycephala rufiventris</i>	Rufus Whistler
<i>Pardalotus punctatus</i>	Spotted Pardalote
<i>Philemon corniculatus</i>	Noisy Friarbird
<i>Platycercus elegans</i>	Crimson Rosella
<i>Pomatostomus temporalis</i>	Grey-crowned Babbler
<i>Rhipidura albiscapa</i>	Grey Fantail
<i>Rhipidura leucophrys</i>	Willy Wagtail
<i>Smicrornis brevirostris</i>	Weebill
<i>Vanellus miles</i>	Masked Lapwing



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