APPENDIX D

Flora and Fauna Survey for Darwin International Airport Expansions

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Flora and Fauna Survey for Darwin International Airport Expansions

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LIMITATIONS

This study, report and analyses have been based on the information available to EcOz at the time of the study. EcOz accepts responsibility for the report and its conclusions to the extent that the information was sufficient and accurate. EcOz does not take responsibility for errors and omissions due to incorrect information or information not available to EcOz at the time of the study.

1 EXECUTIVE SUMMARY

Northern Territory Airports Pty Ltd (NT Airports) are currently preparing an Environmental Impact Assessment (EIA) for two proposed development sites within the Darwin International Airport (DIA); The Bulky Goods site and Terminal Expansion project. The impact assessment requires an investigation of terrestrial fauna that occurs, or is likely to occur, in the areas proposed for the development. Therefore, NT Airports have commissioned EcOz Environmental Services to undertake the appropriate surveys and research to satisfy this component of the EIA. This report presents and discusses results from a comprehensive flora and fauna survey of the two proposed development areas.

The survey component of the Bulky Goods site was carried out between March 26th and 29th 2008, and the Terminal Expansion area was surveyed on April 3rd, 2008. The Bulky Goods site required a comprehensive assessment of flora and fauna within the current *Eucalyptus tetrodonta* Woodland, and the Terminal Expansion area only required assessment of floristic composition and site description records.

1.1 Bulky Goods Retail Site

NT Airports is proposing to commission the development of a home lifestyle retail centre, or 'Bulky Goods Site' on a part of the airport lease with a cadastral listing of 'Prime Development Land'. This site is referred to as the 'Bulky Goods' site throughout this report. An existing Bunnings retail centre is adjacent and to the south of this 8 ha site, which is bordered to the west and north by Bagot Road and McMillans Road, and to the east and southeast by Neale Street and Osgood Drive, respectively. **Appendix 1** shows the site locality map.

The proposed development area consists of one of the few remaining blocks in this area that supports remnant woodland habitat. Vegetation of particular interest on the site includes the Vulnerable 'Darwin' Cycad *Cycas armstrongii*. Two native rat species classified as Near Threatened in the Northern Territory have also previously been reported for the site, according to NT Airports (pers. comm. April 2008). Therefore, NT Airports commissioned EcOz to undertake flora and fauna surveys to complement the pending Environmental Impact Assessment (EIA) and determine the presence of any threatened fauna and to assess the number of *Cycas armstrongii* within the block. The EIA has already been initiated by NT Airports, and these proposed flora and fauna studies are an essential component of this work.

1.1.1 Bulky Goods Fauna Survey

A total of 49 fauna species were recorded at the Bulky Goods site during the survey (**Appendix 3**), these comprised:

- 3 Amphibians;
- 13 Reptiles;
- 27 Birds; and
- 6 Mammals.

The desktop review of the NT Fauna Atlas identified 281 fauna species previously recorded within 10 km of the survey site. Five species identified within the Bulky Goods survey are new additions to the NT Fauna Atlas Database, these are:

- Darwin Skink *Glaphyromorphus darwiniensis*;
- Blind Snake *Ramphotyphlops* (likely *tovelli*);
- Northern Longeared Bat *Nyctophilus bifax*;
- Yellow-bellied Sheathtail Bat *Saccolaimus flaviventris*; and
- Beccari's Freetail Bat *Mormopterus beccarii*.

The short duration of the fauna survey, and the uniformity of the habitat type represented within the survey quadrats is reflected in the low proportion (approximately 17%) of all potentially local species recorded during the survey. This is not an uncommon result from single fauna surveys.

No fauna species identified during the survey are threatened under Northern Territory (*TPWC Act 2000*) or Commonwealth (*EPBC Act 1999*) legislation.

Rainbow Bee-eaters were observed on several occasions feeding over, and perching within the survey quadrats. This a protected Migratory species under the *EPBC Act*, however, it is unlikely that the development of the Bulky Goods site will impact on this highly mobile and common species in the Darwin region.

The NT Fauna Atlas indicates that 8 threatened species protected by the *TPWC Act 2000* have been previously recorded within 10 km of the survey site (see **Section 5.1.3** for species list). This list includes several species (such as the Loggerhead Turtle *Caretta caretta*) whose habitat does not occur within or will be adversely affected by the Bulky Goods development proposal. None of the threatened species were recorded during the survey of the proposed Bulky Goods site and it is unlikely that the development of the area will impact on the further degradation of the status of these species.

The NT Fauna Atlas also shows that five species previously identified within 10 km of the Bulky Goods site hold a current Near Threatened status (see list in Section 5.1.4). Two of these species were observed within the Bulky Goods site, the Bush Thick-knee *Burhinus grallarius* and Pale Field Rat *Rattus tunneyi*. Bush Thick-knees are common in the Darwin region and become more sparsely distributed when travelling south into Central Australia (where populations have been in decline). The species is relatively mobile and is likely to have other local refuge habitat in the area. The Pale Field Rat *Rattus tunneyi* was tentatively identified during a nocturnal search. However, as the rodent was not identified 'in the hand' the identification of the species cannot be confirmed.

1.1.2 Flora Survey

A total of 44 flora species were identified within the Bulky Goods site. The majority of species are widespread species common in *Eucalyptus* woodlands across the Tropical Savannas of Top End NT. The site also contains numerous garden species due to previous disturbances, close proximity to residential gardens/landscaping and containing several soil stockpiles that are vectors for plant introduction.

A search of the NT Flora Atlas Database identified two threatened species within 10 km of the site, however, the Cycad *Cycas armstrongii* was the only species currently established within the proposed Bulky Goods development area. *Cycas armstrongii* is classified as Vulnerable in the Northern Territory. The Cycad patch within the development site was quantified to approximately 899

individual specimens and included specimens just above ground level to over 200 cm tall. Some of the larger individuals are thought to be older than 50 years.

1.1.3 Conclusions

Despite previous disturbances and the location amongst the development and busy roads (Bagot Rd, McMillans Rd, Osgood Dr.) the survey produced a species list that suggests the site supports a favourable habitat for common native reptiles, birds, mammals and amphibians. The capture of six Northern Brown Bandicoots *Isoodon macrourus*, potential sightings of Pale Field Rats *Rattus tunneyi*, a healthy Cycad population and active reptile and bird observations confirm that the small patch of *Eucalyptus* woodland (8 ha) is an effective refuge habitat for native species living in the Darwin urban environment. The Cycad *Cycas armstrongii* is currently classified as vulnerable in the Northern Territory, no other flora species identified held conservation status. No threatened fauna species listed under NT or Commonwealth legislation were identified during the survey.

The proposed development is not likely to impact on the overall status of any threatened flora or fauna species, assuming the implementation of a Cycad Management Plan takes place. There will, however be a net loss of woodland habitat in the Darwin area of around 8 hectares, although the condition of the woodland is relatively compromised by the presence of many introduced weeds.

1.2 Terminal Expansion Site

The Terminal Expansion site is proposed for auxiliary development of the terminal. The proposed expansions will include development or changes to an existing car park and a small, currently undeveloped area. A site visit revealed that this undeveloped area has been cleared in the past leaving only sparsely distributed larger trees surrounded by mown introduced grasses and weeds. This site is less than one hectare and only required a survey of floristic composition.

1.2.1 Flora Survey

The Terminal Expansion site contains maintained (mown) introduced grasses with scattered clusters of tree throughout the site that have been left during past clearing activities. Tree spacing within the site is approximately 10 m on average. Growth under the trees (mostly *Eucalyptus tetrodonta*) contains a wide variety of native sub-trees/shrubs, the more common species being *Acacia auriculiformis, Ficus scobina* and *Maranthes corymbosa.* Introduced vines and weeds were also abundant in the area and several of these species were seeding during the time of survey. Species list for the site is provided in **Appendix 4**.

One threatened species was identified during the floristic survey of the Terminal Expansion site, the Vulnerable Cycad *Cycas armstrongii*. Only four individuals were recorded during the survey, and sizes ranged from less than 50 cm to approximately 150 cm tall.

1.2.2 Conclusions

The Terminal Expansion area contains no impeding issues in regards to vegetation clearance of the site, providing that efforts to re-locate the Cycads are implemented. The site contains several weed species, therefore, clearance activities should be operated in a way to reduce the further spread of these plants into other areas (i.e. vehicle washdown, appropriate storage site for removed vegetation etc).

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ACKNOWLEDGEMENTS

We would like to thank Jill Holdsworth from NT Airports Pty Ltd for providing us with essential flora and fauna information from previous surveys within the DIA. Thanks also to Noel Preece, Ray Hall, Kate Bauer and Glen Ewers for aiding with site setup and field work logistics. Quick and timely flora identification by the NT Herbarium was also greatly appreciated.

2 INTRODUCTION

2.1 Background

Northern Territory Airports Pty Ltd (NT Airports) requested EcOz Environmental Services to undertake appropriate surveys of two development sites at Darwin International Airport (DIA):

- The 'Bulky Goods Site'; and
- The 'Terminal Expansion Site'.

The Master Development Plan process for DIA developments has already commenced, involving the NT Department of Infrastructure, Planning and Environment (DIPE), and the federal government Department of Environment, Water, Heritage and the Arts (DEWHA).

2.1.1 The Bulky Goods Retail Site

NT Airports are proposing to commission the development of a home lifestyle retail centre, or 'Bulky Goods Site' on a part of the airport lease with a cadastral listing of 'Prime Development Land'. An existing Bunnings retail centre is adjacent and to the south of this 8 ha site, which is bordered to the west and north by Bagot and McMillans Roads, and to the east and southeast by Neale Street and Osgood Drive, respectively. **Appendix 1** shows the site location and proposed layout for the Bulky Goods development.

The proposed Bulky Goods development site is one of a few remaining blocks in the local area that support a remnant *Eucalyptus* woodland habitat. Vegetation of interest on the site includes the Vulnerable 'Darwin' Cycad *Cycas armstrongii*. Two native rat species currently considered as near threatened under the *Territory Parks and Wildlife Conservation Act 2000* have also been reported as occurring on this site from a previous study, according to NT Airports (pers. comm. April 2008). NT Airports have commenced an Environmental Impact Assessment for the proposed development, and the current flora and fauna studies will form an essential component of this document.

2.1.2 The Terminal Expansion Site

The Terminal Expansion site is proposed for auxiliary development of the terminal. The proposed expansions will include development or changes to an existing car park and a small, currently undeveloped area. The site is undeveloped land and has been heavily disturbed in the past, and currently consists of mown grasses and weeds with some sparsely scattered woodland tree clusters. The site is approximately one hectare.

3 METHODOLOGY

This study was conducted using standardised methods described in the *Guidelines for the Terrestrial Biodiversity Component of Environmental Impact Assessment* developed by the Biodiversity Conservation Division of DIPE (now NRETA) in 2005. This report includes the findings from two separate surveys:

1) Bulky Goods Site Survey – desktop review, fauna survey, floristic composition, Cycad count; and

2) Terminal Expansion Survey – floristic composition, Cycad count.

3.1 Desktop Review for the Bulky Goods Site

The main data sources utilised in the desktop review were:

- NT Fauna Atlas records provided by the PWSNT;
- NT Flora Atlas records provided by the PWSNT;
- EPBC Act Protected Matters Database Search;
- Previously prepared flora reports completed for the Darwin International Airport; and
- Scientific papers and reference books.

The results of the desktop review were used to identify fauna species and habitats of conservation significance that occur in or near the proposed 'Bulky Goods' site and to focus the field assessments on areas of potential significance to fauna.

3.1.1 NT Fauna and Flora Atlas Database

The NT Fauna Atlas is maintained by the Parks and Wildlife Service NT (PWSNT). The fauna atlas contains point locations of fauna species identified in miscellaneous surveys and from incidental observations. Survey effort has been concentrated in certain areas and as a result many areas in the Northern Territory are currently data deficient. The NT Fauna Atlas was utilised to identify species likely to occur within 10 km and 2 km radius of the survey site, and to assess whether or not species classified as Threatened under Northern Territory or Commonwealth legislation have been previously recorded.

3.1.2 EPBC Database Search Tool

The *Environment Protection and Biodiversity Conservation Act 1999* (*EPBC Act*) database is maintained by the Department of Environment, Water, Heritage and the Arts (DEWHA) – a Department of the Federal Government. This database is provided to assist members of the public in understanding the *EPBC Act* and their rights, obligations and requirements under the Act. The database holds mapped locations of World Heritage properties, Ramsar wetlands, threatened, migratory and marine species, threatened ecological communities and protected areas. It is used to determine whether development is likely to affect a matter of National Environmental Significance and consequently require referral for assessment and approval under the *EPBC Act 1999.* Whether or not an action will trigger assessment under the *EPBC Act 1999* depends on the particular location, scope, timing and other circumstances of the proposed action. The EPBC database and data contained in the other datasets listed in this section were used to identify matters of national environmental significance that occur within 10 km of the proposed 'Bulky Goods' survey site.

3.1.3 Previous Flora and Fauna studies within Darwin International Airport

The following previous vegetation survey was the only previous report provided to EcOz Environmental Services:

- Jacka, S. 2004. The State of Native Vegetation at Darwin International Airport. Prepared for NT Airports Pty Ltd.

3.2 Bulky Goods Fauna Survey

The fauna survey of the Bulky Goods site was conducted between the 26th and 29th of March 2008 by Environmental Scientists Tom Reilly and Jeni Cheater. The survey was conducted using methods described in the *Guidelines for the Terrestrial Biodiversity Component of Environmental Impact Assessment*. This methodology is the standard methodology for fauna surveys in the Northern Territory.

The Bulky Goods survey area is relatively small and contains a uniform woodland community mixed with cleared areas for stockpiling and an overhead power line corridor. Therefore, one site was decided as sufficient to adequately assess the area for fauna species presence. Six quadrats of 50 m x 50 m were established within the site. Quadrat locations were assigned letters A, B, C, D, E and F and recorded by GPS (Datum: GDA 94). Quadrat locations are described in **Table 4.1** and plotted in **Map 1 (Appendix 2)** using ArcView 9.2. Photographs of each quadrat are provided in **Appendix 5**.

The EcOz survey team established the traps and monitored each quadrat continuously for three days and nights. Traps and flagging tape were removed at the end of the survey period, and the pit traps holes filled and compacted to ground level.

The layout of traps in each quadrat involved:

- 20 Elliott traps around the perimeter – 5 on each side approximately 8 m apart;
- Cage traps – one in each corner; and
- Pitfall traps – scattered within each quadrat.

The pit traps used 20 L plastic buckets dug to ground level and 10 m of drift-fence. Where possible, the pits were located within different microhabitats in the quadrat. The pit traps were opened for 3 nights, checked early each morning and rechecked at midday. The Elliott traps and cage traps were rebaited each afternoon, opened overnight and closed in the mornings. The bait involved a mixture of oats, peanut butter and sardine oil. Trapped animals were identified and released near the capture point. There was no need to mark captured animals.

Birds were counted in a 100 m x 100 m quadrat (i.e. 25 m outside of the quadrat). Each quadrat was censused for birds eight times in daylight and twice during two nocturnal visits. Bird counts mainly occurred in the early morning and evening (dusk), with a few spread throughout the day. Each count was considered an instantaneous count of all the birds within the quadrat, and involved viewing the quadrat for five minutes. Birds that were noted outside of the time of bird count, or outside the quadrat were noted as incidentals. This is also true of mammals, amphibians, and reptiles. Only birds using the quadrat were counted and birds merely flying across or overhead were not included. Raptors were included if they were hunting overhead.

The quadrats were also actively searched five times each for reptiles, mammals, and their scats and signs; three daytime searches were conducted (morning, midday, late afternoon), and two nocturnal searches were conducted.

The active searches were for 10 minutes duration and involved:

- Turning rocks and logs, raking through leaf litter and grass, looking under bark, behind trees, in crevices, etc;
- Recording the number of individuals of each species seen; and
- Recording scats, bones and other signs where they could be confidently attributed to species.

Opportunistic observations made whilst travelling around the project area between the survey sites were also recorded. The surveys were conducted by a team of experienced fauna surveyors and field assistants that assisted with site preparation, including installing the traps, checking the traps, collecting animals, loading and unloading equipment.

The following resources were used for species identification and classification:

- Amphibians – A Field Guide to Australian Frogs (Barker *et al*. 1995); Reptiles and Amphibians of Australia (Cogger 2000);
- Reptiles – A Complete Guide to Reptiles of Australia (Wilson and Swan 2003); Reptiles and Amphibians of Australia (Cogger 2000); Skinks of the Northern Territory (Horner 1991);
- Birds – The Field Guide to the Birds of Australian (Pizzey and Knight 1997); and
- Mammals – The Mammals of Australia (Menkhorst & Knight 2001); Mammals of Australia (Strahan 1995); Australian Bats (Churchill 1998); Tracks, Scats and Other Traces (Triggs 1996).

Bats were surveyed using an Anabat bat detector, which was set up to record for one hour on the second night of trapping in a central location of the survey area (near western edge of Quadrat C). Damian J. Milne's (2002) key to the bat calls of microchiropteran bat fauna of the Top End of the Northern Territory was used to analyse the Anabat results in conjunction with a book on Australian Bats (Churchill 1998).

Although using the Anabat to record bat calls is a non-intrusive means of bat detection and identification it can only result in presence of bat species rather than quantification of bat populations (i.e. an individual bat could fly over the detector several times in one survey session. Furthermore, even expert users may only identify as few as 10% of call files to species level (Milne 2002). For the purpose of this report, information on habitat use and range from the book on Australian Bats (Churchill 1998) was used to confirm possible identifications from the bat key (Milne 2002).

3.2.1 Fauna Survey Limitations

- The results of the fauna surveys are only a 'snapshot' in time, and do not allow for seasonal variations or migrations;
- Scats cannot always be correctly attributed to species, however where they can be confidently identified, they provide an accurate indication of the presence and habitat preferences of certain species (Telfer *et al.* 2006).
- Detection of nocturnal species by spotlight potentially only detects about 25% of the animals present (e.g. Goldingay & Sharpe 2004), and is affected by environmental factors (Wayne *et al.* 2005). Specific survey conditions can be selected to improve spotlight detection efficiency (Wayne *et al.* 2005).
- Another study (Read & Moseby 2001a) also concluded that environmental factors affect the capture rates of small reptiles. Unfortunately, planning logistics for fauna surveys around specific

environmental conditions is very difficult. Planning to survey in the early dry season allows the best chance of favourable environmental conditions.

- The trap types and trapping methodologies utilised in this study do not necessarily provide an unbiased or complete indication of species diversity within an area (Cunningham et al. 2005. Read & Moseby 2001b, Thompson et al. 2005).

3.3 Bulky Goods Flora Survey

Each quadrat was assessed for floristic composition and nature of the landscape. Data were recorded on prepared data sheets which included the following information:

- GPS Coordinates using a hand-held 12-satellite GPS set to GDA94 (accuracy around +/- 5 m);
- Site description;
- Description of physical environment;
- Description of the level of disturbance, if any;
- Vegetation classification and species identified;
- Fire history and impact;
- Evidence of weeds (scaled from 0=no evidence to 5=evidence of high numbers);
- Soil description;
- Digital photographs; and
- Any other relevant information.

Field identifications of flora species were made using a variety of books and reference materials, including Brock 1993, Brooker & Kleinig 2004, Cowie & Albrecht 2005, Maslin 2001, Sharp & Simon 2002, Smith 2002, and Wightman & Andrews 1989. Plant species that could not be identified in the field were sampled and preserved for later identification by the NT Herbarium. Identifications from the NT Herbarium have been applied to the sampled specimens and incorporated into the results.

3.4 Evaluation of Conservation Significance

The conservation significance of flora, fauna and habitats within and surrounding the project area were assessed with reference to:

- Species classified as threatened in accordance with the *EPBC Act*; and
- Species classified as threatened in accordance with the *TWPC Act*.

Threatened species are those classified as extinct in the wild, critically endangered, endangered or vulnerable as assessed against International Union for the Conservation of Nature (IUCN) categories. The *TPWC* gives protected status to all species classified as 'threatened' in the NT and requires a person to apply for a permit to take or interfere with protected species. Nationally 'threatened' species constitute a Matter of National Environmental Significance under the *EPBC Act 1999*. In accordance with this Act, a person cannot take an action that will have a significant impact on a 'threatened' species without prior approval of the Commonwealth.

The Northern Territory also classifies certain species as Near Threatened and Data Deficient. Species that fall under these categories are not currently regarded as holding significant conservation status, however,

efforts to improve ecological knowledge and determine more detailed information on these species is regarded as important.

3.5 *Cycas armstrongii* Quantification Survey

The Darwin International Airport (DIA) property has several established Cycad *Cycas armstrongii* patches within its boundary, with one patch occurring within the proposed Bulky Goods site. *Cycas armstrongii* is listed as a vulnerable species within the Northern Territory (*TPWC Act 2000*). For this reason, the Northern Territory Government recommended that DIA obtain a permit from NT Parks and Wildlife Service to relocate the cycads from the proposed development land for later use in landscaping as a part of the NTs Cycad Management Plan. Relocating every cycad from the Bulky Goods Site could become a significant and time-consuming operation, thus consultation with the NT Government on this issue may be necessary.

To assist with this process, EcOz included a quantification survey of the *Cycas armstrongii* patch within the proposed Bulky Goods survey area. Cycads were quantified by walking the site in a systematic pattern to include the entire cycad population within the proposed development area. Each individual was tallied and separated into four height classes listed below: (refer Table 4.2 below).

- Under 50 cm
- 51 cm to 100 cm
- 101 cm to 150 cm
- Greater than 150 cm

3.6 Terminal Expansion Flora Survey

This survey was conducted on the April 3rd 2008 by Tom Reilly and Ray Hall. The methodology for undertaking the flora survey within the Terminal Expansion was similar to the Bulky Storage quadrat surveys (described in **Section 3.3**). The survey area was treated as one quadrat and a full species list was complied for the site, along with photos and site condition assessment. GPS tracks and waypoints were also collected for referencing locations and voucher specimens within the site.

4 RESULTS AND DISCUSSION

4.1 Bulky Goods Flora Survey

4.1.1 Habitat and Vegetation Type

The Bulky Goods survey site currently supports a woodland community dominated by *Eucalyptus tetrodonta* with *E. miniata* and *Acacia auriculiformis* also being frequent co-dominant canopy species. The sub-canopy low tree and shrub layer includes juvenile trees of canopy species and *Cycas armstrongii*, *Buchanania obovata, Brachychiton diversifolius, Terminalia ferdinandiana*, *Planchonia careya, Calytrix exstipulata* and *Pandanus spiralis.* Tall tussock grasses dominated the understorey, including *Heteropogon triticeus*, *H. contortus* and *Sarga sp.* This vegetation type closely aligns with the expected dominant species described within the Australian Tropical Savannas Vegetation Map (Tropical Savannas CRC and Queensland EPA 2001). The (undeclared) noxious weed Gamba Grass *Andropogon gayanus* was present across the whole site.

All six quadrats contained very similar vegetation, namely *Eucalyptus tetrodonta* woodland mixed with previously cleared regrowth areas with a common presence of Gamba Grass (a weed) and native Speargrass *Heteropogon* species. **Table 4.1** describes the floristic composition of each quadrat in combination with several other physical parameters. Photographs of each quadrat are provided in **Appendix 5**, and full species list for the Bulky Goods site is provided in **Appendix 4**. Forty-four flora species were identified within the Bulky Goods site.

The site is surrounded by major roads and development, and has been exposed to major physical disturbance activities in the past, including vegetation clearance for the overhead power line corridor and stockpiling of soil and vegetation. These disturbances have accelerated the invasion of weeds such as Gamba Grass *Andropogon gayanus*, Gambia Pea *Crotalaria goreensis*, Morning Glory *Ipomoea eriocarpa,* Beggarweed *Desmodium pullenii,* Calopo *Calopogonium mucunoides* and *Stylosanthes viscose* and several garden and disturbance species.

Patchy fires appear to frequently occur across the site as Gamba Grass and several trees/shrubs are re-sprouting after recent late dry season 2007 fires. Observations on site suggested that it is unlikely that the fires became hot enough to result in native tree mortalities.

Soils are generally well drained red earths mixed with gravel and a medium level of leaf litter breakdown. The site is spotted with abrupt soil changes in some areas which is most likely due to stockpiling activities bringing in new soil. Erosion is evident within the site but is restricted to local areas of disturbance, as the soil structure appears to be relatively stable.

Table 4.1: Vegetation and Landform description of each survey quadrat within the Bulky Goods site.

Note: Flora species in **bold** are dominant within the stratum. Eastings and Northings were recorded in GDA94.

Quadrat	Easting	Northing	Land-form & Slope%	Disturbance	Rock	Soil	Vegetation Type	Upper Stratum Species	Mid Stratum Species	Lower Stratum Species
A	702008	8628633	Uneven surface, runoff area	Soil stockpiles, weeds, garden plants, traffic	5% Gravel	Mix of new soils and sands, grayish	Open woodland	***Acacia auriculiformis***; *Eucalyptus tetrodonta; Eucalyptus miniata.*	***Acacia holosericea***; *Buchanania obovata; Ficus scobina; Cycas armstrongii; Brachychiton diversifolius; Acacia dunnii; Eucalyptus tetrodonta; Eucalyptus miniata; Cochlospermum fraseri.*	***Andropogon gayanus***; ***Crotalaria goreensis***; *Brachychiton megaphyllus; Gomphrena canescens, Lophostemon.*
B	701940	8628596	Flat, gentle	Cleared patch (20 x 20m), weeds, recent fire	15% Gravel stones	sandy clay loam	Open woodland	***Eucalyptus tetrodonta***, *Acacia auriculiformis; Eucalyptus miniata.*	***Brachychiton diversifolius***; ***Cycas armstrongii***; *Planchonia careya; Acacia mimula.*	***Planchonia careya***; ***Andropogon gayanus***; *Buchanania obovata; Ficus scobina; Brachychiton megaphyllus; Grevillea decurrens; Ampelocissus acetosa.*
C	701882	8628659	Flat	Low disturbance, least disturbed section of site	15% Gravel stones	Gray, black	Woodland	***Eucalyptus tetrodonta***; ***Eucalyptus miniata***; *Acacia auriculiformis*	***Cycas armstrongii; Pandanus spiralis;*** *Brachychiton diversifolius; Ficus scobina; Alstonia actinophylla; Buchanania obovata; Ampelocissus acetosa; Amyema sanguinea.*	***Cycas armstrongii***; ***Andropogon gayanus***; *Brachychiton megaphyllus; Sarga plumosum; Heteropogon triticeus;, Tacca leontopetaloides; Patersonia macrantha; Passiflora foetida, Sorghum, Sehima nervosum, Petalostigma pubescens, Pittosporum sp., Gymnanthera oblonga.*

Quadrat	Easting	Northing	Land-form & Slope%	Disturbance	Rock	Soil	Vegetation Type	Upper Stratum Species	Mid Stratum Species	Lower Stratum Species
D	701978	8628712	Flat	Cleared corridor for overhead power lines, several soil heaps and holes	15% Gravel stones	Sandy clay loam	Open woodland	***Eucalyptus tetrodonta;*** *Eucalyptus miniata; Acacia auriculiformis.*	***Ficus scobina;*** ***Cycas armstrongii;*** *Buchanania obovata; Acacia auriculiformis.*	***Andropogon gayanus;*** *Planchonia careya; Brachychiton megaphyllus; Tacca leontopetaloides, Calopogonium mucunoides.*
E	702079	8628759	Flat	Cleared corridor for overhead power lines, several soil heaps and holes	15% Gravel stones	Reddish , gray	Open woodland	***Eucalyptus tetrodonta;*** *Acacia auriculiformis.*	***Ficus scobina;*** *Planchonia careya; Persoonia falcata; Cycas armstrongii; Acacia mimula; Terminalia grandiflora.*	***Andropogon gayanus;*** *Tacca leontopetaloides; Crotalaria goreensis; Hyptis suaveolens, Gymnanthera oblonga.*
F	702392	8628837	Flat		15% Gravel stones	Sandy clay loam	Open woodland	***Eucalyptus tetrodonta;*** *Acacia auriculiformis; Terminalia ferdinandiana, Heteropogon triticeus.*	***Calytrix exstipulata;*** *Ficus scobina; Buchanania obovata; Cycas armstrongii; Planchonia careya; Alstonia actinophylla; Dioscorea bulbifera; Vigna vexillata.*	***Heteropogon triticeus;*** ***Crotalaria goreensis;*** *Milinis repens; Andropogon gayanus; Hibiscus meraukensis; Gomphrena canescens, Spermacoce sp., Ipomoea eriocarpa, Stylosanthes viscose, Desmodium pullenii.*

4.1.2 Significant Flora Species

One of the four significant flora species identified by Jacka (1994) was found during the Bulky Goods site survey; the Cycad *Cycas armstrongii* (**Appendix 7, Plate 1**). The other three species (*Polymeria pusilla*, *Drosera dilatato-petiolaris* and *Utricularia hamiltonii*) were also targeted during the flora assessment, however, they were not located on site.

A cycad count within the Bulky Goods site indicated the presence of approximately 899 individual *Cycas armstrongii* plants, ranging in size from ground level to greater than 200 cm in height. **Table 4.2** shows results from the cycad quantification survey. The map in **Appendix 9** shows the area of highest cycad density within the survey site. Approximate ages were predicted from known average growth rates for *Cycas armstrongii* (4.5 cm/year) (Watkinson & Powell 2004).

Table 4.2: Results from the Cycad Quantification Survey.

Height Class	Number	Approx. Age
0 cm – 50 cm	306	< 11 years
51 cm – 100 cm	200	< 22 years
100 – 150 cm	244	< 33 years
>150 cm	149	> 33 years

Smaller cycads were generally found in clusters of 3 or 4 with a more established individual in close range. The well established Cycads (over 150 cm) were sparsely distributed except for two patches near the Bagot and McMillans Rd intersection on the Bunnings side. The cycads thinned out towards Neale Rd and in the northern most survey site (Quadrat F area) less then 30 individuals were counted. In most circumstance, only cycads above 150 cm were fruiting during the survey period. The larger Cycad specimens at the site (~200 cm) are predicted to be approximately 50 years old.

4.2 Bulky Goods Fauna Survey

A total of 49 fauna species were recorded at the proposed Bulky Goods site during the survey period (**Appendix 3**), these included:

- 3 Amphibians;
- 13 Reptiles;
- 27 Birds; and
- Mammals

Five of these species have not been previously recorded in the NT Fauna Atlas within 10 km of the site. These new species records include:

- Darwin Skink Glaphyromorphus darwiniensis;
- Blind Snake *Ramphotyphlops* (likely *tovelli*);
- Northern Longeared Bat *Nyctophilus bifax*;
- Yellow-bellied Sheathtail Bat *Saccolaimus flaviventris*; and
- Beccari's Freetail Bat *Mormopterus beccarii*.

A full list of the 49 fauna species recorded in each quadrat is provided in **Appendix 3**. A full list of the fauna species extracted from the NT Fauna Atlas database (10 km radius from centre of Bulky Goods site) is also provided in **Appendix 6,** and lists 281 species. The NT Fauna Atlas includes results from many surveys, and covers a wider area and greater habitat range than the Bulky Goods survey site. Therefore, it is expected that the species list from the NT Fauna Atlas would exceed the current survey. The short duration of the Bulky Goods fauna survey, and the uniformity of the habitat type represented within the survey quadrats is reflected by the low proportion (approximately 17 %) of all previously recorded species in the area. Limitations, as documented in **Section 2.4** of this report, apply to all fauna survey methodologies. These limitations have a large role in limiting the diversity of species recorded during surveys.

4.2.1 Amphibians

Two native frog species were recorded during the two nocturnal searches, Green Tree Frog *Litoria caerulea* and Marbled Frog *Limnodynastes* (likely *convexiusculus*). Another two native species were listed on the NT Fauna Atlas within 10 km of the Bulky Goods survey site. The low numbers trapped and found during the survey could be caused by several factors, however it is likely that limited frog activity occurs within the site due to it being a relatively disturbed *Eucalyptus* woodland that lacks permanent drainage lines and/or ponds. The species identified from the survey and recorded in NT Fauna Atlas records are widespread and common within the Darwin region.

Seven Cane Toads *Bufo marinus* were caught during the field survey (**Appendix 7, Plate 2**). Cane Toads are a noxious pest in Australia and arrived in Darwin approximately 3 years ago. Several toads were also observed as road kill along McMillans Road and Osgood Drive. More discussion on Cane Toads is provided in **Section 4.2.5** below.

4.2.2 Reptiles

Thirteen reptile species were recorded during the Bulky Goods survey, including a range of skinks, dragons, blind snakes, monitors and a gecko (**Appendix 3**). Rainbow Skinks *Carlia* sp. (three species) were the most active reptile within the Bulky Goods area, with the Striped Rainbow Skink *Carlia munda* being the most frequently identified with 18 captures (**Appendix 7, Plate 3**). Six Frill-necked Lizards *Chlamydosaurus kingii* (juveniles to large adults) were identified by captures and active searches within Quadrats A, C, D and E (**Appendix 7, Plate 4** juvenile **Appendix 7, Plate 5** adult). Douglas Skinks *Glaphyromorphus douglasi* (**Appendix 7, Plate 6**) were the most active skinks (6 captures) with the exception of the small *Carlia* species. The Spotted Tree Monitor *Varanus scalaris* (cover photograph) was found in a Pitfall trap in Quadrat C. This species is currently regarded as Data Deficient within the Northern Territory.

The NT Fauna Atlas identifies that 54 reptile species have been previously recorded within 10 km of the survey site (**Appendix 6**). Two species from the Bulky Goods survey are new additions to the NT Atlas, *Ramphotyphlops* (likely *tovelli*) and *Glaphyromorphus darwiniensis*. The majority of the species listed in the Atlas database are likely to occur in the vicinity of the survey site, provided that suitable habitat is available and they are able to survive the surrounding traffic. Only two reptile species identified by the Fauna Atlas search have a threatened (vulnerable) status, *Varanus mertensi* and *V. panoptes*. Both of these monitors require floodplains or drainages as preferred habitat, therefore they are not expected to occur within the Bulky Goods area.

4.2.3 Birds

Twenty-seven bird species were observed within the *Eucalyptus* woodland of the Bulky Goods survey site. White-throated Honeyeaters *Melithreptus albogularis*, White-gaped Honeyeaters *Lichenostomus unicolor*, Brown Honeyeaters *Lichmera indistincta* and Peaceful Doves *Geopelia striata* were the most active within the site during the three day survey. A family of three Bush-stone Thick-knees *Burhinus grallarius* were seen within Quadrat C during the survey. These birds are regarded as Near Threatened within the Northern Territory. The complete bird list from the Bulky Goods site is provided in **Appendix 3**.

The NT Fauna Atlas database lists 204 bird species previously recorded within 10 km of the survey site (**Appendix 6**). All bird records from this survey have been previously identified within 10 km of the site according to the NT Fauna Atlas database. This count far exceeds our bird census for the site. This is expected due to the Bulky Goods site survey being a short-term 'snap shot' survey, the site supporting a uniform habitat type, and the NT Atlas database including results from many observations and surveys. Therefore, results from the Bulky Goods survey provide a subset of the local bird diversity that prefers *Eucalyptus* woodland habitat within an urban environment.

No bird species recorded during the survey are listed as threatened under Northern Territory or Commonwealth criteria. The Rainbow Bee-eater *Merops ornatus* has *EPBC* conservation significance as a migratory terrestrial bird species and was observed perching within the survey quadrats. A further discussion of NT Atlas records and possible presence of threatened birds within the proposed development area is provided in **Section 5.1.3**.

4.2.4 Mammals

The only mammal trapped during the survey was the Northern Brown Bandicoot *Isoodon macrourus* (**Appendix 7, Plate 7**). The Bandicoots were trapped in Cage and Elliott traps on six occasions during the survey period and included males, females and sub-adults. Nocturnal searches of the site observed Bandicoots activity and several digs, scats and tracks across the site (mainly focused around Quadrats A to E). This indicates that the bandicoot population in the survey area is thriving and healthy. Northern Brown Bandicoots are a common species in the Darwin region and have no conservation significance status.

A rodent species was 'tentatively' identified as a Pale Field Rat *Rattus tunneyi* during nocturnal searches within Quadrat C. The individual appeared to have a pale coat, lightly coloured ears, pale under body and was discovered in leaf litter and climbing amongst Pandanus. However, no individuals were caught within our trap lines so positive identifications were not possible to confirm this sighting. Shallow burrows were frequent within the site which is a typical shelter for the Pale Field Rat (Triggs 1996; Cole and Woinarski 2002; Menkhorst and Knight 2001). Several small digs targeting grass roots/stems and gnaw marks on fallen cycad nuts are typical of the Pale Field Rat (Cole and Woinarski 2002). This rodent could also be the introduced Black Rat *Rattus rattus* as this species is known to occur in the Darwin area, and are also known to shelter in shallow burrows and tree hollows (although Black Rats appear to prefer making shelter amongst man-made structures; Triggs 1996).

Black-footed Tree Rats *Mesembriomys gouldii* were not trapped or observed during the survey. This species was targeted during active and nocturnal searches by checking tree hollows and *Pandanus spiralis* crowns during the day, and litter and trees by night. Other evidence of this species (scats, tracks, shelters, food waste) was also lacking during our searches.

Four bat species were keyed out from bat calls detected by an Anabat Recorder. The echolocation calls of some bat species are very similar and cannot be confidently identified to species level, hence the necessary grouping of some species. The species detected indicates only presence data rather than abundance of individuals within the site.

The NT Fauna Atlas has records of 18 mammal species within 10 km of the Bulky Goods site (**Appendix 3**). This survey has identified three new mammal species for the NT Fauna Atlas database, including the Northern Longeared Bat *Nyctophilus bifax*, Yellow-bellied Sheathtail Bat *Saccolaimus flaviventris* and Beccari's Freetail Bat *Mormopterus beccarii*.

4.2.5 Introduced fauna species

Seven Cane Toads *Bufo marinus* were found during the Bulky Goods survey, including trap captures (Pitfall and Elliott) and incidental captures (**Appendix 7, Plate 2**). The Cane Toad is an introduced species that now occupies Queensland, northern New South Wales and the Top End of the Northern Territory. Some individuals have been confirmed to have crossed the Western Australian border; however established populations are not definite. Concern about the ecological impacts of Cane Toads is widespread due to impacts associated with their predation, competition and lethal toxic ingestion. Cane Toads are currently nominated for listing as a 'key threatening process' under the Commonwealth *EPBC Act 1999*.

Domestic dogs and cats also occupy the site, however, their presence is not permanent as it is assumed the site is used by the local public for walking their pets.

4.3 Terminal Expansion Flora Survey

The Terminal Expansion Site has been cleared in the past and has been substantially altered from its original vegetation type, and is now mostly a mown grassy area with a few remnant trees, and many introduced weeds, included the declared weeds mentioned below. The area consists of scattered clusters of tree species (ranging from *Eucalyptus, Corymbia, Acacia, Alstonia, Alphitonia* and *Maranthes* species) separated by regularly mown grasses. The undergrowth contains a mix of native species but largely consists of weedy grasses, sub-shrubs and vines. The site has a flat morphology and appears to not have not been impacted by fire for many years.

There were 35 flora species identified during the survey excluding numerous weedy grasses and vines found throughout the site. **Appendix 4** provides all flora species recorded at the site during the survey period.

Four *Cycas armstrongii* were identified – one between 0 and 50 cm, two between 51 cm and 100 cm and one between 101 cm and 150 cm tall. This was the only protected flora species identified during the survey.

The most significant weeds identified were Gamba Grass *Andropogon gayanus*, Mission Grass *Pennisetum polystachion*, Lions Tail *Leonotis nepetifolia*, *Stachytarpheta jamaicensis* Snake Weed, Hyptis *Hyptis suaveolens* and Gambia Pea *Crotalaria goreensis, Crotalaria montana*. Care will need to be taken to not accelerate the spread of these species during times of vegetation clearance and stockpiling.

5 CONSERVATION SIGNIFICANCE AND POTENTIAL IMPACTS

5.1 Threatened Fauna Species

5.1.1 Nationally Listed Species

A search of matters protected under the Commonwealth *EPBC Act 1999* indicated that although no threatened ecological communities occur in the area, four threatened fauna species and 11 migratory species may inhabit or periodically utilise the proposed Bulky Goods site. None of these nationally listed species or preferred habitat were identified during the Bulky Goods survey.

Table 5.1: Threatened Terrestrial Fauna Species (*EPBC Act 1999*)

Species name and Description	Status (Aust. & NT)	Preferred Habitat and Known Distribution	Likelihood of Occurrence
Red Goshawk *Erythrotriorchis radiatus* Nil records.	Vulnerable (*EPBC Act 1999),* Vulnerable *(TPWC Act 2000)*	Coastal, sub-coastal forests, tropical woodlands.	Moderate. The Red Goshawk may inhabit the region.
Gouldian Finch *Erythrura gouldiae* Nil records.	Endangered *(EPBC Act 1999)* Endangered (*TPWC Act 2000*)	Open tropical woodland that has a grassy understorey, often in hilly areas.	Very Unlikely, the survey sites contained no areas considered as prime habitat for this species.
Partridge Pigeon *Geophaps smithii smithii* Nil records.	Vulnerable *(EPBC Act 1999)* Vulnerable *(TPWC Act 2000)*	Open forest and woodland dominated by *Eucalyptus tetrodonta* and *Eucalyptus miniata* with a structurally diverse understorey.	Very unlikely. The Partridge Pigeon is unlikely to inhabit the area.
Northern Quoll *Dasyurus hallucatus* Once common across Northern Australia, this species' range has contracted by 75%.	Endangered (*EPBC Act 1999),* Critically Endangered (*TPWC Act 2000*)	Rocky escarpment, open forest and open woodland.	Low. The rocky escarpments that are the Quoll's preferred habitat are not close to the survey area.

Several marine and estuarine species were detected in the *EPBC Act* database search and have not been included in **Table 5.1** due to the Bulky Goods site not overlapping or possibly impacting on these environments (Refer to **Appendix 8** for full report).

Gouldian Finches prefer Salmon Gum Woodlands (*Eucalyptus tintinnans*) in hilly areas and feed on the seeds of *Sarga* and other species during the dry season, and move to lowland drainage areas that support perennial grasses in the wet season (Woinarski 2006c – Gouldian Finch Fact Sheet). These habitats do not occur within or near to the Bulky Goods site and it is expected that Gouldian Finches do not reside within the area.

Red Goshawks prefer tall open Eucalyptus woodlands and riparian areas typically supporting Paperbark (*Melaleuca* sp.) and gallery forests (Aumann 1991). Red Goshawks can travel far distances during their hunting and social activities (i.e. can cover an area up to 200 km^2), however, nests generally occur close to permanent drainage lines (Woinarski 2006d – Red Goshawk Fact Sheet). Therefore, habitat and nesting preferences of Red Goshawks indicates a small chance of the species occurring or utilising the Bulky Goods *E. tetrodonta* Woodland.

The information provided from the NT ATLAS database indicates that Partridge Pigeons and Northern Quolls have been previously recorded within 10 km of the surveyed site (**Appendix 6**). Northern Quoll populations have been in decline for the past few decades, and are especially susceptible to Cane Toad poisoning when they attempt to kill or consume the toads (Woinarski 2006a – Northern Quoll Fact Sheet). Currently, Cane Toads are the Northern Quoll's primary threat (Woinarski 2006 – Northern Quoll Fact

Sheet) and populations are not expected to occur in areas of high Cane Toad abundance such as the Bulky Goods site. Partridge Pigeons typically occur in low open woodland communities over a native grass understorey. Partridge Pigeon populations are found to have been adversely impacted by altered fire patterns and the recent invasion of exotic grass species such as Gamba Grass *Andropogon gayanus* (Woinarski 2006b – Partridge Pigeon Fact Sheet). The abundance of Gamba Grass, the high disturbance from surrounding traffic and lack of healthy native grass patches within the Bulky Storage site is unfavourable for Partridge Pigeons.

5.1.2 Migratory Species

Several *EPBC Act* listed migratory species were detected in the threatened species database as potentially occurring within the survey site. These include:

- Melville Cicadabird Coracina tenuirostris melvillensis;
- Gouldian Finch Erythrura gouldiae;
- White-bellied Sea Eagle *Haliaetus leucogaster*;
- Barn Swallow Hirundo rustica;
- Rainbow Bee-eater *Merops ornatus;*
- Derby White-browed Robin *Poecilodryas superciliosa*;
- Rufous Fantail Rhipidura rufifrons;
- Great Egret *Ardea alba*;
- Cattle Egret *Ardea ibis;*
- Saltwater Crocodile *Crocodylus porosus;* and
- Freshwater Crocodile *Crocodylus johnstoni*.

Of these species, the Rainbow Bee-eater was observed on several separate occasions feeding over, and perching within the survey quadrats. However, it is unlikely that the development of the Bulky Goods site will impact on this highly mobile and common species in the Darwin region.

The habitat and vegetation community within the survey site does not hold importance towards conservation of any potential migratory species that could overfly the site. Therefore, it is unlikely that migratory species listed above will not be impacted by the development of the Bulky Goods Storage site.

5.1.3 Protected Fauna in the Northern Territory

The NT Fauna Atlas indicates that 8 threatened species have been previously recorded within 10 km of the survey site (see below). This list includes several species (such as the Loggerhead Turtle *Caretta caretta*) whose habitat does not occur within or will be adversely affected by the Bulky Goods development proposal.

- Northern Quoll *Dasyurus hallucatus* — Critically Endangered
- Gouldian Finch *Erythrura gouldiae* — Endangered
- Loggerhead Turtle *Caretta caretta* — Endangered
- Australian Bustard *Ardeotis australis* — Vulnerable
- Partridge Pigeon *Geophaps smithii smithii* — Vulnerable

- Red Goshawk *Erythrotriorchis radiatus* Vulnerable
- Merten's Water Monitor *Varanus mertensi* Vulnerable
- Flood Plain Monitor *Varanus panoptes* Vulnerable

None of these species were recorded during the March 2008 survey of the proposed Bulky Goods development area, and none are likely to occur there; it is unlikely that the development of the area will impact on the further degradation of the status of these species.

5.1.4 Near Threatened Fauna Species

The NT Fauna Atlas shows that five species with a current Near Threatened status have been previously identified within 10 km of the Bulky Goods site. These species are listed below:

- Bush-stone Curlew *Burhinus grallarius*
- Red-tailed Black Cockatoo *Calyptorhynchus banksii*
- Clamorous Reed-Warbler *Acrocephalus australis*
- Black-footed Tree Rat *Mesembriomys gouldii*
- Pale Field Rat *Rattus tunneyi*

Two of these Near Threatened species were observed within the Bulky Goods site. A family of three Bush-stone Curlews *Burhinus grallarius* were positively identified in Quadrat C and B during the Bulky Goods survey. These birds are common in the Darwin region and become more sparsely distributed when travelling south into Central Australia (where populations have been in decline). The species is relatively mobile and is likely to have other local refuge habitat in the area.

A Pale Field Rat *Rattus tunneyi* was tentatively identified during a nocturnal search of Quadrat C. However, as the rodent was not identified 'in the hand' we cannot be confident of the species identification.

5.2 Protected Flora under the TPWC Act 2000 within the Bulky Goods survey site

The NT Flora Atlas database identified previous recordings of two protected flora species within 10 km of the survey site (**Table 5.2**). Of these, the Cycad *Cycas armstrongii* was identified within the Bulky Goods survey area. Approximately 900 individual specimens were counted, with a size range from ground level up to over 200 cm. The Cycads are currently established across the whole site, however, the southwestern section of the woodland contains the highest densities (**Appendix 2**). Aside from the vulnerable cycad, the woodland contains an abundance of Gamba Grass *Andropogon gayanus* and a relatively low diversity of flora species.

The other vulnerable species listed, Bladderwort *Utricularia singeriana*, was found within another location of the Darwin International Airport by Sally Jacka in 2004 (Jacka 2004). These species prefer moist swampy areas and it is unlikely that the loamy well drained soils of the Bulky Goods site would support the species. Active searches for the species within the six quadrats did not identify the Bladderwort species.

Table 5.2 also shows previous recording of five Near Threatened species within 10 km of the Bulky Goods site. None of these species occurred within the survey quadrat at the time of survey.

Table 5.2: Current TPWC listed plant species with NT flora atlas records within 10 km of survey site

Name	Listing Under *TPWC Act 2000*
Cycas armstrongii	Vulnerable
Utricularia singeriana	Vulnerable
Byblis aquatica	Near Threatened
Crotalaria quinquefolia	Near Threatened
Eucalyptus cupularis	Near Threatened
Peplidium maritimum	Near Threatened
Pittosporum moluccanum	Near Threatened

5.3 Protected Flora within the Terminal Expansion Area

Four Cycads *Cycas armstrongii* were counted within the area proposed for the Terminal Expansion development. This species is Vulnerable in the Northern Territory (*TPWC Act*). No other species of concern were identified within the Terminal Expansion area.

6 CONCLUSION

6.1 Bulky Goods Site

Despite previous disturbances and the location amongst the development and busy roads (Bagot Rd, McMillans Rd, Osgood Dr.) the survey produced a species list that suggests the site supports a favourable habitat for common native reptiles, birds, mammals and amphibians. The capture of six Northern Brown Bandicoots *Isoodon macrourus*, potential sightings of Pale Field Rats *Rattus tunneyi*, a healthy Cycad population and active reptile and bird observations confirm that the small patch of *Eucalyptus* woodland (8 ha) is an effective refuge habitat for native species living in the Darwin urban environment. The Cycad *Cycas armstrongii* is currently classified as vulnerable in the Northern Territory, no other flora species identified held conservation status. No threatened fauna species listed under NT or Commonwealth legislation were identified and the proposed development is unlikely to impact on the status of any flora or fauna species, assuming the implementation of the Cycad Management Plan take place.

6.2 Terminal Expansion Area

The Terminal Expansion area contains no impeding issues in regards to vegetation clearance of the site, providing that efforts to re-locate the Cycads are implemented. The site contains several weed species, therefore, clearance activities should be operated in a way to reduce the further spread of these plants into other areas (i.e. vehicle washdown, appropriate storage site for removed vegetation etc).

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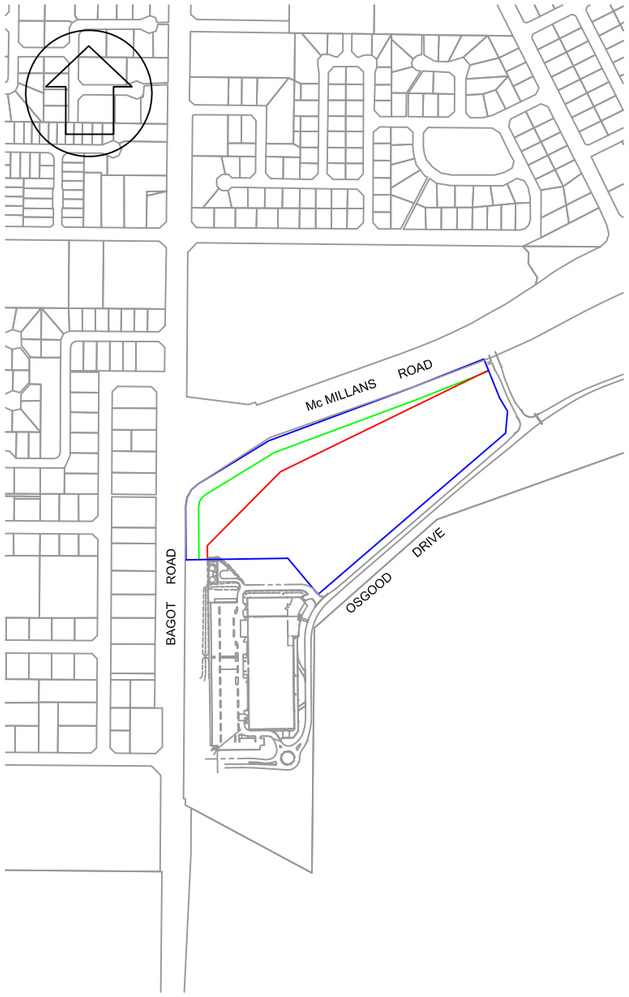
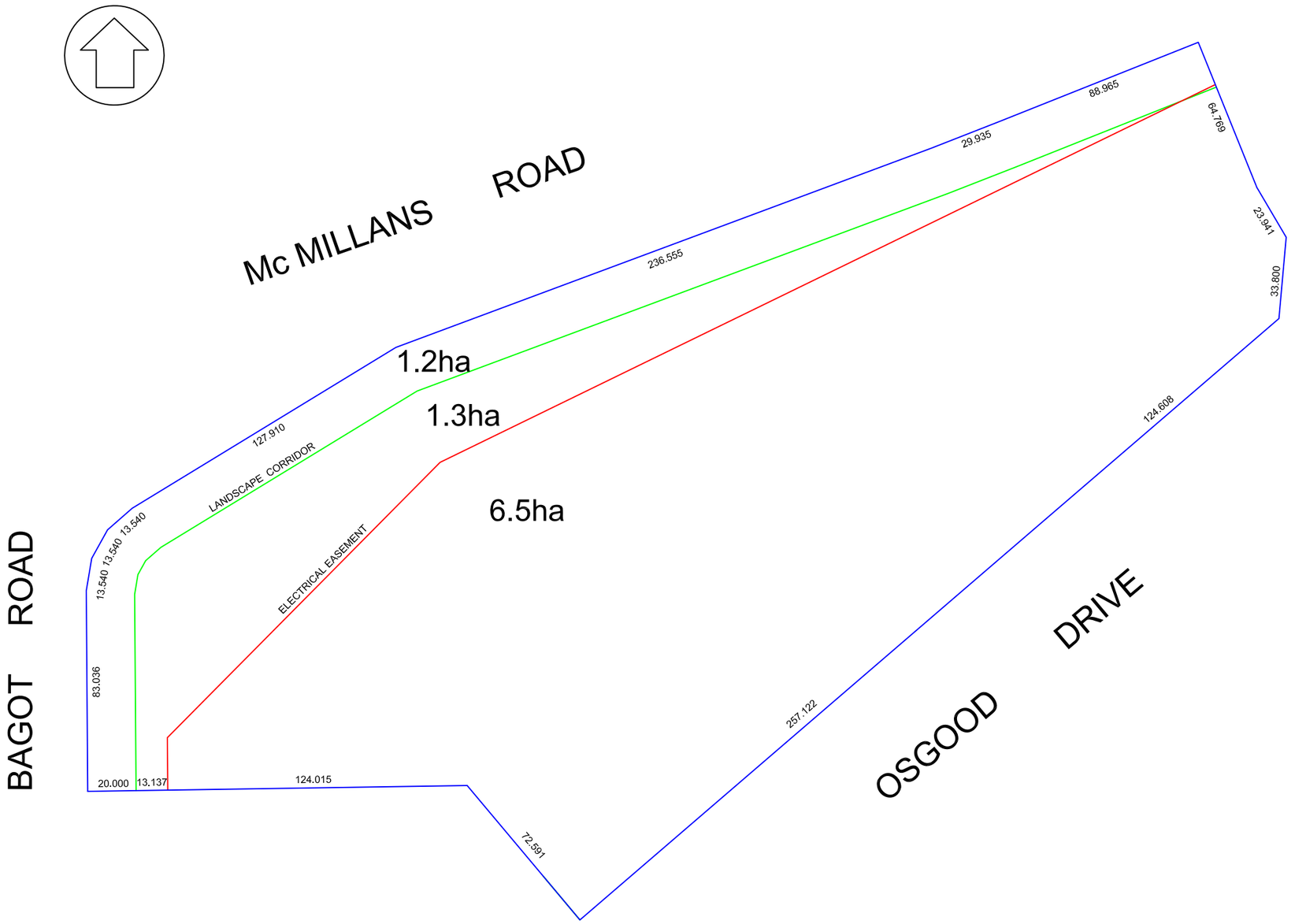
APPENDIX 1
Locality Map



LOCALITY PLAN

Not to Scale



Final Dimensions Subject To On Ground Survey

Licensed Surveyor_____ Date_____

Rego No.

DRAFT

Scale 0 20 40 60 80 100 Metres

LEASE AREA PLAN

No.	REVISION	DATE	INIT.
A	DRAFT ISSUED FOR REVIEW	18/03/2008	DTA

Darwin International Airport

ADDRESS: Osgood Drive
Darwin International Airport
Marrara NT 0812

PRECINCT: AIRPORT BUSINESS

DRAWING NO. DV20856.204-

SHEET 1 of 1

REV. A

APPENDIX 2
Survey Site Layout

Map 1: Flora and Fauna Survey Quadrats for the Proposed Bulky Goods Storage Yard

EcOz VDM GROUP member

Legend

Quadrat Boundary

40 20 0 40 Meters

N

Map produced by Tom Reilly (EcOz Environmental Services, 01/04/2008)

APPENDIX 3
Bulky Goods Site Fauna Results

BULKY GOODS FAUNA SURVEY RESULTS									
Family	**Common name**	**Scientific name**	**Number of times identified**						**Overall Total**
			QA	**QB**	**QC**	**QD**	**QE**	**QF**	
FROGS									
BUFONIDAE	Cane Toad	*Bufo marinus**	0	1	0	4	3	3	**11**
HYLIDAE	Green tree frog	*Litoria caerulea*	0	0	1	0	0	0	**1**
MYOBATRACHIDAE	Marbled Frog	*Limnodynastes (convexiusculus)***	0	0	0	0	0	0	**0**
			0	**1**	**1**	**4**	**3**	**3**	**12**
REPTILES									
GEKKONIDAE	Bynoe's gecko	*Heteronotia binoei*	0	1	0	0	0	1	**2**
AGAMIDAE	Frilled Lizard	*Chlamydosaurus kingii*	1	0	1	1	3	0	**6**
AGAMIDAE	Gilberts Dragon	*Lophognathus gilberti*	1	2	0	0	1	1	**5**
SCINCIDAE	Rainbow Skink	*Carlia sp.*	0	2	2	1	2	1	**8**
SCINCIDAE	Slender Rainbow Skink	*Carlia gracilis*	2	0	4	1	4	0	**11**
SCINCIDAE	Striped Rainbow Skink	*Carlia munda*	2	0	3	5	6	2	**18**
SCINCIDAE	Red-sided Rainbow Skink	*Carlia rufilatus*	1	1	1	0	1	1	**5**
SCINCIDAE	Port Essington	*Ctenotus essingtonii essingtonii*	1	0	0	0	0	0	**1**
SCINCIDAE	Darwin Skink	*Glaphyromorphus darwiniensis*	0	0	0	1	0	0	**1**
SCINCIDAE	Douglas Skink	*Glaphyromorphus douglasi*	1	1	0	0	3	1	**6**
SCINCIDAE	Skink (no official common name)	*Glaphyromorphus isolepis*	0	0	0	0	0	1	**1**
SCINCIDAE	Blue-tongue Lizard	*Tiliqua scincoides intermedia*	0	0	0	0	1	0	**1**
TYPHLOPIDAE	Blind Snake	*Ramphotyphlops tovelli***	0	0	0	0	0	1	**1**
VARANDAE	Spotted Tree Monitor	*Varanus scalaris*	0	0	1	0	0	0	**1**
			9	**7**	**12**	**9**	**21**	**9**	**67**
BIRDS									
BURHINIDAE	Bush Thick-knee	*Burhinus grallius*	0	0	3	0	0	0	**3**
CHARADRIIDAE	Masked Lapwing	*Vanellus miles*	0	0	1	0	0	0	**1**
ACCIPITRIDAE	Whistling Kite	*Haliastur sphenurus*	0	1	1	0	1	0	**3**
COLUMBIDAE	Pied-Imperial Pigeon	*Ducula bicolor*	0	0	1	0	1	0	**2**

BULKY GOODS FAUNA SURVEY RESULTS									
Family	**Common name**	**Scientific name**	**Number of times identified**						**Overall Total**
			QA	**QB**	**QC**	**QD**	**QE**	**QF**	
COLUMBIDAE	Peaceful Dove	*Geopelia striata*	2	2	3	7	7	5	**26**
COLUMBIDAE	Bar-shouldered Dove	*Geopelia humeralis*	0	2	4	2	3	2	**13**
PSITTACIDAE	Red-winged Parrot	*Aprosmictus erythropterus*	0	2	0	0	0	0	**2**
HALCYONIDAE	Forest Kingfisher	*Todiramphus macleayii*	0	1	1	0	1	0	**3**
HALCYONIDAE	Sacred Kingfisher	*Todiramphus sanctus*	0	0	0	0	1	0	**1**
MEROPIDAE	Rainbow Bee-eater	*Merops ornatus*	1	0	0	0	0	1	**2**
MALURIDAE	Red-backed Fairy Wren	*Malurus melanocephalus*	2	1	1	1	0	5	**10**
PARDALOTIDAE	Striated Pardalote	*Pardalotus striatus*	6	0	2	10	1	2	**21**
MELIPHAGIDAE	White-gaped Honeyeater	*Lichenostomus unicolor*	0	1	1	5	7	8	**22**
MELIPHAGIDAE	White-throated Honeyeater	*Melithreptus albogularis*	11	8	8	10	7	7	**51**
MELIPHAGIDAE	Brown Honeyeater	*Lichmera indistincta*	1	2	0	1	3	6	**13**
MELIPHAGIDAE	Rufous-banded Honeyeater	*Canopophila albogularis*	0	1	0	0	0	0	**1**
PETROICIDAE	Lemon-bellied Flycatcher	*Microeca flavigaster*	0	0	0	1	1	2	**4**
DICRURIDAE	Northern Fantail	*Rhipidura rufiventris*	0	0	0	0	1	0	**1**
DICRURIDAE	Leaden Flycatcher	*Myiagra rubecula*	0	0	0	0	1	0	**1**
DICRURIDAE	Magpie-lark	*Grallina cyanoleuca*	0	2	2	0	0	1	**5**
DICRURIDAE	Spangled Drongo	*Dicrurus bracteatus*	1	0	0	0	0	0	**1**
CAMPEPHAGIDAE	White-bellied Cuckoo-shrike	*Coracina papuensis*	0	0	1	0	2	1	**4**
ESTRILIDIDAE	Double-barred Finch	*Taeniopygia bichenovii*	1	1	4	1	6	4	**17**
ESTRILIDIDAE	Long-tailed Finch	*Poephila acuticauda*	0	0	6	0	2	1	**9**
DICAEIDAE	Mistletoebird	*Dicaeum hirundinaceum*	0	1	0	0	1	2	**4**
NEOSITTIDAE	Varied Sittella	*Daphoenositta chrysoptera*	0	0	0	0	0	1	**1**
			25	**25**	**39**	**38**	**46**	**48**	**221**
MAMMALS									
PERAMELIDAE	Northern Brown Bandicoot	*Isoodon macrourus*	0	1	1	2	1	0	**5**
MURIDAE	Pale Field Rat	*Rattus tunneyi*	0	0	0	1	0	0	**1**

BULKY GOODS FAUNA SURVEY RESULTS									
Family	**Common name**	**Scientific name**	**Number of times identified**						**Overall Total**
			QA	**QB**	**QC**	**QD**	**QE**	**QF**	
VESPERTILIONIDAE	Little Broadnosed Bat/Hoary Wattled Bat	*Scotorepens greyii/Chalinolobus nigrogriseus*	0	0	6	0	0	0	**6**
VESPERTILIONIDAE	Northern Longeared Bat	*Nyctophilus bifax*	0	0	4	0	0	0	**4**
EMBALLONURIDAE	Yellow-bellied Sheathtail Bat	*Saccolaimus flaviventris*	0	0	4	0	0	0	**4**
MOLOSSIDAE	Beccari's Freetail Bat	*Mormopterus beccarii*	0	0	3	0	0	0	**3**
			0	**1**	**18**	**3**	**1**	**0**	**23**

* Introduced Species
** Likely this species

Flora Species Identified from the Bulky Goods Survey Quadrats and Terminal Expansion (TE) Site.

Scientific name	Common name	Bulky Goods Survey Quadrats						TE
		A	B	C	D	E	F	
Acacia auriculiformis	Black Wattle	X	X	X	X		X	
Acacia dunnii	Elephant Ear Wattle	X						
Acacia holosericea	Silky Wattle	X						X
Acacia mimula			X			X		X
Alphitonia excelsa	Red Ash							X
Alstonia actinophylla	Milkwood			X			X	X
Ampelocissus acetosa	Wild Grape		X	X				X
Amyema sanguinea	Mistletoe			X				X
Andropogon gayanus *	Gamba Grass	X	X	X	X	X	X	X
Brachychiton diversifolius	Kurrajong	X	X					X
Brachychiton megaphyllus		X	X	X	X			X
Buchanania obovata	Green Plum		X	X	X		X	X
*Calopogonium mucunoides**	Calopo				X			
Calytrix exstipulata	Turkey Bush						X	
Cochlospermum fraseri	Kapok Bush	X						
Crotalaria goreensis *	Gambia Pea	X				X	X	X
*Crotalaria Montana**								X
Cycas armstrongii	Cycad		X	X	X	X	X	X
*Desmodium pullenii**	Beggarweed						X	
Dioscorea bulbifera	Round Yam						X	
Dioscorea transversa	Native Yam							X
Eucalyptus miniata	Woollybutt	X	X	X	X			X
Eucalyptus tetrodonta	Stringybark	X	X	X	X	X	X	X
Ficus scobina	Sandpaper Fig		X		X		X	X
Gomphrena canescens		X					X	X

Scientific name	Common name	Bulky Goods Survey Quadrats						TE
		A	B	C	D	E	F	
Gymnanthera oblonga	Harpoon Bud			X		X		
Heteropogon triticeus				X			X	X
Hibiscus meraukensis	Bush Hibiscus						X	X
Hyptis suaveolens *	Hyptis				X	X		X
*Ipomoea eriocarpa**	Morning Glory						X	
Leonotis nepetifolia	Lions Tail							X
Lophostemon sp.		X						
Maranthes corymbosa								X
Milinis repens *	Red Natel Grass					X	X	
Palm sp.								X
Pandanus spiralis			X	X	X			X
Passiflora foetida				X				X
Patersonia macrantha				X				
Pennisetum polystachion *	Mission Grass							X
Persoonia falcata			X			X		
Petalostigma pubescens	Bitter Bark			X				
Pittosporum sp	Whitewood			X				
Planchonia careya	Cocky Apple		X		X	X	X	X
Sarga plumosum	Sarga, Annual Sorghum			X				
Sehima nervosum				X				
Sorghum				X				
Spermacoce								X
Stachytarpheta jamaicensis *	Snakeweed							X
*Stylosanthes viscose**							X	
Syzygium suborbiculare	Red Bush Apple							X
*Rottboellia cochinchinensis**								X
Tacca leontopetaloides				X	X	X		X

Scientific name	Common name	Bulky Goods Survey Quadrats						TE
		A	B	C	D	E	F	
Terminalia ferdinandiana	Billy Goat Plum						X	X
Terminalia grandiflora						X		
Vigna vexillata							X	X
	TOTAL Species	**11**	**14**	**17**	**12**	**11**	**17**	**32**

NOTE:
* Weed Species

APPENDIX 5
Quadrat Sites

Plate 1: Quadrat A, north view. This site contained soil stockpile and was dominated by Gamba Grass *Andropogon gayanus* **and disturbance Acacias (mainly** *Acacia holosericea***). (P3280010)**

Plate X.2: Quadrat A, south view. Photograph taken from the top of one of the soil stockpiles. Pitfall trap can be seen on the left side of the image. (P3280012)

Plate 3: Quadrat B, north view. *Eucalyptus tetrodonta* **woodland. (P3270058)**

Plate 4: Quadrat C, east view. *Eucalyptus* woodland. This quadrat contained a high density of *Cycas armstrongii*. (P3270041)

Plate 5: Quadrat D, east view. *Eucalyptus* woodland with high level of Gamba Grass *Andropogon gayanus* understorey. *Cycas armstrongii* is present but thinning out from the denser patches in Quadrats C. (P3280010)

Plate 6: Quadrat E, south view. *Eucalyptus* woodland with cleared patches and soil heaps. (P32800114)

Plate 7: Quadrat F, west view. Patchy *Eucalyptus* woodland with open areas dominated by *Calytrix exstipulata* and *Heteropogon* sp. (P3280100)

APPENDIX 6
Site Fauna & NT Fauna Atlas

Records of species previously identied within 10 km of the Bulky Goods site (NT Fauna Atlas Database)

Threatened Species (NT)
CR = Critically Endangered
EN = Endangered
V = Vulnerable

Other Classifications (NT)
LC = Least Concern
DD = Data Deficient
NT = Near Threatened
NE = Not Evaluated
Int = Introduced species
New record = species is not currently listed on the NT Fauna Atlas within 10km of the Bulky Goods site

Family	Scientific Name	Common Name	NT Fauna Atlas Records	Bulky Goods Survey	Conservation Status
AMPHIBIANS					
Myobatrachidae	*Limnodynastes convexiusculus*	Marbled Frog	X	X	LC
Myobatrachidae	*Limnodynastes ornatus*	Ornate Burrowing Frog	X		DD
Hylidae	*Cyclorana australis*	Giant Frog	X		DD
Hylidae	*Litoria caerulea*	Green Tree Frog	X	X	LC
Bufonidae	*Bufo marinus* *	Cane Toad	X	X	Int
REPTILES					
Cheloniidae	*Caretta caretta*	Loggerhead Turtle	X		EN
Cheloniidae	*Chelonia mydas*	Green Turtle	X		LC
Cheloniidae	*Eretmochelys imbricata*	Hawksbill Turtle	X		DD
Cheloniidae	*Lepidochelys olivacea*	Olive Ridley	X		DD
Cheloniidae	*Natator depressus*	Flatback Turtle	X		DD
Chelidae	*Chelodina rugosa*	Northern Long-necked Turtle	X		LC
Chelidae	*Elseya dentata*	Northern Snapping Turtle	X		LC
Chelidae	*Emydura tanybaraga*	Northern Yellow-faced Turtle			LC

Family	Scientific Name	Common Name	NT Fauna Atlas Records	Bulky Goods Survey	Conservation Status
Gekkonidae	*Hemidactylus frenatus* *	Asian House Gecko	X		Int
Gekkonidae	*Heteronotia binoei*	Bynoe's Gecko	X	X	LC
Gekkonidae	*Gehyra australis*	Northern Dtella/ Native House Gecko	X		LC
Gekkonidae	*Oedura rhombifera*	Zig-zag Gecko	X		LC
Gekkonidae	*Strophurus ciliaris*	Spiny-tailed Gecko	X		LC
Pygopodidae	*Delma borea*	Rusty-topped Delma	X		LC
Pygopodidae	*Lialis burtonis*	Burton’s Legless Lizard	X		LC
Agamidae	*Chlamydosaurus kingii*	Frilled Lizard	X	X	LC
Agamidae	*Diporiphora bilineata*	Two-Lined Dragon	X		LC
Agamidae	*Lophognathus gilberti*	Gilbert's Dragon	X	X	LC
Agamidae	*Lophognathus temporalis*	Northern Water Dragon	X		LC
Varanidae	*Varanus mertensi*	Merten's Water Monitor	X		V
Varanidae	*Varanus mitchelli*	Mitchell's Water Monitor	X		DD
Varanidae	*Varanus panoptes*	Floodplain Monitor	X		V
Varanidae	*Varanus scalaris*	Spotted Tree Monitor	X	X	DD
Varanidae	*Varanus tristis*	Black-tailed Monitor	X		DD
Scincidae	*Carlia amax*	Two-spined Rainbow Skink	X		LC
Scincidae	*Carlia gracilis*	Slender Rainbow Skink	X	X	LC
Scincidae	*Carlia munda*	Striped Rainbow Skink	X	X	LC
Scincidae	*Carilia rufilatus*	Red-sided Rainbow Skink	X	X	LC
Scincidae	*Ctenotus essingtonii*	Port Essington Ctenotus	X	X	LC
Scincidae	*Ctenotus hilli*	Hill's Ctenotus	X		LC
Scincidae	*Cryptoblepharus plagiocephalus*	Aboreal Snake-Eyed Skink	X		LC
Scincidae	*Glaphyromorphus darwiniensis*	Darwin’ Skink		X	New record
Scincidae	*Glaphyromorphus douglasi*	Douglas' Skink	X	X	LC
Scincidae	*Glaphyromorphus isolepis*	Smooth-Tailed Skink	X		LC
Scincidae	*Morethia storri*	Storr's Snake-Eyed Skink	X		LC

Family	Scientific Name	Common Name	NT Fauna Atlas Records	Bulky Goods Survey	Conservation Status
Scincidae	*Tiliqua scincoides*	Common Blue-Tongued Lizard	X	X	DD
Typhlopidae	*Ramphotyphlops braminus*	Flower-pot Blind Snake	X		Int
Typhlopidae	*Ramphotyphlops tovelli*	Blind Snake		X	New record
Boidae	*Antaresia childreni*	Children's Python	X		DD
Boidae	*Aspidites melanocephalus*	Black-headed Python	X		LC
Boidae	*Liasis fuscus*	Water Python	X		LC
Boidae	*Liasis olivaceus*	Olive Python	X		LC
Boidae	*Morelia spilota*	Carpet Python	X		LC
Colubridae	*Boiga irregularis*	Brown Tree Snake	X		DD
Colubridae	*Dendrelaphis punctulatus*	Green Tree Snake	X		DD
Colubridae	*Fordonia leucobalia*	White-bellied Mangrove Snake	X		LC
Colubridae	*Myron richardsonii*	Richardson's Mangrove Snake	X		LC
Colubridae	*Stegonotus cucullatus*	Slaty-grey Snake	X		LC
Colubridae	*Cerberus australis*	Australian Bockadam	X		LC
Elapidae	*Cryptophis pallidiceps*	Northern Small-eyed Snake	X		DD
Elapidae	*Demansia vestigiata*	Black Whip Snake	X		DD
Elapidae	*Furina ornata*	Orange-naped Snake	X		DD
Elapidae	*Pseudonaja nuchalis*	Western Brown Snake	X		DD
Elapidae	*Tropidonophis mairii*	Keelback	X		LC
Hydrophiidae	*Astrotia stokesii*	Stokes' Sea Snake	X		LC
BIRDS					
Megapodiidae	*Megapodius reinwardt*	Orange-footed Scrubfowl	X		LC
Phasianidae	*Coturnix ypsilophora*	Brown Quail	X		LC
Procellariidae	*Puffinus pacificus*	Wedge-tailed Shearwater	X		DD
Pelecanidae	*Pelecanus conspicillatus*	Australian Pelican	X		LC
Fregatidae	*Fregata minor*	Great Frigatebird	X		DD
Fregatidae	*Fregata ariel*	Lesser Frigatebird	X		LC

Family	Scientific Name	Common Name	NT Fauna Atlas Records	Bulky Goods Survey	Conservation Status
Anhingidae	*Anhinga melanogaster*	Darter	X		LC
Phalacrocoracidae	*Phalacrocorax varius*	Pied Cormorant	X		LC
Phalacrocoracidae	*Phalacrocorax melanoleucos*	Little Pied Cormorant	X		LC
Phalacrocoracidae	*Phalacrocorax sulcirostris*	Little Black Cormorant	X		LC
Podicipedidae	*Tachybaptus novaehollandiae*	Australasian Grebe	X		LC
Anseranatidae	*Anseranas semipalmata*	Magpie Goose	X		LC
Anatidae	*Dendrocygna arcuata*	Wandering Whistling-Duck	X		LC
Anatidae	*Tadorna radjah*	Radjah Shelduck	X		LC
Anatidae	*Anas superciliosa*	Pacific Black Duck	X		LC
Anatidae	*Nettapus pulchellus*	Green Pygmy-Goose	X		LC
Rallidae	*Gallirallus philippensis*	Buff-banded Rail	X		LC
Rallidae	*Eulabeornis castaneoventris*	Chestnut Rail	X		LC
Ardeidae	*Ardea sumatrana*	Great-billed Heron	X		LC
Ardeidae	*Ardea pacifica*	White-necked Heron	X		LC
Ardeidae	*Ardea picata*	Pied Heron	X		LC
Ardeidae	*Egretta novaehollandiae*	White-faced Heron	X		LC
Ardeidae	*Ardea ibis*	Cattle Egret	X		LC
Ardeidae	*Ardea alba*	Great Egret	X		LC
Ardeidae	*Ardea garzetta*	Little Egret	X		LC
Ardeidae	*Ardea intermedia*	Intermediate Egret	X		LC
Ardeidae	*Egretta sacra*	Eastern Reef Egret	X		LC
Ardeidae	*Butorides striatus*	Striated Heron	X		LC
Ardeidae	*Nycticorax caledonicus*	Nankeen Night Heron	X		LC
Ardeidae	*Ixobrychus flavicollis*	Black Bittern	X		DD
Threskiornithidae	*Threskiornis molucca*	Australian White Ibis	X		LC
Threskiornithidae	*Threskiornis spinicollis*	Straw-necked Ibis	X		LC
Threskiornithidae	*Platalea regia*	Royal Spoonbill	X		LC

Family	Scientific Name	Common Name	NT Fauna Atlas Records	Bulky Goods Survey	Conservation Status
Ciconiidae	*Ephippiorhynchus asiaticus*	Black-necked Stork	X		LC
Gruidae	*Grus rubicunda*	Brolga	X		LC
Otididae	*Ardeotis australis*	Australian Bustard	X		V
Scolopacidae	*Arenaria interpres*	Ruddy Turnstone	X		LC
Scolopacidae	*Numenius madagascariensis*	Eastern Curlew	X		LC
Scolopacidae	*Numenius phaeopus*	Whimbrel	X		LC
Scolopacidae	*Numenius minutus*	Little Curlew	X		LC
Scolopacidae	*Tringa glareola*	Wood Sandpiper	X		NE
Scolopacidae	*Heteroscelus brevipes*	Grey-tailed Tattler	X		LC
Scolopacidae	*Actitis hypoleucos*	Common Sandpiper	X		LC
Scolopacidae	*Tringa nebularia*	Common Greenshank	X		LC
Scolopacidae	*Tringa stagnatilis*	Marsh Sandpiper	X		LC
Scolopacidae	*Xenus cinereus*	Terek Sandpiper	X		LC
Scolopacidae	*Gallinago megala*	Swinhoe's Snipe	X		DD
Scolopacidae	*Limosa lapponica*	Bar-tailed Godwit	X		LC
Scolopacidae	*Calidris canutus*	Red Knot	X		LC
Scolopacidae	*Calidris tenuirostris*	Great Knot	X		LC
Scolopacidae	*Calidris acuminata*	Sharp-tailed Sandpiper	X		LC
Scolopacidae	*Calidris melanotos*	Pectoral Sandpiper	X		DD
Scolopacidae	*Calidris ruficollis*	Red-necked Stint	X		LC
Scolopacidae	*Calidris ferruginea*	Curlew Sandpiper	X		LC
Glareolidae	*Glareola maldivarum*	Oriental Pratincole	X		LC
Glareolidae	*Stiltia isabella*	Australian Pratincole	X		LC
Jacanidae	*Irediparra gallinacea*	Comb-crested Jacana	X		LC
Burhinidae	*Burhinus grallarius*	Bush Stone-curlew	X	X	NT
Burhinidae	*Esacus neglectus*	Beach Stone-curlew	X		LC
Haematopodidae	*Haematopus longirostris*	Pied Oystercatcher	X		LC

Family	Scientific Name	Common Name	NT Fauna Atlas Records	Bulky Goods Survey	Conservation Status
Haematopodidae	*Haematopus fuliginosus*	Sooty Oystercatcher	X		LC
Charadriidae	*Vanellus miles*	Masked Lapwing	X	X	LC
Charadriidae	*Pluvialis squatarola*	Grey Plover	X		LC
Charadriidae	*Pluvialis fulva*	Pacific Golden Plover	X		LC
Charadriidae	*Charadrius mongolus*	Lesser Sand Plover	X		LC
Charadriidae	*Charadrius leschenaultii*	Greater Sand Plover	X		LC
Charadriidae	*Charadrius ruficapillus*	Red-capped Plover	X		LC
Recurvirostridae	*Himantopus himantopus*	Black-winged Stilt	X		LC
Laridae	*Larus novaehollandiae*	Silver Gull	X		LC
Laridae	*Chilidonias hybridus*	Whiskered Tern	X		LC
Laridae	*Chlidonias leucopterus*	White-winged Black Tern	X		LC
Laridae	*Sterna caspia*	Caspian Tern	X		LC
Laridae	*Sterna nilotica*	Gull-billed Tern	X		LC
Laridae	*Sterna fuscata*	Sooty Tern	X		NE
Laridae	*Sterna albifrons*	Little Tern	X		LC
Laridae	*Sterna bergii*	Crested Tern	X		LC
Accipitridae	*Aviceda subcristata*	Pacific Baza	X		LC
Accipitridae	*Elanus axillaris*	Black-shouldered Kite	X		LC
Accipitridae	*Pandion haliaetus*	Osprey	X		LC
Accipitridae	*Lophoictinia isura*	Square-tailed Kite	X		NT
Accipitridae	*Milvus migrans*	Black Kite	X		LC
Accipitridae	*Haliastur sphenurus*	Whistling Kite	X	X	LC
Accipitridae	*Haliastur indus*	Brahminy Kite	X		LC
Accipitridae	*Haliaeetus leucogaster*	White-bellied Sea-eagle	X		LC
Accipitridae	*Aquila audax*	Wedge-tailed Eagle	X		LC
Accipitridae	*Hieraaetus morphnoides*	Little Eagle	X		LC
Accipitridae	*Accipiter fasciatus*	Brown Goshawk	X		LC

Family	Scientific Name	Common Name	NT Fauna Atlas Records	Bulky Goods Survey	Conservation Status
Accipitridae	*Erythrotriorchis radiatus*	Red Goshawk	X		V
Accipitridae	*Circus approximans*	Swamp Harrier	X		LC
Falconidae	*Falco berigora*	Brown Falcon	X		LC
Falconidae	*Falco longipennis*	Australian Hobby	X		LC
Falconidae	*Falco cenchroides*	Nankeen Kestrel	X		LC
Columbidae	*Ptilinopus regina*	Rose-crowned Fruit-dove	X		LC
Columbidae	*Ducula bicolour*	Pied Imperial Pigeon	X	X	LC
Columbidae	*Ducula concinna*	Elegant Imperial Pigeon	X		NE
Columbidae	*Columba livia*	Rock Dove	X		Int
Columbidae	*Geopelia placida*	Peaceful Dove	X	X	LC
Columbidae	*Geopelia cuneata*	Diamond Dove	X		LC
Columbidae	*Geopelia humeralis*	Bar-shouldered Dove	X	X	LC
Columbidae	*Chalcophaps indica*	Emerald Dove	X		LC
Columbidae	*Phaps chalcoptera*	Common Bronzewing	X		LC
Columbidae	*Geophaps smithii*	Partridge Pigeon	X		V
Cacatuidae	*Calyptorhynchus banksii*	Red-tailed Black-cockatoo	X		NT/LC
Cacatuidae	*Cacatua roseicapilla*	Galah	X		LC
Cacatuidae	*Cacatua sanguinea*	Little Corella	X		LC
Cacatuidae	*Cacatua galerita*	Sulphur-crested Cockatoo	X		LC
Psittacidae	*Trichoglossus haematodus*	Rainbow Lorikeet	X		LC
Psittacidae	*Psitteuteles versicolor*	Varied Lorikeet	X		LC
Psittacidae	*Aprosmictus erythropterus*	Red-winged Parrot	X	X	LC
Psittacidae	*Nymphicus hollandicus*	Cockatiel	X		LC
Psittacidae	*Platycercus venustus*	Northern Rosella	X		LC
Cuculidae	*Cuculus saturatus*	Oriental Cuckoo	X		LC
Cuculidae	*Cacomantis variolosus*	Brush Cuckoo	X		LC
Cuculidae	*Chalcites minutillus*	Little Bronze-Cuckoo	X		LC

Family	Scientific Name	Common Name	NT Fauna Atlas Records	Bulky Goods Survey	Conservation Status
Cuculidae	*Eudynamys scolopacea*	Common Koel	X		LC
Cuculidae	*Scythrops novaehollandiae*	Channel-billed Cuckoo	X		LC
Centropodidae	*Centropus phasianinus*	Pheasant Coucal	X		LC
Strigidae	*Ninox novaeseelandiae*	Boobook Owl	X		LC
Strigidae	*Ninox connivens*	Barking Owl	X		LC
Podargidae	*Podargus strigoides*	Tawny Frogmouth	X		LC
Aegothelidae	*Aegotheles cristatus*	Australia Owlet-nightjar	X		LC
Caprimulgidae	*Caprimulgus macrurus*	Large-tailed Nightjar	X		LC
Apodidae	*Apus pacificus*	Fork-tailed Swift	X		LC
Alcedinidae	*Alcedo azurea*	Azure Kingfisher	X		LC
Alcedinidae	*Alcedo pusilla*	Little Kingfisher	X		LC
Halcyonidae	*Dacelo leachii*	Blue-winged Kookaburra	X		DD
Meropidae	*Merops ornatus*	Rainbow Bee-eater	X	X	LC
Coraciidae	*Eurystomus orientalis*	Dollarbird	X		LC
Halcyonidae	*Todiramphus pyrrhopygia*	Red-backed Kingfisher	X		LC
Halcyonidae	*Todiramphus macleayii*	Forest Kingfisher	X	X	LC
Halcyonidae	*Todiramphus chloris*	Collared Kingfisher	X		LC
Halcyonidae	*Todiramphus sanctus*	Sacred Kingfisher	X	X	LC
Pittidae	*Pitta iris*	Rainbow Pitta	X		LC
Neosittidae	*Daphoenositta chrysoptera*	Varied Sittella		X	LC
Maluridae	*Malurus melanocephalus*	Red-backed Fairy-wren	X	X	LC
Pardalotidae	*Pardalotus striatus*	Striated Pardalote	X	X	LC
Pardalotidae	*Smicrornis brevirostris*	Weebill	X		LC
Pardalotidae	*Gerygone chloronotus*	Green-backed Gerygone	X		LC
Pardalotidae	*Gerygone levigaster*	Mangrove Gerygone	X		LC
Pardalotidae	*Gerygone magnirostris*	Large-billed Gerygone	X		LC
Meliphagidae	*Philemon buceroides*	Helmeted Friarbird	X		LC

Family	Scientific Name	Common Name	NT Fauna Atlas Records	Bulky Goods Survey	Conservation Status
Meliphagidae	*Philemon argenticeps*	Silver-crowned Friarbird	X		LC
Meliphagidae	*Philemon citreogularis*	Little Friarbird	X		LC
Meliphagidae	*Entomyzon cyanotis*	Blue-faced Honeyeater	X		LC
Meliphagidae	*Manorina flavigula*	Yellow-throated Miner	X		LC
Meliphagidae	*Lichenostomus unicolor*	White-gaped Honeyeater	X	X	LC
Meliphagidae	*Melithreptus albogularis*	White-throated Honeyeater	X	X	LC
Meliphagidae	*Lichmera indistincta*	Brown Honeyeater	X	X	LC
Meliphagidae	*Ramsayornis fasciatus*	Bar-breasted Honeyeater	X		LC
Meliphagidae	*Conopophila albogularis*	Rufous-banded Honeyeater	X	X	LC
Meliphagidae	*Conopophila rufogularis*	Rufous-throated Honeyeater	X		LC
Meliphagidae	*Myzomela obscura*	Dusky Honeyeater	X		LC
Meliphagidae	*Myzomela erythrocephala*	Red-headed Honeyeater	X		LC
Pomatostomidae	*Pomatostomus temporalis*	Grey-crowned Babbler	X		LC
Petroicidae	*Peneoenanthe pulverulenta*	Mangrove Robin	X		LC
Petroicidae	*Microeca flavigaster*	Lemon-bellied Flycatcher	X	X	LC
Pachycephalidae	*Colluricincla megarhyncha*	Little Shrike-thrush	X		LC
Pachycephalidae	*Pachycephala simplex*	Grey Whistler	X		LC
Pachycephalidae	*Pachycephala rufiventris*	Rufous Whistler	X		LC
Dicruridae	*Rhipidura rufiventris*	Northern Fantail	X	X	LC
Dicruridae	*Rhipidura phasiana*	Mangrove Grey Fantail	X		LC
Dicruridae	*Rhipidura dryas*	Arafura Fantail	X		LC
Dicruridae	*Rhipidura leucophrys*	Willie Wagtail	X		LC
Dicruridae	*Myiagra ruficollis*	Broad-billed Flycatcher	X		LC
Dicruridae	*Myiagra rubecula*	Leaden Flycatcher	X	X	LC
Dicruridae	*Myiagra alecto*	Shining Flycatcher	X		LC
Dicruridae	*Myiagra inquieta*	Restless Flycatcher	X		LC
Dicruridae	*Grallina cyanoleuca*	Magpie-lark	X	X	LC

Family	Scientific Name	Common Name	NT Fauna Atlas Records	Bulky Goods Survey	Conservation Status
Dicruridae	*Dicrurus bracteatus*	Spangled Drongo	X	X	LC
Oriolidae	*Oriolus flavocinctus*	Yellow Oriole	X		LC
Oriolidae	*Oriolus sagittatus*	Olive-backed Oriole	X		LC
Oriolidae	*Sphecotheres viridis*	Figbird	X		LC
Ptilonorhynchidae	*Chlamydera nuchalis*	Great Bowerbird	X		LC
Campephagidae	*Coracina novaehollandiae*	Black-faced Cuckoo-shrike	X		LC
Campephagidae	*Coracina papuensis*	White-bellied Cuckoo-shrike	X	X	LC
Campephagidae	*Coracina tenuirostris*	Cicadabird	X		LC
Campephagidae	*Lalage sueurii*	White-winged Triller	X		LC
Campephagidae	*Lalage leucomela*	Varied Triller	X		LC
Artamidae	*Artamus leucorynchus*	White-breasted Woodswallow	X		LC
Artamidae	*Artamus superciliosus*	White-browed Woodswallow	X		LC
Artamidae	*Artamus cinereus*	Black-faced Woodswallow	X		LC
Artamidae	*Artamus minor*	Little Woodswallow	X		LC
Artamidae	*Cracticus quoyi*	Black Butcherbird	X		LC
Artamidae	*Cracticus argenteus*	Silver-backed Butcherbird	X		LC
Artamidae	*Cracticus nigrogularis*	Pied Butcherbird	X		LC
Corvidae	*Corvus orru*	Torresian Crow	X		LC
Hirundinidae	*Hirundo nigricans*	Tree Martin	X		LC
Hirundinidae	*Hirundo ariel*	Fairy Martin	X		LC
Motacillidae	*Anthus novaeseelandiae*	Richard's Pipit	X		LC
Alaudidae	*Mirafra javanica*	Singing Bushlark	X		LC
Sylviidae	*Acrocephalus australis*	Clamorous Reed-Warbler	X		NT
Sylviidae	*Cisticola juncidis*	Zitting Cisticola	X		LC
Sylviidae	*Cisticola exilis*	Golden-headed Cisticola	X		LC
Sylviidae	*Megalurus timoriensis*	Tawny Grassbird	X		LC
Passeridae	*Taeniopygia bichenovii*	Double-barred Finch	X	X	LC

Family	Scientific Name	Common Name	NT Fauna Atlas Records	Bulky Goods Survey	Conservation Status
Passeridae	*Taeniopygia guttata*	Zebra Finch	X		LC
Passeridae	*Poephila acuticauda*	Long-tailed Finch	X	X	LC
Passeridae	*Poephila personata*	Masked Finch	X		LC
Passeridae	*Neochmia phaeton*	Crimson Finch	X		LC
Passeridae	*Lonchura flaviprymna*	Yellow-rumped Mannikin	X		NT
Passeridae	*Lonchura castaneothorax*	Chestnut-breasted Mannikin	X		LC
Passeridae	*Erythrura gouldiae*	Gouldian Finch	X		EN
Dicaeidae	*Dicaeum hirundinaceum*	Mistletoebird	X	X	LC
Zosteropidae	*Zosterops luteus*	Yellow White-eye	X		LC
MAMMALS					
Petauridae	*Petaurus breviceps*	Sugar Glider	X		LC
Dugongidae	*Dugong dugon*	Dugong	X		NT
Phalangeridae	*Trichosurus vulpecula*	Common Brushtail Possum	X		LC
Dasyuridae	*Dasyurus hallucatus*	Northern Quoll	X		CR
Peramelidae	*Isoodon macrourus*	Northern Brown Bandicoot	X	X	LC
Macropodidae	*Macropus antilopinus*	Antilopine Wallaroo	X		LC
Macropodidae	*Macropus agilis*	Agile Wallaby	X		LC
Pteropodidae	*Pteropus alecto*	Black Flying-fox	X		LC
Pteropodidae	*Pteropus scapulatus*	Little Red Flying-Fox	X		LC
Pteropodidae	*Macroglossus minimus*	Northern Blossom-bat	X		LC
Emballonuridae	*Saccolaimus flaviventris*	Yellow-bellied Sheathtail Bat		X	New record
Molossidae	*Mormopterus beccarii*	Beccari's Freetail Bat		X	New record
Vespertilionidae	*Scotorepens greyii/ Scotorepens sanborni/ Chalinolobus nigrogriseus*	Little Broadnosed Bat/ Northern Broadnosed Bat/ Hoary Wattled Bat	X	X	LC
Vespertilionidae	*Pipistrellus westralis/Miniopterus schreibersii*	Northern Pipistrelle/Large Bentwing Bat	X		LC
Vespertilionidae	*Myotis macropus*	Large-footed Myotis	X		LC
	Nyctophilus bifax	Northern Longeared Bat		X	New record

Family	Scientific Name	Common Name	NT Fauna Atlas Records	Bulky Goods Survey	Conservation Status
Vespertilionidae	*Nyctophilus walkeri*	Pygmy Long-eared Bat	X		LC
Muridae	*Mesembriomys gouldii*	Black-footed Tree-rat	X		NT
Muridae	*Rattus tunneyi*	Pale Field-rat		X	NT
Muridae	*Rattus rattus*	Black Rat	X		Int
Tachyglossidae	*Tachyglossus aculeatus*	Echidna	X		LC

APPENDIX 7
Fauna Plates

Plate 1: Cycad *Cycas armstrongii*.

Plate 2: Cane Toad *Bufo marinus* caught at various locations over the survey site.

Plate 3: Striped-rainbow Skink *Carlia munda* is the most common skink caught and seen in the survey area.

Plate 4: Juvenile Frill-necked Lizard *Chlamydosaurus kingii* caught in pit traps and documented during active searches.

Plate 5: Adult Frilled-necked Lizard *Chlamydosaurus kingii* documented during day and nocturnal active searches.

Plate 6: Douglass Skink *Glaphyromorphus douglasi* caught in pit traps and documented during day active searches.

Plate 7: Northern Brown Bandicoot *Isoodon macrourus* caught in cage traps, Elliott traps and documented during nocturnal active searches.

APPENDIX 8
EPBC Protected Matters Report

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Department of the Environment, Water, Heritage and the Arts home page

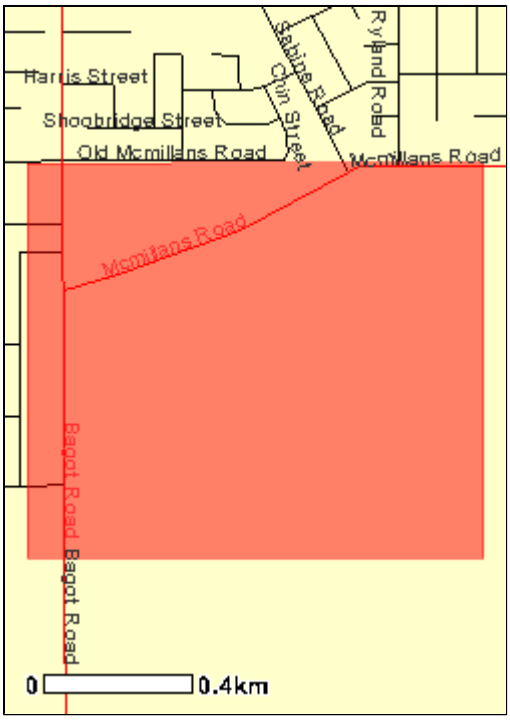
25 March 2008 15:42

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

You may wish to print this report for reference before moving to other pages or websites.

The Australian Natural Resources Atlas at http://www.environment.gov.au/atlas may provide further environmental information relevant to your selected area. Information about the EPBC Act including significance guidelines, forms and application process details can be found at http://www.environment.gov.au/epbc/assessmentsapprovals/index.html



Search Type: Area

Buffer: 0 km

Coordinates: -12.395409,130.855265, -12.404317,130.855265, -12.404317,130.865538, -12.39540,130.865538

Report Contents:

Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance - see http://www.environment.gov.au/epbc/assessmentsapprovals/guidelines/index.html.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Significance: (Ramsar Sites)	None
Commonwealth Marine Areas:	None
Threatened Ecological Communities:	None
Threatened Species:	13
Migratory Species:	39

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area

you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place and the heritage values of a place on the Register of the National Estate. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage/index.html.

Please note that the current dataset on Commonwealth land is not complete. Further information on Commonwealth land would need to be obtained from relevant sources including Commonwealth agencies, local agencies, and land tenure maps.

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species. Information on EPBC Act permit requirements and application forms can be found at http://www.environment.gov.au/epbc/permits/index.html.

Commonwealth Lands:	2
Commonwealth Heritage Places:	None
Places on the RNE:	1
Listed Marine Species:	75
Whales and Other Cetaceans:	11
Critical Habitats:	None
Commonwealth Reserves:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	None
Other Commonwealth Reserves:	None
Regional Forest Agreements:	None

Details

Matters of National Environmental Significance

Threatened Species [Dataset Information]	Status	Type of Presence
Birds		

Erythrotriorchis radiatus * Red Goshawk	Vulnerable	Species or species habitat likely to occur within area
Erythrura gouldiae * Gouldian Finch	Endangered	Species or species habitat may occur within area
*Geophaps smithii smithii** Partridge Pigeon (eastern)	Vulnerable	Species or species habitat likely to occur within area
Mammals		
Dasyurus hallucatus * Northern Quoll	Endangered	Species or species habitat may occur within area
Megaptera novaeangliae * Humpback Whale	Vulnerable	Species or species habitat likely to occur within area
Reptiles		
Caretta caretta * Loggerhead Turtle	Endangered	Species or species habitat may occur within area
Chelonia mydas * Green Turtle	Vulnerable	Species or species habitat may occur within area
Dermochelys coriacea * Leathery Turtle, Leatherback Turtle, Luth	Vulnerable	Species or species habitat may occur within area
Eretmochelys imbricata * Hawksbill Turtle	Vulnerable	Species or species habitat may occur within area
Natator depressus * Flatback Turtle	Vulnerable	Breeding likely to occur within area
Sharks		
Pristis microdon * Freshwater Sawfish	Vulnerable	Species or species habitat likely to occur within area
Pristis zijsron * Green Sawfish, Dindagubba, Narrowsnout Sawfish	Vulnerable	Species or species habitat may occur within area
Rhincodon typus * Whale Shark	Vulnerable	Species or species habitat may occur within area
Migratory Species [Dataset Information]	Status	Type of Presence
Migratory Terrestrial Species		
Birds		
Coracina tenuirostris melvillensis Melville Cicadabird	Migratory	Species or species habitat may occur within area
Erythrura gouldiae Gouldian Finch	Migratory	Species or species habitat may occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle	Migratory	Species or species habitat likely to occur within area
Hirundo rustica Barn Swallow	Migratory	Species or species habitat may occur within area
Merops ornatus * Rainbow Bee-eater	Migratory	Species or species habitat may occur within area

Poecilodryas superciliosa cerviniventris Derby White-browed Robin	Migratory	Species or species habitat likely to occur within area
Rhipidura rufifrons Rufous Fantail	Migratory	Species or species habitat may occur within area

Migratory Wetland Species

Birds

Actitis hypoleucos Common Sandpiper	Migratory	Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret	Migratory	Species or species habitat may occur within area
Ardea ibis Cattle Egret	Migratory	Species or species habitat may occur within area
Arenaria interpres Ruddy Turnstone	Migratory	Species or species habitat likely to occur within area
Calidris alba Sanderling	Migratory	Species or species habitat likely to occur within area
Calidris tenuirostris Great Knot	Migratory	Species or species habitat likely to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover	Migratory	Species or species habitat likely to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover	Migratory	Species or species habitat likely to occur within area
Charadrius veredus Oriental Plover, Oriental Dotterel	Migratory	Species or species habitat may occur within area
Glareola maldivarum Oriental Pratincole	Migratory	Species or species habitat may occur within area
Limosa lapponica Bar-tailed Godwit	Migratory	Species or species habitat likely to occur within area
Limosa limosa Black-tailed Godwit	Migratory	Species or species habitat likely to occur within area
Numenius minutus Little Curlew, Little Whimbrel	Migratory	Species or species habitat may occur within area
Numenius phaeopus Whimbrel	Migratory	Species or species habitat likely to occur within area
Pluvialis squatarola Grey Plover	Migratory	Species or species habitat likely to occur within area

Migratory Marine Birds

Apus pacificus Fork-tailed Swift	Migratory	Species or species habitat may occur within area
Ardea alba Great Egret, White Egret	Migratory	Species or species habitat may occur within area
Ardea ibis Cattle Egret	Migratory	Species or species habitat may occur within area
Sterna albifrons	Migratory	Species or species habitat may occur

Little Tern		within area
Migratory Marine Species		
Mammals		
Balaenoptera edeni Bryde's Whale	Migratory	Species or species habitat may occur within area
Megaptera novaeangliae ***** Humpback Whale	Migratory	Species or species habitat likely to occur within area
Orcaella brevirostris Irrawaddy Dolphin	Migratory	Species or species habitat may occur within area
Orcinus orca Killer Whale, Orca	Migratory	Species or species habitat may occur within area
Sousa chinensis Indo-Pacific Humpback Dolphin	Migratory	Species or species habitat may occur within area
Tursiops aduncus (Arafura/Timor Sea populations) Spotted Bottlenose Dolphin (Arafura/Timor Sea populations)	Migratory	Species or species habitat likely to occur within area
Reptiles		
Caretta caretta ***** Loggerhead Turtle	Migratory	Species or species habitat may occur within area
Chelonia mydas ***** Green Turtle	Migratory	Species or species habitat may occur within area
Crocodylus porosus Estuarine Crocodile, Salt-water Crocodile	Migratory	Species or species habitat likely to occur within area
Dermochelys coriacea ***** Leathery Turtle, Leatherback Turtle, Luth	Migratory	Species or species habitat may occur within area
Eretmochelys imbricata ***** Hawksbill Turtle	Migratory	Species or species habitat may occur within area
Natator depressus ***** Flatback Turtle	Migratory	Breeding likely to occur within area
Sharks		
Rhincodon typus Whale Shark	Migratory	Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species [Dataset Information]	Status	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper	Listed	Species or species habitat likely to occur within area
Anseranas semipalmata Magpie Goose	Listed - overfly marine area	Species or species habitat may occur within area

Apus pacificus Fork-tailed Swift	Listed - overfly marine area	Species or species habitat may occur within area
Ardea alba Great Egret, White Egret	Listed - overfly marine area	Species or species habitat may occur within area
Ardea ibis Cattle Egret	Listed - overfly marine area	Species or species habitat may occur within area
Arenaria interpres Ruddy Turnstone	Listed	Species or species habitat likely to occur within area
Calidris alba Sanderling	Listed	Species or species habitat likely to occur within area
Calidris tenuirostris Great Knot	Listed - overfly marine area	Species or species habitat likely to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover	Listed	Species or species habitat likely to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover	Listed	Species or species habitat likely to occur within area
Charadrius veredus Oriental Plover, Oriental Dotterel	Listed - overfly marine area	Species or species habitat may occur within area
Glareola maldivarum Oriental Pratincole	Listed - overfly marine area	Species or species habitat may occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle	Listed	Species or species habitat likely to occur within area
Hirundo rustica Barn Swallow	Listed - overfly marine area	Species or species habitat may occur within area
Limosa lapponica Bar-tailed Godwit	Listed	Species or species habitat likely to occur within area
Limosa limosa Black-tailed Godwit	Listed - overfly marine area	Species or species habitat likely to occur within area
Merops ornatus ***** Rainbow Bee-eater	Listed - overfly marine area	Species or species habitat may occur within area

Numenius minutus Little Curlew, Little Whimbrel	Listed - overfly marine area	Species or species habitat may occur within area
Numenius phaeopus Whimbrel	Listed	Species or species habitat likely to occur within area
Pluvialis squatarola Grey Plover	Listed - overfly marine area	Species or species habitat likely to occur within area
Rhipidura rufifrons Rufous Fantail	Listed - overfly marine area	Species or species habitat may occur within area
Sterna albifrons Little Tern	Listed	Species or species habitat may occur within area
Ray-finned fishes		
Campichthys tricarinatus Three-keel Pipefish	Listed	Species or species habitat may occur within area
Choeroichthys brachysoma Pacific Short-bodied Pipefish, Short-bodied Pipefish	Listed	Species or species habitat may occur within area
Choeroichthys suillus Pig-snouted Pipefish	Listed	Species or species habitat may occur within area
Corythoichthys amplexus Fijian Banded Pipefish, Brown-banded Pipefish	Listed	Species or species habitat may occur within area
Corythoichthys flavofasciatus Yellow-banded Pipefish, Network Pipefish	Listed	Species or species habitat may occur within area
Corythoichthys haematopterus Reef-top Pipefish	Listed	Species or species habitat may occur within area
Doryrhamphus excisus Indian Blue-stripe Pipefish, Blue-stripe Pipefish	Listed	Species or species habitat may occur within area
Doryrhamphus janssi Cleaner Pipefish, Janss' Pipefish	Listed	Species or species habitat may occur within area
Festucalex cinctus Girdled Pipefish	Listed	Species or species habitat may occur within area
Halicampus brocki Brock's Pipefish	Listed	Species or species habitat may occur within area
Halicampus grayi Mud Pipefish, Gray's Pipefish	Listed	Species or species habitat may occur within area
Halicampus spinirostris Spiny-snout Pipefish	Listed	Species or species habitat may occur within area
Haliichthys taeniophorus Ribboned Seadragon, Ribboned Pipefish	Listed	Species or species habitat may occur within area
Hippichthys cyanospilos Blue-speckled Pipefish, Blue-spotted Pipefish	Listed	Species or species habitat may occur within area

Hippichthys parvicarinatus Short-keeled Pipefish	Listed	Species or species habitat may occur within area
Hippichthys penicillus Beady Pipefish, Steep-nosed Pipefish	Listed	Species or species habitat may occur within area
Hippocampus histrix Spiny Seahorse	Listed	Species or species habitat may occur within area
Hippocampus kuda Spotted Seahorse, Yellow Seahorse	Listed	Species or species habitat may occur within area
Hippocampus planifrons Flat-face Seahorse	Listed	Species or species habitat may occur within area
Hippocampus spinosissimus Hedgehog Seahorse	Listed	Species or species habitat may occur within area
Micrognathus micronotopterus Tidepool Pipefish	Listed	Species or species habitat may occur within area
Solegnathus hardwickii Pipehorse	Listed	Species or species habitat may occur within area
Solegnathus lettiensis Indonesian Pipefish, Gunther's Pipehorse	Listed	Species or species habitat may occur within area
Solenostomus cyanopterus Blue-finned Ghost Pipefish, Robust Ghost Pipefish	Listed	Species or species habitat may occur within area
Syngnathoides biaculeatus Double-ended Pipehorse, Alligator Pipefish	Listed	Species or species habitat may occur within area
Trachyrhamphus bicoarctatus Bend Stick Pipefish, Short-tailed Pipefish	Listed	Species or species habitat may occur within area
Trachyrhamphus longirostris Long-nosed Pipefish, Straight Stick Pipefish	Listed	Species or species habitat may occur within area
Reptiles		
Acalyptophis peronii Horned Seasnake	Listed	Species or species habitat may occur within area
Aipysurus duboisii Dubois' Seasnake	Listed	Species or species habitat may occur within area
Aipysurus eydouxii Spine-tailed Seasnake	Listed	Species or species habitat may occur within area
Aipysurus laevis Olive Seasnake	Listed	Species or species habitat may occur within area
Astrotia stokesii Stokes' Seasnake	Listed	Species or species habitat may occur within area
Caretta caretta ***** Loggerhead Turtle	Listed	Species or species habitat may occur within area
Chelonia mydas ***** Green Turtle	Listed	Species or species habitat may occur within area
Crocodylus johnstoni Freshwater Crocodile	Listed	Species or species habitat may occur within area

Crocodylus porosus Estuarine Crocodile, Salt-water Crocodile	Listed	Species or species habitat likely to occur within area
Dermochelys coriacea * Leathery Turtle, Leatherback Turtle, Luth	Listed	Species or species habitat may occur within area
Disteira kingii Spectacled Seasnake	Listed	Species or species habitat may occur within area
Disteira major Olive-headed Seasnake	Listed	Species or species habitat may occur within area
Enhydrina schistosa Beaked Seasnake	Listed	Species or species habitat may occur within area
Eretmochelys imbricata * Hawksbill Turtle	Listed	Species or species habitat may occur within area
Hydrelaps darwiniensis Black-ringed Seasnake	Listed	Species or species habitat may occur within area
Hydrophis atriceps Black-headed Seasnake	Listed	Species or species habitat may occur within area
Hydrophis coggeri Slender-necked Seasnake	Listed	Species or species habitat may occur within area
Hydrophis elegans Elegant Seasnake	Listed	Species or species habitat may occur within area
Hydrophis inornatus Plain Seasnake	Listed	Species or species habitat may occur within area
Hydrophis mcdowelli	Listed	Species or species habitat may occur within area
Hydrophis ornatus a seasnake	Listed	Species or species habitat may occur within area
Hydrophis pacificus Large-headed Seasnake	Listed	Species or species habitat may occur within area
Lapemis hardwickii Spine-bellied Seasnake	Listed	Species or species habitat may occur within area
Natator depressus * Flatback Turtle	Listed	Breeding likely to occur within area
Parahydrophis mertoni Northern Mangrove Seasnake	Listed	Species or species habitat may occur within area
Pelamis platurus Yellow-bellied Seasnake	Listed	Species or species habitat may occur within area
Whales and Other Cetaceans [Dataset Information]	Status	Type of Presence
Balaenoptera edeni Bryde's Whale	Cetacean	Species or species habitat may occur within area
Delphinus delphis Common Dolphin	Cetacean	Species or species habitat may occur within area
Grampus griseus Risso's Dolphin, Grampus	Cetacean	Species or species habitat may occur within area

Megaptera novaeangliae * Humpback Whale	Cetacean	Species or species habitat likely to occur within area
Orcaella brevirostris Irrawaddy Dolphin	Cetacean	Species or species habitat may occur within area
Orcinus orca Killer Whale, Orca	Cetacean	Species or species habitat may occur within area
Sousa chinensis Indo-Pacific Humpback Dolphin	Cetacean	Species or species habitat may occur within area
Stenella attenuata Spotted Dolphin, Pantropical Spotted Dolphin	Cetacean	Species or species habitat may occur within area
Tursiops aduncus (Arafura/Timor Sea populations) Spotted Bottlenose Dolphin (Arafura/Timor Sea populations)	Cetacean	Species or species habitat likely to occur within area
Tursiops aduncus Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin	Cetacean	Species or species habitat likely to occur within area
Tursiops truncatus s. str. Bottlenose Dolphin	Cetacean	Species or species habitat may occur within area

Commonwealth Lands [Dataset Information]

Defence

Transport and Regional Services

Places on the RNE [Dataset Information]
Note that not all Indigenous sites may be listed.

Natural

Darwin Foreshores NT

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the *Environment Protection and Biodiversity Conservation Act 1999*. It holds mapped locations of World Heritage and Register of National Estate properties, Wetlands of International Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from

recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

For species where the distributions are well known, maps are digitised from sources such as recovery plans and detailed habitat studies. Where appropriate, core breeding, foraging and roosting areas are indicated under "type of presence". For species whose distributions are less well known, point locations are collated from government wildlife authorities, museums, and non-government organisations; bioclimatic distribution models are generated and these validated by experts. In some cases, the distribution maps are based solely on expert knowledge.

Only selected species covered by the migratory and marine provisions of the Act have been mapped.

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers.

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites;
- seals which have only been mapped for breeding sites near the Australian continent.

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Acknowledgments

This database has been compiled from a range of data sources. The Department acknowledges the following custodians who have contributed valuable data and advice:

- New South Wales National Parks and Wildlife Service
- Department of Sustainability and Environment, Victoria
- Department of Primary Industries, Water and Environment, Tasmania
- Department of Environment and Heritage, South Australia Planning SA
- Parks and Wildlife Commission of the Northern Territory
- Environmental Protection Agency, Queensland
- Birds Australia
- Australian Bird and Bat Banding Scheme
- Australian National Wildlife Collection
- Natural history museums of Australia
- Queensland Herbarium
- National Herbarium of NSW
- Royal Botanic Gardens and National Herbarium of Victoria
- Tasmanian Herbarium
- State Herbarium of South Australia
- Northern Territory Herbarium
- Western Australian Herbarium
- Australian National Herbarium, Atherton and Canberra

- University of New England
- Other groups and individuals

ANUCliM Version 1.8, Centre for Resource and Environmental Studies, Australian National University was used extensively for the production of draft maps of species distribution. Environment Australia is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

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APPENDIX 9
Cycad Map

Map 2: Cycad Density Plan

Note: Cycas armstrongii are scattered throughout the survey site. High density areas only are depicted on this plan.

Legend

- High_Cycad_Density2
- Very_High_Cycad_Density2
- Very_High_Cycad_Density
- High_Cycad_Density

70 35 0 70 Meters

Map produced by Kate Bauer (EcOz Environmental Services, 01/04/2008)