Detailed Ecological Site Assessment Report

Lot 226 Cunningham Highway, Mutdapilly, Qld (Lot 226 on RP220388)

orogen

Prepared For

Doyle Group

October 2010

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18 October 2010

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Environmental Planning, Assessment and Management

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The preparation of this report has been in accordance with the project brief provided by the client and has relied upon the information, data and results provided or collected from the sources and under the conditions outlined in the report.

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Table of Contents

Introduction

1.1 Background 1
1.2 Objectives of the Report 1
1.3 Outline of the Report 1

Description of the Proposal

2.1 Proposed Development Activity 3

Environmental Setting

3.1 Site Description 4
3.2 Topography 4
3.3 Geology 4

Study Methodology

4.1 Desktop Review 5
4.2 Field Assessment 5
4.2.1 Vegetation Community Surveys 6
4.2.2 Targeted Threatened Flora Surveys 6
4.2.3 Exotic Flora 6
4.2.4 Fauna Habitat Assessment 6
4.2.5 Koala Scat Assessment 7
4.2.6 Bird Surveys 7
4.2.7 Call Playbacks 7
4.2.8 Spotlighting Surveys 7
4.2.9 Herpetofauna 8
4.2.10 Opportunistic Searches and Records 8
4.2.11 Survey Limitations 8

Results – Desktop Review

5.1 Local Government 10
5.1.1 Ipswich Planning Scheme 10

5.2 State Government 12
5.2.1 South East Queensland Regional Plan 2009-2031 12
5.2.2 Qld Vegetation Management Act 1999 – Remnant Vegetation 13
5.2.3 Essential Habitat 14
5.2.4 Regrowth Vegetation and Essential Habitat Regrowth 14
5.2.5 Threatened Species – Wildlife Online 15
5.2.6 South East Queensland Koala Conservation State Planning Regulatory Provisions 15
5.2.7 Referable Areas 15
5.2.8 Referable Wetlands and Significant Wetlands 16

5.3 Commonwealth Government 16
5.3.1 Environment Protection and Biodiversity Conservation Act 1999 16

Results – Field Assessment

6.1 Botanical Surveys....21
6.1.1 Vegetation Communities....21
6.1.2 Threatened Flora Species....24
6.1.3 Exotic Flora Species....24

6.2 Fauna Assessment....25
6.2.1 Habitat Assessment....26
6.2.2 Koala Activity Levels and Habitat Utilisation....28
6.2.3 Bird Surveys....28
6.2.4 Call Playback Surveys....28
6.2.5 Spotlighting Surveys....29
6.2.6 Herpetofauna Surveys....29
6.2.7 Threatened Fauna Species....29
6.2.8 Declared Pest Animals....29

6.3 Significant Ecological Features & Functions....30
6.3.1 Fauna Corridors....30
6.3.2 Significant (Subject) Species....30
6.3.3 Significant Vegetation Communities....31
6.3.4 Drainage lines, Wetland Areas and Dams....32

Discussion of Potential Impacts

7.1 Flora....33
7.1.1 Vegetation Clearing....33
7.1.2 Pest Flora....33

7.2 Fauna....34
7.2.1 Fauna Habitat Modification....34
7.2.2 Pest Fauna....35

7.3 Subject Species....35
7.4 Waterways and Wetlands....36

Mitigation Measures

8.1 Vegetation Management....37
8.1.1 Threatened Flora Surveys....37
8.1.2 Retention of Vegetation....37
8.1.3 Vegetation Clearing Management....38
8.1.4 Weed Management and Restoration....38
8.1.5 Native Landscaping....39

8.2 Fauna and Habitat Management....39
8.2.1 Minimise Clearing Extent and Impact on Habitats....39
8.2.2 Koalas....41

8.3 Waterways....41

Conclusion and Recommendations

9.1 Conclusion....42
9.2 Recommendations....42

References

Figures

Appendix A

Subject Species Tables

Appendix B

Wildlife Online Results

Appendix C

EPBC Act Protected Matters Search Results

Appendix D

Flora and Fauna Observed During Orogen Fieldworks

Appendix E

Targeted Management Plan for Swamp Tea-tree

Table of Contents *Continued*

Figures

Figure 1.1 Site Locality Plan
Figure 2.1 Proposed Plan of Development
Figure 4.1 Survey Sites
Figure 5.1 Regionally Significant Business Enterprise and Industry Area
Figure 5.2 Ebenezer-Willowbank Precincts Plan
Figure 5.3 Flooding and Urban Stormwater Flow Path Areas
Figure 5.4 Buffers to Highways and Regional Transport Corridors
Figure 5.5 Defence (Area Control) Regulations and Obstruction Clearance Surfaces
Figure 5.6 Operational Airspace, Wildlife Attraction and Lighting Issues
Figure 5.7 Motor Sports Buffer
Figure 5.8 High Voltage Electricity Transmission Lines
Figure 5.9 Designated Water Courses
Figure 5.10 Principle Conservation Areas
Figure 5.11 Draft Key Koala Habitat Areas Map
Figure 5.12 South East Queensland Regional Plan 2009-2031
Figure 5.13 REMAP designation of the subject site
Figure 5.14 VM Act Essential Habitat Map Version 3
Figure 5.15 The Regrowth Vegetation Map – Version 2
Figure 5.16 Referable Areas designation of the subject site
Figure 5.17 Referable Wetland designation of the subject site
Figure 5.18 Relevant Extract from Wetland Maps
Figure 6.1 Vegetation Community Plan
Figure 6.2 Post-fire photographs of the subject site

Introduction

1.1 Background

Orogen Pty Ltd (Orogen) was commissioned by the Doyle Group (the client) to prepare a Detailed Ecological Site Assessment Report (DESAR) for the site identified as Lot 226 Cunningham Highway, Mutdapilly, Queensland (Qld) (Lot 226 on RP220388) (the site). Refer to **Figure 1.1** to view the site Locality Plan.

This DESAR has been prepared in consideration of the proposed development of the site for industrial purposes. This DESAR has been formulated to guide the client in development planning and to assist Council in the assessment of the site's ecological value. This DESAR is intended to be submitted to Council as part of the Material Change of Use (MCU) / Reconfiguration of a Lot (RaL) Development Application (DA) and associated preliminary approval for vegetation clearing for the above-mentioned development proposal. It is provided in response to Item 9 (Ecological Survey and Vegetation Retention) of the Ipswich City Council (Council) Information Request pertaining to the proposed development (dated 11 August 2009; Ref: 3939/09 SPD).

1.2 Objectives of the Report

The objectives of the subject DESAR are:

- To assess and describe the existing ecological attributes of the site;
- To assess the potential direct ecological impacts of the proposed development on the site and the potential indirect ecological impacts on the surrounding locality; and
- To formulate and document mitigation measures to alleviate the potential ecological impacts of the proposed development on the site and surrounding locality.

1.3 Outline of the Report

The subject DESAR is structured as follows:

- Section 2 - describes the proposed development activity;
- Section 3 - describes the environmental context of the site;
- Section 4- describes the desktop and field study methodology employed;
- Section 5 - provides the results of desktop review;
- Section 6 - provides the results of field assessment;

- Section 7 - identifies potential ecological impacts of the proposed development;
- Section 8 - recommends mitigation measures to reduce or alleviate potential ecological impacts; and
- Section 9 - provides conclusions as to the potential ecological impacts associated with the proposed development and provides a summary of recommendations to reduce these potential impacts.

Description of the Proposal

2.1 Proposed Development Activity

The proposed development activity involves the establishment of an industrial subdivision (and associated infrastructure e.g. roads, stormwater detention basins) and constitutes a MCU/RaL. The development footprint area covers approximately 202.3 ha of the 266.9 ha site. Refer to **Figure 2.1** for the Proposed Plan of Development.

Environmental Setting

3.1 Site Description

The 266.9 ha site occurs within the Ipswich City Government Area and is situated within the locality of Mutdapilly, approximately 15 km south-west of Ipswich City. The site occurs within the Southeast Queensland Bioregion and the Bremer Catchment.

The site is bounded in the east by the Cunningham Highway and by land currently used for agricultural purposes to the south, west and north. It is noted that land to the north and east of the site is zoned as Regional Business and Industry Investigation Area under the current Ipswich Planning Scheme (refer to (ICC, 2006). The site itself is also designated as a Regional Business and Industry Investigation Area under the current Ipswich Planning Scheme (ICC, 2006).

3.2 Topography

The site is relativity flat and variance in elevation ranges between 49-55 m Australian Height Datum (AHD).

3.3 Geology

The Moreton Geology Map (1:500 000) shows the site's geology is comprised of the Jurassic – Walloon Coal Measures – shale, siltstone, sandstone, coal, mudstone and limestone (Geological Survey of Qld, 1980).

The Department of Environment and Resource Management (DERM) Regional Ecosystem Mapping depicts Land Zones 9 and 10 as occurring in the immediate vicinity of the site (DERM, 2010a). Land zone 9 is described as fine-grained sedimentary rocks, including siltstones, mudstones, shales, calcareous sediments, conglomerates, siliceous sandstones and lithic and labile sandstones with minor interbedded volcanics, while Land Zone 10 is described as coarse-grained sedimentary rocks including, , siliceous sandstones conglomerates and minor interbedded volcanics (DERM, 2010a).

Field surveys found the soils on site to be predominantly sandy loam to loam with clayey loam in the alluvial systems. The soils were observed to be of an erosive nature with gully erosion occurring throughout the site, particularly on tracks.

Study Methodology

4.1 Desktop Review

A desktop review was undertaken to assist in determining the site's ecological attributes and associated constraints and opportunities. The review consisted of searches of Local, State and Commonwealth Government planning instruments and databases. Information was collected through internet sources and from Orogen's library of scientific publications. Sources of information included: as well as relevant academic literature. Sources of information included:

- Ipswich Planning Scheme (ICC, 2006);
- Ipswich City Council's Draft Key Koala Habitat Areas Map (ICC, 2009);
- South East Queensland Regional Plan 2009-2031 (DIP, 2009);
- Regional Ecosystem and Remnant Map – Version 6 (DERM, 2010a);
- Essential Habitat Map – Version 3.0 (DERM, 2010b);
- Regrowth Vegetation Map – Version 2.0 (DERM, 2010c);
- Referable Areas Mapping (DERM, 2010d);
- Referable Wetland Mapping (DERM, 2010e);
- Wildlife Online Database (DERM, 2010f);
- WetlandMaps (DERM, 2010g);
- South East Queensland Koala State Planning Regulatory Provisions (SEQ Koala SPRP) (DIP, 2010); and
- EPBC Act Protected Matters Search (DEWHA, 2010).

4.2 Field Assessment

An ecological field assessment was undertaken within the site to complement the desktop review, and to identify the suitability of the habitats within the site for terrestrial flora and fauna, including, Threatened species and ecological communities listed by the *Nature Conservation (Wildlife) Regulation 2006* (NC Reg) and *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The field assessment was undertaken by two Orogen personnel for a five day period during 21 – 25 June 2010. The following survey methods were employed.

4.2.1 Vegetation Community Surveys

General baseline botanical surveys were undertaken within the site to inventory dominant flora and characterise native vegetation communities throughout the site. The botanical surveys were generally consistent with the *Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland* (Neldner *et al*, 2005). Survey sites were surveyed using random meander transects. A total of 13 surveys, generally consistent with a tertiary level assessment, were undertaken on site.

All vascular taxa observed during the transect survey were recorded on Orogen field data proforma. Other bio-physiographic attributes were also recorded, including, vegetative structure, geology, soils, slope, aspect, morphoterrain, local context of vegetation (corridor, core, support for core, local representativeness) and extent of disturbance (e.g. fire, logging, grazing). Plant taxa not identified in the field were collected and subsequently identified using standard botanical texts. Specimens that could not be positively identified by Orogen, and/or potential threatened species, were sent to the Queensland Herbarium for identification.

The locations of botanical survey sites are presented in **Figure 4.1**.

4.2.2 Targeted Threatened Flora Surveys

During the botanical surveys and opportunistically throughout the site investigations, specific searches were undertaken in appropriate habitats for flora taxa listed as Threatened by the NC Reg and EPBC Act.

4.2.3 Exotic Flora

Exotic flora species were recorded during the botanical surveys and opportunistically throughout the field investigations.

4.2.4 Fauna Habitat Assessment

A habitat assessment was conducted for all habitat types occurring within the site. The Threatened species known or potentially occurring within the locality, and the occurrence of specific habitat features appropriate for these, were evaluated during this habitat assessment. This included searches for features, such as, hollow-bearing trees, nest sites, rocky outcrops, water courses, wetland habitats, leaf litter and caves/drains or other structures suitable for roosting or denning purposes.

A total of 13 formal habitat assessment sites (covering an area of approximately 1 ha per formal site) were conducted within the site. In addition, habitat assessment was undertaken opportunistically during all other survey types during the survey period.

The habitat assessment was used as the primary basis for determining the Subject Species for the proposed development (refer to **Section 6.2.1** and **Appendix A**, **Table A.1**).

The locations of the formal habitat assessment sites are presented in **Figure 4.1**.

4.2.5 Koala Scat Assessment

Specific Koala scat searches were undertaken within the site to evaluate the level of Koala activity. The scat searches were undertaken in general accordance with the Spot Assessment Technique as ascribed in Phillips and Callaghan (undated). The methodology involves searching the basal circumference of trees for Koala scats and scratches that are known to, or likely to be utilised by Koalas. Each tree was searched for a maximum of two person minutes, or until a Koala scat was found, whichever came first.

A total of two sample sites (62 trees) were surveyed using this method. A number of suitable Koala feed trees within other parts of the site were also opportunistically searched for signs of Koala usage during the fauna transect searches and habitat assessment.

The location of the specific Koala scat searches is provided in **Figure 4.1**.

4.2.6 Bird Surveys

Four formal bird surveys targeting diurnal bird species was undertaken within the site. The surveys involved two morning surveys and two afternoon surveys, with each survey lasting approximately one hour. Each census was undertaken by two personnel. An opportunistic list was also produced for all bird species observed or recorded from calls heard while performing other surveys.

The locations of the bird survey sites are provided in **Figure 4.1**.

4.2.7 Call Playbacks

Call playback surveys were undertaken on two consecutive nights (22 – 23 June 2010) to target the presence of Koala (*Phascolartcos cinereus*), Powerful Owl (*Ninox strenua*), Yellow-bellied Glider (*Petaurus australis*), Southern Boobook (*Ninox novaeseelandiae*) and Barking Owl (*Ninox connivens*).

The standard call playback technique that was utilised is as follows: after an initial five minute listening period, calls were broadcast for a five minute period, followed by a five minute listening period. After completion of the call playback surveys, the area was searched by spotlight for any species that may have approached the broadcast site without eliciting calls. The spotlighting surveys were then undertaken immediately after the call playback surveys.

The locations of the call playback broadcast sites are presented in **Figure 4.1**.

4.2.8 Spotlighting Surveys

Spotlighting surveys targeting owls, nocturnal terrestrial and scansorial/arboreal mammals and amphibians were undertaken on three consecutive nights. The spotlighting on each night was undertaken by two personnel (using 100 watt spotlights) for approximately one hour. Surveys were

predominantly conducted using driving transects, however some on foot spotlighting was also included. In total, approximately six person hours of spotlighting was undertaken within the site.

Approximate routes of each of the spotlighting transects are indicated on **Figure 4.1**.

4.2.9 Herpetofauna

Diurnal Surveys

Reptile searches were undertaken opportunistically at each formal habitat assessment site. These searches included searches of leaf litter, decorticating bark, fallen timber and rotting logs within an area of approximately 1 ha. The locations of herpetofauna survey sites are presented in **Figure 4.1**

Diurnal amphibian surveys were undertaken throughout areas of appropriate habitat (eg. creeks) where present around any of the formal habitat assessment survey sites. Amphibian surveys included searching riparian vegetation and listening for any frog calls. A small scoop net was used at one of the survey locations in order to capture tadpoles observed. In addition, all species observed or heard calling while undertaking other survey types were noted.

Spotlighting Surveys

The spotlighting surveys conducted for reptile and amphibian species were combined with the spotlighting surveys conducted for other species groups. Amphibians were specifically targeted during the spotlighting around the drainage channels and depressions and dams.

4.2.10 Opportunistic Searches and Records

Specific searches for Threatened fauna or signs thereof were undertaken opportunistically within the site during all survey types. All fauna species observed opportunistically within the site during the survey period were noted and a cumulative fauna species list was produced (**Appendix E**).

4.2.11 Survey Limitations

A number of factors are considered likely to influence survey results for particular species or species groups. These factors are:

- Timing (seasons) of the survey period;
- Weather conditions in the preceding seasons, and
- Restricted spatial area of the habitats within the site.

The surveys undertaken may not provide a true indication of seasonal habitat utilisation by fauna species within the site and some cryptic flora species may only be detected during particular flowering periods. With the exception of using scoop nets to catch tadpoles, the field investigations undertaken

by Orogen were limited to passive techniques (e.g. no live trapping) and the investigations were undertaken in winter when some species, such as particular frogs, are not as active.

Notwithstanding the limitations, the surveys were undertaken at a suitable time of year for detecting the presence of the majority of the target species and, although not detected within the site during the surveys, the Precautionary Principle was applied in determining a number of Threatened species potentially utilising the site's habitats.

Results – Desktop Review

5.1 Local Government

5.1.1 Ipswich Planning Scheme

The site is located within Ipswich City Council Local Government Area and is therefore subject to the provisions of the Ipswich Planning Scheme 2006 (Ipswich Planning Scheme) (ICC, 2006). Ipswich Planning Scheme was prepared in accordance with the *Integrated Planning Act 1997* (IPA) as a framework for managing development in the area.

The Desired Environmental Outcomes for Ipswich (s 3.1) include:

- "*the values of significant natural features, including the principal conservation areas are not compromised*";
- "*adverse effects on the natural environment are minimised or prevented with respect to the loss of natural vegetation and associated habitat, soil degradation, air pollution and water pollution owing to erosion, chemical contamination, acidification, salinity, sewage and wastewater treatment, management and effluent disposal and the like*"; and
- "*the adverse effects from natural and other hazards, including flooding, land subsidence, bush fires, ordnance explosions and aircraft operations, are minimised*" (ICC, 2006).

Under the Ipswich Planning Scheme, the site is located within the Regionally Significant Business Enterprise and Industry Area (**Figure 5.1**). Within this locality, the site is zoned as a Regional Business and Industry Investigation Area. The exception to this is a narrow strip parallel to the Cunningham Highway that is zoned as a Regional Business and Industry Buffer. Development of the site would therefore be required to comply with the requirements of the *Regional Business and Industry Investigation Zone: Assessment Criteria and Assessment Tables* (Part 6, Division 5) and the *Regional Business and Industry Buffer Zone: Assessment Criteria and Assessment Tables* (Part 6, Division 6). The overall vision for the Regionally Significant Business Enterprise and Industry Area is that regionally significant business enterprise and industry nodes are created and maintained, which enjoy sustained economic growth, good design and ecological sustainability (ICC, 2006).

The site is bordered by Regional Business and Industry Investigation Areas to the north and west, with Rural land uses including Rural A (Agricultural), Rural B (Pastoral) and Rural C (Special Land Management), occurring to the south and east. It is noted that the Ebenezer-Willowbank Precincts plan of the Ipswich Planning Scheme (ICC, 2006) identifies the site as 'Future Industry' area (**Figure 5.2**).

Under the Overlay Mapping of the Ipswich Planning Scheme, relevant mapping for the site is as follows:

- A small portion of land in the south-east corner of the site is included within the 1 in 100 Flood Line under *OV05 – Flooding and Urban Stormwater Flow Path Areas* (**Figure 5.3**);
- A narrow strip of land along the eastern site boundary is mapped as Buffers to Highways and Regional Transport Corridors under *OV06 – Buffers to Highways and Regional Transport Corridors* (**Figure 5.4**);
- The entire site is included within the 90 m building height restriction area under *OV07a – Defence (Area Control) Regulations and Obstruction Clearance Surfaces* (**Figure 5.5**);
- The site is located between the 8 km and 13 km Operational Airspace – Wildlife Attraction Restriction Areas under *OV07b – Operational Airspace, Wildlife Attraction and Lighting Issues* (**Figure 5.6**);
- The entire site is located within the Ipswich Motorsport Precinct Primary Buffer Area under *OV08 – Motor Sports Buffer* (**Figure 5.7**); and
- High voltage electricity transmission lines are mapped as traversing the north of the site in an east-west direction under *OV13 - High Voltage Electricity Transmission Lines* (**Figure 5.8**).

Development of the site is therefore required to comply with the relevant sections within *Part 11 – Overlays* of the Ipswich Planning Scheme, specifically, sections 11.4.7 (Flooding and Urban Stormwater Flow Path Areas), 11.4.8 (Buffers to Highways and Regional Transport Corridors), 11.4.9 (Defence Facilities), 11.4.10 (Motor Sports Buffers) and 11.4.15 (High Voltage Electricity Transmission Lines). As the proposed development is for a Reconfiguration of a Lot (RaL) for an industrial purpose, development will also be required to comply with the *Reconfiguring a Lot Code* (Part 12, Division 5) and the *Commercial and Industrial Code* (Part 12, Division 7). Clearing of vegetation on site will also be required to comply with the *Vegetation Management Code* (Part 12, Division 4). Other codes that may be applicable to the proposed development include the *Parking Code* (Part 12, Division 9), the *Earthworks Code* (Part 12, Division 15) and the *Development Constraints Overlay Code* (Part 11, Division 4).

In addition to Overlay Mapping, Key Reference Maps under the Ipswich Planning Scheme do not identify any Designated Water Courses (**Figure 5.9**) or Principle Conservation Areas (**Figure 5.10**) on site.

Ipswich City Council has also prepared a *Draft Key Koala Habitat Areas Map* (ICC, 2009). This map shows no existing core Koala habitat on site that is protected by the Ipswich Planning Scheme, and presents only a narrow strip of existing green space zones/open space corridors that can be supplementary planted with Koala food trees to contribute to Koala habitat and movement (**Figure 5.11**). This strip corresponds to the Regional Business and Industry Buffer zone within the site. The *Draft Key Koala Habitat Areas Map* also shows that the site occurs within the Southern Freight Rail Corridor Study Original Corridor of Interest). While **Figure 5.11** presents the Southern Freight Rail Corridor Study Preferred Alignment as occurring on the subject site, it is understood that the alignment

that was ultimately preferred now occurs to the site's north (G. Connors, pers. comm., 26 February 2010).

5.2 State Government

5.2.1 South East Queensland Regional Plan 2009-2031

The site is mapped as occurring within the Urban Footprint and within a designated Development Area under the *South East Queensland Regional Plan 2009-2031* (SEQ Regional Plan) (**Figure 5.12**) (DIP, 2009).

The SEQ Regional Plan desired regional outcome for the natural environment is stated as follows:

"*A healthy and resilient natural environment is protected, maintained and restored to sustainably support the region's rich biodiversity and ecosystem services including clean air and water, outdoor lifestyles and other community needs that critically underpin economic and social development*."

The SEQ Regional Plan natural environment policies applicable to the proposed development include:

- 2.1.2 – Avoid or minimise impacts on areas with significant biodiversity values in the Urban Footprint or Rural Living Area including biodiversity corridors;
- 2.1.3 – Avoid offsite impacts from development or other activities on adjacent areas with significant biodiversity values;
- 2.1.4 – Where impacts on areas with significant biodiversity values cannot be avoided, offset impacts in accordance with the principles of the Queensland Government Environmental Offsets Policy and relevant specific issue offset policies;
- 2.1.5 – Within biodiversity networks, protect significant biodiversity values, improve ecological connectivity, enhance habitat extent and condition and rehabilitate degraded areas;
- 2.1.6 – Optimise biodiversity conservation outcomes by locating environmental and carbon offsets within identified biodiversity networks and other suitable areas, giving a high priority to the protection or rehabilitation of significant biodiversity values; and
- 2.2.2 – Ensure development impacts on Koala habitat throughout SEQ are offset through the delivery of a net benefit to Koalas, including through the expansion of habitat on lands identified as suitable for rehabilitation.

The intent of the SEQ Regional Plan ecological policies are addressed through the mitigation and management measures described in **Sections 7** - **9**.

5.2.2 Qld Vegetation Management Act 1999 – Remnant Vegetation

Remnant vegetation in Queensland is regulated by the *Vegetation Management Act 1999* (VM Act). The DERM *Regional Ecosystems and Remnant Map – Version 6* (REMAP) (DERM, 2010a) presents the distribution and status of regional ecosystems as gazetted under the VM Act (Vegetation Management Status). The Vegetation Management Status used in this report is based on DERM's assessment of the pre-clearing and remnant extent of a regional ecosystem and is as per the *Vegetation Management Regulation 2000* (VM Regulation).

The VM Act defines a community as 'Remnant' when the vegetation exhibits more than 50 % of the undisturbed predominant canopy, averages more than 70 % of the vegetation's undisturbed height and is composed of species characteristic of the undisturbed predominant canopy of the given vegetation community.

Refer to **Figure 5.13** for REMAP designation of the site. The unshaded areas of **Figure 5.13** represent non-remnant vegetation in accordance with the VM Act. The site is not designated as hosting Remnant vegetation. Consequently, a RaL or MCU application (and associated preliminary vegetation clearing approval) would not require referral to the DERM as a Concurrence Agency for vegetation management. This should be indicated on the referral checklist when making an application.

Review of the regional ecosystems mapped within a one kilometre buffer of the site shows that the surrounding area is predominantly non-remnant vegetation (much of which is cleared and appears to be developed for agricultural purposes). Remnant vegetation remaining in the surrounds primarily occurs to the site's south, east and west. Of the remnant vegetation occurring within a one kilometre buffer of the site, Of Concern RE 12.9-10.7 appears to be the most extensive community, with Endangered RE 12.9-10.11 also commonly occurring. Of Concern RE 12.3.8 also occurs to the east of the site, and is associated with the freshwater wetland area. Regional ecosystems mapped within a one kilometre buffer of the site are listed in Table 5.1 below.

Table 5.1 – Regional Ecosystems Mapped within 1 km Buffer of the Site

RE Type	Brief RE Description (Qld Herbarium, 2009)
Of Concern RE 12.9-10.7	*Eucalyptus crebra*, *E. tereticornis* +/- *Corymbia tessellaris*, *Angophora* spp., *E. melanophloia* woodland on sedimentary rocks
Endangered RE 12.9-10.11	*Melaleuca irbyana* low open forest on sedimentary rocks
Of Concern RE 12.3.8	Freshwater swamps with *Cyperus* spp., *Schoenoplectus* spp. and *Eleocharis* spp.

REMAP presents data at a large scale (e.g.: 1:100, 000) and, subsequently, inaccuracies can occur. Accordingly, ground-truthing field investigations would be required to validate the remnant vegetation community mapping adjacent to the subject site. Furthermore, mapping of remnant vegetation is

constantly updated and the status of vegetation within the development footprint should be checked with DERM prior to clearing.

5.2.3 Essential Habitat

Essential Habitat is a vegetation ecotype that is considered by DERM to form potential habitat to a species that is listed as; Endangered, Vulnerable or Near Threatened under the Qld *Nature Conservation (Wildlife) Regulation 2006* (NC Reg). Essential Habitat mapping is provided in conjunction with Regional Ecosystem Maps by DERM and is represented as diagonal blue lines over a Remnant vegetation polygon. Essential Habitat species records are represented as a blue dot.

As the site is not mapped as containing Remnant vegetation (**Figure 5.13**), there is also no Essential Habitat mapped on site under the VM Act *Essential Habitat Map Version 3* (**Figure 5.14**). However, mapping indicates an Essential Habitat species record for Swamp Tea-tree (*Melaleuca irbyana*) (Label 26403) immediately adjacent to the south-east corner of the site, and Essential Habitat for Koala (*Phascolarctos cinereus*) (Label 29186) in the vicinity of the site.

5.2.4 Regrowth Vegetation and Essential Habitat Regrowth

Regulations for clearing high-value regrowth vegetation and regrowth watercourse vegetation came into effect 8 October 2009. The regulations operate under the VM Act and apply to the clearing of:

- High-value regrowth vegetation on freehold and Indigenous land and leasehold land used for agriculture and grazing;
- Regrowth vegetation within 50 m of identified watercourses in priority reef catchments of the Burdekin, Mackay/Whitsunday and Wet Tropics; and
- Vegetation within a Category C area shown on a PMAV (previously shown as a category 4 area) ('regulated regrowth vegetation').

The *Regrowth Vegetation Map – Version 2* depicts small polygons of High Value Regrowth Vegetation containing Of Concern regional ecosystems along the southern site boundary (**Figure 5.15**). A small polygon also occurs in the far north-east corner of the site. This regrowth vegetation is also mapped as Essential Regrowth Habitat for Koala.

Clearing of regulated regrowth vegetation is assessable against the *Regrowth Vegetation Code* (DERM, 2009) except where exemptions apply. As future development of the site is for an urban purpose in an urban area, clearing of regrowth vegetation is exempt from assessment in accordance with Schedule 24 of the *Sustainable Planning Regulation 2009* (SP Reg).

5.2.5 Threatened Species – Wildlife Online

Threatened Species are those defined as Endangered, Vulnerable and Near Threatened under the NC Act and listed in Schedules 2-5 of the NC Reg, and those defined as Critically Endangered, Endangered and Vulnerable in Section 179 of the EPBC Act.

A search of DERM Wildlife Online records was conducted for the locality of the site (10 km radius) (refer **Appendix B**). A total of 11 Threatened Species listed under the NC Reg have been recorded within the site's locality, eight fauna and three flora species. Refer to **Appendix A**, **Tables A.1** and **A.2** to view the Threatened fauna and flora species recorded as potentially occurring in the locality and discussions on the potential impacts of the proposed development on these species.

5.2.6 South East Queensland Koala Conservation State Planning Regulatory Provisions

The *South East Queensland Koala Conservation State Planning Regulatory Provisions* (SEQ Koala Conservation SPRP) regulate assessable development within targeted areas. The SEQ Koala Conservation SPRP incorporates the areas previously regulated by the *South East Queensland Koala State Planning Regulatory Provision* (February 2010) or the *Nature Conservation (Koala) Conservation Plan 2006 and Management Program 2006-2026*. The *SPRP Trigger maps* highlight assessable development areas defined under the SPRP, the subject site's mapping indicates the SPRP does not apply to the site.

Furthermore development applications lodged prior to the commencement of the SPRP on 31 May 2010 will be assessed against local government planning schemes and, where relevant, the South East Queensland Koala State Planning Regulatory Provision (February 2010) or the Nature Conservation (Koala) Conservation Plan 2006 and Management Program 2006–2026. Under the local government planning schemes the site is not shown to host areas suitable for koala habitat or areas that may contribute to Koala habitat by providing koala food trees (refer **Figure 5.11**).

5.2.7 Referable Areas

Referable Areas include Conservation Estate (Protected Areas, Recreation Areas, State Marine Parks, World Heritage Areas and Brisbane Forest Park) and areas listed under the Qld Heritage Register. Referable Areas Maps are provided by DERM (DERM, 2010d).

Figure 5.16 presents the Referable Areas designation of the site. As indicated by the absence of shading, no Referable Areas occur either within the site or within the 100 m buffer of the site (indicated by pink hatching).

Sites containing a Heritage Registered Place, or identified as containing a Conservation Estate in or within the 100 m buffer require referral to DERM if the proposed development is for the activities outlined in Schedule 2 of the SP Reg. As neither the site nor the 100 m site buffer contains a Referable Area, future development of the site does not trigger referral to DERM for Advice Agency assessment.

5.2.8 Referable Wetlands and Significant Wetlands

The location of Great Barrier Reef Wetland Protection Areas and Wetland Management Areas (Referable Wetlands) across Queensland are identified on DERM's Map of Referable Wetlands (DERM, 2010e). Wetlands contained on the maps are those identified as Wetland Protection Areas or Wetland Management Areas as defined in the SP Reg.

Figure 5.17 presents the Referable Wetlands designation of the site. As indicated by the absence of shading within the site, no Referable Wetlands occur on site.

A search of Significant Wetlands was conducted using WetlandMaps (DERM, 2010g). The search indicated that although the site does not host any State Significant wetlands. A Lacustrine waterbody is mapped as occurring in the north-west corner of the site (Figure 5.18).

5.3 Commonwealth Government

5.3.1 Environment Protection and Biodiversity Conservation Act 1999

Protected Matters Search

An assessment of Protected Matters (as defined by the EPBC Act) was undertaken to determine whether the proposed development is expected to have a significant impact on a matter of National Environmental Significance (NES) and, consequently, whether the proposed development would require referral to the Commonwealth Minister for Environment, Heritage and the Arts for approval. The EPBC Act lists the following seven matters of NES that a proponent must address in a 'self assessment':

- World Heritage properties;
- National Heritage Places;
- Ramsar wetlands of international significance;
- Listed Threatened species and ecological communities;
- Listed migratory species;
- Commonwealth marine areas; and
- Nuclear actions (including uranium mining).

Table 5.2, presented below, lists the Matters of NES identified within the nominated search area (10 km radius of subject site) and provides a qualitative impact assessment on each identified NES Matter as a result of future proposed development. Refer to Appendix C for full EPBC Act Protected Matters Search Results.

Table 5.2 – EPBC Act Protected Matters Search – Results and Assessment

NES Matter	Results of Search	Assessment
World Heritage Properties	The Protected Matters Search Report did not identify any World Heritage Properties within site's locality.	The proposal will not impact on the World Heritage Properties of Australia.
National Heritage Places	The Protected Matters Search Report did not identify any National Heritage Places within site's locality.	The proposal will not impact on the National Heritage Places of Australia.
Ramsar Wetlands of International Significance	The Protected Matters Search Report identified one Ramsar Wetland of International Significance within the site's locality – Moreton Bay. Moreton Bay is situated approximately 65 km north-east of the site. Moreton Bay is a semi-enclosed basin bounded on its eastern side by Moreton Island. It is one of only three extensive intertidal areas of seagrass, mangroves and saltmarsh on the eastern coast of Australia that provide habitat for water birds.	The site supports no intertidal habitats important for migratory shorebirds. Stormwater from the site indirectly drains into Moreton Bay. As such, stormwater quantity and quality are to be managed to ensure that stormwater from the site does not significantly impact Moreton Bay. Subsequently, the proposed development is not likely to impact upon the health and functioning of Moreton Bay.
Listed Threatened Species	A total of 25 Threatened Flora and Fauna species listed under the EPBC Act have been identified by the Protected Matters Search Report as possible occurrences in the Site's locality.	An Ecological Assessment was undertaken within the site to survey for the 25 nationally threatened species identified in search results and to determine whether suitable habitat exists for these species. No nationally threatened species were recorded during the ecological assessment. The habitat resources requiring removal or modification are unlikely to represent a significant area of habitat for EPBC listed fauna species in a local or regional context. The proposal will not cause isolation of habitats in the locality. The proposal is therefore considered unlikely to cause a significant impact to any Threatened species listed under the

Table 5.2 – EPBC Act Protected Matters Search – Results and Assessment

NES Matter	Results of Search	Assessment
		EPBC Act. The proposal would be directed to the Commonwealth Minister of the Department of the Environment, Water, Heritage and the Arts for assessment should it be found that the proposal offers a significant impact on Threatened species listed under the EPBC Act.
Listed Threatened Ecological Communities	The Protected Matters Search Report identified two Listed Threatened Ecological Communities within site's locality – White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Grassland, and Swamp Tea-tree (*Melaleuca irbyana*) Forest of South-east Queensland.	An Ecological Assessment was undertaken within the site to determine whether the Listed Threatened Ecological Communities identified, occurred within the site. Field investigations indicate that the site does not contain the listed threatened ecological communities – White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Grassland, or Swamp Tea-tree (*Melaleuca irbyana*) Forest of South-east Queensland. The proposal will not impact on the Listed Threatened Ecological Communities.
Listed Migratory Species	A total of 17 Migratory species listed under the EPBC Act have been identified by the Protected Matters Search Report as possible occurrences in the site's locality.	An Ecological Assessment was undertaken within the site to determine whether suitable habitat existed for the 17 Migratory species identified through the Protected Matters Search. It is noted that the site does not host intertidal or marine habitats and does not contain an 'important area' of habitat for any migratory species. Appropriate sediment control and stormwater run-off is to be managed in accordance with an

Table 5.2 – EPBC Act Protected Matters Search – Results and Assessment

NES Matter	Results of Search	Assessment
		approved Stormwater Management Plan. Accordingly, the proposal is unlikely to cause significant offsite impacts (eg. sedimentation of receiving water ways). The proposal is therefore unlikely to cause a significant impact to any listed migratory species, including those on JAMBA/CAMBA. The proposal would be directed to the Commonwealth Minister of the Department of the Environment, Water, Heritage and the Arts for assessment should it be found that the proposal offers a significant impact on Migratory species listed under the EPBC Act.
Commonwealth Marine Areas	The Protected Matters Search Report did not identify any Commonwealth Marine Areas within the Site's locality.	The proposal will not impact upon Commonwealth Marine Areas.
Nuclear Actions (including uranium mining)	The Protected Matters Search Report did not identify any Nuclear matters within the Site's locality.	The proposal does not constitute a nuclear action nor will it impact upon a nuclear action.

Other Matters Protected by the EPBC Act

In addition to the Matters of National Environmental Significance, consideration must be given to other matters protected by the EPBC Act when assessing proposals. These additional matters are summarised in Table 5.3.

Table 5.3 – Consideration of Additional Protected Matters under the EPBC Act

Protected Matters	Assessment
Commonwealth Lands and Commonwealth Heritage Places	One Commonwealth Land and Heritage Place was identified within the site's locality. Amberley RAAF Base Group is located approximately 8 km north of the site. As such, the proposal is not expected to significantly impact upon any Commonwealth Lands or Heritage Places.
Places listed on the Register of the National Estate (RNE)	One place listed on the RNE was identified within the site's locality. Amberley RAAF Base Group is located approximately 8 km north of the site. As the site is removed from this place, the proposed development is not expected to significantly impact this RNE site.
Listed Marine Species	A total of 15 Listed Marine Species under the EPBC Act have been identified by the Protected Matters Search Report as possible occurrences in the locality. No marine habitats occur within the site. The proposal is unlikely to cause significant impacts to any marine habitats in the locality.
Whales and Other Cetaceans	No Whales and Other Cetaceans listed under the EPBC Act have been identified by the Protected Matters Search Report as possible occurrences in the site's locality. It is noted that the site does not host marine habitats. The proposed development is not deemed to offer impact upon Whales and Other Cetaceans.
Critical Habitats	No critical habitats listed under the EPBC Act have been identified within the site's locality. The proposed activity will not impact upon any critical habitats.
Commonwealth Reserves	No Commonwealth Reserves have been identified within the site's locality. The proposed activity will not impact upon any Commonwealth Reserves.

Results – Field Assessment

6.1 Botanical Surveys

6.1.1 Vegetation Communities

The vegetation community surveys conducted during field surveys determined the presence of three vegetation communities within the site. A summary of the vegetation community survey results is provided below.

A floristic list has been compiled and is included in **Appendix D**. Refer to **Figure 6.1** to view the Vegetation Community Plan pertaining to the site. It should also be noted that since the field surveys were undertaken the site was subject to a fire (Aug 2010). The fire spread over the majority of the site and as such current condition of vegetation on site will differ from that at the time of the field surveys. **Figure 6.2** provides a visual representation of the extent of the fire.

Vegetation Community 1 – Eucalypt Open Woodland/Grassland Mosaic

Vegetation community 1 was observed to be the dominant vegetation community on site. Vegetation within this community varied across the site, primarily due to varying cover of the upper and mid strata. Vegetation Community 1 was characterised by vegetation community field surveys V5, V6, V7, V8, V11, V12 and V13.

Based on tree age, it is expected that historical clearing occurred across this vegetation community greater than 20 years previously. Subsequent land management practices on site, such as grazing, regrowth poisoning, logging and additional clearing have resulted in the sparse upper T1 stratum and restricted regrowth within the lower strata. Cattle grazing was observed to be a current land use. Weed growth was also observed to be a current disturbance, albeit primarily restricted to the ground stratum.

Below is a description of the flora species observed within each stratum of this community.

Upper T1 Stratum (projective foliage cover 0-5%, height range 20-27 m)

Narrow-leaved Ironbark (*Eucalyptus crebra*) was the dominant upper T1 species recorded within this vegetation community. Rusty Gum (*Angophora leiocarpa*) was also recorded at one survey location.

Mid Stratum (projective foliage cover ~0-15%, height range 1-8 m)

The mid stratum varied in cover throughout this vegetation community and included Eucalyptus saplings, Swamp Tea-tree (*Melaleuca irbyana*), Black Wattle (*Acacia concurrens*) and Early Black Wattle (*Acacia leiocalyx*).

Ground Stratum (projective foliage cover 95-99%, height range 0-1 m)

Ground stratum species recorded included Rhodes Grass*[1] (*Chloris gayana*), Black Speargrass (*Heteropogon contortus*), Red Natal Grass* (*Melinis repens*), Queensland Bluegrass (*Dichanthium sericeum*), Brown's Lovegrass (*Eragrostis brownii*), Barbed Wire Grass (*Cymbopogon refractus*), Two-colour Panic (*Panicum simile*), Kangaroo Grass (*Themeda triandra*), Green Couch* (*Cynodon dactylon*), Blady Grass (*Imperata cylindrica*), Eucalyptus saplings, Creeping Lantana* (*Lantana montevidensis*), Native Desmodium (*Desmodium rhytidophyllum*), Yellow Buttons (*Chrysocephalum apiculatum*), Dirty Dora (*Cyperus difformis*), Common Prickly Pear* (*Opuntia stricta*), Scrobic* (*Paspalum scrobiculatum*), Slender Rats Tail Grass (*Sporobolus creber*), Paddy's Lucerne* (*Sida rhombifolia*), Common Rush (*Juncus usitatus*), Scotch Thistle* (*Cirsium vulgare*), Fireweed* (*Senacio madagascariensis*), Elastic Grass* (*Eragrostis tenuifolia*), Many-flowered Mat Rush (*Lomandra multiflora*), Balloon Cotton Bush* (*Gomphocarpus physocarpus*), Early Black Wattle saplings and Blue Flax Lily (*Dianella caerulea*).

Vegetation Community 2 – Eucalypt Woodland

This vegetation community primarily occurred within the north-eastern area of the site. Vegetation Community 2 was characterised by vegetation community field survey V9.

Historical clearing of this area was expected to have occurred greater than 20 years previously, as trees within this vegetation community were observed to be quite mature. However, selective logging has continued to occur within the community.Cattle grazing was observed to currently occur within the vegetation community, however due to low stocking rates, the impact of grazing was considered low. Weed species were also observed within the vegetation community, however as they were limited to the ground stratum, weed infestation levels were considered to be low.

Below is a description of the flora species observed within each stratum of this community.

Upper T1 Stratum (projective foliage cover ~ 15%, height range 23-30 m)

The upper T1 stratum was observed to be dominated by Narrow-leaved Ironbark. Additional species recorded included Forest Red Gum (*Eucalyptus tereticornis*) and Pink Bloodwood (*Corymbia intermedia*).

Upper T2 Stratum (projective foliage cover ~5%, height range 6-10 m)

Species recorded within the upper T2 stratum included Forest Red Gum and Early Black Wattle.

Mid Stratum (projective foliage cover ~10%, height range 1-2 m)

Species recorded within the mid stratum included Eucalyptus and Early Black Wattle saplings.

Ground Stratum (projective foliage cover ~98%, height range 0-1 m)

The ground stratum was observed to be dominated by Rhodes Grass*. Other commonly occurring species included Red Natal Grass*, Two-colour Panic, Brown's Lovegrass, Barbed Wire Grass, Black

[1] * denotes exotic species

Speargrass, Yellow Buttons, Queensland Bluegrass and Green Couch*. Other species recorded included Creeping Lantana* and Native Desmodium.

Vegetation Community 3 – Freshwater Wetland/Dams

This vegetation community was primarily associated with the five dams on site, and included the Lacustrine waterbody mapped in the north-west corner of the site. The freshwater wetland vegetation community provides a fringe of vegetation (of varying width) around the circumference of each open water body. Vegetation Community 3 was characterised by vegetation community field surveys V1, V2, V3, V4 and V10.

The freshwater wetland vegetation community is associated with historically constructed anthropogenic dams on site. The exception to this is the Lacustrine waterbody mapped in the north-west site corner, which extends to the south of such a dam, and is likely to be naturally occurring. It is expected that the dam locations were historically cleared of vegetation and drainage modification works occurred through dam construction. It is estimated that these works occurred greater than 20 years previously.

Current disturbances within the freshwater wetland vegetation community include cattle grazing, weed infestation and erosion. The low number of cattle currently grazing on site has minimised the impact on the freshwater wetlands/dams, however adverse impacts including trampling of vegetation and sedimentation of water were observed. Exotic flora species were observed to occur within the wetland vegetation community, however the impact on the vegetation community was considered to be low, due to the dominance of native flora species. Soil erosion was observed to occur on dam banks, with severities observed ranging from low to moderate. Turbidity of the dam water was observed to be low however, with water quality evidently not greatly affected.

Below is a description of the flora species observed within each stratum of this community.

Emergent Stratum (projective foliage cover ~5%, height range 10-30 m)

Mature/regrowth Eucalypt trees were observed to occur fringing the freshwater wetland vegetation community. Species observe included Forest Red Gum, Narrow-leaved Ironbark, Moreton Bay Ash (*Corymbia tessellaris*) and Silver-leaved Ironbark (*Eucalyptus melanophloia*).

Mid Stratum (projective foliage cover <5%, height range 1-5 m)

Swamp Tea-tree shrubs were observed to occur fringing two of the freshwater wetlands/dams.

Ground Stratum (projective foliage cover 20-80%, height range 0-1 m)

The ground stratum was the predominant stratum recorded to occur within the freshwater wetland vegetation community. The freshwater wetland in the north-west corner of the site was observed to have the most extensive cover of ground stratum, due to the extension of the vegetation community approximately 200 m south of the open waterbody. Vegetation within the ground stratum was dominated by Tall Spikerush (*Eleocharis sphacelata*), Triangular Clubrush (*Schoenoplectus mucronatus*), Water Snowflakes (*Nymphoides indica*) and Water Couch (*Paspalum distichum*). Other commonly occurring species included Swamp Ricegrass (*Leersia hexandra*), Woolly Frogmouth

(*Philydrum lanuginosum*), Dirty Dora, Common Rush, Water Primrose (*Ludwigia peploides* subsp. *montevidensis*), a Smatweed (*Persicaria attenuata*), Slender Knotweed (*Persicaria decipiens*), Smooth Nardoo (*Marsilea mutica*), Water Milfoil (*Myriophyllum crispatum*), Nitella (*Nitella* sp.), Cape Blue Waterlily* (*Nymphaea caerulea* subsp. *zanzibarensis*) and Water Chestnut (*Eleocharis dulcis*).

6.1.2 Threatened Flora Species

One Threatened flora Species, Swamp Tea-tree, was observed on site. Swamp Tea-tree is listed as Endangered under the NC Reg and is protected under the NC Act. Approximately 1500 individuals have subsequently been recorded on site during a Threatened Species Survey (Appendix E), primarily occurring in areas of lower elevation in the southern and western areas of the site.

Refer to **Appendix A**, **Table A.1** to view additional Threatened flora species recorded as potentially occurring the locality and subsequent discussions on the potential impacts of the proposed development on these species.

6.1.3 Exotic Flora Species

Declared Weed Species

A declared weed species is defined as such if listed under the Queensland *Land Protection (Pest and Stock Route Management) Act 2002*. Refer to **Table 6.1** below for declared plant species were recorded during field assessments.

Table 6.1 – Declared Weed Species Recorded on Site

Scientific Name	Common Name	Class of Declaration
Lantana montevidensis	Creeping Lantana	3
Opuntia stricta	Common Prickly Pear	2
Senecio madagascariensis	Fireweed	2

Class 2 pests are established in Queensland and have, or could have, an adverse economic, environmental or social impact. Landowners must take reasonable steps to keep land free of Class 2 pests. It is an offence under the *Land Protection (Pest and Stock Route Management) Act 2002* to introduce, keep or supply a Class 2 pest without a permit issued by the Department of Employment, Economic Development and Innovation (DEEDI) (DEEDI, 2009).

Class 3 pests are established in Queensland and have, or could have, an adverse economic, environmental or social impact. It is an offence under the *Land Protection (Pest and Stock Route Management) Act 2002* to supply a Class 3 pest without a permit issued by the DEEDI. Landholders

are required to control Class 3 plants if their land is adjacent to an environmentally significant area (DEEDI, 2010).

Environmental Weeds

An environmental weed species is defined as such if included in the List of the 200 Most Invasive Environmental Weeds in SEQ (NRM, 2003). **Table 6.2** presents the environmental weed species recorded on the site during the field assessments.

Table 6.2 – Environmental Weed Species Recorded on Site

Scientific Name	Common Name	Significance Classification
Chloris gayana	Rhodes Grass	46
Cynodon dactylon	Green Couch	99
Gomphocarpus physocarpus	Balloon Cotton Bush	86
Lantana montevidensis	Creeping Lantana	18
Melinis repens	Red Natal Grass	65
Nymphaea caerulea subsp. zanzibarensis	Cape Blue Waterlily	66
Opuntia stricta	Common Prickly Pear	111
Senecio madagascariensis	Fireweed	82
Sida rhombifolia	Paddy's Lucerne	153

6.2 Fauna Assessment

A total of 45 vertebrate fauna species were detected within the site during the survey period, comprising 38 bird species, three mammal species, two reptiles, one amphibian and one fish species.

No Threatened fauna species were detected on site during field assessments; however Koala (*Phascolarctos cinereus*) was observed offsite immediately over the southern boundary within Remnant Regional Ecosystem Open Forest (RE type 12.9-10.7). Koala is listed as Vulnerable by the NC Reg (SEQ Bioregion).

The comprehensive list of fauna species detected opportunistically and during the surveys is provided in **Appendix E**.

6.2.1 Habitat Assessment

The field assessments undertaken by Orogen identified that the site supports three main habitat types, namely:

- Habitat Type 1 – Eucalypt Open Woodland/Grassland Mosaic;
- Habitat Type 2 – Eucalypt Woodland; and
- Habitat Type 3 – Freshwater Wetlands/Dams.

Habitat types directly correspond to vegetation communities on site. The most common habitat type within the site was therefore Eucalypt Open Woodland/Grassland Mosaic, which corresponds with Vegetation Community 1 – Eucalypt Open Woodland/Grassland Mosaic (**Figure 6.1**).

The fauna habitat value of the identified habitats is discussed in the following sections. The threatened species known or considered to potentially occur within the site based on the habitats present and local records are provided in **Appendix A**, **Table A.2**.

Habitat Type 1 – Eucalypt Open Woodland/Grassland Mosaic

Habitat for hollow dependant fauna was observed to be limited within this habitat type, primarily due to the sparse upper T1 canopy stratum within this vegetation community and the apparent age of individual trees. The majority of the trees were found to be less than 60 cm diameter at breast height (DBH) and, therefore, did not appear to be of sufficient maturity to have developed substantial arboreal hollows. The dominance of Narrow-leaved Ironbark within the canopy was also expected to have restricted the occurrence of hollows, as this species is not prone to hollow formation (Wormington *et al.,* 2003). A variety of hollow sizes were recorded, despite the limited hollow numbers, with hollows primarily recorded within stags.

Fallen timber and branches were observed to be common throughout this habitat type, with large log piles also occurring in recently cleared areas. The majority of fallen timber and branches were small in size (10-50 cm diameter), with only a scattered occurrence of large sized logs (> 50 cm diameter). The majority of fallen logs/branches were also too small or not aged sufficiently to provide hollow resources. As such, the majority of the logs observed would not be suitable for denning by large species, such as, Spotted-tail Quoll. The fallen logs however would be expected to provide potential habitat for small reptile species.

The ground cover vegetation was generally quite dense and was dominated by native and exotic grasses. The ground stratum therefore provided foraging and/or shelter resources for macropods, smaller mammals, ground dwelling birds, grass birds and raptors. Macropods were observed to be commonly occurring across the site, with numerous raptor bird species also observed to be foraging overhead. An active Wedge-tailed Eagle nest was also observed within this habitat type and was located in a large stag close to the southern site boundary.

Scattered patches of Swamp Tea-tree provided shelter and nesting habitat resources for small birds. Surface rocks (10-30 cm diameter and >30 cm diameter) were scattered throughout this habitat type. However, due to the general small size of these rocks (predominantly 10-30 cm diameter) and the sparse distribution, habitat for rock dependant fauna was limited. In addition, no rock outcrops, cliffs or overhangs were observed on site; Eucalypt trees within this habitat type were found to provide potential foraging resources for nectivorous birds and mammals (e.g. flying foxes, possums, gliders) and a potential supply of foliage food for Koalas. No evidence of habitat utilisation by Koala was observed within this habitat type. This habitat area was observed to be immediately adjacent to a polygon of remnant vegetation occurring to the south of the site (~50-100 ha). It is therefore expected that this habitat type provides potential foraging habitat for fauna species living within the remnant vegetation.

Habitat Type 2 – Eucalypt Woodland

Fauna habitat potential within the Eucalypt Woodland included potential foraging habitat for Koala. However, the quality of potential Koala habitat was limited by the extensive dieback observed in the canopy.

The canopy stratum also provided roosting/nesting opportunities for birds, with a number of birds nest (~30 cm diameter) were observed in the canopy Eucalypts. Potential habitat for smaller birds was also observed in the Eucalypt saplings and Swamp Tea-tree shrubs in the mid stratum, however, this was also limited by the degraded nature of the Eucalypt saplings.

The ground cover vegetation was generally dense and was dominated by native and exotic grasses. The ground stratum therefore provided foraging and/or shelter resources for macropods, smaller mammals, ground dwelling birds, grass birds and raptors. Macropods were observed to be commonly occurring across the site, with numerous raptor species also observed foraging overhead.

Scattered habitat was observed within this community for hollow dependant fauna. Habitat for log dependant fauna was abundant with numerous wood piles noted throughout this vegetation community. Habitat for rock dependant fauna was less abundant with surface rocks (10-30 cm diameter and >30 cm diameter) scattered throughout this habitat type. Due to the general small size of these rocks (predominantly 10-30 cm diameter) and the sparse distribution, habitat for rock dependant fauna was limited from this community. Habitat features such as cliffs, caves and overhangs were absent from this vegetation community.

Habitat Type 3 – Freshwater Wetland/Dams

Wetland areas were associated with each of the five anthropogenic dams on site. The largest wetland area was associated with the Lacustrine waterbody in the north-west corner of the site, where the wetland area extended approximately 200 m south of the open water (survey location S02).

The wetland areas would provide potential habitat opportunities for a variety of amphibian and water bird species. Habitat observed for water birds included expanses of open water for foraging (likely to be permanent) and large areas of reeds/rushes/water lilies for shelter/nesting. Numerous water birds were opportunistically recorded on site including Purple Swamp Hen (*Porphyrio porphyrio*), Pacific Black

Duck (*Anas superciliosa*), Australasian *Grebe*, (*Tachybaptus novaehollandiae)* and Dusky Moorhen (*Gallinula tenebrosa*). These water bird habitat features also provided foraging and shelter/nesting habitat for amphibian species. Cane Toad tadpoles were observed within the dams, which indicated that the wetland areas may be subject to degradation by populations of Cane Toads. Nonetheless habitat quality may be suitable for resilient native amphibians able to compete with introduced Cane Toads. The open water of the dams also provides a water resource for terrestrial fauna (e.g. macropods), evidence of which was noted in the form of tracks leading to the water's edge.

Forest Red Gum trees often located in the vicinity of the dams are classed as mature Koala habitat trees and therefore provide potential habitat for Koalas although no evidence of koala activity was noted during site assessment (see section **6.2.2** below).

6.2.2 Koala Activity Levels and Habitat Utilisation

- No confirmed samples of Koala scats were identified from the two formal Koala scat survey sites (K1 and K2).
- Scat samples collected during Koala surveys were identified (tentatively) as Macropod and Common Brushtail Possum (*Trichosurus vulpecular*) scats (Triggs, 1998).

6.2.3 Bird Surveys

- A total of 38 bird species were detected within the site during the field surveys (Appendix E). Of these, 20 were detected during the specific diurnal avifauna surveys; and
- None of the species detected were threatened species. The majority of the avifauna present within the site were typical open country species common throughout the region. Certain forest associated species were noted in areas adjacent to heavily vegetated neighbouring properties (largely the Southern boundary).
- One noteworthy observation was the presence of an active Wedge-tallied Eagle (Aquila audax) nest close to the southern property boundary. This nest was located within a large stag. An Adult bird was seen foraging over the subject site and adjacent properties.

6.2.4 Call Playback Surveys

- The call playbacks surveys did not elicit any response from target species during either of the surveys (CB 1 and CB 2; refer **Figure 4.1** for survey locations).

6.2.5 Spotlighting Surveys

- A total of four vertebrate fauna species were detected during the spotlighting surveys, these included Tawny Frogmouth (*Podargus strigoides*), Common Brushtail Possum (*Trichosurus vulpecular*), Koala (*Phascolarctos cinereus*) (offsite) and Eastern Grey Kangaroo (*Macropus giganteus*)
- The most common observation was the Common Brushtail Possum.
- The one Koala detected during the spotlighting surveys was 'off site' and located on the boundary between the subject site and neighbouring property. Observations of Koala within the subject site were not confirmed during field surveys.

6.2.6 Herpetofauna Surveys

- No herpetofauna species of conservation significance were detected. One introduced amphibian species; the Cane Toad (*Rhinella marinus*) was noted to be relatively abundant during Herpetofauna Surveys.
- An unidentified native Tadpole was collected during Herpetofauna Surveys.
- One Rainbow fish (*Hypseleotris* sp.) was incidentally captured during the attempts to catch tadpoles.
- It should be noted that cold temperatures were experienced during the survey period. Conditions during the surveys, particularly at night were cold. The limited frog calls and Heretofauna observations during the surveys is likely to be partially attributable to the weather conditions at the time of surveys.

6.2.7 Threatened Fauna Species

No Threatened fauna species were detected on site during field assessments. One Koala (listed as Vulnerable in SEQ Bioregion under the NC Reg) was observed on the southern boundary within the neighbouring property. Incursions of this species into the subject site were not confirmed during site assessment and are at present speculative.

6.2.8 Declared Pest Animals

A declared pest animal is defined as such if listed under the Queensland *Land Protection (Pest and Stock Route Management) Act 2002.* One declared pest animal species was detected during field investigations:

- European hare (*Lepus capensis*) - Class 1 pest animal.

A Class 1 pest is one that is not commonly present in Queensland, and if introduced would cause an adverse economic, environmental or social impact. Class 1 pests established in Queensland are subject to eradication from the state. Landowners must take reasonable steps to keep land free of Class 1 pests.

6.3 Significant Ecological Features & Functions

The sites potential significant ecological features and functions are described below;

6.3.1 Fauna Corridors

Within a cleared or semi cleared landscape, fauna corridors can be defined as contiguous or semi contiguous patches of vegetation or wildlife habitat (of any shape or size) that provide a conduit of movement for fauna typically between relatively large vegetated areas (core breeding habitats). Corridors are important for maintaining gene flow and genetic diversity among populations / sub populations and provide a means of refuge for fauna during stochastic events.

The site is bounded to the south by an extensive area of Remnant vegetation, including Of Concern RE 12.9-10.7 and Endangered RE 12.9-10.11 (**Figure 5.14**). This area is also mapped as a Principle Conservation Area under the Ipswich Planning Scheme (**Figure 5.10**). In addition, RE 12.9-10.11 is Swamp Tea-tree (*Melaleuca irbyana*) Forest of South-east Queensland ecological community that is listed as a Threatened ecological community under the EPBC Act.

The site does not provide ecological corridor functions from the aforementioned ecologically significant areas largely due to the extensive historic vegetation clearing of the site and ongoing land management practises (e.g. cattle grazing). The area within the subject site that is adjacent to the aforementioned Conservation Area does provide foraging opportunities for species resident within this neighbouring area. Vegetated connectivity to other areas of significant vegetation (largely to the North West of the site) is not evident from Aerial Photography Interpretation works (API) and field assessment. Consequently, there is very limited scope in terms of connectivity for most terrestrial fauna and these areas are most likely only able to be traversed by highly mobile species such as birds, bats and species associated with open country habitat (e.g. Eastern Grey Kangaroos).

Some connectivity within the site is provided by the vegetated drainage lines traversing the site, however the efficacy of these features as wildlife corridors is limited due to the sparseness of the vegetation resulting from historic clearing and land management practices (e.g. cattle grazing).

6.3.2 Significant (Subject) Species

The site hosts habitat resources potentially suitable for a number of subject species potentially occurring in the locality, this included 10 species (7 fauna species and 3 flora species) listed as

Threatened under either the NC Reg or EPBC Act. Only one threatened species (*Melaleuca irbyana*) was confirmed during site inspections. For the remaining species noted as subject species during this study it was concluded that while the site provides potential habitat it is not likely to form the core habitat for these species. Furthermore restoration works proposed as part of the development activity aim to mitigate any potential loss of habitat for species potential utilising the resources found within the subject site. For further discussion on subject species and the impact of the proposed development refer to **Appendix A**, **Tables A.1** and **A.2** for further information on the sites subject species).

One species listed as migratory under the EPBC Act was identified during site inspections, the Rufous Fantail (*Rhipidura rufifrons*)

6.3.3 Significant Vegetation Communities

Two Endangered vegetation communities noted within the EPBC protected Matters Report were considered as potentially occurring on the subject site. The two communities being Swamp Tea-tree (*Melaleuca irbyana*) Forest of South-east Queensland and White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland. For the latter community there is no evidence from field assessment that the site hosts such a vegetation community.

The Swamp Tea-tree Forest ecological community is based on two RE types – RE 12.9-10.11 and RE 12.3.3c (DEWHA, 2010). Both of these RE types are listed as Endangered under the *Vegetation Management Act 1999*. RE 12.9-10.11 and RE 12.3.3c are described as low open forest vegetation communities (Queensland Herbarium, 2009). In accordance with the *Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland* (Neldner et al., 2005), low open forest is defined by a foliage projective cover of 30-70%, with a tree height range of <10 m. Although the average height of Swamp Tea-tree is less than 10 m, the predominant growth form onsite was observed to be shrub[2] rather than tree[3]. This indicates that the Swamp Tea-tree population on site does not suit the definition of low open forest. In addition, the projective foliage cover of the population was less than 15%, which indicates that the foliage cover is insufficient to meet the Remnant vegetation requirements.

The Swamp Tea-tree population observed onsite was therefore not considered to comprise Remnant RE 12.9-10.11 or RE 12.3.3c, and as such, was not deemed a Swamp Tea-tree Forest ecological community. The Swamp Tea-tree population was also not considered to comprise the additional RE types presented by Ryan (2010) as Swamp Tea-tree communities, as these RE types (RE 12.9-10.11a, RE 12.3.3b and RE 12.5.2x) were not recorded on site.

Rather, the Swamp Tea-tree population was observed to be composed of regrowth vegetation in historically cleared grazing land, resulting from a reduction in agricultural land management practices on site.

[2] Shrub is a woody plant less than 8 m tall either multi-stemmed or branching close to the ground, occasionally with a single stem (Neldner et al., 2005).
[3] Tree is a woody plant more than 5 m tall usually with a single stem (Neldner et al., 2005).

This conclusion is supported by Cooper et al. (1995), who observed that Swamp Tea-tree forest has a low, usually closed, canopy, and that wider spacing between trees is usually the result of human disturbance, where the trees consist of regrowth sprouting in a once cleared paddock.

6.3.4 Drainage lines, Wetland Areas and Dams

The site contains a number ephemeral drainage lines, five anthropogenic dams and an area of wetland (associated with a Lacustrine waterbody). At a 1:100 000 scale, the site is mapped as hosting three first-order streams and three second-order streams (**Figure 5.13**). The majority of the ephemeral water courses within the site are not mapped at 1:100,000 scale.

The majority of the site's watercourses were found to be degraded by bank erosion with an altered natural flow regime. Nonetheless, these systems provide aquatic and riparian terrestrial habitat for a variety of flora and fauna species and provide limited connectivity through the site and locality. Wetland areas were associated with each of the five anthropogenic dams on site. The largest wetland area was associated with the Lacustrine waterbody in the north-west corner of the site, here the wetland area extended approximately 200 m south of the open water.

Discussion of Potential Impacts

7.1 Flora

7.1.1 Vegetation Clearing

The subject site is 266ha in size and the proposed development footprint encompasses approximately 202.3ha. The majority of the development footprint is subject to vegetation clearing (see **Figure 2.1**). However, the subject site will also host a number of areas dedicated to habitat restoration (see **Figure 2.1**), in particular areas associated with the wetland in the north west of the site and areas adjacent to the southern boundary. Furthermore, a number of retention basins are to be formed from existing dams on the site; these areas will also be subject to restoration with the intention of forming aquatic/wetland habitat. None of the proposed vegetation clearing will result in the loss of Remnant vegetation and/or High Value Regrowth vegetation. Vegetation impacted by clearing will largely be pasture grasses comprised of non-native species. Native trees (largely immature Eucalyptus *sp*. and Acacia *sp*.) will be subject to clearance and appropriate management measures will be implemented to minimise the impact of such (see **section 8.1**).

One Threatened flora species was recorded on site (*Melaleuca irbyana)* and is subject to clearance as part of the proposed development. The species has a scattered distribution over the site and are largely immature specimens that have grown due to a relaxation of grazing intensity. A Threatened Species Management Plan (Appendix E) has been prepared for this species and it is proposed that one of the aforementioned restoration areas will focus on the restoration of *Melaleuca irbyana*. The aim being to provide a functioning *Melaleuca irbyana* community with connectivity to existing *Melaleuca irbyana* forest communities present on adjacent properties.

With adherence to the impact mitigation and management measures outlined in **Section 8**, the proposed development aims to manage the ecological impact and provide measures to retain and restore the ecological features of the site. The proposed development is not expected to have significant long-term impacts upon the native flora and fauna of the surrounding locality.

7.1.2 Pest Flora

There is the potential for the proposed development to contribute to the spread of pest flora throughout the site and facilitate the introduction and establishment of additional pest flora species. This would potentially result in the degradation of adjoining remnant vegetation, particularly the areas in closest proximity to the development (e.g. bushland allotments), as well as any areas of non-remnant that are to be retained and road reserve vegetation along the roads accessing the site.

Conversely the proposed development has the potential to assist in the management of non native flora species on site, as vegetation clearing would include the clearing of extensive areas on non-native vegetations (mainly grasses). Furthermore weed control works would be outlined an approved Rehabilitation Plan pertaining to the proposed development. With adherence to the Mitigation Measures and Recommendations provided in **Section 8** the potential impacts associated with pest flora are not expected to be significant.

7.2 Fauna

7.2.1 Fauna Habitat Modification

The proposal will result in the direct removal of vegetation and alteration of other habitat resources, such as minor drainage lines and anthropogenic dams. Any clearing for the proposed development will, therefore, reduce the area of potential habitat available for fauna species, known or potentially occurring, in the locality. The habitat types identified within the proposed development area are well represented within the wider region. The vegetation within the proposed development area was found to be subject to previous disturbance, such as, clearing and weed infestation (and most recently fire; see **Figure 6.2**). Consequently, the habitat resources within the proposed development area are generally lower in quality in comparison to the habitat resources available in the adjoining neighbouring properties which contain mature remnant vegetation.

The habitat proposed to be removed or modified as a result of the development represents relatively low quality habitat in the context of the adjoining remnant vegetation. The habitats of the proposed development area alone are unlikely to represent core habitat for any Threatened fauna species recorded within the region. Also it should be noted that no threatened fauna was found during field inspection.

The area of vegetation/habitat proposed to be removed or modified for the proposed development; however, still represents a large area of habitat for some fauna species, particularly less mobile species and/or those with small home ranges. The proposed development is, therefore, likely to result in a reduction of the fauna carrying capacity of the habitats occurring within the property and adjoining lands.

Loss of grazing habitat

The proposed development will result in the loss of foraging habitat for grazing fauna e.g. macropods, due to the clearing of the ground stratum within the development footprints. However comparable habitat is known to be common within region, furthermore the species noted utilising the grazing habitat were common native species (Eastern Grey Kangaroo) and a Class 1 pest species (European Hare); as such the loss of such habitat is not thought to be greatly significant.

Removal of Hollow Bearing Trees

The proposal will result in the removal of hollow bearing trees that provide potential shelter, denning, roosting and nesting habitat, for a variety of fauna species. However, the majority of the hollow bearing trees observed within the proposed development area lack larger sized cavities and, therefore, potential impacts to potential nesting habitat for larger species such as Owls is considered to be minimal. The species noted utilising hollows during site surveys were Common Brushtail Possums.

There is the potential for injury to such fauna inhabiting hollow resources at the time of clearing and this impact is discussed in a later section of this report.

Removal of Nesting Trees

Several active nests (including one large raptor nest) were identified within the proposed development area during the field surveys. Therefore it is possible that injury and/or disturbance to nesting avifauna could occur during clearing activities. A number of mitigation measures have been formulated for the proposal to reduce the potential for injury to fauna during the clearing. These measures are detailed in Section 8.

Aquatic Habitats

The proposed development has the potential to impact upon aquatic habitats through direct removal of drainage lines, depressions and dams and through indirect impacts, such as sedimentation and erosion. Use of fertilisers for ground maintenance would also increase the potential for excess nutrient loading which can cause eutrophication, particularly within stagnant waters. Appropriate controls during and post construction would reduce impacts to receiving waters, including, any retained aquatic habitat. Restoration works will also be undertaken within the both the retained dams/wetlands and also in associated with the modified storm water detention basins proposed as part of the development activity.

7.2.2 Pest Fauna

Pest fauna species recorded on site included the European hare, a species listed as a Class 1 declared species under the LP (PSRM) Act. Declared species are targeted for control as they represent a threat to primary industries, natural resources and the environment. European hares are noted to be sensitive to anthropogenic disturbance; as such it is likely that the nature of the proposed development (with increases visitation) will prove unfavourable for this species.

7.3 Subject Species

The desktop review indentified that a total of 13 Threatened plant species and 16 Threatened fauna species have been previously recorded, or are considered as potentially occurring within the site's locality. A number of these species, however, are not considered likely to occur within the development footprint area based on the habitat requirements of the species and the lack of these features within

the development footprint. Such species are not considered as Subject Species for the proposal. For species that were recognised as Subject Species it was concluded that the subject site is unlikely to provide core habitat for the majority of these species as the habitat resources within the proposed development area are generally lower in quality in comparison to the habitat resources available in the adjoining neighbouring properties. Nonetheless appropriate mitigation measures are proposed to limit the impact on Subject Species determined as potentially occurring within the subject site (**Section 8**)

All the Threatened species highlighted through EPBC and Wildlife online searches within the locality are listed in **Tables A.1 - A.2 in Appendix A,** which also provides an assessment of likely occurrence within the development footprint, and based on this, the determination of Subject Species for the proposal.

7.4 Waterways and Wetlands

The drainage lines and dams on site provide potential habitat for a number of species. The development will result in clearing and/or modification of drainage lines and dams for construction and installation of infrastructure. Such disturbances have the potential to result in:

- Loss of fauna habitat;
- Loss of flora habitat;
- Destabilisation of stream banks and beds;
- Degradation of water quality (e.g. increased turbidity from sediment-laden runoff) and subsequent alteration of aquatic flora and fauna species composition;
- Alteration of hydrological regime (e.g. modification of channel size and shape through increased sedimentation of waterway and increased stormwater loading); and
- Introduction of invasive weeds through anthropogenic vectors (e.g. weed propagules may be introduced into the streams by construction plant.

With adherence to the Mitigation Measures and Recommendations provided in **Sections 8** the potential impacts associated with waterways and wetlands are not expected to be significant.

Mitigation Measures

8.1 Vegetation Management

Measures to mitigate and manage the potential impacts of the proposed development on vegetation within the development footprint and surrounding locality are described below.

8.1.1 Threatened Flora Surveys

- A pre-clearing Threatened flora survey has been undertaken (Appendix E) in relation to the known Threatened species on site, specifically Swamp Tea-tree (*Melaleuca irbyana*). Details of species distribution and biometric data are to be recorded for *Melaleuca irbyana* specimens found during survey work.
- A restoration plan is proposed for *Melaleuca irbyana* and will incorporate a designated restoration area within the subject site (Appendix E). This species currently has a scattered distribution over the subject site and is largely comprised of regrowth specimens that have grown due to relaxation in grazing intensity. The aim of such work is to provide a net ecological gain for the species by establishing a significant area of *Melaleuca irbyana* forest with connectivity to existing *Melaleuca irbyana* forest communities on neighbouring properties.

8.1.2 Retention of Vegetation

- A landscaped buffer is to be provided along the eastern boundary of the site, namely alongside the Cunningham highway. Likewise two main areas of restoration are proposed within the site (see **Figure 2.1**); any existing native vegetation within these two areas will also be retained and enhanced by supplementary plantings of local native species; and
- Landscaping within the proposed development footprint (including bioretention basins) is to comprise local native species and Threatened flora species where appropriate (namely *Melaleuca irbyana*);
- An Environmental offset is proposed to alleviate any impact associated with cumulative loss of Threatened flora on site. Proposed offset areas (indicated as restoration areas) are shown in **Figure 2.1.** These areas will be restored using local native flora species, with a bias toward use of *Melaleuca irbyana* where appropriate.

8.1.3 Vegetation Clearing Management

- Vegetation clearing is to be staged to allow the existing native vegetation to persist in the development footprint area as long as possible. This will allow for the continued release of native propagules into the site and its surrounding environment until such time as it is necessary to clear for construction and will minimise the potential for weed invasion;
- The proposed clearing activity is to be confined to the minimum area required for the current stage of the proposed activity. Prior to the commencement of clearing operations, the extent of the proposed clearing will need to be accurately surveyed and clearly marked in the field. No clearing is to occur outside the defined boundaries;
- During clearing operations, all machinery and associated materials should be stored within existing cleared areas. Machinery and materials must not be stored or stockpiled outside of the designated clearing area. Access to the works areas will need to be via designated access ways, avoiding vegetation areas where possible;
- All trees cleared are to be felled away from the adjoining vegetation communities, back into the proposed clearing area to avoid damaging vegetation outside of the defined clearing boundaries;
- If any additional threatened species are confirmed within the development footprint during clearing activities, clearing must cease immediately and the finding is to be reported to the project manager, who in-turn, should seek advice from a qualified environmental scientist/environmental planner on the appropriate course of action to take. Encountered individuals are to be retained on site where possible. The translocation, damage or destruction of a Threatened flora and fauna species requires a permit from DERM;
- Felled native vegetation is to be mulched and spread on the disturbed areas in order to stabilise these areas, to increase the seed bank and to provide a mulch material for nutrient cycling and water retention purposes. This does not include any weed species present on site. Hollow logs should be retained and relocated to areas where of vegetation is to be retained (except within waterways). Millable timber should be recycled appropriately;
- Care is to be taken in the disposal of vegetation cleared from the development footprint so that spread of exotic propagules is managed. No vegetative material cleared from the development footprint is to be placed near or within vegetation occurring adjacent to the clearing area. All cleared vegetation (that is not mulched and recycled) is to be disposed of at an appropriately licensed waste management facility;

8.1.4 Weed Management and Restoration

- The wetland community associated with north western dam is to be restored through targeted weed control and addition of appropriate local flora species (as prescribed in an approved Rehabilitation Plan); and

- The constructed detention basins proposed within the site are to be revegetated using appropriate local flora species (as prescribed in an approved Rehabilitation Plan);
- Areas designated as rehabilitation/offset areas for threatened species are to be planted using appropriate locally sourced flora, the ongoing management of such areas is to follow an approved Rehabilitation Plan and/or Threatened Species management Plan.
- Weed species are to be managed during construction and post-development in accordance with a Weed Management Plan.

8.1.5 Native Landscaping

- Landscaping and streetscaping areas are to utilise local native flora species. Where possible, propagules should be collected from the site, propagated and utilised in the sites restoration activities.

8.2 Fauna and Habitat Management

The following mitigation measures are recommended for the proposed development to reduce the potential impact of the proposal on fauna and their habitats.

A Fauna Management Plan (FMP) is to be prepared by a Queensland Parks and Wildlife Service (QPWS) licensed Spotter Catcher prior to clearing works. It is recommended that the FMP include any mitigation measures detailed in this report.

8.2.1 Minimise Clearing Extent and Impact on Habitats

The following measures have been formulated to reduce the potential impact to fauna that may be occupying trees within or adjoining the clearing area at the time of the clearing operations. In addition, measures have been formulated in an attempt to reduce the potential impact of habitat loss.

- A QPWS licensed Spotter Catcher is to be present during clearing operations. Any trees to be cleared, and those within the vicinity of the tree being felled must be checked for inhabiting fauna immediately prior to felling. In particular, the crowns will need to be inspected for occupation by Koalas prior to removal;
- Any trees found to contain a Koala, or trees within felling distance of any tree with a Koala in the crown must not be removed until the Koala has vacated the area by its own free will;
- The cavities of any hollow bearing trees will also need to be checked for inhabiting fauna upon felling. Any injured fauna should be captured where possible and taken to the local wildlife carer. Once rehabilitation has been achieved (if possible), the individual will be released into habitats adjoining the capture site, and if required, into shelter sites appropriate for that species (i.e. nest boxes);

- Following the removal of each hollow bearing tree, the ecologist will need to identify if any hollow resources can be salvaged for resiting into the adjoining habitats and also denote such hollows to the clearing contractors for preparation purposes. The details of salvaged hollows (*eg.* cavity dimension and fauna suitability) should be documented as a component of the resource recovery;

- Ecological pre-clearing surveys would be undertaken by an ecologist/ licensed Spotter Catcher prior to the commencement of the clearing. These surveys will be aimed at targeting particular Threatened species known or potentially occurring in the area and attempt to identify critical sites for these species. If critical habitat sites are located, appropriate impact mitigation measures will be undertaken according to the type of site/feature and species concerned;

- It is recommended that all hollow bearing trees occurring within the proposed development area be identified and marked in the field by an ecologist/ licensed Spotter Catcher prior to the commencement of the clearing operations. Identification of significant features within the clearing area (*eg.* raptor nests) would also be undertaken opportunistically during the hollow bearing tree marking program. The clearing boundaries should be defined in the field prior to the hollow tree marking program;

- A selection of hollow resources is to be harvested from felled habitat trees and resited into the retained habitats. In addition, various sized nest boxes are to be installed within retained vegetation adjoining the development area in an effort to compensate for the loss of hollow resources removed for the proposal. A selection of logs and timber derived from the clearing operations will also need to be relocated into the adjoining habitats to provide shelter and refuge habitat for fauna;

- The active Wedge Tail eagle identified during field assessment is to be retained within the proposed restoration area adjacent to the southern site boundary (refer **Figure 2.1**). Should any additional active raptor nests be found within the proposed development area during the pre-clearing ecological works, the QPWS will need to be notified and further directions sought. No clearing of the tree, and also no clearing within a 50 m radius of the tree, could commence until directed by QPWS. Strategies may include ensuring any fledglings have vacated, and erecting nesting platforms in nearby retained habitats.

- A site induction must be undertaken so as to clearly inform personnel involved in the clearing and ecological works the relevance of any marked items (such as clearing boundaries and hollow trees), and identify their responsibilities (*eg.* checking trees for Koala, checking hollows upon felling). An ecological site induction notice will need to be prepared and signed by all relevant personnel involved with the clearing and maintenance operations.

8.2.2 Koalas

Given the presence of Koala on neighbouring properties, specifically the heavily vegetated property to the south of the subject site, mitigation measures to protect Koala from potential hazards associated with the development area need to be considered. In particular due to the industrial nature of development proposed for the site it is considered favourable that Koalas are excluded from the developed area of the site and maintained within the large bushland area occurring to the south of the site via exclusion fencing. Figure 2.1 presents potential movement linkages which are associated with Open Forest and Open Woodland ecotypes to the site's south and west. The following mitigation measures are considered to be appropriate requirements for managing the potential impacts of development within the site on Koala from neighbouring properties. These measures are consistent the Koala plans prepared for developments in Qld.

- Slow speed roads in areas adjacent to known Koala habitat (southern property boundary);
- Koala exclusion fencing around areas where potential for collisions with vehicles is high;
- Koala safe internal fencing (e.g. post and rail);
- Targeted domestic dog management (namely within protected restoration area(s); and
- Ropes in detention basins to help prevent drowning where Koalas have not been excluded via other means such as Koala exclusion fencing.

8.3 Waterways

It is recommended that a Council-approved Stormwater Management Plan (SMP) and Sediment and Erosion Control Plan be developed and adhered to in order to mitigate potential impacts of the proposed development on waterways in the surrounding locality. The SMP should ensure stormwater runoff from the development footprint is managed to mitigate adverse impacts on the water quality, hydrology and structural stability of receiving waterways.

It is recommended that any such approved Rehabilitation Plan formulated for the subject site considers any retained waterways. In particular rehabilitation will aim to improve the ecological function and also aesthetics of these features. The Rehabilitation Plan would include a weed management program and planting of local native flora. In addition, the development should incorporate best practise design for roads or structures that traverse any retained drainage lines to reduce the impact of development on the flow regimes.

Conclusion and Recommendations

9.1 Conclusion

The proposed development involves the MCU/RaL and preliminary approval for vegetation clearing operational works of a 266.9ha site (comprised of non-remnant vegetation) for the purpose of the creation of industrial lots and associated infrastructure. The proposed development will primarily impact the Eucalypt Open Woodland/Grassland Mosaic vegetation community (the site's dominant vegetation community) which is largely comprised of non-native grasses with scattered emergent and immature native trees.

A number of flora and fauna species either listed as Threatened under the NC Reg or EPBC Act, were recorded as potentially occurring within the site, although none were observed during site assessment, with the exception of *Melaleuca irbyana*. Mitigation measures have been proposed that will result in a net ecological gain for this Threatened species (Appendix E). Furthermore key ecological features associated with the site including an area of wetland are to be retained, and where necessary rehabilitated.

The proposed development will also result in the modification of a number of anthropogenic dams present within the site, these areas will also receive rehabilitation works to improve the ecological value and maintain aquatic habitat on site. Management of stormwater flow within the development footprint area will be addressed to ensure the proposed development does not significantly impact upon these and other receiving watercourses of the locality.

With adherence to the mitigation and management measures outlined in **Section 8,** the proposed development is not expected to significantly impact on any other Threatened species detected within, or considered potentially to occur within the site.

9.2 Recommendations

The recommendations to mitigate and manage the potential impacts of the proposed development on the ecological integrity of the site and its surrounding locality, outlined in this report, are summarised below:

- Mitigation measures outlined in **Section 8** are to be implemented to reduce the potential impacts of the development on flora and fauna and their habitats, including impacts to Threatened species;
- A Fauna Management Plan is to be prepared by a QPWS licensed Spotter Catcher prior to clearing works. The Fauna Management Plan would need to include any relevant mitigation measures detailed in **Section 8** of this report;

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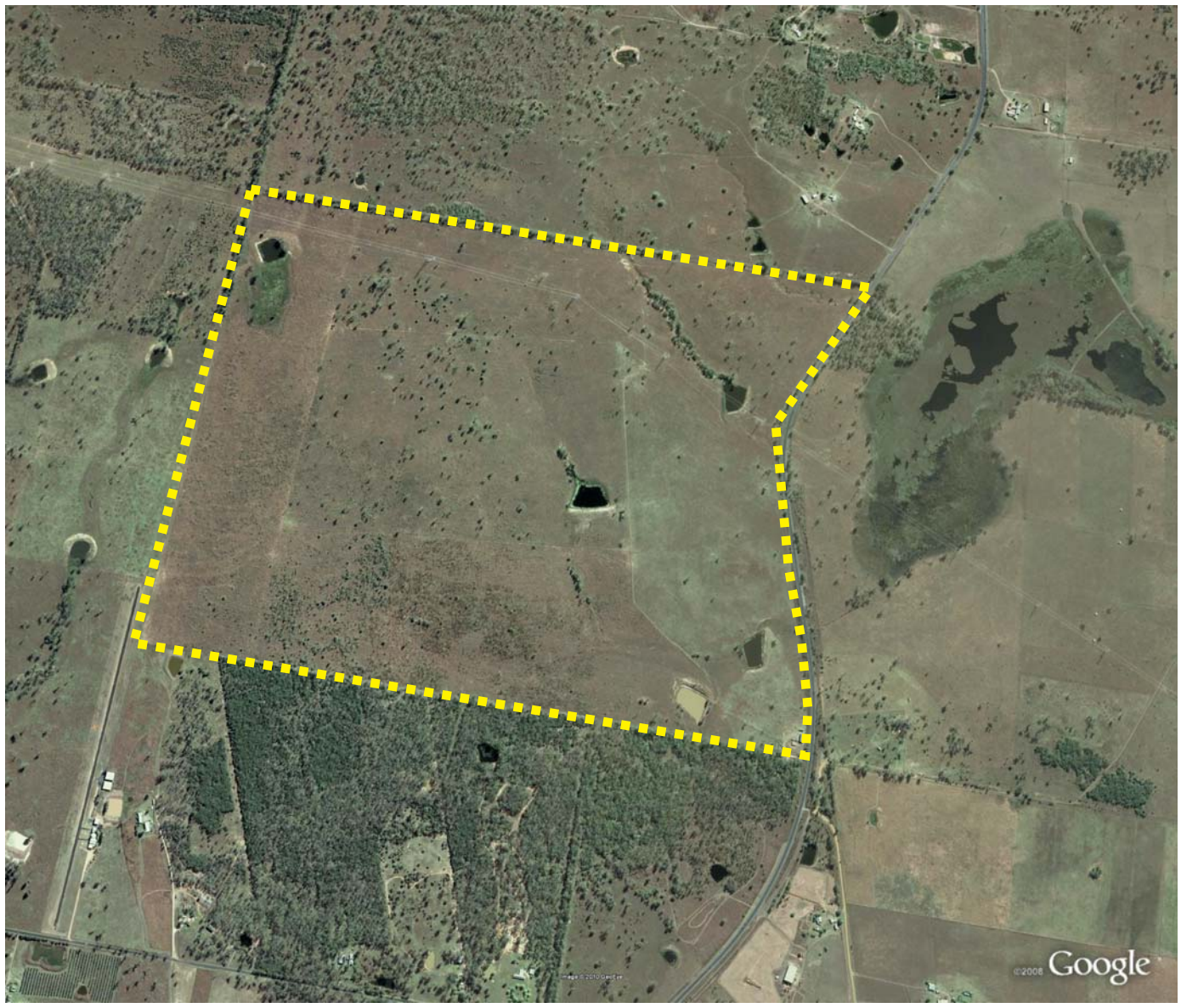
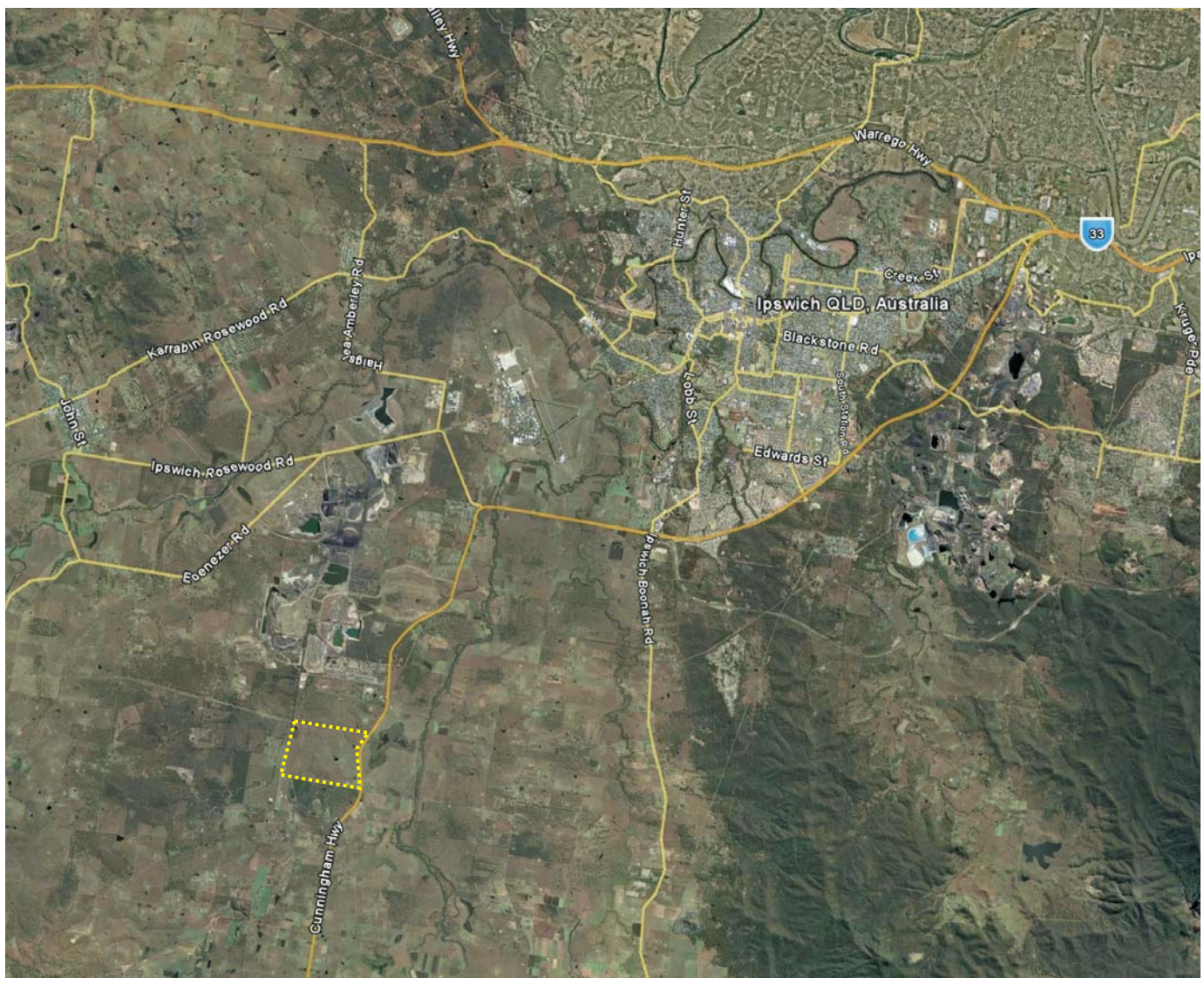
Figures



Source: Google Earth (2010) - *Lot 226 Cunningham Highway, Mutdapilly, Qld* (satellite image). GeoEye/MapData Sciences Pty Ltd, PSMA. Image dated 11 August 2009.



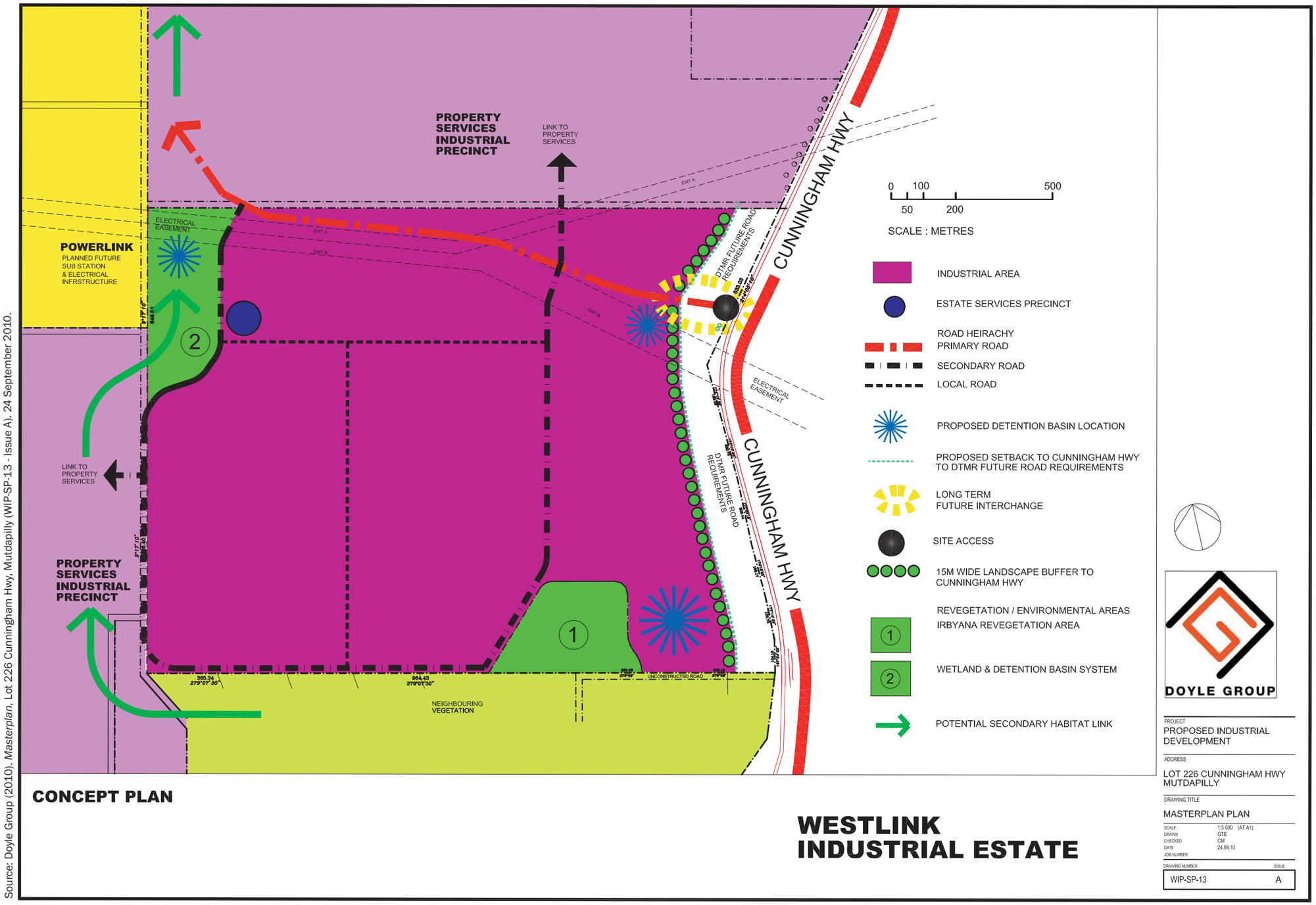
Source: Google Earth (2010) - *Lot 226 Cunningham Highway, Mutdapilly, Qld* (satellite image). GeoEye/Sinclair Knight Merz & Fugro/MapData Sciences Pty Ltd, PSMA. Image dated 16 April 2007 - 11 August 2009.

LEGEND

Site Boundary

NOTES:
1. Map indicative only
2. Map to be printed in A3
3. Aerial imagery does not accurately reflect current vegetation on site due to historic land management practices

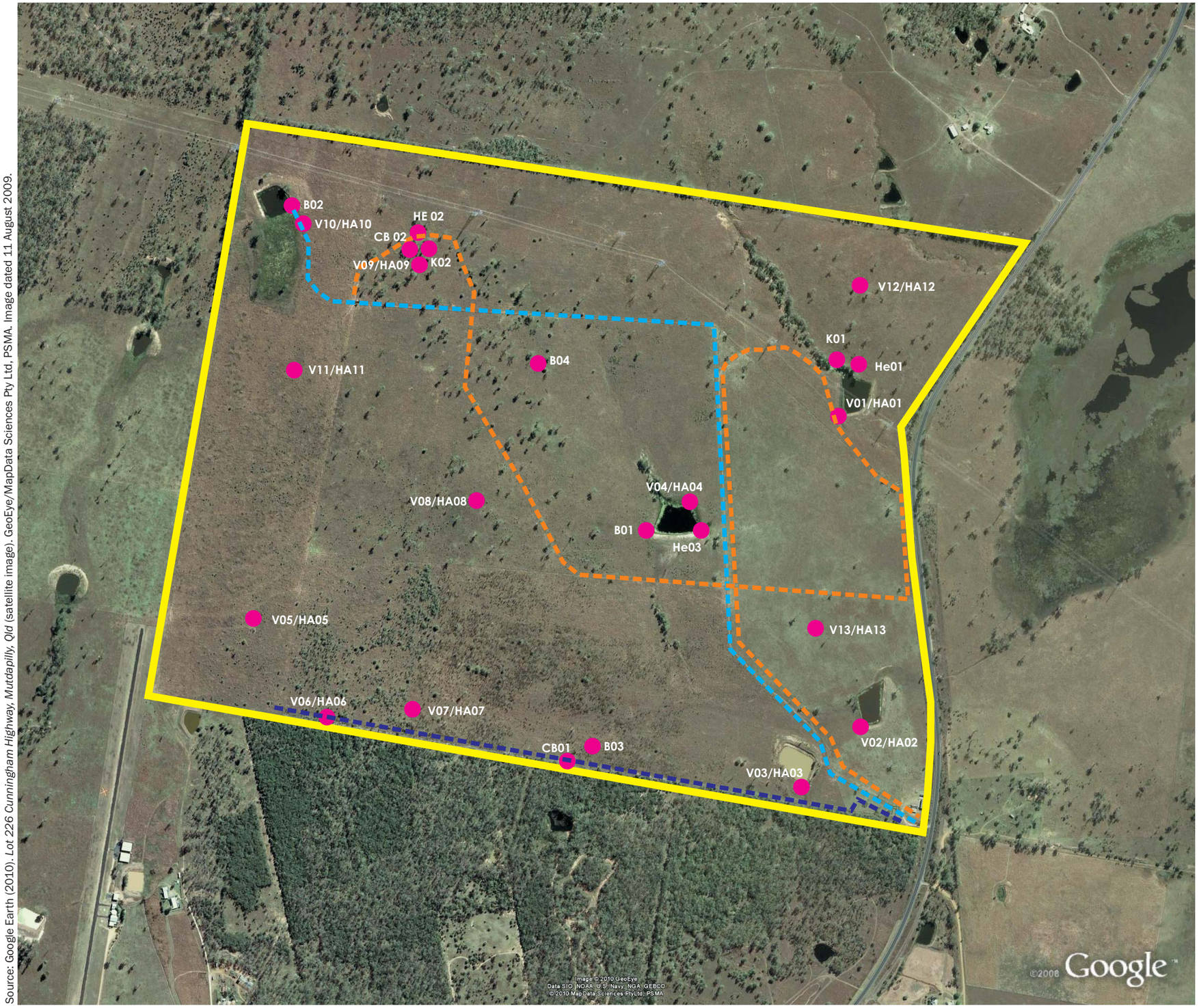
Figure 1.1 - Locality Plan



Source: Doyle Group (2010), *Masterplan*, Lot 226 Cunningham Hwy, Mutdapilly (WIP-SP-13 - Issue A), 24 September 2010.

NOTES:
1. Map indicative only
2. Map to be printed in A3

Figure 2.1 - Proposed Plan of Development



Source: Google Earth (2010). *Lot 226 Cunningham Highway, Mutdapilly, Qld* (satellite image). GeoEye/MapData Sciences Pty Ltd, PSMA. Image dated 11 August 2009.

LEGEND

- Site Boundary
- V02 Vegetation Surveys (V01-V13)
- HA 01 Habitat Assessment Surveys (HA01-HA13)
- K01 Koala Spot Assessment Surveys (K01-K02)
- B01 Bird Surveys (B01-B04)
- HE 02 Herpetofauna Surveys (HE01-HE03)
- CB 02 Call Play Back Surveys (CB01-CB02)
- Spotlight Survey (S01)
- Spotlight Survey (S02)
- Spotlight Survey (S03)

NOTES:
1. Map indicative only.
2. Map to be printed in A3.
3. Aerial imagery does not accurately reflect current vegetation on site due to historic land management practices.
4. Ecological data from formal surveys was supplemented with opportunistic records taken by Orogen throughout the site.

Figure 4.1 - Ecological Survey Locations Plan

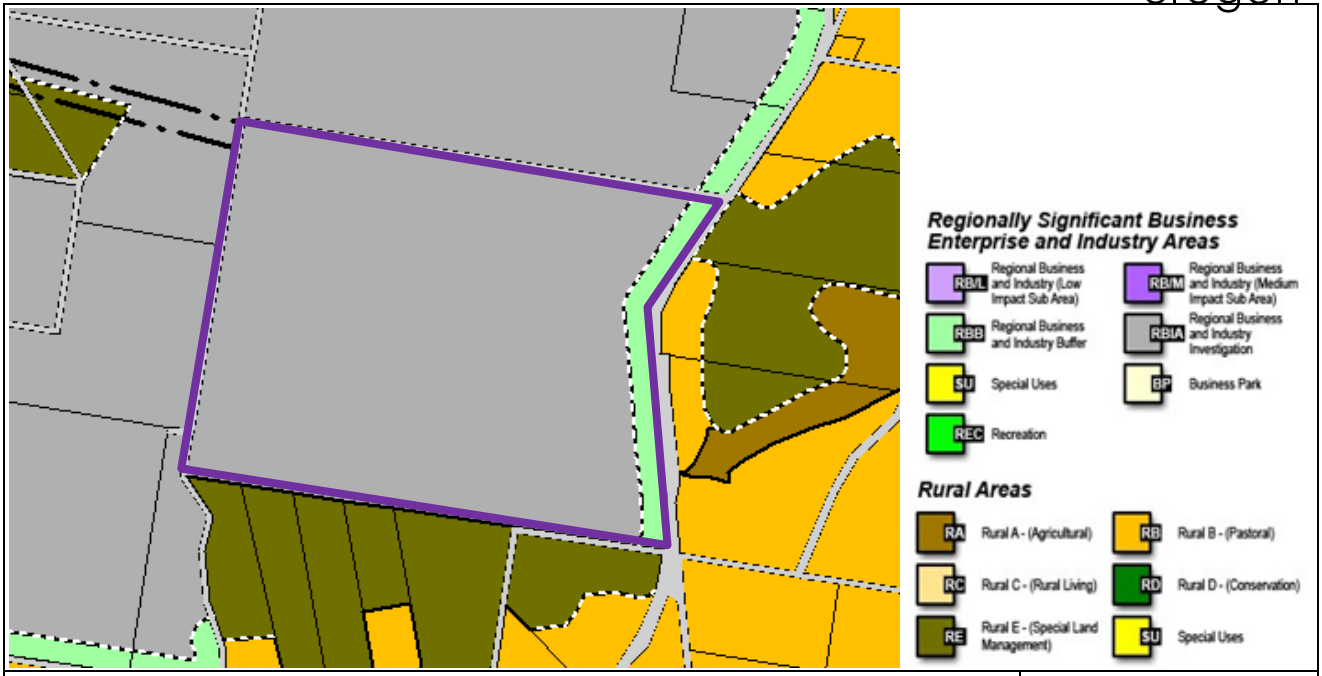


Figure 5.1 – Relevant Extract from Zoning Map

Source: ICC (2006). *Ipswich Planning Scheme 2006*. Ipswich City Council, Ipswich, Qld.

Subject Site

Figure 5.2 – Relevant Extract from Ebenezer-Willowbank Precincts

Source: ICC (2006). *Ipswich Planning Scheme 2006*. Ipswich City Council, Ipswich, Qld.

Subject Site

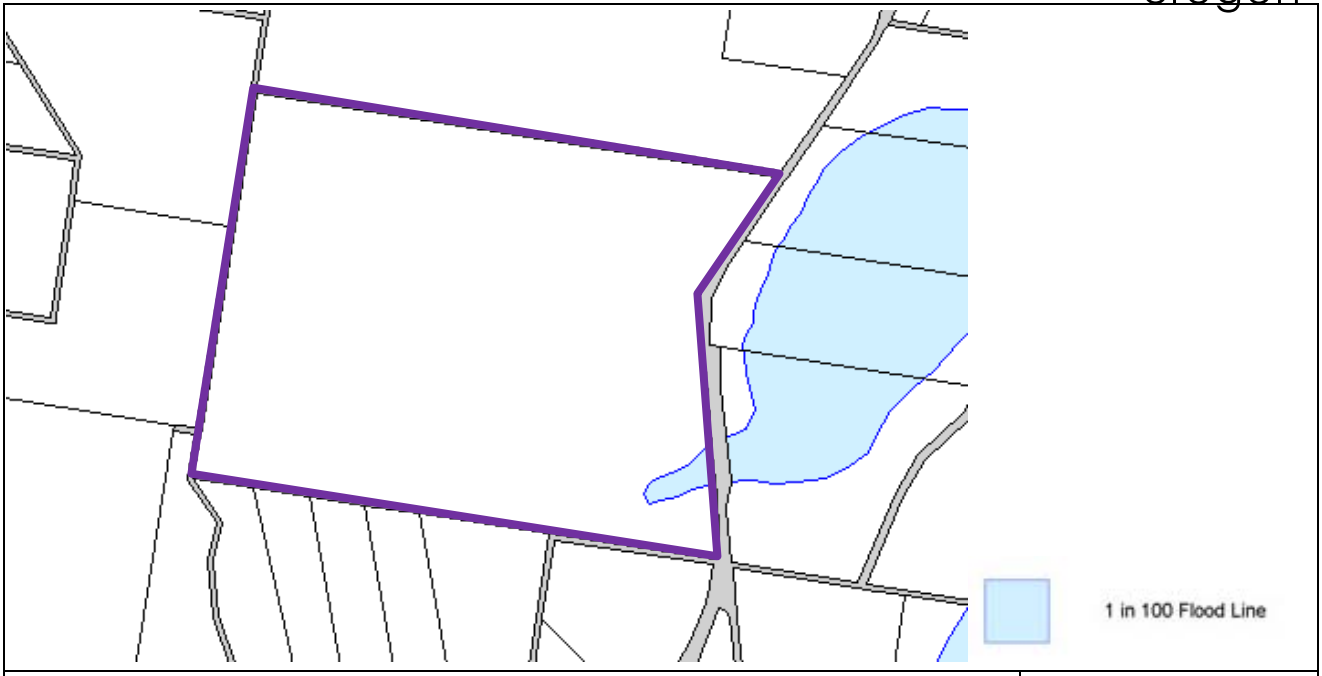


Figure 5.3 – Relevant Extract from OV05 – Flooding and Urban Stormwater Flow Path Areas

Source: ICC (2006). *Ipswich Planning Scheme 2006*. Ipswich City Council, Ipswich, Qld.

Subject Site

Figure 5.4 – Relevant Extract from OV06 – Buffers to Highways and Regional Transport Corridors

Source: ICC (2006). *Ipswich Planning Scheme 2006*. Ipswich City Council, Ipswich, Qld.

Subject Site

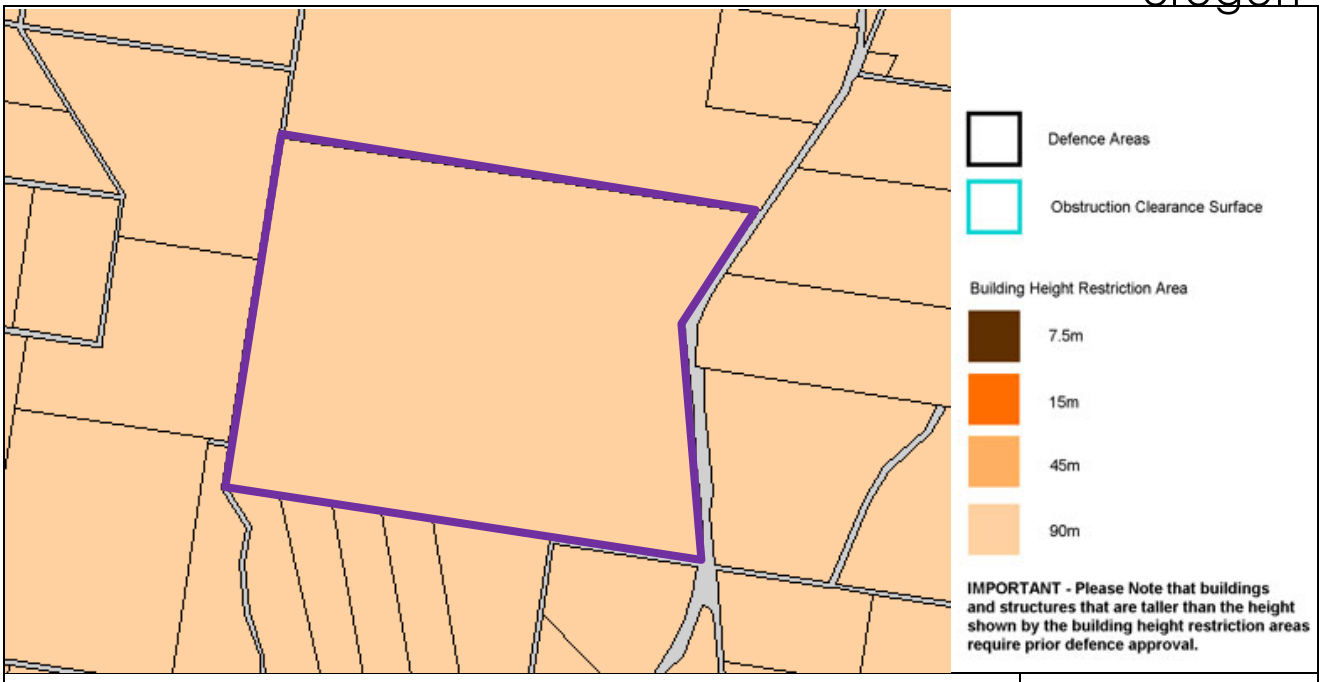


Figure 5.5 – Relevant Extract from OV07a – Defence (Area Control) Regulations and Obstruction Clearance Surfaces

Source: ICC (2006). *Ipswich Planning Scheme 2006*. Ipswich City Council, Ipswich, Qld.

Subject Site

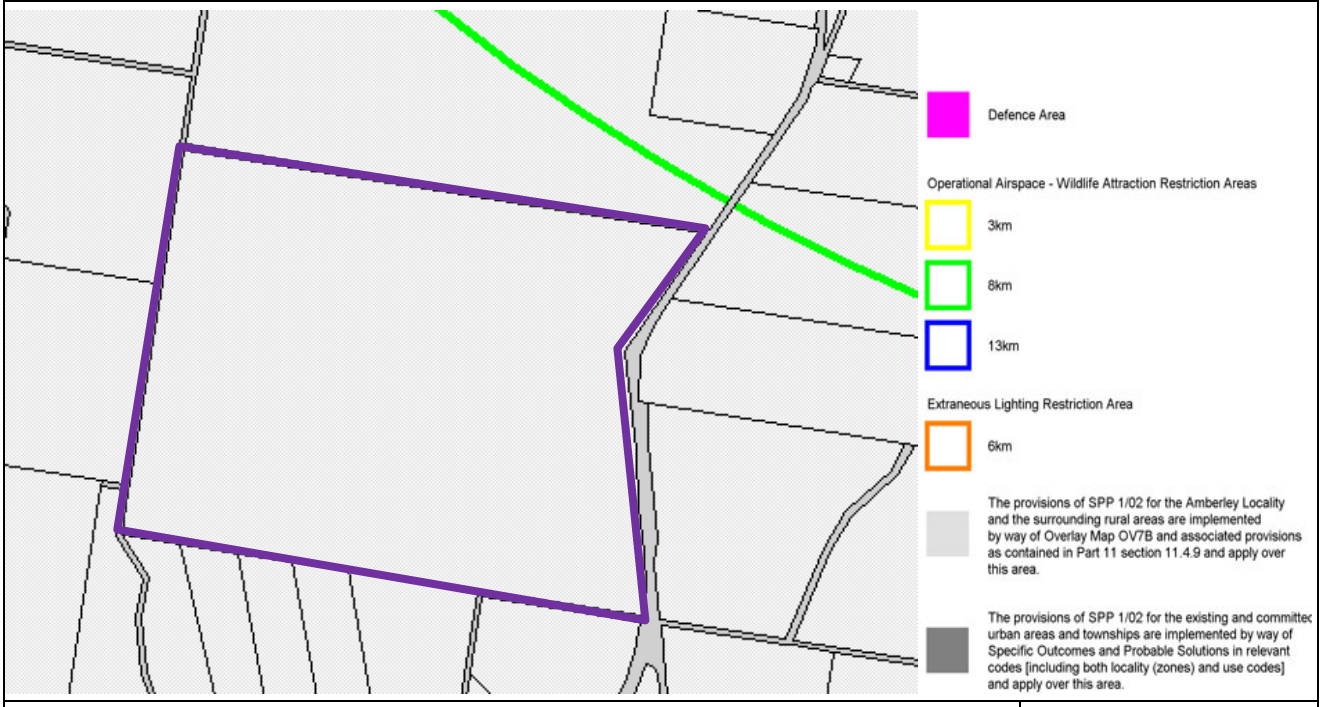


Figure 5.6 – Relevant Extract from OV07b – Operational Airspace, Wildlife Attraction and Lighting Issues

Source: ICC (2006). *Ipswich Planning Scheme 2006*. Ipswich City Council, Ipswich, Qld.

Subject Site

Figure 5.7 – Relevant Extract from OV08 – Motor Sports Buffer

Source: ICC (2006). *Ipswich Planning Scheme 2006*. Ipswich City Council, Ipswich, Qld.

Subject Site

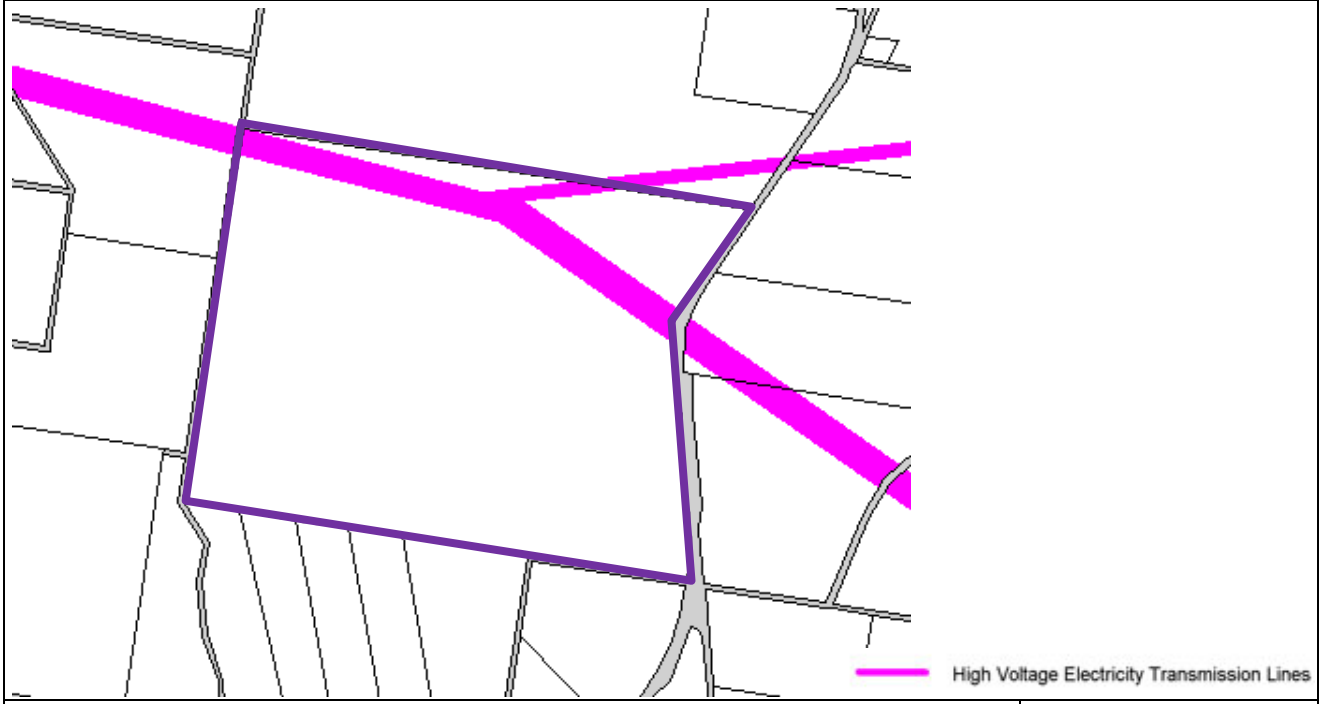


Figure 5.8 – Relevant Extract from OV13 – High Voltage Electricity Transmission Lines

Source: ICC (2006). *Ipswich Planning Scheme 2006*. Ipswich City Council, Ipswich, Qld.

Subject Site

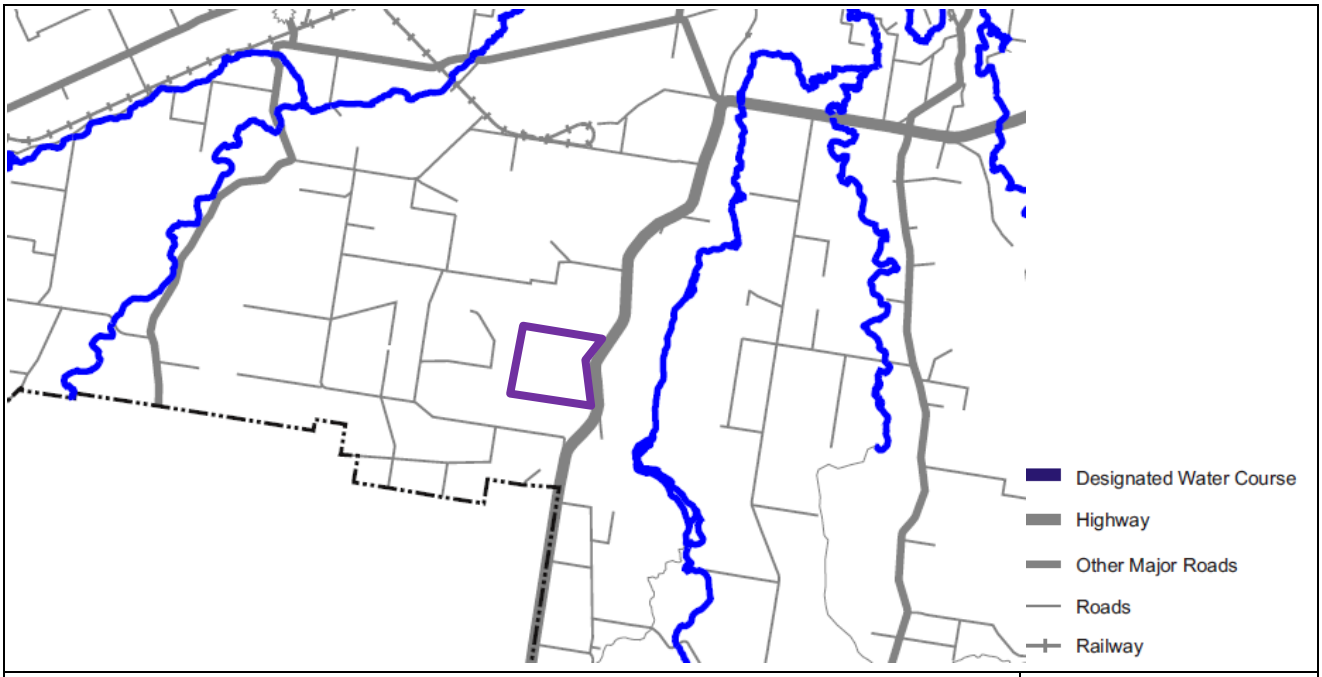


Figure 5.9 – Relevant Extract from Key Reference Map 6 – Designated Water Courses

Source: ICC (2006). *Ipswich Planning Scheme 2006*. Ipswich City Council, Ipswich, Qld.

Subject Site

Figure 5.10 – Relevant Extract from Key Reference Map 1 – Principle Conservation Areas & Integrated Open Space Network

Source: ICC (2006). *Ipswich Planning Scheme 2006*. Ipswich City Council, Ipswich, Qld.

Subject Site

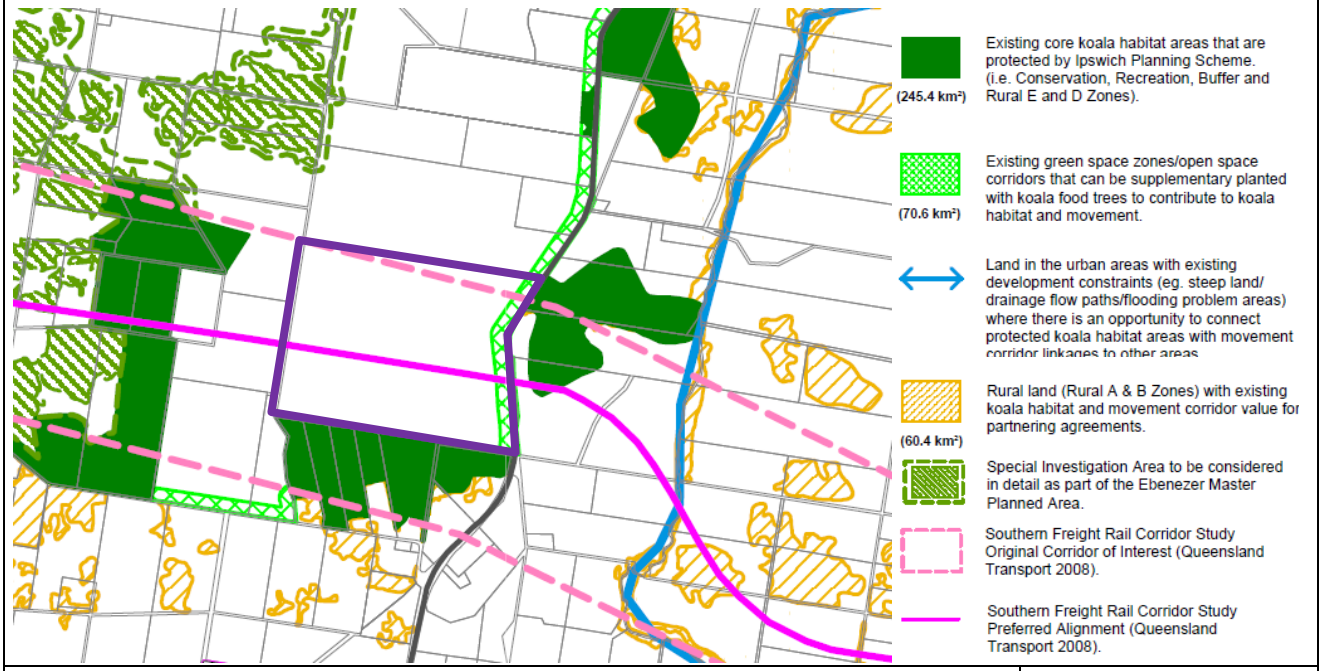


Figure 5.11 – Relevant Extract from Draft Key Koala Habitat Areas Map

Source: ICC (2009). *Draft Key Koala Habitat Areas Map*. Ipswich City Council, Ipswich, Qld. Dated 9 October 2009.

Subject Site

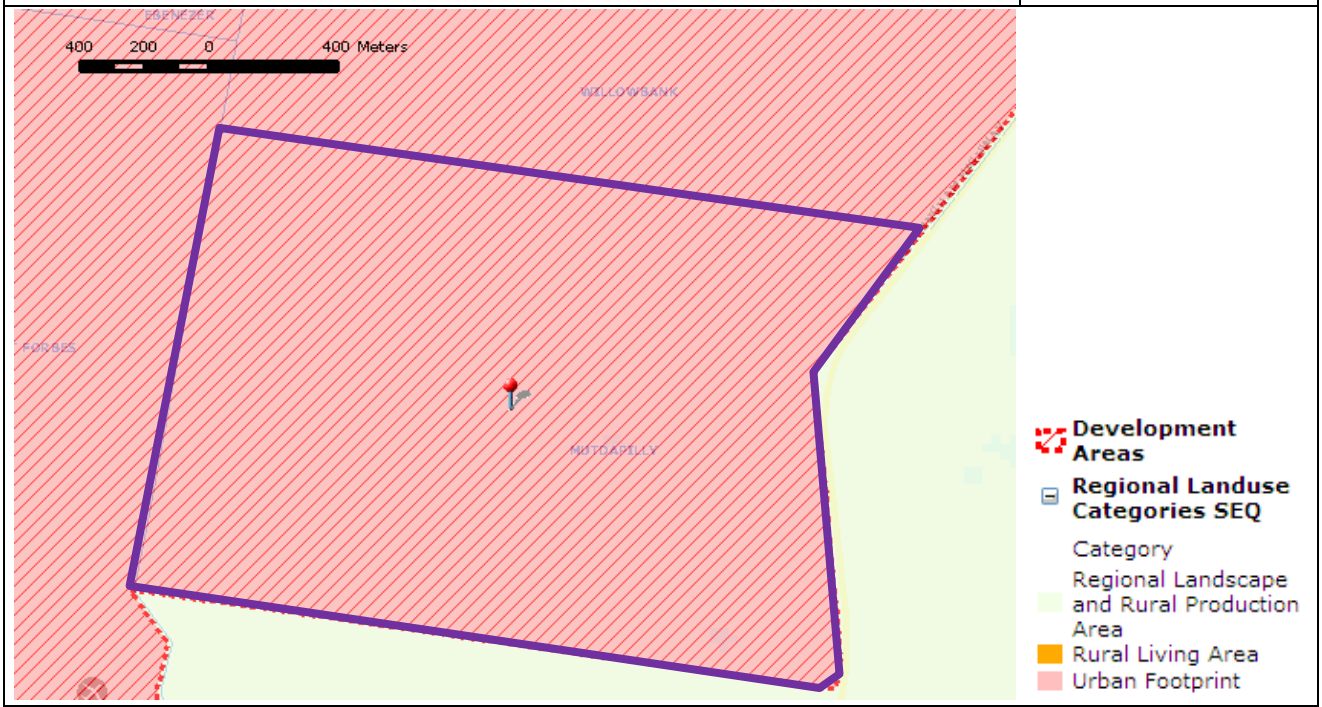


Figure 5.12 – Relevant Extract from South East Queensland Regional Plan 2009-2031

Source: DIP (2009). *South East Queensland Regional Plan 2009-2031*. Department of Infrastructure and Planning, Brisbane, Qld.

Subject Site

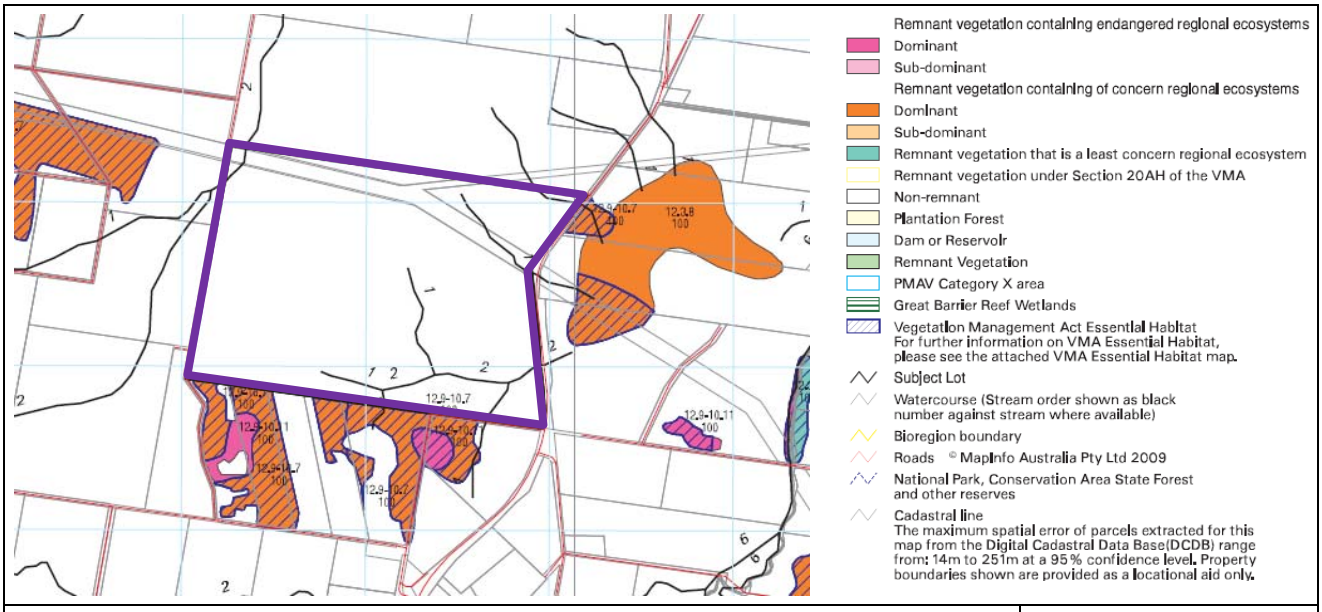


Figure 5.13 – Relevant Extract from Vegetation Management Act Regional Ecosystem and Remnant Map – Version 6

Source: DERM (2010a). *Copy of the certified Regional Ecosystem and Remnant Map—version 6 for the purpose of the Vegetation Management Act 1999*. Online RE Maps, The Department of Environment and Resource Management, Brisbane. [URL: http://www.derm.qld.gov.au/REMAP] Accessed on 8 September 2010.

Subject Site

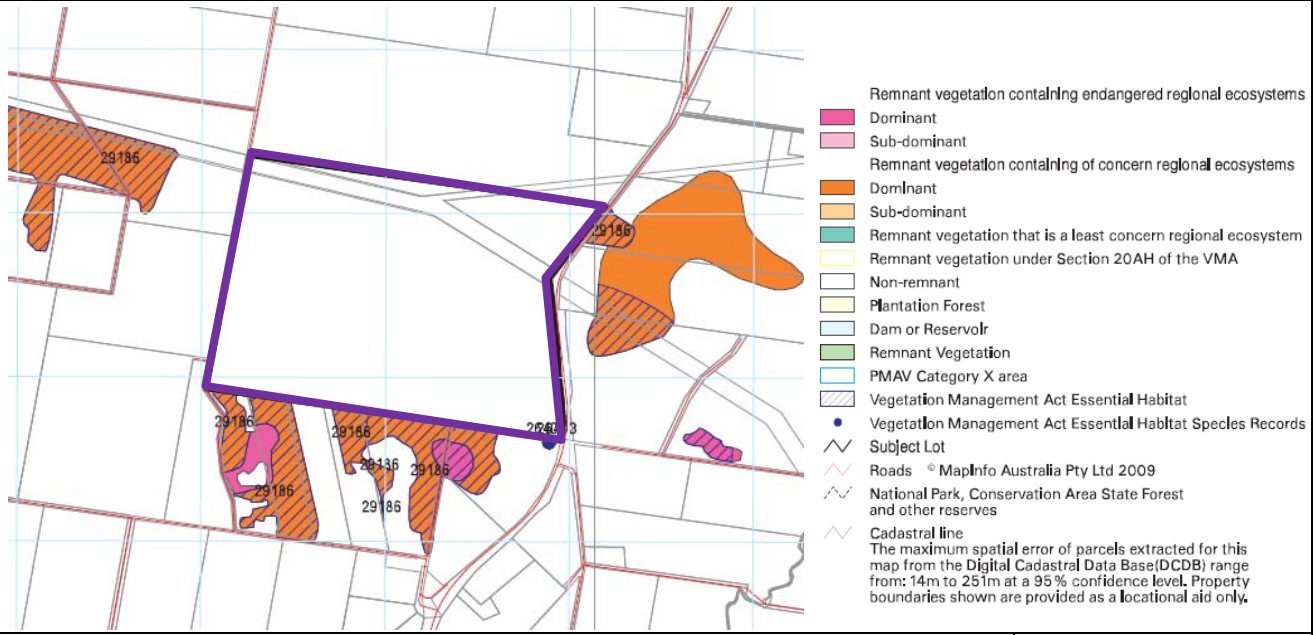


Figure 5.14 – Relevant Extract from Vegetation Management Act Essential Habitat Map – Version 3

Source: DERM (2010b). *Copy of the certified Essential Habitat Map–version 3 for the purpose of the Vegetation Management Act 1999*. Online RE Maps, The Department of Environment and Resource Management, Brisbane. [URL: http://www.derm.qld.gov.au/REMAP] Accessed on 8 September 2010.

Subject Site

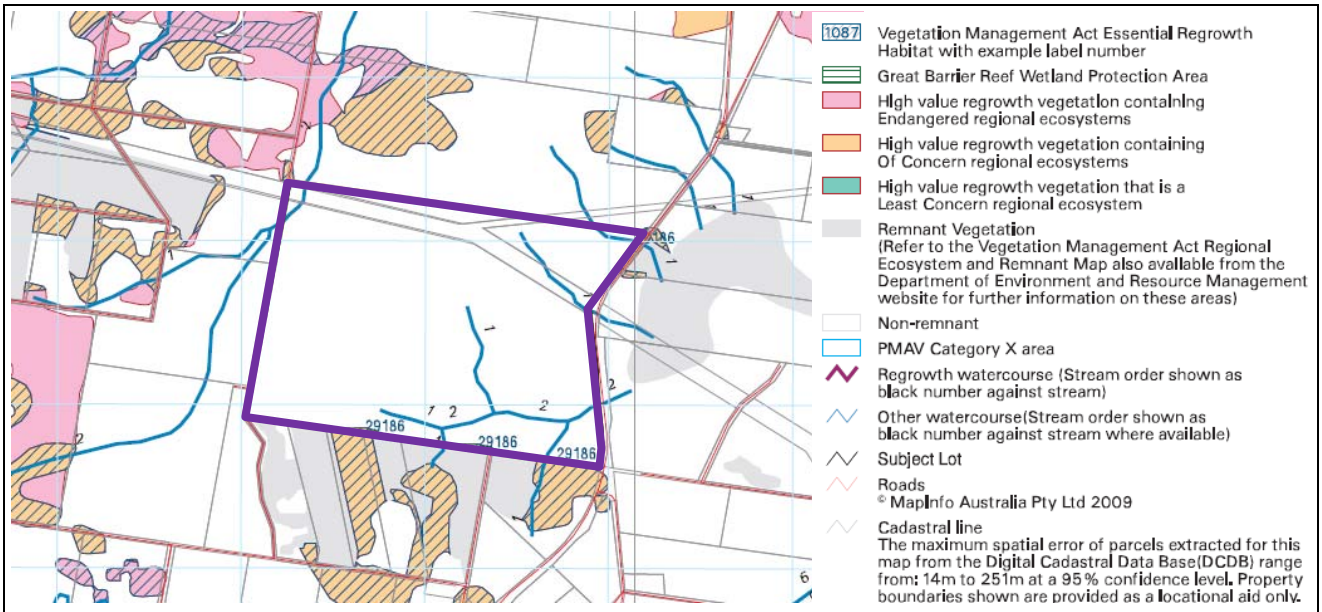


Figure 5.15 – Relevant Extract from Regrowth Vegetation Map – Version 2

Source: DERM (2010c). *Copy of the certified Regrowth Vegetation Map—version 2 for the purpose of the Vegetation Management Act 1999*. Online RE Maps, The Department of Environment and Resource Management, Brisbane. [URL: http://www.derm.qld.gov.au/REMAP] Accessed on 8 September 2010.

Subject Site

Figure 5.16 – Relevant Extract from Referable Areas Mapping

Source: DERM (2010d). *Referable Areas Mapping*. Department of Environment and Resource Management, Brisbane. [URL: http://www.derm.qld.gov.au/environmental_management/planning_and_guidelines/environmental_legislation/integrated_planning_act/referable-areas-mapping.php] Accessed on 30 Sept 2010.

Subject Site

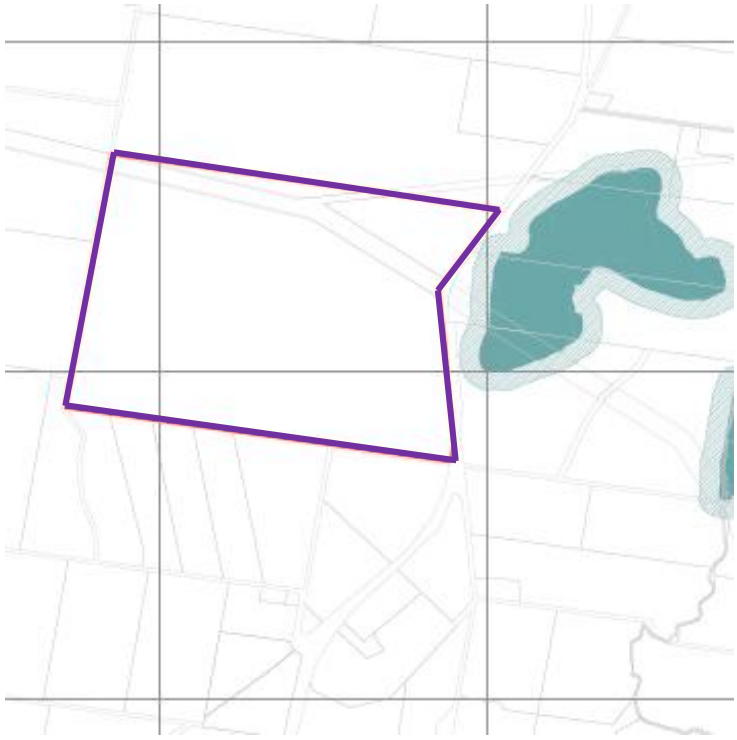


Figure 5.17 – Relevant Extract from Map of Referable Wetlands

Source: DERM (2010g). Department of Environment and Resource Management, Brisbane.[URL: http://www.derm.qld.gov.au/wildlife-ecosystems/ecosystems/referable-wetlands-form.php]. Accessed 30 Sept 2010

Subject Site

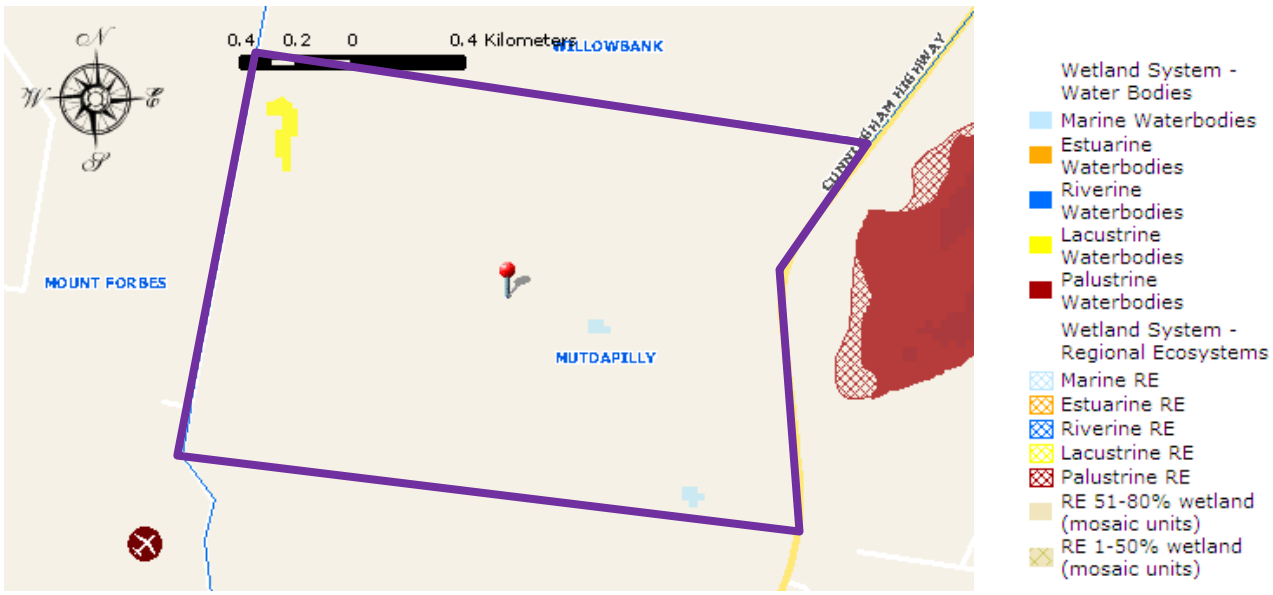
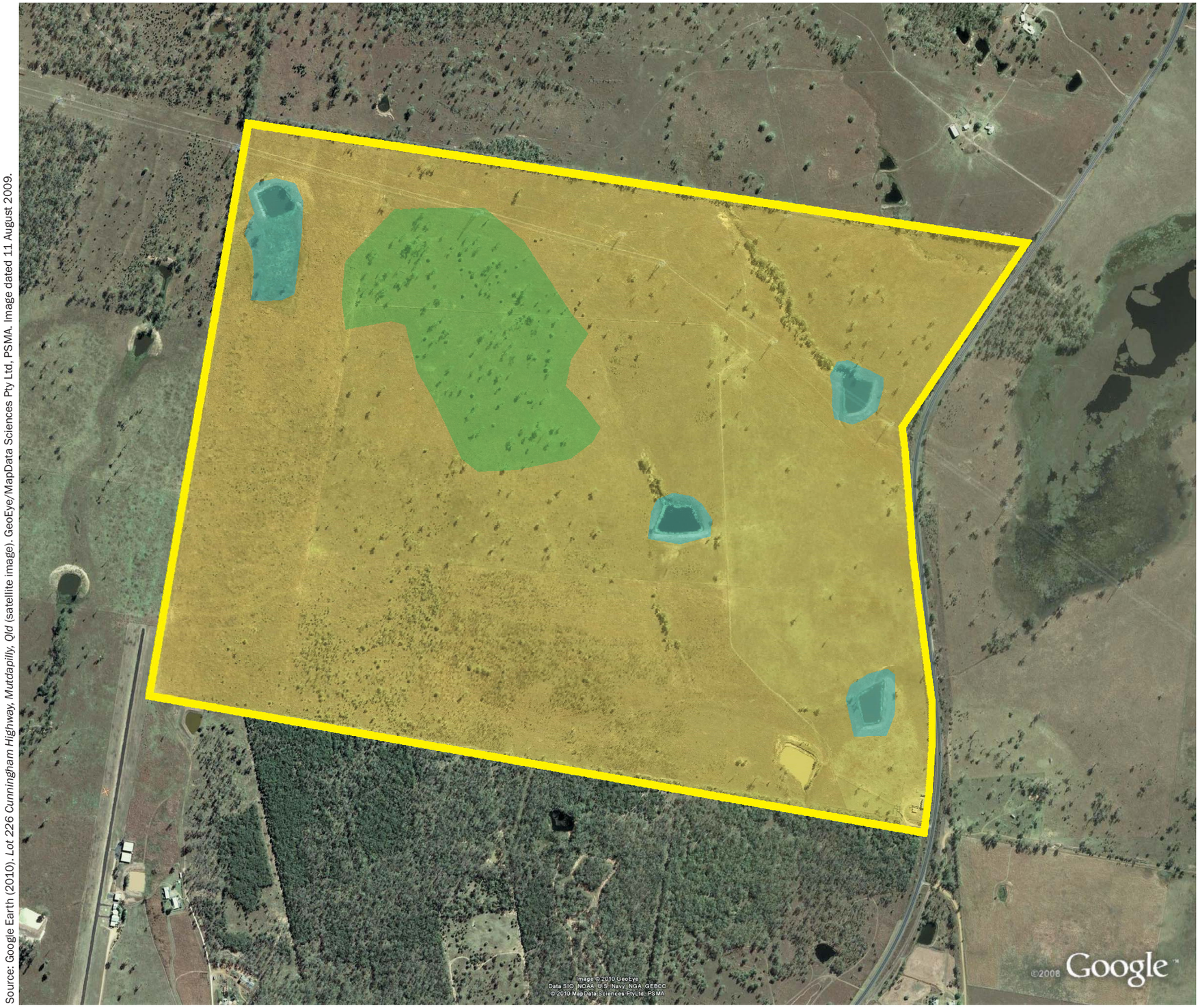


Figure 5.18 – Relevant Extract from WetlandMaps

Source: DERM (2010g). *WetlandMaps*. Department of Environment and Resource Management, Brisbane. [URL: http://atlas.information.qld.gov.au/atlas/wetlandmaps.html]. Accessed on 30 Sept 2010.

Subject Site

orogen



Source: Google Earth (2010). *Lot 226 Cunningham Highway, Mutdapilly, Qld* (satellite image). GeoEye/MapData Sciences Pty Ltd, PSMA. Image dated 11 August 2009.

LEGEND

- Site Boundary
- Vegetation Community 1 - Eucalypt Open Woodland/Grassland Mosaic
- Vegetation Community 2 - Eucalypt Woodland
- Vegetation Community 3 - Freshwater Wetland/Dam

NOTES:
1. Map indicative only.
2. Map to be printed in A3.
3. Aerial imagery does not accurately reflect current vegetation on site due to historic land management practices.

↑

Figure 6.1 - Vegetation Community Plan

Figure 6.2 a – Aerial image showing extent of fire

Indicative location of lot boundary

Figure 6.2 b – Representative example of post fire condition within the subject site

Figure 6.2 – Post Fire Photographs

Appendix A

SUBJECT SPECIES TABLES

Appendix A - Table A.1
Flora

Class	Family	Scientific Name/ Common Name	Legal Status QLD	Potential habitats within the site and likelihood of species occurance on site	Identification of Subject Species and percieved impact of proposal on Subject Species	Known Habitat	References
Plants	POACEAE	*Arthraxon hispidus* (Hairy-joint Grass)	NC Act: Vulnerable; EPBC Act: Vulnerable	The proposed development area does not provide suitable habitat for this species. **Unlikely to occur on site.**	**Not Recognised as a Subject Species**	Moisture and shade-loving grass, found in or on the edges of rainforest and in wet eucalypt forest, often near creeks or swamps. Occurs over a wide area in south-east Queensland, and on the northern tablelands and north coast of NSW, but is never common. Also found from Japan to central Eurasia (DECC, 2005).	DECC. (2005). *Hairy Jointgrass – profile* . Threatened Species, Populations and Ecological Communities of NSW, Department of the Environment and Climate Change, NSW Government. [URL: http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10066] Accessed on 12 September 2008.
Plants	EUPHORBIACEAE	*Bertya ernestiana*	NC Act: Vulnerable; EPBC Act: Vulnerable	The proposed development area does not provide suitable habitat for this species. **Unlikely to occur on site.**	**Not Recognised as a Subject Species**	This species grows on skeletal sandy loam soils derived from rhyolite on steep rocky slopes and rock pavements in heath or open eucalypt forest with heath understorey (BRI; Halford & Henderson 2002).	Halford, D.A. & R.J.F.Henderson (2002). Studies in Euphorbiaceae A.L.Juss. sens. lat. 3. A revision of Bertya Planch. (Ricinocarpeae Müll.Arg., Bertyinae Müll.Arg.). Austrobaileya. 6(2):187-245.
Plants	RUTACEAE	*Bosistoa transversa* (Three-leaved Bosistoa, Yellow Satinheart)	NC Act: Not listed; EPBC Act: Vulnerable	The proposed development area does not provide suitable habitat for this species. **Unlikely to occur on site.**	**Not Recognised as a Subject Species.**	Lowland subtropical rainforest up to 300 m in altitude. Occurs from Maryborough in Queensland south to the Nightcap Range north of Lismore in north-east NSW (DECC, 2005).	DECC. (2005). *Yellow Satinheart- profile* . Threatened Species, Populations and Ecological Communities of NSW, Department of the Environment and Climate Change, NSW Government. [URL: http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10103] Accessed on 12 September 2008.
Plants	ORCHIDACEAE	*Cryptostylis hunteriana* (Leafless Tongue-orchid)	NC Act: Vulnerable; EPBC Act: Vulnerable	The site does not contain the specific core habitat requirements for this species, furthermore detailed botanical surveys show the species is restricted to specific localities (outside of the subject site). **Unlikely to occur on site**	**Not Recognised as a Subject Species.**	Does not appear to have well defined habitat preferences and is known from a range of communities, including; swamp-heath and woodland. The larger populations typically occur in woodland dominated by Scribbly Gum (*Eucalyptus sclerophylla*), Silvertop Ash (*E. sieberi*), Red Bloodwood (*Corymbia gummifera*) and Black Sheoak (*Allocasuarina littoralis*); appears to prefer open areas in the understorey of this community (DECC, 2005).	DECC. (2005). *Leafless Tongue Orchid – profile* . Threatened Species, Populations and Ecological Communities of NSW, Department of the Environment and Climate Change, NSW Government. [URL: http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10187] Accessed on 11 September 2008.

Appendix A - Table A.1
Flora

Class	Family	Scientific Name/ Common Name	Legal Status QLD	Potential habitats within the site and likelihood of species occurance on site	Identification of Subject Species and percieved impact of proposal on Subject Species	Known Habitat	References
Plants	SAPINDACEAE	*Cupaniopsis tomentella*	NC Act: Vulnerable; EPBC Act: Vulnerable	The proposed development area does not provide suitable habitat for this species. In particular site assessment found the site lacks the species required vine thickets. **Unlikely to occur on site.**	**Not Recognised as a Subject Species**	Boonah Tuckeroo is known only from an area between Boonah and Ipswich in south-eastern Queensland (Queensland Herbarium, 2008). It grows in vine thickets predominantly on fertile clay soils.	Barry, SJ & Thomas, GT 1994, Threatened Vascular Rainforest Plants of South-east Queensland: A Conservation Review, Department of Environment and Heritage, Brisbane.
Plants	HYDROCHARITACEAE	*Hydrocharis dubia* (Frogbit)	NC Act: Vulnerable; EPBC Act: Vulnerable	The proposed development site does provide suitable habitat for this aquatic flora species, in particular the habitat provided by the anthropogenic dams and modified water bodies within the site. The most optimal habitat being within the natural waterbody (outside of the proposed development area). **Potentially occurring on site**	**Recognised as a Subject Species.** This species was not recorded on site, however the site does provide potential habitat requirements for this species. The most suitable habitat (Lacustrine waterbody; See **figure 2.1)** is to be retained as part of the proposed activity, furthermore the anthropogenic dams that will be modified and retained on site also undergo weed management and restoration works, as such providing more optimal habitiat for the species than the site currently offers	Grows in small shallow freshwater bodies or swamps (Jacobs, 2008)	Jacobs, S. W. L. (2008). *Hydrocharis dubia (Blume) Backer* . in PlantNET - The Plant Information Network System of Botanic Gardens Trust, Sydney, Australia. [URL: http://plantnet.rbgsyd.nsw.gov.au/cgi-bin/NSWfl.pl?page=nswfl&lvl=sp&name=Hydrocharis~dubia] Accessed on 14 October 2008.

Appendix A - Table A.1
Flora

Class	Family	Scientific Name/ Common Name	Legal Status QLD	Potential habitats within the site and likelihood of species occurance on site	Identification of Subject Species and percieved impact of proposal on Subject Species	Known Habitat	References
Plants	ASCLEPIADACEAE	*Marsdenia coronata* (Slender Milkvine)	NC Act: Vulnerable; EPBC Act: Vulnerable	The site has potential sub-optimal habitat requirements for this species, however its viability as a location for a viable long term population is limited due to the sites degraded nature, recent fire activity and land management practices (grazing). **Potentially occurring on site**	**Recognised as a Subject Species.** This species was not recorded during field surveys and the development area is unlikely to provide long term core habitat for this species, as such proposed development is not likely to impact significant populations	Slender Milkvine occurs in south-east Queensland, where it is commonly found in eucalypt forest or, at Mount Coolum, in open grassland among rocks (Threatened Species Scientific Committee, 2008).	Threatened Species Scientific Committee, (2008). *Commonwealth Conservation Advice on Marsdenia coronata* . Department of the Environment, Water, Heritage and the Arts, Australian Government.
Plants	MYRTACEAE	*Melaleuca irbyana (previously Melaleuca tamariscina* subsp. *irbyana)* Weeping Paperbark	NC Act: Rare; EPBC Act: Not listed	The proposed development provides the necessary habitat requirements for this species. Although establishment of a *Melaleuca irbyana* community is limited due to land management practices such as grazing. **Species occurs on site**	**Recognised as a Subject Species**. The species has been recorded on site and has a scattered distribution over the site. The proposed development will impact on individual trees within the development area. A net ecological gain is to be achieved for this species through the establishment of a restoration area aimed at creating a *Melaleuca irbyana* community with connectivity to neighbouring *Melaleuca irbyana* communities.	Limited distribution in north east NSW including near Coraki, Casino and Grafton. Also recorded within south east Queensland near Ipswich and on the plains and low hills of the Moreton basin (DECC, 2008; (DEH, 2005). Grows in open eucalypt forest on poorly drained sites, often with clay soils (DECC, 2008; PlantNET, 2008).	EPBC (2005) Swamp Tea-tree (Melaleuca irbyana) Forest of South-east Queensland. Nationally threatened ecological community information sheet. http://www.environment.gov.au/biodiversity/threatened/publications/swamp-tea-tree-forest.html

Appendix A - Table A.1
Flora

Class	Family	Scientific Name/ Common Name	Legal Status QLD	Potential habitats within the site and likelihood of species occurance on site	Identification of Subject Species and percieved impact of proposal on Subject Species	Known Habitat	References
Plants	OLEACEAE	*Notelaea ipsviciensis* (Cooneana Olive)	NC Act: Not listed; EPBC Act: Critically Endangered	This species has a very limited range and in confined to 3 sub-populations. Extensive botanical survey work has indicated the species distribution is limited to these 3 sub-populations. **Unlikely to occur on site.**	**Not Recognised as a Subject Species.**	The Cooneana Olive is known from only three closely clustered sub-populations in the Ipswich area of southern Queensland (Approved Conservation Advice, 2008). The Cooneana Olive grows as an understorey plant in open woodlands, and is primarily associated with eucalypt-dominated dry sclerophyll communities situated on poor, sandstone-based soils (Approved Conservation Advice, 2008).	Approved Conservation Advice (2008). *Approved Conservation Advice for Notelaea ipsviciensis (Cooneana Olive)* . This conservation advice was approved by the Minister on: 19 December 2008 [URL: http://www.environment.gov.au/biodiversity/threatened/species/pubs/81858-conservation-advice.pdf] Accessed on 23 March 2009.
Plants	RUTACEAE	*Phebalium distans* (Mt Berryman Phebalium)	NC Act: Not listed; EPBC Act: Critically Endangered	The proposed development area does not provide suitable habitat for this species. **Unlikely to occur on site.**	**Not Recognised as a Subject Species.**	Mt Berryman Phebalium is found in semi-evergreen vine thicket on red volcanic soils, or in communities adjacent to this vegetation type (DEWHA, 2009). Geology of the area in which this species occurs is deeply weathered basalt with undulating to hilly terrain (DEWHA, 2009). Vegetation associated with this species includes microphyll to notophyll vine forest with or without *Araucaria cunninghamii* and low microphyll vine forest and semi-evergreen vine thicket with or without *Araucaria cunninghamii* (DEWHA, 2009).	DEWHA (2009). *Phebalium distans in Species Profile and Threats Database* , Department of the Environment, Water, Heritage and the Arts, Canberra [URL: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=81869] Accessed on 27/02/09.

Appendix A - Table A.1
Flora

Class	Family	Scientific Name/ Common Name	Legal Status QLD	Potential habitats within the site and likelihood of species occurance on site	Identification of Subject Species and percieved impact of proposal on Subject Species	Known Habitat	References
Plants	SAPOTACEAE	*Planchonella eerwah* (previously *Pouteria eerwah*) (Shiny-leaved Coondoo)	NC Act: Endangered; EPBC Act: Endangered	The proposed development area does not provide suitable habitat for this species. **Unlikely to occur on site.**	**Not Recognised as a Subject Species.**	This species occurs in sub-tropical and dry rainforest from the Boonah area north to Eumundi, Qld (Williams et al., 1984).	Williams, J. B., Harden, G. J. and McDonald, W. J. F. (1984). *Trees and Shrubs in Rainforests on New South Wales and Southern Queensland* . Botany Department, University of New England, Armidale.
Plants	RUTACEAE	*Bosistoa selwynii* (Heart-leaved Bosistoa)	NC Act: Not listed; EPBC Act: Vulnerable	The proposed development area does not provide suitable habitat for this species. **Unlikely to occur on site.**	**Not Recognised as a Subject Species.**	Rainforest up to 300 m in altitude. Occurs on deep asaltic soils. In NSW, it prefers alluvial flats, particularly creek banks. Found from Maryborough in Queensland south to the Tweed River district in north-east NSW (DECC, 2005).	DECC. (2005). *Heart-leaved Bonewood – profile* . Threatened Species, Populations and Ecological Communities of NSW, Department of the Environment and Climate Change, NSW Government. [URL: http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10874] Accessed on 12 September 2008.

Appendix A - Table A.2
Fauna

Class	Family	Scientific Name/ Common Name	Legal Status QLD	Potential habitats within the site and likelihood of species occurence on site	Identification of Subject Species and perceived impact of proposal on Subject Species	Known Habitat	References
Amphibian	MYOBATRACHIDAE	*Mixophyes iteratus* (Southern Barred Frog, Giant Barred Frog)	NC Act: Endangered; EPBC Act: Endangered	The proposed development does not provide suitable habitat for this species. **Unlikely to occur within the proposed development area**.	**Not Recognised as a Subject Species.**	The Giant Barred Frog occurs on the coast and ranges from south-east QLD to the Hawkesbury River in NSW. Its stronghold is in north-east NSW, particularly the Coffs Harbour – Dorrigo area. Preferred habitat for this species is rainforest, moist eucalypt forest and adjoining dry eucalypt forest at elevations below 1000m. Giant Barred frogs breed around shallow rocky streams from late spring to summer (DECC, 2008; NPWS, 2002).	DECC (2008). Threatened Species Profiles available from the Department of Environment and Climate Change Website. Accessed online at:http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/home_species.aspx; NPWS (2002). *Threatened Species of the Upper North Coast of NSW – Fauna* . NSW National Parks and Wildlife Service, Northern Directorate, Coffs Harbour.
Bird	MELIPHAGIDAE	*Anthochaera phrygia* (formally known as *Xanthomyza phrygia*) (Regent Honeyeater)	NC Act: Endangered; EPBC Act: Endangered and Migratory (JAMBA)	This species in not typically associated with open pasture areas as found within the developement area, furthermore the sites disturbed condition and lack preferred Eucalypt species make it **unlikely to occur within the proposed development area**.	**Not Recognised as a Subject Species.**	The Regent Honeyeater is predominantly found along the western slopes of the Great Dividing Range, however, it is often recorded along the eastern flank of this range. (Schodde & Tidemann, 1993; DEWHA, 2007). They spend much of their time feeding on the nectar from eucalypts such as the Mugga Ironbark, White Box and Yellow Box, and Blakeley's Red Gum on which they are reliant (DEWHA, 2007). While nectar represents a major food source, insects, manna, lerps and fruit also comprise the diet of this species (DECC, 2005; Schodde & Tidemann, 1993). The Regent Honeyeater is partly migratory travelling to the south and west during spring to breed. Nests are cup-shaped and are constructed of bark, grass, twigs and wool (DECC, 2005). Nests are located in horizontal branches or forks in tall mature eucalypts and Sheoaks (DECC, 2005). Also nest in mistletoe haustoria (DECC, 2005).	DECC, (2005). *Regent Honeyeater – profile* . Threatened Species, Populations and Ecological Communities of NSW, Department of the Environment and Climate Change, NSW Government. [URL: http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10841] Accessed on 13 October 2008; DEWHA (2007). *Regent Honeyeater (Xanthomyza phrygia*). Department of the Environment, Water, Heritage and the Arts. Australian Government, Canberra. [URL: http://www.environment.gov.au/biodiversity/threatened/publications/regent-honeyeater.html] Accessed on 13 October 2008; Schodde, R and Tidemann, S.C., (1993) *Reader's Digest Complete Book of Australian Birds.* Reader's Digest, Sydney.
Bird	CACATUIDAE	*Calyptorhynchus lathami* (Glossy Black Cockatoo)	NC Act: Vulnerable; EPBC Act: Not Listed	The proposed development area does not provide suitable habitat for this species due to the absence of Allocasuarina sp. Unlikely to occur within the proposed development area. **unlikely to occur within the proposed development area.**	**Not Recognised as a Subject Species.**	The Glossy Black-Cockatoo primarily feeds upon the fruit cones of *Allocasuarina* species and are more often found in moist and dry coastal forests timbered watercourses and inland woodland (Schodde and Tidemann, 1993; NPWS, 2000). They are distributed in a wide coastal band on the east coast of Australia from central Queensland, south to Victoria (Schodde and Tidemann, 1993; NPWS, 2000). The Glossy Black-Cockatoo requires hollow bearing trees located within close proximity to good stands of feeding habitat for nesting (NPWS, 2000).	NPWS, (2000). *Threatened Species of the Lower North Coast of New South Wales* , National Parks and Wildlife Service, Coffs Harbour; Schodde, R and Tidemann, S.C., (1993) Reader's Digest Complete Book of Australian Birds. Reader's Digest, Sydney.

Appendix A - Table A.2
Fauna

Class	Family	Scientific Name/ Common Name	Legal Status QLD	Potential habitats within the site and likelihood of species occurence on site	Identification of Subject Species and perceived impact of proposal on Subject Species	Known Habitat	References
Bird	PSITTACIDAE	*Cyclopsitta diopthalma* (Coxen's Fig-parrot)	NC Act: Endangered; EPBC Act: Endangered	The proposed development area does not provide suitable habitat for this species. **Unlikely to occur on site.**	**Not Recognised as a Subject Species**	This species is limited to about five populations scattered between Bundaberg in Queensland and the Hastings River in NSW. Usually recorded from drier rainforests and adjacent wetter eucalypt forest. Also found in the wetter lowland rainforests (DECC, 2005).	DECC, (2005). *Double-eyed Fig-Parrot – profile* . Threatened Species, Populations and Ecological Communities of NSW, Department of the Environment and Climate Change, NSW Government. URL: http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10195] Accessed on 13 October 2008
Bird	CICONIIDAE	*Ephippiorhynchus asiaticus* (Black-necked Stork)	NC Act: Rare; EPBC Act: Not Listed	The Black-necked Stork is typically associated with permanent freshwater wetlands including margins of billabongs, swamps, shallow floodwaters, and adjacent grasslands and savannah woodlands. The subject site hosts suitable habitat in the form of wetland habitat and several anthropogenic dams. **Potentially occurring within the proposed development area.**	**Recognised as a Subject Species.** Considering the nomadic nature of this species, and the large extent of additional higher quality permanent wetland habitat in the surrounding locality, the proposed development is unlikely to impact significantly on this speceis. Furthermore the most optimal habitiat within the subject site is outside of the developement area and will undergo restoration.	The Black-necked Stork is widely distributed in northern Australia, and also sparsely distributed in coastal eastern Australia from Queensland to southern NSW (NPWS, 2000). Inhabits permanent freshwater wetlands including margins of billabongs, swamps, shallow floodwaters, and adjacent grasslands and savannah woodlands; can also be found occasionally on inter-tidal shorelines, mangrove margins and estuaries (DECC, 2005). A large nest, up to 2 m in diameter, is made in a live or dead tree, in or near a freshwater swamp (DECC, 2005).	DECC, (2005). *Black-necked Stork – profile* . Threatened Species, Populations and Ecological Communities of NSW, Department of the Environment and Climate Change, NSW Government. URL: http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10275] Accessed on 13 October 2008; NPWS, (2000). *Threatened Species of the Lower North Coast of New South Wales* , National Parks and Wildlife Service, Coffs Harbour.
Bird	ACCIPITRIDAE	*Erythrotriorchis radiatus* (Red Goshawk)	NC Act: Endangered; EPBC Act: Vulnerable	It is unlikely the proposed development area would provide optimal habitat for this species. However it could provides sub- optimal foraging habitat. **Potentially occurring within the proposed development area.**	**Recognised as a Subject Species**. Considering the mobile nature and large home range of this species, and the extent of additional higher quality habitat in the site balance and surrounding locality, it is not expected to be significantly impacted by the proposed development.	Occurs across northern Australia and south through to eastern Queensland and far north eastern NSW. Reported to be rare in NSW, with most records in NSW from around the Clarence River Catchment (DECC, 2005). Within its range, the Red Goshawk occurs sparsely in a wide range of open forests and woodlands, especially near rivers, wetlands and rainforest fringes (Pizzey and Knight, 1997).	DECC, (2005). *Red Goshawk – profile* . Threatened Species, Populations and Ecological Communities of NSW, Department of the Environment and Climate Change, NSW Government. URL: http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10279] Accessed on 13 October 2008; Pizzey, G., and Knight, F., (1997) *Field Guide to the Birds of Australia* . Angus & Robertson, Sydney.

Appendix A - Table A.2
Fauna

Class	Family	Scientific Name/ Common Name	Legal Status QLD	Potential habitats within the site and likelihood of species occurence on site	Identification of Subject Species and perceived impact of proposal on Subject Species	Known Habitat	References
Bird	COLUMBIDAE	*Geophaps scripta scripta* (Squatter Pigeon) (Southern form)	NC Act: Vulnerable; EPBC Act: Vulnerable	The proposed development provides potential habitat for this species, however it is expected to be limited due to regular disturbance the ground stratum within the proposed development (e.g. grazing). **Potentially occuring within the proposed development area.**	**Recognised as a Subject Species.** Considering the disturbed nature of the ground stratum within the proposed development the development area is not expected to provide core habitat for this species. As such, the proposed development is not expected to significantly impact this species.	This species occurs from northern Queensland to the north-west slopes of New South Wales. The Squatter Pigeon occurs in Grassy woodlands and plains, preferring sandy areas and usually close to water. (DECC, 2005).	DECC, (2005). *Squatter Pigeon – profile* . Threatened Species, Populations and Ecological Communities of NSW, Department of the Environment and Climate Change, NSW Government. URL: http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10350] Accessed on: 13 October 2008.
Bird	PSITTACIDAE	*Lathamus discolor* (Swift Parrot)	NC Act: Endangered; EPBC Act: Endangered	The proposed development areas would provide foraging opportunities for this species. **Potentially occurring within the proposed development area.**	**Recognised as a Subject Species.** The location of the proposed developement is outside of the species breeding range (restricted to Tasmania), as such the proposed development area does not provide core habitat for the species. The proposed development is unlikely to significantly impact this species as additional foraging habitat is maintained (and rehabilitation) within the subject site (outside of the development area) and in neighbouring properties.	The Swift Parrot breeds in Tasmania between spring and summer and migrates to the mainland during winter where they disperse widely across south eastern Australia (NPWS, 2000; Schodde & Tidemann, 1993). Swift Parrots nest in tree hollows from a variety of Eucalypt species and usually in old growth trees with a DBH of over 0.8 m. They forage in woodlands, riparian vegetation, and also remnant patches of mature eucalypts in agricultural areas where they feed on nectar, lerps and other insects from eucalypt foliage (NPWS, 2000; Swift Parrot Recovery Team, 2001, Schodde and Tidemann, 1993). This species also feeds on insect larvae, seeds, and fruit including berries (Schodde and Tidemann, 1993).	NPWS, (2000). *Threatened Species of the Lower North Coast of New South Wales* , National Parks and Wildlife Service, Coffs Harbour; Schodde, R and Tidemann, S.C., (1993) *Reader's Digest Complete Book of Australian Birds.* Reader's Digest, Sydney; Swift Parrot Recovery Team, (2001). *Swift Parrot (Lathamus discolor) Recovery Plan 2001-2005* . Tasmanian Department of Primary Industries, Water and Environment.
Bird	RALLIDAE	*Lewinia pectoralis* (Lewin's Rail)	NC Act: Rare; EPBC Act: Not Listed	The open nature of vegetation within the proposed development area indicates that the proposed development area does not provide suitable habitat for this species. **Unlikely to occur within the proposed development area.**	**Not Recognised as a Subject Species**	Grassy, reedy or thickly vegetated areas usually close to water; also offshore islands. Prefers coastal regions (Simpson and Day, 2004).	Simpson, K. and Day, N. (2004). *Field Guide to the Birds of Australia* . Penguin Group (Australia), Australia.

Appendix A - Table A.2
Fauna

Class	Family	Scientific Name/ Common Name	Legal Status QLD	Potential habitats within the site and likelihood of species occurence on site	Identification of Subject Species and perceived impact of proposal on Subject Species	Known Habitat	References
Bird	SCOLOPACIDAE	*Numenius madagascariensis* (Eastern Curlew)	NC Act: Rare; EPBC Act: Migratory	The proposed development area does not provide suitable habitat for this species. **Unlikely to occur on site.**	**Not Recognised as a Subject Species**	Coastal estuaries, mudflats, sandspits and mangroves (Simpson and Day, 2004).	Simpson, K. and Day, N. (2004). *Field Guide to the Birds of Australia* . 7th edition. Penguin Group (Australia), Australia.
Bird	PSITTACIDAE	*Psephotus pulcherrimus* (Paradise Parrot)	NC Act: Extinct; EPBC Act: Extinct	The proposed development area provides sub-optimal habitat for this species. **Unlikely to occur within the proposed development area.**	**Not Recognised as a Subject Species**	The Paradise Parrot is now extinct. It formerly occurred in central and southern Queensland, north near Brisbane to sites near Duaringa and on the Comet and Nogoa Rivers, and west to St George. The Paradise Parrot mainly inhabited undulating river valleys, lightly timbered with eucalypt woodlands or open forests, often dominated by ironbarks and bloodwoods, with an understorey of annual and perennial native grasses; these areas were often dotted with termitaria (termite mounds). There is little information on the food of the Paradise Parrot other than it fed on the seeds of native grasses (DEWHA, 2009).	DEWHA (2009). *Psephotus pulcherrimus* in Species Profile and Threats Database, Department of the Environment, Water, Heritage and the Arts, Canberra. Available from: http://www.environment.gov.au/sprat. Accessed on 18 September 2009.
Bird	SCOLOPACIDAE	*Rostratula australis* (Australian Painted Snipe) (formally *R. benghalensis australis and R. benghalensis s. lat.)*	NC Act: Vulnerable; EPBC Act: Vulnerable (as *R. australis*) and Migratory	The Australian painted snipe is typically associated inland wetlands however has been recorded in the locality of farm dams. The subject site hosts suitable habitat in the form of both wetland habitat and several anthropogenic dams. **Potentially occurring within the proposed development area.**	**Recognised as a Subject Species.** Considering the mobile nature of this species, and the large extent of additional higher quality permanent wetland habitat in the surrounding locality, the proposed development is unlikely to impact significantly on this speceis. Furthermore the most optimal habitiat within the subject site is outside of the developement area and will undergo restoration.	The Australian Painted Snipe primarily occurs along the east coast from North Queensland to Eyre Peninsula in South Australia. This species is often found in shallow inland wetlands that are both brackish and freshwater and is also found among fringes of swamps, dams and marshy areas (NPWS, 2000; DEH, 2003). This species nests on the ground among tall vegetation including grass tussocks or reeds and feeds near the water's edge and on mudflats, taking invertebrates, such as insects and worms, and seeds (DEH, 2003; NPWS, 1999).	DEH (2003). *Nationally Threatened Species & Ecological Communities: Australian Painted Snipe (Rostratula australis).* Commonwealth Department of Environment and Heritage, Canberra ACT; NPWS, (1999). *Threatened Species Information* . New South Wales National Parks and Wildlife Service, Hurstville; NPWS, (2000). *Threatened Species of the Lower North Coast of New South Wales* , National Parks and Wildlife Service, Coffs Harbour.
Bird	ANATIDAE	*Stictonetta naevosa* (Freckled Duck)	NC Act: Rare; EPBC Act: Migratory	The proposed development area provides potential foraging habitat for this species, in the form of wetlands and anthropogenic dams.**Potentially occurring within the proposed development area.**	**Recognised as a Subject Species.** Additional optimal habitat is within the surrounding locality, the proposed development is unlikely to impact significantly on this speceis.	Primarily occurs in south-eastern and south-western Australia, however the species occasionally occurs in coastal NSW and Victoria, particularly during drought. Breeds in large temporary swamps created by floods in the Bulloo and Lake Eyre basins and the Murray-Darling system. Prefer permanent freshwater swamps and creeks with heavy growth of Cumbungi, Lignum or Tea-tree. May also utilise lakes, reservoirs, farm dams and sewage ponds (DECC, 2007).	DECC (2007). Threatened Species Profiles available from the Department of Environment and Climate Change Website. Accessed online at:http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/home_species.aspx

Appendix A - Table A.2
Fauna

Class	Family	Scientific Name/ Common Name	Legal Status QLD	Potential habitats within the site and likelihood of species occurence on site	Identification of Subject Species and perceived impact of proposal on Subject Species	Known Habitat	References
Fish		*Neoceratodus forsteri* (Australian Lungfish)	NC Act: Not Listed; EPBC Act: Vulnerable	The proposed development area does not provide suitable habitat for this species. **Unlikely to occur on site.**	**Not Recognised as a Subject Species**	Prefers deep slow flowing waterholes, with dense banks of aquatic plants along the edges. The species is restricted to areas of permanent water (DEWHA, 2008).	DEWHA, (2008). *Neoceratodus forsteri — Australian Lungfish, Queensland Lungfish* , in Species Profile and Threats Database, Department of the Environment, Water, Heritage and the Arts, Canberra.[URL: http://www.environment.gov.au/sprat] Accessed on 13 October 2008.
Mammal		*Chalinolobus dwyeri* (Large-eared Pied Bat)	NC Act: Rare; EPBC Act: Vulnerable	The proposed development area does not provide suitable habitat for this species. **Unlikely to occur on site.**	**Not Recognised as a Subject Species**	The Large-eared Pied Bat is a recent discovery, first found in the early 1960's in Copeton NSW (Strahan 1995). Found in scattered locations from near Rockhampton in Queensland to Bungonia in southern NSW (Strahan 1995). It is generally found in drier habitats such as dry sclerophyll forests and woodlands, however, recent records includefrom sub alpine woodland and Rainforest edges. The Large-eared Pied bat is known to utilise day time roosts , including; caves, mine, tunnels and abandoned mud nests of Fairy Martins (Strahan 1995, and DECC, 2005).	DECC, (2005). *Large-eared Pied Bat – profile* . Threatened Species, Populations and Ecological Communities of NSW, Department of the Environment and Climate Change, NSW Government. [URL: http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10157] Accessed on 14 October 2008; Strahan, R. (1995) *The Mammals of Australia* . Second Edition. Reed Books, Chatswood.
Mammal	DASYURIDAE	*Dasyurus hallucatus* (Northern Quoll)	NC Act: Not listed; EPBC Act: Endangered	The proposed development area does not provide suitable habitat for this species. **Unlikely to occur on site.**	**Not Recognised as a Subject Species**	The Northern Quoll is a solitary carnivorous marsupial that makes its dens in rock crevices, tree holes or occasionally termite mounds, and is predominantly nocturnal. In savanna landscapes, females maintain territories of about 35 ha, with males estimated to range over 150 ha. Northern Quolls consume a wide range of prey including beetles, grasshoppers, spiders, scorpions and centipedes. They also eat fruit, nectar, and are known to feed on carrion and human refuse. Northern Quolls hunt a wide variety of vertebrates including the Northern Brown Bandicoot, the Common Brushtail Possum, rats, Sugar Gliders, insectivorous bats, quails, bird eggs, snakes and frogs (Threatened Species Scientific Committee, 2005).	Threatened Species Scientific Committee (2005). *Commonwealth Listing Advice on Northern Quoll (Dasyurus hallucatus)* . Department of the Environment, Water, Heritage and the Arts. Online [URL: http://www.environment.gov.au/biodiversity/threatened/species/dasyurus-hallucatus.html] Accessed on 4 August 2009.

Appendix A - Table A.2
Fauna

Class	Family	Scientific Name/ Common Name	Legal Status QLD	Potential habitats within the site and likelihood of species occurence on site	Identification of Subject Species and perceived impact of proposal on Subject Species	Known Habitat	References
Mammal	DASYURIDAE	*Dasyurus maculatus maculatus* (Spotted-tailed Quoll)	NC Act: Vulnerable; EPBC Act: Endangered (SE mainland population)	The proposed development area does not provide suitable habitat for thisspecies. **Unlikely to occur on site.**	**Not Recognised as a Subject Species**	The Spotted-tailed Quoll occurs on the east coast of NSW, Tasmania, eastern Victoria and north-eastern Queensland. Only in Tasmania is it still considered common (DECC, 2005). The Spotted-tailed Quoll has been recorded in a wide range of habitat types including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline. This species been occasionally sighted in treeless areas, rocky outcrops and grazing lands (DECC, 2005; NPWS, 2000; Strahan, 1998). The Spotted-tailed Quoll shelters and dens in small caves, fallen logs with large hollows and tree hollows and may utilise numerous dens within its home range which has been estimated to be between 359-5512 ha for males and 88-1515 ha for females (NPWS, 2000; EPA, 2007). The Spotted-tailed Quoll is partly arboreal and feeds upon a variety of prey species including birds, rodents, lizards, small wallabies, and even insects. The Spotted-tailed Quoll is also known to scavenge and feed upon carrion, road kills including wild dogs, and litter (Strahan; 1998; NPWS; 2000).	DECC, (2005). *Spotted-tailed Quoll – profile* . Threatened Species, Populations and Ecological Communities of NSW, Department of the Environment and Climate Change, NSW Government. [URL: http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10207] Accessed on 13 October 2008; EPA, (2007). *Spotted-tailed quoll (southern subspecies) Dasyurus maculatus maculates* . In Conservation Management Profile Fauna Species. Environmental Protection Agency. Queensland Government. [URL: http://www.epa.qld.gov.au/publications/p02353aa.pdf/Spottedtailed_quoll_southern_subspecies_emDasyurus_maculatus_maculatus/em.pdf] Accessed on 14 October 2008; NPWS, (2000). *Threatened Species of the Lower North Coast of New South Wales* , National Parks and Wildlife Service, Coffs Harbour; Strahan R. (ed), (1998) *The Mammals of Australia* . Reed Books, Chatswood.
Mammal	MACROPODIDAE	*Petrogale penicillata* (Brush-tailed Rock-wallaby)	NC Act: Vulnerable; EPBC Act: Vulnerable	The proposed development area does not provide suitable habitat for this species. **Unlikely to occur on site.**	**Not Recognised as a Subject Species**	The range of the Brush-tailed Rock-wallaby extends from south-east Queensland to the Grampians in western Victoria, roughly following the line of the Great Dividing Range (DECC, 2005). Brush-tailed Rock Wallabies occupy rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges facing north (DECC, 2005). They browse on vegetation in and adjacent to rocky areas eating grasses and forbs as well as the foliage and fruits of shrubs and trees and shelter or bask during the day in rock crevices, caves and overhangs (DECC, 2005).	DECC (2005). Brush-tailed Rock-wallaby – profile. Threatened Species, Populations and Ecological Communities of NSW, Department of the Environment and Climate Change, NSW Government. [URL: http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10605] Accessed on 4 November 2008.
Mammal	MACROPODIDAE	*Petrogale penicillata* (Brush-tailed Rock-wallaby)	NC Act: Vulnerable; EPBC Act: Vulnerable			The range of the Brush-tailed Rock-wallaby extends from south-east Queensland to the Grampians in western Victoria, roughly following the line of the Great Dividing Range (DECC, 2005). Brush-tailed Rock Wallabies occupy rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges facing north (DECC, 2005). They browse on vegetation in and adjacent to rocky areas eating grasses and forbs as well as the foliage and fruits of shrubs and trees and shelter or bask during the day in rock crevices, caves and overhangs (DECC, 2005).	DECC (2005). Brush-tailed Rock-wallaby – profile. Threatened Species, Populations and Ecological Communities of NSW, Department of the Environment and Climate Change, NSW Government. [URL: http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10605] Accessed on 4 November 2008.

Appendix A - Table A.2
Fauna

Class	Family	Scientific Name/ Common Name	Legal Status QLD	Potential habitats within the site and likelihood of species occurence on site	Identification of Subject Species and perceived impact of proposal on Subject Species	Known Habitat	References
Mammal	PHASCOLARCTIDAE	*Phascolarctos cinereus* (Koala)	NC Act: Vulnerable (southeast Queensland bioregion only); EPBC Act: Not Listed	The proposed development area provides potential foraging habitat for this species. **Potentially occurring within the proposed development area.**	**Recognised as a Subject Species**. Koala presence was noted on properties adjacent to the subject site and the proposed development areas would provide (sub optimal) foraging opportunities for the species. To reduce the impact of the development on this species it is proposed that Koala barriers are incorporated into the proposed development to limit incursion form their optimal habitat to the development area	The Koala occurs in eucalypt woodlands and forests throughout eastern Australia (NPWS, 2000). The Koala feeds almost exclusively on the foliage of particular eucalypts, and may prefer certain species within any local or regional area (Strahan, 1998; Callaghan *et al,* 2002).	Callaghan, J., Curran, T., Thompson, J., and Floyd, R., (2002) *Greater Taree City Council Draft Comprehensive Koala Plan of Management Part 1: The CKPoM* . Australian Koala Foundation with Greater Taree City Council and the CKPoM Steering Committee; NPWS, (2000). *Threatened Species of the Lower North Coast of New South Wales* , National Parks and Wildlife Service, Coffs Harbour; Strahan R. (ed), (1998) *The Mammals of Australia* . Reed Books, Chatswood.
Mammal	POTOROIDAE	*Potorous tridactylus tridactylus* (Long-nosed Potoroo)	NC Act: Vulnerable; EPBC Act: Vulnerable	The proposed development does not provide suitable habitat for this species. **Unlikely to occur within the proposed development area.**	**Not Recognised as a Subject Species.**	The Long-nosed Potoroo is known to occur in a wide variety of habitats including moist and dry forests, wet heathland and cool temperate rainforests with dense layers of grasses, ferns, vines or shrubs (NPWS, 2000).	NPWS, (2000). *Threatened Species of the Lower North Coast of New South Wales* , National Parks and Wildlife Service, Coffs Harbour.
Mammal	PTEROPODIDAE	*Pteropus poliocephalus* (Grey-headed Flying-fox)	NC Act: Not listed; EPBC Act: Vulnerable	The proposed development does not provide suitable habitat for this species. Unlikely to occur within the proposed development area.	**Recognised as a Subject Species.** The extent of potential foraging habitat to be lost as part of the proposed development is considered minor in comparison to the available habitat in surrounding locality. As such, the proposed development is not expected to significantly impact this species.	The Grey-headed Flying-fox occurs in a range of habitats including subtropical and temperate rainforests, dry and wet sclerophyll forests, Banksia woodland, heaths and Melaleuca swamps (Duncan *et al.* , 1999; NPWS, 2001).	Duncan, A., Baker, G.B., and Montogomery, N., (eds) (1999). *The Action Plan for Australian Bats. Recovery Outlines and Taxon Summaries – Grey-headed Flying-fox* . Department of the Environment and Heritage, Australian Government; NPWS, (2001). *Grey-headed Flying-fox Pteropus poliocephalus* . Threatened Species Information. New South Wales National Parks and Wildlife Service, Hurstville.

Appendix A - Table A.2
Fauna

Class	Family	Scientific Name/ Common Name	Legal Status QLD	Potential habitats within the site and likelihood of species occurence on site	Identification of Subject Species and perceived impact of proposal on Subject Species	Known Habitat	References
Reptile	SCINCIDAE	*Coeranoscincus reticulatus* (Three-toed Snake-tooth Skink)	NC Act: Rare; EPBC Act: Vulnerable	The proposed development area does not provide suitable habitat for this species. **Unlikely to occur on site.**	**Not Recognised as a Subject Species.**	Occurs in Rainforest and occasionally in wet and dry sclerophyll forest with abundant leaf litter and ground debris (NPWS, 2000). Usually found in these habitats amongst loose soil, deep litter, decaying logs and fallen epiphytes. Feeds on earthworms and beetle grubs (DECC, 2005).	DECC, (2005). *Three-toed Snake-tooth Skink – profile* . Threatened Species, Populations and Ecological Communities of NSW, Department of the Environment and Climate Change, NSW Government. [URL: http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10172] Accessed on 14 October 2008; NPWS, (2000). *Threatened Species of the Lower North Coast of New South Wales* , National Parks and Wildlife Service, Coffs Harbour.
Reptile	PYGOPODIDAE	*Delma torquata* (Collared Delma)	NC Act: Vulnerable; EPBC Act: Vulnerable	The proposed development area does not provide suitable habitat for this species. **Unlikely to occur on site.**	**Not Recognised as a Subject Species.**	The species occurs on rocky hillsides on basalt and lateritic soils supporting open eucalypt and *Acacia* woodland with a sparse understorey of shrubs and tussocks or semi-evergreen vine thicket (DEWHA, 2008).	DEWHA, (2008). *Delma torquata — Collared Delma* . In Species Profile and Threats Database. Department of the Environment, Water Heritage and the Arts, Canberra. [URL: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=1656] Accessed on 14 October 2008.

Appendix B

WILDLIFE ONLINE RESULTS

Queensland Government
Environmental Protection Agency
Queensland Parks and Wildlife Service

Wildlife Online Extract

Search Criteria: Species List for a Specified Point
Species: All
Type: All
Status: Rare and threatened species
Records: All
Date: All
Latitude: 27.7136
Longitude: 152.6562
Distance: 10
Email: drollinson@orogen.com.au
Date submitted: Tuesday 14 Sep 2010 08:44:46
Date extracted: Tuesday 14 Sep 2010 08:46:24

The number of records retrieved = 11

Disclaimer

As the EPA is still in a process of collating and vetting data, it is possible the information given is not complete. The information provided should only be used for the project for which it was requested and it should be appropriately acknowledged as being derived from Wildlife Online when it is used.

The State of Queensland does not invite reliance upon, nor accept responsibility for this information. Persons should satisfy themselves through independent means as to the accuracy and completeness of this information.

No statements, representations or warranties are made about the accuracy or completeness of this information. The State of Queensland disclaims all responsibility for this information and all liability (including without limitation, liability in negligence) for all expenses, losses, damages and costs you may incur as a result of the information being inaccurate or incomplete in any way for any reason.

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
animals	birds	Anatidae	*Stictonetta naevosa*	freckled duck		NT		2
animals	birds	Cacatuidae	*Calyptorhynchus lathami*	glossy black-cockatoo		V		2
animals	birds	Ciconiidae	*Ephippiorhynchus asiaticus*	black-necked stork		NT		10
animals	birds	Psittacidae	*Psephotus pulcherrimus*	paradise parrot		PE	EX	1
animals	birds	Rallidae	*Lewinia pectoralis*	Lewin's rail		NT		1
animals	birds	Scolopacidae	*Numenius madagascariensis*	eastern curlew		NT		1
animals	mammals	Dasyuridae	*Dasyurus maculatus maculatus*	spotted-tailed quoll (southern subspecies)		V	E	1
animals	mammals	Phascolarctidae	*Phascolarctos cinereus (southeast Queensland bioregion)*	koala (southeast Queensland bioregion)		V		268
plants	higher dicots	Apocynaceae	*Marsdenia coronata*	slender milkvine		V	V	1
plants	higher dicots	Myrtaceae	*Melaleuca irbyana*			E		12/10
plants	monocots	Hydrocharitaceae	*Hydrocharis dubia*	frogbit		V	V	1/1

CODES

I - Y indicates that the taxon is introduced to Queensland and has naturalised.

Q - Indicates the Queensland conservation status of each taxon under the *Nature Conservation Act 1992.* The codes are Presumed Extinct (PE), Endangered (E), Vulnerable (V), Rare (R), Common (C) or Not Protected ( ).

A - Indicates the Australian conservation status of each taxon under the *Environment Protection and Biodiversity Conservation Act 1999.* The values of EPBC are Conservation Dependent (CD), Critically Endangered (CE), Endangered (E), Extinct (EX), Extinct in the Wild (XW) and Vulnerable (V).

Records – The first number indicates the total number of records of the taxon for the record option selected (i.e. All, Confirmed or Specimens).
This number is output as 99999 if it equals or exceeds this value. The second number located after the / indicates the number of specimen records for the taxon.
This number is output as 999 if it equals or exceeds this value.

Appendix C

EPBC ACT PROTECTED MATTERS SEARCH RESULTS

-

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

header images | header images | header images

Protected Matters Search Tool

14 September 2010 08:45

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

Map of Search Region including any Buffer

This map may contain data which are
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Search Type:	Point
Buffer:	10 km
Coordinates:	-27.71356,152.6561

Thumbnail Map of Search Region

Report Contents:

Summary
Details
- Matters of NES
- Other matters protected by the EPBC Act

- Extra Information

Caveat
Acknowledgments

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)	1
Commonwealth Marine Areas:	None
Threatened Ecological Communities:	2
Threatened Species:	27
Migratory Species:	17

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:	1
Commonwealth Heritage Places:	1
Places on the RNE:	1
Listed Marine Species:	15
Whales and Other Cetaceans:	None
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:	1

Details

Matters of National Environmental Significance

Wetlands of International Significance [Dataset Information] (Ramsar Sites)		
MORETON BAY		Within same catchment as Ramsar site
Threatened Ecological Communities [Dataset Information]	Status	Type of Presence
Swamp Tea-tree (*Melaleuca irbyana*) Forest of South-east Queensland	Critically Endangered	Community likely to occur within area
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered	Community may occur within area
Threatened Species [Dataset Information]	Status	Type of Presence
Birds		
Anthochaera phrygia Regent Honeyeater	Endangered	Species or species habitat likely to occur within area
Cyclopsitta diophthalma coxeni Coxen's Fig-Parrot	Endangered	Species or species habitat likely to occur within area
Erythrotriorchis radiatus Red Goshawk	Vulnerable	Species or species habitat likely to occur within area

Geophaps scripta scripta Squatter Pigeon (southern)	Vulnerable	Species or species habitat likely to occur within area
Lathamus discolor Swift Parrot	Endangered	Species or species habitat likely to occur within area
Rostratula australis Australian Painted Snipe	Vulnerable	Species or species habitat may occur within area
Turnix melanogaster Black-breasted Button-quail	Vulnerable	Species or species habitat likely to occur within area
Frogs		
Mixophyes iteratus Southern Barred Frog, Giant Barred Frog	Endangered	Species or species habitat likely to occur within area
Lungfishes		
Neoceratodus forsteri Australian Lungfish, Queensland Lungfish	Vulnerable	Species or species habitat likely to occur within area
Mammals		
Chalinolobus dwyeri Large-eared Pied Bat, Large Pied Bat	Vulnerable	Species or species habitat may occur within area
Dasyurus hallucatus Northern Quoll	Endangered	Species or species habitat may occur within area
Petrogale penicillata Brush-tailed Rock-wallaby	Vulnerable	Species or species habitat may occur within area
Potorous tridactylus tridactylus Long-nosed Potoroo (SE mainland)	Vulnerable	Species or species habitat may occur within area
Pteropus poliocephalus Grey-headed Flying-fox	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Reptiles		
Coeranoscincus reticulatus Three-toed Snake-tooth Skink	Vulnerable	Species or species habitat may occur within area
Delma torquata Collared Delma	Vulnerable	Species or species habitat likely to occur within area
Plants		
Arthraxon hispidus Hairy-joint Grass	Vulnerable	Species or species habitat likely to occur within area
Bertya ernestiana a shrub	Vulnerable	Species or species habitat may occur within area
Bosistoa selwynii Heart-leaved Bosistoa	Vulnerable	Species or species habitat likely to occur within area
Bosistoa transversa Three-leaved Bosistoa	Vulnerable	Species or species habitat likely to occur within area
Cryptostylis hunteriana Leafless Tongue-orchid	Vulnerable	Species or species habitat may occur within area
Cupaniopsis tomentella Boonah Tuckeroo	Vulnerable	Species or species habitat likely to occur within area

Hydrocharis dubia Frogbit	Vulnerable	Species or species habitat likely to occur within area
Notelaea ipsviciensis Cooneana Olive	Critically Endangered	Species or species habitat may occur within area
Phebalium distans Mt Berryman Phebalium	Critically Endangered	Species or species habitat may occur within area
Planchonella eerwah Shiny-leaved Condoo, Black Plum, Wild Apple	Endangered	Species or species habitat likely to occur within area
Thesium australe Austral Toadflax, Toadflax	Vulnerable	Species or species habitat likely to occur within area
Migratory Species [Dataset Information]	Status	Type of Presence
Migratory Terrestrial Species		
Birds		
Cyclopsitta diophthalma coxeni Coxen's Fig-Parrot	Migratory	Species or species habitat likely to occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle	Migratory	Species or species habitat likely to occur within area
Hirundapus caudacutus White-throated Needletail	Migratory	Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater	Migratory	Species or species habitat may occur within area
Monarcha melanopsis Black-faced Monarch	Migratory	Breeding may occur within area
Monarcha trivirgatus Spectacled Monarch	Migratory	Breeding likely to occur within area
Myiagra cyanoleuca Satin Flycatcher	Migratory	Breeding likely to occur within area
Rhipidura rufifrons Rufous Fantail	Migratory	Breeding may occur within area
Xanthomyza phrygia Regent Honeyeater	Migratory	Species or species habitat likely to occur within area
Migratory Wetland Species		
Birds		
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
Gallinago hardwickii Latham's Snipe, Japanese Snipe	Migratory	Species or species habitat may occur within area
Nettapus coromandelianus albipennis Australian Cotton Pygmy-goose	Migratory	Species or species habitat may occur within area
Rostratula benghalensis s. lat. Painted Snipe	Migratory	Species or species habitat may 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

Other Matters Protected by the EPBC Act

Listed Marine Species [Dataset Information]	Status	Type of Presence
Birds		
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
Gallinago hardwickii Latham's Snipe, Japanese Snipe	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
Hirundapus caudacutus White-throated Needletail	Listed - overfly marine area	Species or species habitat may occur within area
Lathamus discolor Swift Parrot	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
Monarcha melanopsis	Listed -	Breeding may occur within area

Black-faced Monarch	overfly marine area	
Monarcha trivirgatus Spectacled Monarch	Listed - overfly marine area	Breeding likely to occur within area
Myiagra cyanoleuca Satin Flycatcher	Listed - overfly marine area	Breeding likely to occur within area
Nettapus coromandelianus albipennis Australian Cotton Pygmy-goose	Listed - overfly marine area	Species or species habitat may occur within area
Rhipidura rufifrons Rufous Fantail	Listed - overfly marine area	Breeding may occur within area
Rostratula benghalensis s. lat. Painted Snipe	Listed - overfly marine area	Species or species habitat may occur within area

Commonwealth Lands [Dataset Information]

Defence

Commonwealth Heritage Places [Dataset Information]

Amberley RAAF Base Group QLD

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

Historic

Amberley RAAF Base Group QLD

Extra Information

Regional Forest Agreements [Dataset Information]
Note that all RFA areas including those still under consideration have been included.

, Queensland

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 D

FLORA AND FAUNA OBSERVED DURING OROGEN FIELDWORKS

Appendix D - Table D.1
Flora

Family	Genus	Common Name	Form
ASCLEPIADACEAE	*Gomphocarpus physocarpus**	Balloon Cotton Bush	shrub
ASTERACEAE	*Chrysocephalum apiculatum*	Yellow Buttons	herb
ASTERACEAE	*Cirsium vulgare**	Spear Thistle	herb
ASTERACEAE	*Helichrysum italicum**	Curry Plant	shrub
ASTERACEAE	*Senecio madagascariensis**	Fireweed	herb
CACTACEAE	*Opuntia stricta**	Common Prickly Pear	shrub/tree
CHARACEAE	*Nitella* sp.	Nitella	algae
CYPERACEAE	*Cyperus difformis*	Dirty Dora	sedge
CYPERACEAE	*Cyperus polystachyos*	Bunchy Sedge	sedge
CYPERACEAE	*Eleocharis dulcis*	Water Chestnut	sedge
CYPERACEAE	*Eleocharis sphacelata*	Tall Spikerush	sedge
CYPERACEAE	*Juncus usitatus*	Common Rush	sedge
CYPERACEAE	*Schoenoplectus mucronatus*	Triangular Clubrush	sedge
FABACEAE	*Desmodium rhytidophyllum*	Native Desmodium	herb
HALORAGACEAE	*Myriophyllum crispatum*	Water Milfoil	herb
MALVACEAE	*Sida rhombifolia**	Paddy's Lucerne	herb
MARSILEACEAE	*Marsilea mutica*	Smooth Nardoo	herb
MENYANTHACEAE	*Nymphoides indica*	Water Snowflakes	water lily
MIMOSACEAE	*Acacia concurrens*	Black Wattle	shrub
MIMOSACEAE	*Acacia leiocalyx*	Black Wattle	shrub/tree
MYRTACEAE	*Angophora leiocarpa*	Rusty Gum	tree
MYRTACEAE	*Corymbia intermedia*	Pink Bloodwood	tree
MYRTACEAE	*Corymbia tessellaris*	Moreton Bay Ash	tree
MYRTACEAE	*Eucalyptus crebra*	Narrow-leaved Ironbark	tree
MYRTACEAE	*Eucalyptus melanophloia*	Silver-leaved Ironbark	tree
MYRTACEAE	*Eucalyptus tereticornis*	Blue Gum	tree
MYRTACEAE	*Melaleuca irbyana*	Swamp Tea-tree	shrub/tree
NYMPHAEACEAE	*Nymphaea caerulea subsp. zanzibarensis**	Cape Blue Waterlily	water lily
ONAGACEAE	*Ludwigia peploides* subsp. *montevidensis*	Water Primrose	herb
PHILYDRACEAE	*Philydrum lanuginosum*	Woolly Frogmouth	herb
PHOMERIACEAE	*Dianella caerulea*	Blue Flax Lily	herb
POACEAE	*Chloris gayana**	Rhodes Grass	grass
POACEAE	*Cymbopogon refractus*	Barbed Wire Grass	grass
POACEAE	*Cynodon dactylon**	Green Couch	grass
POACEAE	*Dichanthium sericeum*	Queensland Blue Grass	grass
POACEAE	*Eragrostis brownii*	Brown's Lovegrass	grass
POACEAE	*Eragrostis tenuifolia**	Elastic Grass	grass
POACEAE	*Heteropogon contortus*	Black Speargrass	grass
POACEAE	*Imperata cylindrica*	Blady Grass	grass
POACEAE	*Leersia hexandra*	Swamp Ricegrass	grass
POACEAE	*Melinis repens**	Red Natal Grass	grass
POACEAE	*Panicum simile*	Two-colour Panic	grass
POACEAE	*Paspalum distichum*	Water Couch	grass
POACEAE	*Paspalum scrobiculatum**	Ditch Millet	grass
POACEAE	*Sporobolus creber*	Slender Rats Tail Grass	grass
POACEAE	*Themeda triandra*	Kangaroo Grass	grass
POLYGONACEAE	*Persicaria attenuata*	A Smartweed	herb
POLYGONACEAE	*Persicaria decipiens*	Slender Knotweed	herb
VERBENACEAE	*Lantana montevidensis**	Creeping Lantana	shrub
XANTHORRHOEACEAE	*Lomandra multiflora*	Many-flowered Mat Rush	herb

*** - Introduced species**

Appendix D- Table D.2
Fauna

Scientific Name	Common Name	Type of Record
MAMMALS		
*Lepus europaeus**	Brown Hare	Obs/Sc
Macropus giganteus	Eastern Grey Kangaroo	Obs/Sc
Phascolarctos cinereus^ (offsite)	Koala	Obs
Trichosurus vulpecula	Common Brushtail Possum	Obs
AVIFAUNA		
Acanthiza pusilla	Brown Thornbill	Obs
Anas superciliosa	Pacific Black Duck	Obs
Aquila audax	Wedge-tailed Eagle	Obs
Ardea ibis%	Cattle Egret	Obs
Artamus personatus	Masked Woodswallow	Obs
Cacatua tenuirostris	Long-billed Corella	Obs/CH
Coracina novaehollandiae	Black-faced Cuckoo-shrike	Obs
Corvus orru	Torresian Crow	Obs/CH
Cracticus nigrogularis	Pied Butcherbird	Obs
Cracticus torquatus	Grey Butcherbird	Obs
Cygnus atratus	Black Swan	Obs
Dacelo novaeguineae	Laughing Kookaburra	Obs/CH
Egretta novaehollandiae	White-faced Heron	Obs
Elanus axillaris	Black-shouldered Kite	Obs
Falco cenchroides (tentative)	Nankeen (Australian) Kestrel	Obs
Fulica atra	Eurasian Coot	Obs
Gerygone sp.	Gerygone	Obs
Grallina cyanoleuca	Magpie-lark	Obs/CH
Gymnorhina tibicen	Australian Magpie	Obs/CH
Hirundo neoxena	Welcome Swallow	Obs
Malurus cyaneus	Superb Fairy-wren	Obs
Manorina melanocephala	Noisy Miner	Obs/CH
Megalurus timoriensis	Tawny Grassbird	Obs
Ocyphaps lophotes	Crested Pigeon	Obs
Pachycephala rufiventris	Rufous Whistler	Obs
Pardalotus striatus	Striated Pardalote	Obs/CH
Petrochelidon nigricans	Tree Martin	Obs
Phalacrocorax varius	Pied Cormorant	Obs
Platycercus eximius subsp. *palliceps*	Pale-headed Rosella	Obs/CH
Podargus strigoides	Tawny Frogmouth	Obs
Pomatostomus temporalis	Grey-crowned Babbler	Obs/CH
Porphyrio porphyrio	Purple Swamphen	Obs/CH
Rhipidura albiscapa	Grey Fantail	Obs
Rhipidura leucophrys	Willie Wagtail	Obs/CH
Tachybaptus novaehollandiae	Australasian Grebe	Obs

Taeniopygia bichenovii	Double-barred Finch	Obs
Trichoglossus chlorolepidotus	Scaly-breasted Lorikeet	Obs/CH
Vanellus miles	Masked Lapwing	Obs/CH
REPTILES		
Oxyuranus scutellatus (juv.) (dead) (tentative)	Coastal Taipan	Obs
Pseudonaja textilis (tentative)	Eastern Brown Snake	Obs
AMPHIBIANS		
*Bufo marinus**	Cane Toad	Obs
FISH		
Hypseleotris sp. (tentative)	Gudgeon	Obs

KEY

^ - Threatened species pursuant to *Nature Conservation (wildlife) Act 1992*

% - Migratory species pursuant to *Environment Protection and Biodiversity Conservation Act 1999*

* - Introduced Species

Obs – Observation

CH – Call Heard

Sc – Scat Identification

Appendix E

TARGETED MANAGEMENT PLAN FOR SWAMP TEA-TREE

Targeted Management Plan for Swamp Tea-tree (*Melaleuca irbyana*)

Lot 226 Cunningham Highway, Mutdapilly, Qld (Lot 226 on RP220388)

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Delivering customised solutions, on time.

Targeted Management Plan for Swamp Tea-tree (*Melaleuca irbyana)*

Lot 226 Cunningham Highway, Mutdapilly, Qld

(Lot 226 on RP220388)

Prepared For:

Doyle Group

8 October 2010

410054_REO_002_v2.doc

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Report Title:	***Targeted Management Plan for Swamp Tea-tree (Melaleuca irbyana)***
Project:	Lot 226 Cunningham Highway, Mutdapilly, Qld (Lot 226 on RP220388)
Client:	*Doyle Group*
Report No.:	*410054_REO_002_v2.doc*
Draft/Final:	Final

Orogen Pty Ltd and the authors responsible for the preparation and compilation of this report declare that we do not have, nor expect to have a beneficial interest in the study area of this project and will not benefit from any of the recommendations outlined in this report.

The preparation of this report has been in accordance with the project brief provided by the client and has relied upon the information, data and results provided or collected from the sources and under the conditions outlined in the report.

All maps, plans and cadastral information contained within this report are prepared for the exclusive use of the Doyle Group to accompany this report for the land described herein and are not to be used for any other purpose or by any other person or entity. No reliance should be placed on the information contained in this report for any purposes apart from those stated therein.

Orogen Pty Ltd accepts no responsibility for any loss, damage suffered or inconveniences arising from, any person or entity using the plans or information in this study for purposes other than those stated above.

Reviewed By:	*Nelson Wills*
Position:	*Project Director*
Signed:	*A signed copy can be provided upon request*
Date:	08/10/2010

Prepared By:	*April Freeman*
Position:	*Environmental Scientist*
Signed:	*A signed copy can be provided upon request*
Date:	08/10/2010

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Study Team

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April Freeman	*Environmental Scientist*	*Fieldwork and Reporting*
Theresa Telfer	*Administration Manager*	*Administration*

Table of Contents

Introduction **1**

1.1 Background 1
1.2 Swamp Tea-tree 1
1.2.1 Species Description 1
1.2.2 Community Description 2
1.3 Objectives of the Report 2
1.4 Outline of the Report 3

Study Methodology **4**

2.1 Desktop Review 4
2.2 Site Inspection 4

Results **5**

3.1 Desktop Review 5
3.1.1 Ipswich Planning Scheme 2006 5
3.1.2 Nature Conservation Act 1992 6
3.1.3 Nature Conservation (Protected Plants) Conservation Plan 2000 6
3.1.4 Environment Protection and Biodiversity Conservation Act 1999 8
3.2 Site Inspection 9
3.2.1 Individual Tree Data 9
3.2.2 Population Data 10
3.2.3 Fauna Habitat Features 11

Discussion of Potential Impacts **12**

4.1 Vegetation Clearing 12
4.2 Loss of Fauna Habitat 13

Management Plan **14**

5.1 Overview 14
5.2 Pre-construction Measures 14
5.2.1 Targeted Survey 14
5.2.2 Seed Collection and Propagation 15
5.2.3 Targeted Soil Investigation 16
5.3 Construction Measures 16
5.3.1 Rehabilitation Works 16
5.4 Post-construction Measures 19
5.4.1 Monitoring and Maintenance Regime 19
5.4.2 Protection of Rehabilitation Area 19

Conclusions and Recommendations **20**

6.1 Conclusions and Recommendations 20

Figures

Table of Contents *Continued*

Tables

Table 3.1 - Swamp Tea-tree Communities Regional Ecosystem Descriptions 8
Table 5.1 - Estimated Schedule for Swamp Tea-tree Seed Collection and Propagation 15
Table 5.1 - Proposed Planting Densities and Tubestock Numbers for the Rehabilitation Area 18

Figures

Figure 1.1 - Locality Plan
Figure 3.1 – Swamp Tea-tree (*Melaleuca irbyana*) Distribution Plan
Figure 5.1 – Plan of Proposed *Melaleuca irbyana* Forest Restoration Area

Introduction

1.1 Background

Orogen Pty Ltd (Orogen) was commissioned by the Doyle Group (the client) to prepare a Targeted Management Plan for Swamp Tea-tree (*Melaleuca irbyana*) with regards to future development of the site identified as Lot 226 Cunningham Highway, Mutdapilly, Queensland (Qld) (Lot 226 on RP220388) (the site). Refer to **Figure 1.1** to view the site locality plan.

The current land use of the site is agricultural (cattle grazing), however future development of the site is proposed to include an industrial estate. The proposed future development is in accordance with site designations under the Ipswich Planning Scheme, as the site is located within the Regionally Significant Business Enterprise and Industry Area and is also identified as a 'Future Industry' area under the Ebenezer-Willowbank Precincts plan (ICC, 2006). The proposed development is therefore considered to be a regionally significant development.

Orogen previously completed a Preliminary Biodiversity Opportunities & Constraints Assessment (BOCA) for the site to determine the current potential environmental opportunities and constraints to future development of the site (Orogen, 2010). This assessment confirmed the widespread occurrence of Swamp Tea-tree on site. Preparation of a Targeted Management Plan for Swamp Tea-tree, including a targeted Swamp Tea-tree survey, was therefore recommended.

This document provides the results of the targeted site survey and discusses potential impacts of the proposed development on the population recorded onsite. Management measures for pre-construction, construction- and post-construction are also presented. Also included in this document is an overview of planning instruments relevant to the conservation management of Swamp Tea-tree.

1.2 Swamp Tea-tree

1.2.1 Species Description

Swamp Tea-tree is listed as Endangered under the *Nature Conservation (Wildlife) Regulation 2006* (NC Reg) and is protected under the *Nature Conservation Act 1992* (NC Act). Swamp Tea-tree is a small shrub or tree growing up to eight metres tall, with spongy, papery bark (Wilson, 2010). The leaves are alternate and sessile and are very small in size (2-5 mm long by 1-1.5 mm wide) (Wilson, 2010). The leaves are pressed close to the branchlets, wrapping around them slightly (DECC, 2005). Swamp Tea-tree flowers from spring to summer with white/cream flowers in groups of three (Wilson, 2010). Flowering is followed by tight clusters of woody fruit (3.5-4 mm diameter) (DECC, 2005, Wilson, 2010).

The habitat of Swamp Tea-tree primarily includes open eucalypt forest on poorly drained, usually clay, soils (DECC, 2005; Barlow, 1987). Swamp Tea-tree is restricted to small area of southern Queensland near Ipswich and Beaudesert, and near Casino in northern New South Wales (Cooper et al. 1995).

1.2.2 Community Description

Swamp Tea-tree usually grows in dense 'colonies', forming a Swamp Tea-tree Forest (Cooper et al., 1995). Swamp Tea-tree Forest of South-East Queensland is listed as a Critically Endangered ecological community under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Swamp Tea-tree Forest of South-East Queensland usually comprises low open to closed forest, closed scrub or thickets dominated by Swamp Tea-tree, with or without an emergent tree layer of scattered eucalypts (DEWHA, 2010). The Swamp Tea-tree Forest ecological community is based on two regional ecosystems (RE) – RE 12.9-10.11 and RE 12.3.3c (DEWHA, 2010). Refer to **Section 3.1.4** for further information on these RE types.

Recent studies conducted by Ryan (2010), identified additional Swamp Tea-tree community RE types, which generally present a dominant stratum comprised of *Eucalyptus* and *Corymbia* species and an understorey containing Swamp Tea-tree. It is thought that this form has generally been overlooked by previous studies, although it is considered to be the most widespread structural form of Swamp Tea-tree community (Ryan, 2010). The additional RE types presented by Ryan (2010), include RE 12.9-10.11a, RE 12.3.3b and RE 12.5.2x1. Refer to **Section 3.1.4** for further information on these additional RE types.

Swamp Tea-tree Forests usually grow on cracking clay soils in areas that become seasonally saturated within water (Cooper et al., 1995). The clay soils drain slowly and often become waterlogged after heavy rains, resulting in the appearance of numerous temporary ponds (DEH, 2005). However, Swamp Tea-tree Forests rarely grow along watercourses or within permanent wetlands (Cooper et al., 1995).

The general structure of Swamp Tea-tree Forest is a low closed forest with three distinct strata: emergent eucalypts, Swamp Tea-tree canopy and low ground stratum (Cooper et al., 1995). Shrubs and vines are rarely occurring (Cooper et al., 1995). Dominant emergent eucalypts include Narrow-leaved Ironbark (*Eucalyptus creba*), Forest Red Gum (*Eucalyptus tereticornis*) and Gum-topped Box (*Eucalyptus moluccana*) (Greening Australia, undated). The ground stratum is often diverse, with numerous species of native herbs and grasses (Cooper et al., 1995). Ground stratum species are often distinctive due to the heavy shade and clay soil conditions often apparent within Swamp Tea-tree Forest (Cooper et al., 1995).

1.3 Objectives of the Report

The objectives of this report are:

- To conduct a survey of the Swamp Tea-tree population on site, including collection of data regarding population characteristics;
- To inform the client of their responsibilities with regards to this species from an environmental planning perspective;
- To identify potential impacts of the proposed development on the Swamp Tea-tree population on site; and

- To formulate and document management and mitigation measures required to alleviate potential impacts of the proposed development on the Swamp Tea-tree population on the site.

1.4 Outline of the Report

This report is structured as follows:

- Section 2 - describes the survey methodology undertaken with regard to investigating the Swamp Tea-tree population on site;
- Section 3 - describes the results of the Swamp Tea-tree population survey;
- Section 4 - discusses the potential impacts of the proposed development on the Swamp Tea-tree population on site;
- Section 5 – provides management and mitigation measures to minimise the potential impacts of the proposed development on the Swamp Tea-tree population on site; and
- Section 6 – provides conclusions and summarises recommendations.

Study Methodology

2.1 Desktop Review

Orogen undertook a review of Local, State and Commonwealth Government planning instruments relevant to the conservation of Swamp Tea-tree. Relevant planning instruments included:

- *Ipswich Planning Scheme 2006* (ICC, 2006);
- *Nature Conservation Act 1992*;
- *Nature Conservation (Wildlife) Regulation 2006*;
- *Nature Conservation (Protected Plants) Conservation Plan 2000*; and
- *Environment Protection and Biodiversity Conservation Act 1999*.

2.2 Site Inspection

Orogen conducted a site inspection on 7-9 July, 26-30 July and 16 August 2010, primarily for the purpose of surveying each individual Swamp Tea-tree plant on site. Survey data collected for each individual Swamp Tea-tree included location (GPS coordinate), plant height (metres), plant width (metres) and presence of habitat features (e.g. bird nests). Data collected was recorded on an Orogen pro forma datasheet. Each Swamp Tea-tree surveyed was labelled with flagging tape marked with a tree identification number to ensure no repetition in survey data. Detailed survey data is available on request in electronic format.

The Swamp Tea-tree survey was brought to a close by a wild fire that burnt across the site on 16 August 2010. An additional site inspection was conducted on 23 August 2010, to determine the extent of damage caused by the fire. The fire caused extensive damage across the site, which meant that it was no longer possible to identify which trees had already been surveyed, and whether trees were dead or alive. As the survey had been completed for approximately 75% of the site, the number of Swamp Tea-tree individuals over the remaining 25% of the site was estimated based on Orogen ecologist knowledge of the site as well as the number of trees counted over the balance of the site.

Results

3.1 Desktop Review

3.1.1 Ipswich Planning Scheme 2006

The Vegetation Management Code, Part 12, Division 4 of the *Ipswich Planning Scheme 2006*, addresses the conservation of Swamp Tea-tree at a Local Government level with regards to the current land use of the site. Under the Vegetation Management Code, vegetation is able to be removed for the purposes of bona fide, existing and ongoing agricultural or animal husbandry activities (Table 12.4.1, point 3). However, removal of vegetation for this purpose must still comply with the following acceptable solutions:

a) *The removal of the vegetation involves a continuation of existing agricultural or animal husbandry activities, including the management of understorey vegetation to maintain existing grazing activities (e.g. through removing early regrowth such as fast growing wattles).*

b) *The removal of vegetation under Clause (a) above does not involve the removal of—*

i. *species identified as endangered, vulnerable or rare under the Nature Conservation Act 1992 and associated subordinate legislation; or*

ii. *species identified as critically endangered, endangered, vulnerable or conservation dependent under the Environment Protection and Biodiversity Conservation Act 1999 and associated subordinate legislation; or*

iii. *other vegetation which has a circumference of 50 cm measured at a height of 1.2 m above the ground (Table 12.4.1, point 3).*

Based on the above acceptable solutions, clearing/removal of Swamp Tea-tree under the current land use is not permitted under the *Ipswich Planning Scheme 2006*, due to the listing of Swamp Tea-tree as Endangered under the NC Act.

In addition, an overall outcome for the Vegetation Management Code includes:

"Vegetation which is of cultural heritage, ecological, horticultural, scientific, educational, recreation or aesthetic (including streetscape, townscape or landscape) significance or value is conserved and appropriately managed" (Section 12.4.3 (2) (d)).

Swamp Tea-tree is expected to be considered as vegetation of ecological significance, and therefore is required to be appropriately managed in accordance with the Vegetation Management Code.

3.1.2 Nature Conservation Act 1992

Swamp Tea-tree is listed as an Endangered species under the NC Reg. Under the NC Act, a species listed as Endangered is considered to be a 'protected' species. Section 89 of the NC Act states that *subject to section 93* [Aborigines' and Torres Strait Islanders' rights to take etc. protected wildlife]*, a person, other than an authorised person, must not take a protected plant that is in the wild, other than under—*

a) a conservation plan applicable to the plant; or

b) a licence, permit or other authority issued or given under a regulation; or

c) an exemption under a regulation.

It is therefore deemed that a licence/permit is required to allow for the 'taking' of Swamp Tea-tree individuals on site.

3.1.3 Nature Conservation (Protected Plants) Conservation Plan 2000

The purpose of the *Nature Conservation (Protected Plants) Conservation Plan 2000* is ultimately to facilitate the protection of protected plants and to control the taking, using and keeping of protected plants. Swamp Tea-tree is listed as Endangered under the NC Reg and is considered to be a protected plant. Sections of the *Nature Conservation (Protected Plants) Conservation Plan 2000* that are considered most relevant to the protection of Swamp Tea-tree on site are provided below:

12 Restriction on taking and using endangered plant

1) A person may take a whole endangered plant in the wild only under—

a) a recreational wildlife harvesting licence for protected plants, if the plant—

i. would otherwise have been lawfully destroyed; or

ii. is to be taken under section 26(2); or

b) a clearing permit; or

c) a scientific purposes permit; or

d) a damage mitigation permit; or

e) a commercial wildlife harvesting licence for protected plants that complies with a conservation plan or approved recovery plan for the plant for propagating the species and returning it to the wild (Part 3, Division 1, Section 12).

13 Restriction on grant of licence, permit or authority for taking endangered plant

The chief executive must not grant a licence, permit or authority for taking endangered plants if the taking may reduce the ability of the plant's population to expand (Part 3 Division 1, Section 13).

29 Restrictions on grant of clearing permit

1) The chief executive may grant a clearing permit for taking protected plants only if the chief executive is satisfied—

a) the applicant is the landholder, or has the approval of the landholder, of the land on which the plants are located; and

b) the taking will not adversely affect the survival in the wild of the plant; and

c) for a plant mentioned in section 11(1)(a), (b) or (c) —exceptional circumstances apply to its taking (Part 3, Division 4, Section 29).

30 Conditions of clearing permit

1) The chief executive may grant a clearing permit on the following conditions—

a) the permit holder must try to find a lawful commercial or recreational use for the plants taken under the permit;

b) the plants must be transplanted and maintained by the permit holder or someone else.

2) Subsection (1) does not limit the conditions that may be imposed on a clearing permit (Part 3, Division 4, Section 30).

41 Exemption for requirement for clearing permit

1) A clearing permit is not needed for taking a protected plant if—

a) the taking happens in the course of an activity under an authority made, granted or given under another Act by—

i. the Governor in Council; or

ii. someone else and the chief executive approves the taking in the course of the activity; or

b) for a least concern plant on private land—the person taking the plant is the landholder of the land.

2) For subsection (1)(a)(ii), the chief executive's approval may be given—

a) for a particular activity or class of activity; and

b) *with or without conditions; and*

c) *only if the chief executive is satisfied the taking will not adversely affect the survival in the wild of the plant* (Part 4, Division 2, Section 41).

Based on the above excerpts, it is evident that the *Nature Conservation (Protected Plants) Conservation Plan 2000* requires a clearing permit for the taking of whole endangered plants in the wild. However, a clearing permit may not be granted if the taking of the plants may reduce the ability of the plant's population to expand or if the taking will adversely affect the survival in the wild of the plant. In the event that a clearing permit is issued, it is likely that the permit will be subject to specific conditions.

3.1.4 Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act lists species listed as Threatened at a Commonwealth Government level. Swamp Tea-tree is not listed as a Threatened species under the EPBC Act. However, Swamp Tea-tree Forest of South-East Queensland is listed as a Critically Endangered ecological community under the EPBC Act.

The Swamp Tea-tree Forest ecological community is based on two RE types – RE 12.9-10.11 and RE 12.3.3c (DEWHA, 2010). Both of these RE types are listed as Endangered under the *Vegetation Management Act 1999*. Refer to **Table 3.1** for a brief description of each RE type.

As previously mentioned, studies conducted by Ryan (2010) concluded that RE 12.9-10.11a, RE 12.3.3b and RE 12.5.2x1 also represent Swamp Tea-tree communities in addition to RE 12.9-10.11 and RE 12.3.3c. These additional RE types are also listed as Endangered under the *Vegetation Management Act 1999* and are described in **Table 3.1** below.

Table 3.1 - Swamp Tea-tree Communities Regional Ecosystem Descriptions

RE Type	Description
12.9-10.11	*Melaleuca irbyana* low open-forest or thicket, +/- emergent trees e.g. *Eucalyptus moluccana*, *E. crebra* and *E. tereticornis*, occurring on Cainozoic and Mesozoic sediments. *Casuarina glauca* or *Acacia harpophylla* may also be occasionally present (Queensland Herbarium, 2009).
12.3.3c	Floodplain (other than floodplain wetlands) with *Melaleuca irbyana* low open-forest or thicket +/- emergent trees e.g. *Eucalyptus moluccana*, *E. crebra*, *E. tereticornis* and *Corymbia citriodora*. *Casuarina glauca* or *Acacia harpophylla* may also be occasionally present (Queensland Herbarium, 2009).
12.9-10.11a	*Corymbia citriodora*, *Eucalyptus crebra* &/or *E. moluccana*, *E. tereticornis*, *E. crebra* open forest with a sparse to mid-dense understorey of *Melaleuca irbyana*. Occurs on lower slopes and elevated flats with impeded drainage on Mesozoic sediments (Ryan, 2010).

Table 3.1 - Swamp Tea-tree Communities Regional Ecosystem Descriptions

RE Type	Description
12.3.3b	Open-forest to woodland of *Eucalyptus moluccana* &/or *Eucalyptus tereticornis* and *E. crebra*, with a sparse to mid-dense understorey of *Melaleuca irbyana*. Occurs on Quaternary alluvial plains (Ryan, 2010).
12.5.2x1	*Melaleuca irbyana* low open-forest or thicket with emergent *Eucalyptus moluccana*. Occurs on deeply weathered Tertiary alluvium where drainage of soils is impeded (Ryan, 2010).

It is questionable whether the additional Swamp Tea-tree community RE types meet the official Commonwealth requirements for Swamp Tea-tree Forest of South-East Queensland (currently based on RE 12.9-10.11 and RE 12.3.3c), however to ensure a thorough site investigation, vegetation on site was also assessed against these additional RE types. This decision is supported by the recommendation by DEWHA (2010) that where Eucalyptus woodland with a clear Swamp Tea-tree understorey occurs as an intergrade/buffer zone adjacent to Swamp Tea-tree forest, it is best considered part of the Swamp Tea-tree Forest ecological community.

None of the RE types described in **Table 3.1** were recorded on site during site investigations for the Preliminary BOCA (Orogen, 2010) or during the targeted survey for Swamp Tea-tree. As such, the Swamp Tea-tree Forest ecological community is not considered to occur on site. Swamp Tea-tree plants on site are therefore not protected under the EPBC Act.

3.2 Site Inspection

3.2.1 Individual Tree Data

The Swamp Tea-tree survey identified a population of approximately 2081 Swamp Tea-tree individuals on site. 1561 were officially recorded during the survey (prior to the wildfire), with the remaining trees estimated based on the extent of the site currently surveyed. It was estimated that 75% of the site had been surveyed and therefore the assumption was made that 1561 comprised 75% of the total number of trees on site. Calculations to determine 100% of trees on site resulted in the estimation of a total of 2081 trees. It is possible that this may be an overestimation of actual numbers on site, as the densest areas of Swamp Tea-tree had already been included in the survey. However, given the circumstances, this was determined to be the most accurate method for calculating the total Swamp Tea-tree population on site. Refer to **Figure 3.1** to view the location of each of the surveyed individuals, as taken using a GPS, and the areas that were not officially surveyed.

Based on the data collected for the 1561 Swamp Tea-tree trees surveyed, the mean tree height was calculated to be 2.97 m (+/-1.11 sd), with a mean width (canopy spread) of 1.83 m (+/-0.83 sd). The growth form of Swamp Tea-trees on site was predominantly multi-stemmed shrubs.

The trees were observed to be scattered across the site, with concentrated groups primarily occurring at lower elevations on the western and central areas of the site (**Figure 3.1**).

Swamp Tea-tree predominantly occurred within a cleared grassland mosaic vegetation community on site, generally comprised of native/exotic grasses and herbs, with a scattered canopy (<5% projective foliage cover) of Narrow-leaved Ironbark (*Eucalyptus crebra*). The community had been historically cleared for agricultural purposes, namely cattle grazing.

Although the site was burnt by wildfire on 16 August 2010, it is likely that while there may be some attrition of Swamp Tea-tree on site, the majority of trees will regrow, as mature trees are expected to be fire resistant (Cooper et al., 1995). During the site inspection on 23 August 2010 following the wildfire, Swamp Tea-trees, while burnt, were observed to still be alive when small branches were snapped. It is therefore expected that the majority of Swamp Tea-trees will re-sprout in the weeks following the fire.

3.2.2 Population Data

As mentioned in **Section 3.1.4**, the Swamp Tea-tree Forest of South-East Queensland ecological community is based on RE 12.9-10.11 and RE 12.3.3c (DEWHA, 2010). The *Vegetation Management Act 1999* (VM Act) defines a community as 'Remnant' when the vegetation exhibits more than 50 % of the undisturbed predominant canopy, averages more than 70 % of the vegetation's undisturbed height and is composed of species characteristic of the undisturbed predominant canopy of the given vegetation community. Although the floristics of the Swamp Tea-tree population on site were comparable to the descriptions of RE 12.9-10.11 and 12.3.3c, the average height and canopy of the population were not.

RE 12.9-10.11 and RE 12.3.3c are described as low open forest vegetation communities (Queensland Herbarium, 2009). In accordance with the *Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland* (Neldner et al., 2005), low open forest is defined by a foliage projective cover of 30-70%, with a tree height range of <10 m. Although the average height of Swamp Tea-tree is less than 10 m, the predominant growth form was observed to be shrub[1] rather than tree[2]. This indicates that the Swamp Tea-tree population on site does not suit the definition of low open forest. In addition, the projective foliage cover of the population was less than 15%, which indicates that the foliage cover is insufficient to meet the Remnant vegetation requirements.

[1] Shrub is a woody plant less than 8 m tall either multi-stemmed or branching close to the ground, occasionally with a single stem (Neldner et al., 2005).
[2] Tree is a woody plant more than 5 m tall usually with a single stem (Neldner et al., 2005).

The Swamp Tea-tree population was therefore not considered to comprise Remnant RE 12.9-10.11 or RE 12.3.3c, and as such, was not deemed a Swamp Tea-tree Forest ecological community. The Swamp Tea-tree population was also not considered to comprise the additional RE types presented by Ryan (2010) as Swamp Tea-tree communities, as these RE types (RE 12.9-10.11a, RE 12.3.3b and RE 12.5.2x) were not recorded on site.

Rather, the Swamp Tea-tree population was observed to be composed of regrowth vegetation in historically cleared grazing land, resulting from a reduction in agricultural land management practices on site.

This conclusion is supported by Cooper et al. (1995), who observed that Swamp Tea-tree forest has a low, usually closed, canopy, and that wider spacing between trees is usually the result of human disturbance, where the trees consist of regrowth sprouting in a once cleared paddock.

3.2.3 Fauna Habitat Features

The trees were observed to provide shelter/nesting habitat for small birds, with a number of small bird nests observed. This was also observed by Cooper et al. (1995), who recorded that the dense canopy of Swamp Tea-tree trees creates a favourable environment for nests due to the protection offered from weather, birds of prey and aggressive bird species e.g. Noisy Miners (*Manorina melanocephala*). Cooper et al. (1995) also recorded that insectivorous birds were the most common bird species observed within Swamp Tea-trees, and noted that the Swamp Tea-tree flowers do not produce sufficient nectar to attract nectar-feeding birds.

The trees were also observed to provide shelter for amphibians, with Eastern Sedgefrog (*Litoria fallax*) recorded within a number of trees. The small depressions often observed in the vicinity of Swamp Tea-tree clumps are likely to form small pools following rain periods, which would also provide potential habitat for amphibians. In addition, the cracking clay soils provide cracks in which amphibians are able to shelter (Cooper et al., 1995).

Due to the sparse distribution of Swamp Tea-trees on site, the population also provided potential foraging habitat for macropods and raptors within the tall ground stratum. Eastern Grey Kangaroo (*Macropus giganteus*) and Red-necked Wallaby (*Macropus rufogriseus*) were observed during survey works. Wedge-tailed Eagle (*Aquila audax*) and Black-shouldered Kite (*Elanus axillaris*) were also observed foraging. This is in contrast to Swamp Tea-tree Forest, where a sparse ground stratum provides limited foraging for herbivores (Cooper et al., 1995).

The dense ground stratum would also provide potential shelter/foraging habitat for terrestrial fauna species e.g. reptiles. In addition, emergent Eucalypt trees (predominantly Narrow-leaved Ironbark (*Eucalyptus crebra*)), provided potential Koala (*Phascolarctos cinereus*) habitat and seasonal nectar resources for nectivorous fauna.

Discussion of Potential Impacts

4.1 Vegetation Clearing

The proposed future industrial development of the site requires the clearing of vegetation across the majority of the site. This will therefore result in the clearing of the majority of Swamp Tea-trees on site, which will significantly impact the existing population. Due to the scattered positioning of trees across the site, the proposed clearing is considered to be unavoidable if the site is to be developed in accordance with the intent of the Ipswich Planning Scheme. As previously mentioned, under the Ipswich Planning Scheme, the site is located within the Regionally Significant Business Enterprise and Industry Area and is also identified as a 'Future Industry' area under the Ebenezer-Willowbank Precincts plan (ICC, 2006). As such, future development of the site is considered to be a regionally significant development. However, the clearing of existing onsite vegetation is not considered to significantly impact the Swamp Tea-tree population of the locality, and will ultimately result in a net benefit of Swamp Tea-tree on site provided that the management measures detailed in **Section 5** are adhered to.

Swamp Tea-tree forest/regrowth was observed to occur to the south, west and north-west of the site. RE 12.9-10.11 (Swamp Tea-tree Forest) is also mapped as occurring to the south of the site (DERM, 2010). This indicates that there are extensive Swamp Tea-tree populations within the immediate vicinity of the site, and that the loss of regrowth individuals on site is unlikely to comprise a significant loss to the locality. Further, adherence to the management measures outlined in **Section 5**, will ultimately provide a net benefit to the Swamp Tea-tree population on site and Swamp Tea-tree Forests within the locality. Management measures primarily involve the rehabilitation of a 10 ha area on site with Swamp Tea-tree Forest at a ratio of 1:5 (5 Swamp Tea-trees to be planted for every 1 cleared). The rehabilitated Swamp Tea-tree Forest is expected to have greater ecological value than the existing scattered regrowth Swamp Tea-tree, and will therefore minimise the impact of clearing existing Swamp Tea-trees on site. Further, tubestock for the Swamp Tea-tree Forest are to be germinated from seed collected either on site or in the immediate vicinity of the site. This will ensure that the local genetic base is not lost. Refer to **Section 5** for further detail.

In addition, the existing Swamp Tea-tree population on site is not considered to comprise a significant population within the region. This is due to the fact that the onsite Swamp Tea-tree population was observed to be comprised of regrowth individuals within cleared agricultural land rather than a Swamp Tea-tree Forest. Young regrowth is not considered to have as great ecological value as older remnants of Swamp Tea-tree (Cooper et al., 1995). The wide spacing and sparse distribution of trees across the site also indicates human disturbance (Cooper et al., 1995). In addition, the multiple trunks observed for the majority of Swamp Tea-tree individuals on site indicates that trees have been damaged, likely as a result of cattle grazing or agricultural land management practices (Cooper et al., 1995).

Based on the above points, it is evident that the existing population of Swamp Tea-tree on site is not considered to provide a significant community, and that the proposed rehabilitation management measure will provide a net benefit from both a tree number and ecological value perspective.

4.2 Loss of Fauna Habitat

Clearing of Swamp Tea-tree on site will result in the temporary loss of a variety of potential fauna habitats associated with Swamp Tea-tree. Potential habitat loss includes:

- Shelter/nesting/foraging habitat for small birds;
- Potential habitat for amphibians;
- Foraging habitat for macropods and raptors;
- Shelter habitat for small terrestrial fauna e.g. reptiles; and
- Foraging habitat for Koalas and nectivorous fauna.

The majority of the above listed habitat resources associated with the existing Swamp Tea-tree population on site are expected to also be provided within the proposed 10 ha rehabilitation area (Section 5). Loss of these habitat features will therefore be temporary. Further, the proposed Swamp Tea-tree Forest to be rehabilitated is expected to ultimately have greater ecological value than the existing scattered Swamp Tea-tree regrowth population on site, therefore resulting in an increase in potential habitat resource value.

The exception to this includes potential foraging for macropods and raptors and shelter habitat for terrestrial fauna e.g. reptiles, as the canopy of the proposed Swamp Tea-tree Forest is expected to be denser and is therefore likely to have a more sparse ground stratum. This is not expected to significantly impact macropod, raptor or small terrestrial fauna populations within the locality however, as similar habitat types i.e. cleared open grassland/Eucalypt woodland, are abundant within the locality.

Management Plan

5.1 Overview

The impact of the proposed development on the Swamp Tea-tree population on site is to be primarily offset through the rehabilitation of a 10 ha 'offset' area on site to be revegetated as Swamp Tea-tree Forest (rehabilitation area). The proposed offset ratio is 1:5 trees (five Swamp Tea-trees planted for every one Swamp Tea-tree cleared), which will provide a considerable net benefit to the Swamp Tea-tree population in the locality.

The rehabilitation area is proposed to be located in the south-east corner of the site (**Figure 5.1**). This location was considered preferable due to its positioning immediately adjoining the Remnant bushland vegetation to the south. This will improve the value of the rehabilitated area for the following reasons:

- There will be a reduction in 'edge effects' on the rehabilitated area;
- The value of fauna habitat within the rehabilitated area will be greater due to the connection with a larger patch of Remnant vegetation; and
- Rates of natural regeneration within the rehabilitated area are likely to increase due to the seed source immediately adjacent.

Additional management measures to be implemented throughout the site include the planting of Swamp Tea-tree as a common species within the revegetated stormwater detention basin areas on site and also as a landscaping species where appropriate. Swamp Tea-tree has been planted as park plantings and as a street tree by Ipswich City Council and is therefore likely to be suited to these conditions (Cooper et al., 1995).

The management plan to mitigate the impact of the proposed development on the Swamp Tea-tree population includes pre-, during- and post-construction measures. Provided below is an overview of processes that are to occur within each development phase.

5.2 Pre-construction Measures

5.2.1 Targeted Survey

A targeted survey of the Swamp Tea-tree population currently on site was necessary to calculate the total number of Swamp Tea-trees required to be cleared and to provide a description of the onsite population characteristics. This survey has recently been conducted, with the results detailed in the previous sections of this document. In summary, the survey calculated a total of 2081 Swamp Tea-tree individuals on site, with a mean height of 2.97 m (+/-1.11 sd) and a mean width of 1.83 m (+/-0.83 sd).

Trees were predominantly observed to be multi-stemmed shrubs, with the total population considered to be comprised of regrowth vegetation in previously cleared farmland.

This survey provided vital information to allow for an offset ratio to be calculated that would provide a net benefit for Swamp Tea-tree within the locality.

5.2.2 Seed Collection and Propagation

Seed collection and propagation from individual Swamp Tea-trees in the immediate vicinity of the site is required to ensure that the rehabilitated Swamp Tea-tree Forest consists of local provenance of seed and a diverse genetic base. Seed will be collected by a specialist contractor, with appropriate licensing and expertise, during the relevant fruiting season from Swamp Tea-tree individuals either on site or in the immediate vicinity of the site (adjoining properties only). Preference will be given to seed collected on site, and seed will only be collected from adjoining properties if insufficient seed is able to be collected on site. Depending on the time frame of the proposed development, the recent wildfire on site may impact on seed production in the coming season. In the event that insufficient seed can be collected either on site or on adjoining properties, seed may then be collected within a 10 km radius of the site or within the naturally occurring range of the species, in order of preference.

The collected seed will be submitted to specialist native nurseries for seed storage and propagation. Tubestock quantities propagated would be based on nominated out-planting densities as determined by the proposed off-set ratio of 1:5. Determination of tubestock quantities will also include a contingency for natural out planted tubestock attrition (20%). This calculates to the propagation of a minimum total of 12,486 Swamp Tea-tree plants. It is noted that an additional (and significant) number of site seed-derived Swamp Tea-tree tubestock will be grown by specialist contractor for outplanting in stormwater drainage/treatment and street landscaping areas. Refer to **Table 5.1** below for an outline of the estimated schedule for the seed collection and propagation process.

Table 5.1 – Estimated Schedule for Swamp Tea-tree Seed Collection and Propagation

Process	Estimated Schedule
Seed Collection	Seed is to be collected during late summer (expect February 2011 and/or 2012 depending on given flowering season).
Seed Storage	Seed will be stored from time of collection until 6 months prior to proposed outplanting.
Seed Germination and Propagation	Seed germination and propagation will commence 6 months prior to proposed outplanting, as a 6 month period is required from seed germination for plants to reach a suitable outplanting size.

5.2.3 Targeted Soil Investigation

Prior to commencement of rehabilitation works, it is recommended that a targeted soil survey be conducted on site. The purpose of the soil survey would be to ensure the soil within the proposed rehabilitation area provides a suitable soil type for successful regeneration of a Swamp Tea-tree Forest. Given the growth of Swamp Tea-tree in the immediate vicinity of the rehabilitation area, it is expected that soil conditions will be suitable, however testing will provide confirmation. It is recommended that soil test pits are positioned within the following locations:

- Proposed rehabilitation area;
- Areas on site where Swamp Tea-trees currently grow; and
- Areas on site where no Swamp Tea-trees were recorded (as comparison).

It is also recommended that a chemical analysis be conducted for soil samples collected within the proposed rehabilitation area, to ensure no chemical residues are present from past agricultural activities, which may adversely affect the rehabilitation process. Soil testing would be required to be conducted in accordance with an approved soil sampling program.

5.3 Construction Measures

5.3.1 Rehabilitation Works

Works within the rehabilitation area are proposed to occur during the construction phase of the development. The objective of the rehabilitation program is to create a Swamp Tea-tree Forest and restore it to remnant status, specifically RE 12.9-10.11. In achieving this, the rehabilitation area will be restored to an indigenous, viable, forested community that is similar in structure and floristics to the adjoining bushland remnants with minimal need for long term maintenance. Through the rehabilitation program, the aim is to:

- Revegetate the rehabilitation area using native species of local provenance that are suited to restoring a Swamp Tea-tree Forest (RE 12.9-10.11);
- Reduce the coverage of weeds, to <5% cover for declared weed species and <10% cover for environmental weed species;
- Enhance habitat for fauna within the area; and
- Enhance the aesthetic value of the development.

Rehabilitation works will include revegetation (out-planting) and weed management. Provided below are overviews on each of these work aspects. Preparation of a detailed Rehabilitation Plan is required prior to commencement of site clearing works, and prior to commencement of rehabilitation works.

The Rehabilitation Plan will provide specific detail regarding the entire rehabilitation program, including seed collection and propagation, weed control, revegetation (out-planting) and monitoring and maintenance.

Weed Management

Declared weed species (as defined in the *Qld Land Protection (Pest and Stock Route Management) Act 2002*) and environmental weeds (as identified in the *List of the 200 Most Invasive Environmental Weeds in South-East Queensland*) are to be removed from the rehabilitation area as part of the rehabilitation program. The objective of the weed management strategy for the rehabilitation area is to reduce declared weed species cover to <5% and environmental weed species to <10% cover, and gradually deplete the weed soil seed bank. Not only will this assist in the success of the revegetation works but it will also limit the spread of weed species from the development site into the adjoining remnant bushland.

Weed control will be coordinated and undertaken by a qualified bush regenerator. It is proposed that primary weed control will be undertaken in winter (dependant on construction timeframe) prior to the onset of flowering/fruiting season. Primary weed control is to occur prior to the commencement of revegetation (out-planting) works, to assist in preparation of the rehabilitation area. Secondary weed control will then also be undertaken on a monthly basis following the completion of primary weeding to limit the reinvasion of weed species.

Weed control will be undertaken in a targeted manner, with consideration given to the target weed species and the most appropriate control method (e.g. mechanical removal, chemical or biological), variety of herbicide (where chemical control is employed) and equipment (e.g. backpack sprayer, mechanised spray unit, boom spray). This will assist to reduce the incidence of accidental loss of revegetation stock and will allow natural regeneration to occur.

Revegetation (Out-planting)

The revegetation program involves the out-planting of locally sourced native tubestock, including emergent and canopy species. Refer to Table 5.2 for estimates of tubestock numbers for each stratum. As discussed above, the objective of the rehabilitation program is to create a Swamp Tea-tree Forest and restore it to remnant status, specifically RE 12.9-10.11. As such, Swamp Tea-tree is to be the dominant species within the community, for which tubestock are to be obtained from the collection and propagation of locally sourced seeds (Section 5.2.2). Given the magnitude of the proposed rehabilitation area and the proposed offset ratio, it was not considered feasible to propose a translocation program for existing Swamp Tea-trees on site. This is further supported by the damaged condition of the majority of Swamp Tea-trees on site (evident through the multi-stemmed shrub growth form) (Cooper et al., 1995) and the additional factor of the majority of Swamp Tea-trees being burnt by the recent wildfire. It was considered more suitable to provide healthy tubestock with no issues that may restrict the success of the revegetation program. It is proposed that no low mid stratum (low shrubs) will be included within the rehabilitated community, as Swamp Tea-tree Forest generally lacks shrubs (Cooper et al., 1995).

An emergent Eucalypt stratum dominated by Narrow-leaved Ironbark and Forest Red Gum (*Eucalyptus tereticornis*), is also to be included within the rehabilitated community. Although RE 12.9-10.11 does not necessarily require emergent trees to meet the floristic requirements of this RE type, the increase in diversity and additional habitat features associated with an emergent stratum are considered to provide significant value. Cooper et al. (1995) noted that emergent Eucalypts contribute significantly to the richness of Swamp Tea-tree forests, through the provision of tall perches for birds, Koala habitat, shelter for arboreal fauna and reptiles and foraging habitat for insectivorous and nectivorous fauna. Narrow-leaved Ironbark and Forest Red Gum have been selected as the dominant emergent species as these species are characteristic of RE 12.9-10.11 and were both recorded to occur on site. In addition, Cooper et al. (1995) observed these species to be the dominant emergent stratum species in Swamp Tea-tree forest east of the Bremer River, during their study of Swamp Tea-tree Forest in the locality. The site is located to the east of the Bremer River.

Tubestock for the emergent stratum is to be sourced from local nurseries, where possible. For the purpose of this project, local nurseries are those within 10 km of the site. Where demand cannot be met within the 10 km radius, stock will be sourced from nurseries located further afield but within the South-Eastern Queensland bioregion. In the event of limited tubestock availability (with regards to either species selection or tubestock numbers), collection of local seed provenance and propagation of seed at local specialist nurseries may be required.

Ground stratum species are not proposed to be included within the revegetation program, as soil seed stocks combined with natural regeneration from adjoining vegetation, are expected to provide sufficient seed for re-generation of this stratum. In addition, ground stratum species within Swamp Tea-tree Forest are often distinct species reflective of heavy shade and clay soils. As the revegetated Swamp Tea-tree Forest will not initially provide heavy shade, conditions may not be suited to Swamp Tea-tree Forest specific ground stratum species. Targeted weed control would comprise an important component of this strategy to ensure weed invasion does not inhibit natural regeneration of ground stratum species.

Table 5.2 - Proposed Planting Densities and Tubestock Numbers for the Rehabilitation Area

Stratum	Example Species	Density	Numbers
Emergent	Narrow-leaved Ironbark; Forest Red Gum	1 tree/100 m^2	80
Canopy	Swamp Tea-tree	1 tree/9.6 m^2	10,405

5.4 Post-construction Measures

5.4.1 Monitoring and Maintenance Regime

Post-construction measures for the rehabilitation area are to include a monitoring and maintenance regime. The monitoring and maintenance regime is intended to contribute to the success of the rehabilitation program through ongoing identification and management of key threatening processes and replacement of unsuccessful tubestock to achieve the prescribed survival rate.

Monitoring is to be undertaken by a qualified bush regenerator and is to assess plant health, tubestock survival rates and weed presence. Monitoring is to commence following the completion of revegetation works and is to continue until the rehabilitated area attains remnant status. A detailed monitoring and maintenance program is to be included within the approved Rehabilitation Plan.

5.4.2 Protection of Rehabilitation Area

The proposed rehabilitation area is to be sufficiently separated from the surrounding proposed industrial development to ensure edge effects are minimised. The western boundary of the proposed rehabilitation area is proposed to be bound by a road, which will separate the rehabilitation area from industrial land use to the west. The northern boundary of the rehabilitation area is proposed to adjoin an industrial allotment, however, buildings on this allotment are to be setback a minimum of 20 m from the rehabilitation area boundary, and the industrial allotment is also to be fenced. This will minimise interaction between the rehabilitation area and the proposed industrial land use to the north. To the east, the rehabilitation area is adjacent to an allotment dedicated to a proposed stormwater detention basin and revegetation area. As this allotment is to be revegetated with locally native species (including additional Swamp Tea-tree), it is considered beneficial to allow interaction between the rehabilitation area and this allotment to the east. As such, no setbacks are required for the eastern boundary of the rehabilitation area.

In addition to the setbacks listed above, the site is to be reconfigured so that the proposed rehabilitation area is recognised as an individual allotment. This will assist in future management and protection of the site and will further separate the rehabilitation area from the surrounding proposed industrial land estate. The rehabilitation area is also proposed to be dedicated to either Local or State Government. In the event that neither Local nor State Government has interest in obtaining the area, the rehabilitation area is to be protected under an environmental covenant by a covenantor.

Conclusions and Recommendations

6.1 Conclusions and Recommendations

This Targeted Management Plan for Swamp Tea-tree has been prepared with regard to future development of the site identified as Lot 226 Cunningham Highway, Mutdapilly, Qld (Lot 226 on RP220388). Swamp Tea-tree is listed as an Endangered species under the NC Reg and is considered to be a 'protected' species under the NC Act. A licence/permit is therefore required to allow for the 'taking' of Swamp Tea-trees on site.

A key component of the Management Plan was to conduct a targeted survey for Swamp Tea-tree on site. A wildfire burnt through the site prior to completion of the survey (approximately 75% complete). However, based on the number of trees surveyed, calculations to determine the total number of trees on site were able to be performed. The calculations determined that approximately 2081 Swamp Tea-trees currently occur on site, with a mean height of 2.97 m (+/-1.11 sd) and a mean width of 1.83 m (+/-0.83 sd).

The Swamp Tea-tree population on site was determined to be scattered regrowth within cleared agricultural land, rather than a Swamp Tea-tree Forest. This was indicated by the sparse nature of the population and the predominant growth form of multi-stemmed shrubs rather than trees. The Swamp Tea-tree population was not considered to comprise Remnant RE 12.9-10.11 or RE 12.3.3c, which are the RE types representative of Swamp Tea-tree Forest (DEWHA, 2010). The Swamp Tea-tree population was also not considered to comprise the additional Swamp Tea-tree community RE types presented by Ryan (2010) (RE 12.9-10.11a, RE 12.3.3b and RE 12.5.2x). As such, the Swamp Tea-tree population on site is not considered to comprise a Swamp Tea-tree Forest and is therefore not protected under the EPBC Act.

The proposed development requires the clearing of the majority of Swamp Tea-trees on site. To offset the proposed clearing of Swamp Tea-trees, a 10 ha area on site is to be rehabilitated as a Swamp Tea-tree Forest. The rehabilitation area will be revegetated with emergent and canopy species suited to RE12.9-10.11, with the aim to restore the area to an indigenous, viable, forested community. Swamp Tea-trees are to be planted at a 1:5 ratio, based on the total number of trees currently on site, with seed collected and propagated from either trees on site or in the immediate site vicinity. Rehabilitation works are to be conducted in accordance with a detailed Rehabilitation Plan. This is to include weed control works, revegetation (out-planting) and a monitoring and maintenance program. It is also recommended that a soil testing survey is conducted on site prior to the commencement of rehabilitation works.

The rehabilitation strategy concept presented within this report will provide a net benefit to Swamp Tea-tree on site and within the locality, from both a tree numbers and ecological value perspective. This will ultimately provide a beneficial impact to individual Swamp Tea-trees and Swamp Tea-tree Forest within the locality.

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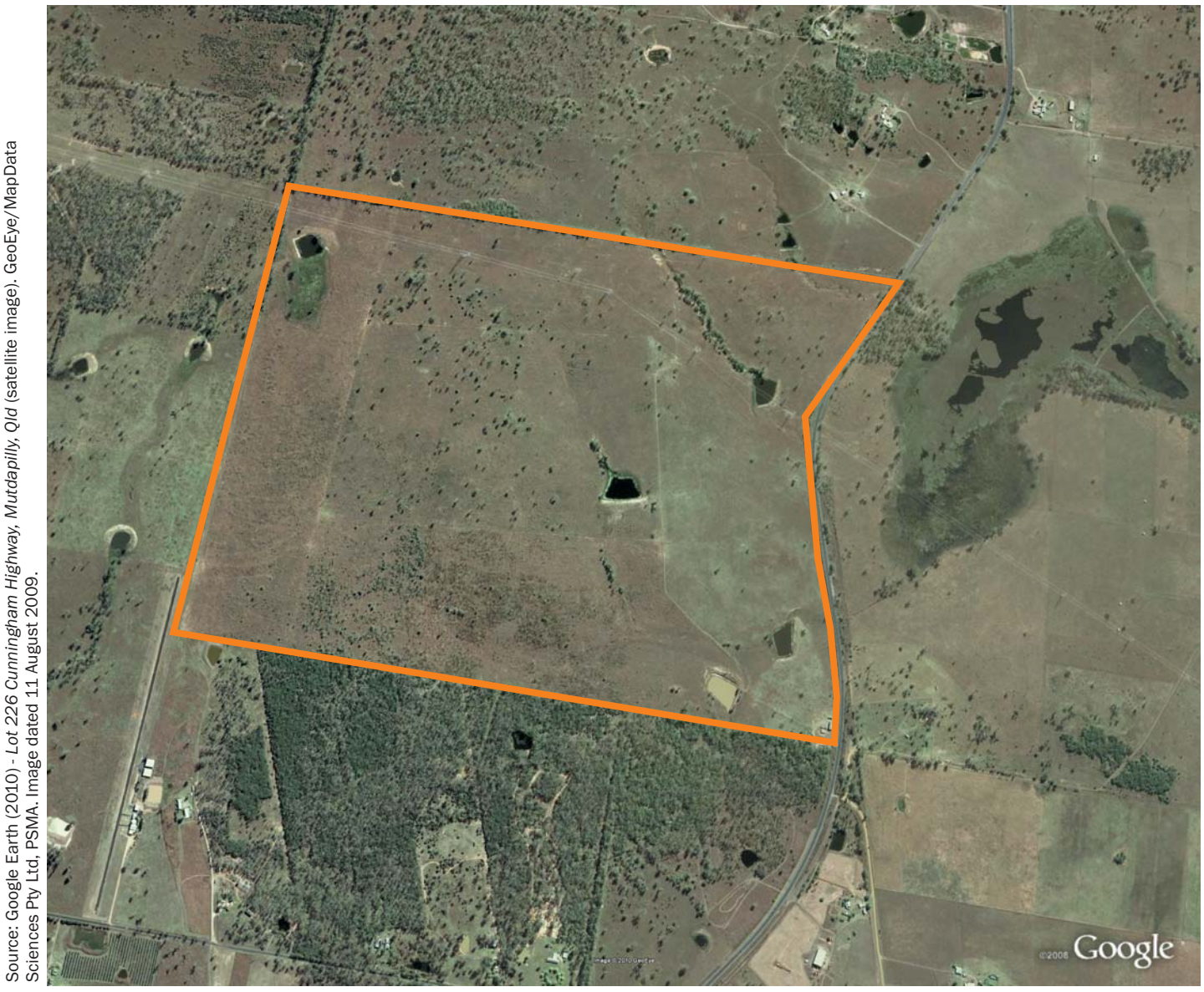
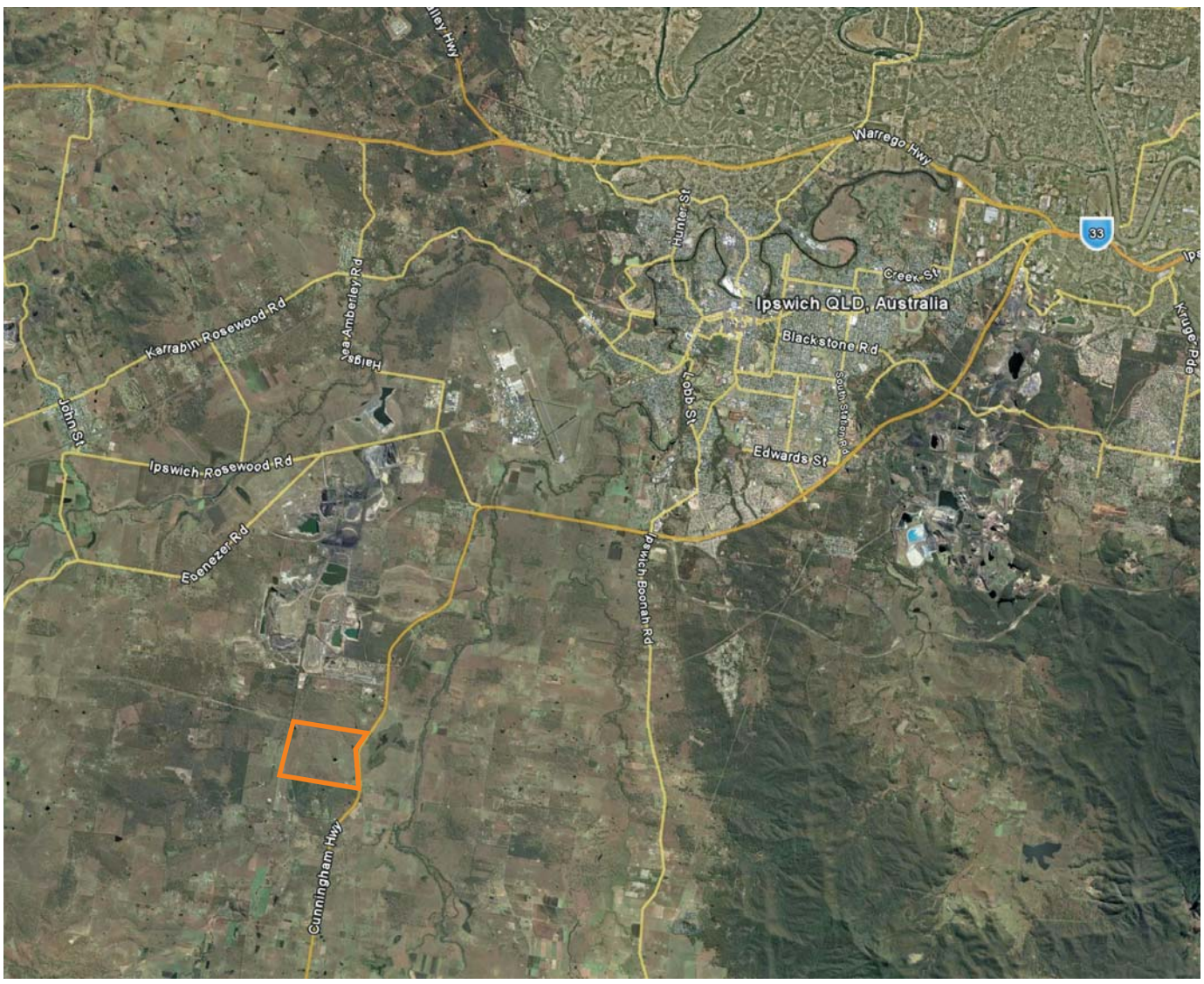
Figures



Source: Google Earth (2010) - *Lot 226 Cunningham Highway, Mutdapilly, Qld* (satellite image). GeoEye/MapData Sciences Pty Ltd, PSMA. Image dated 11 August 2009.



Source: Google Earth (2010) - *Lot 226 Cunningham Highway, Mutdapilly, Qld* (satellite image). GeoEye/Sinclair Knight Merz & Fugro/MapData Sciences Pty Ltd, PSMA. Image dated 16 April 2007 - 11 August 2009.

LEGEND

Site Boundary

NOTES:
1. Map indicative only
2. Map to be printed in A3
3. Aerial imagery does not accurately reflect current vegetation on site due to land management practices

Figure 1.1 - Locality Plan

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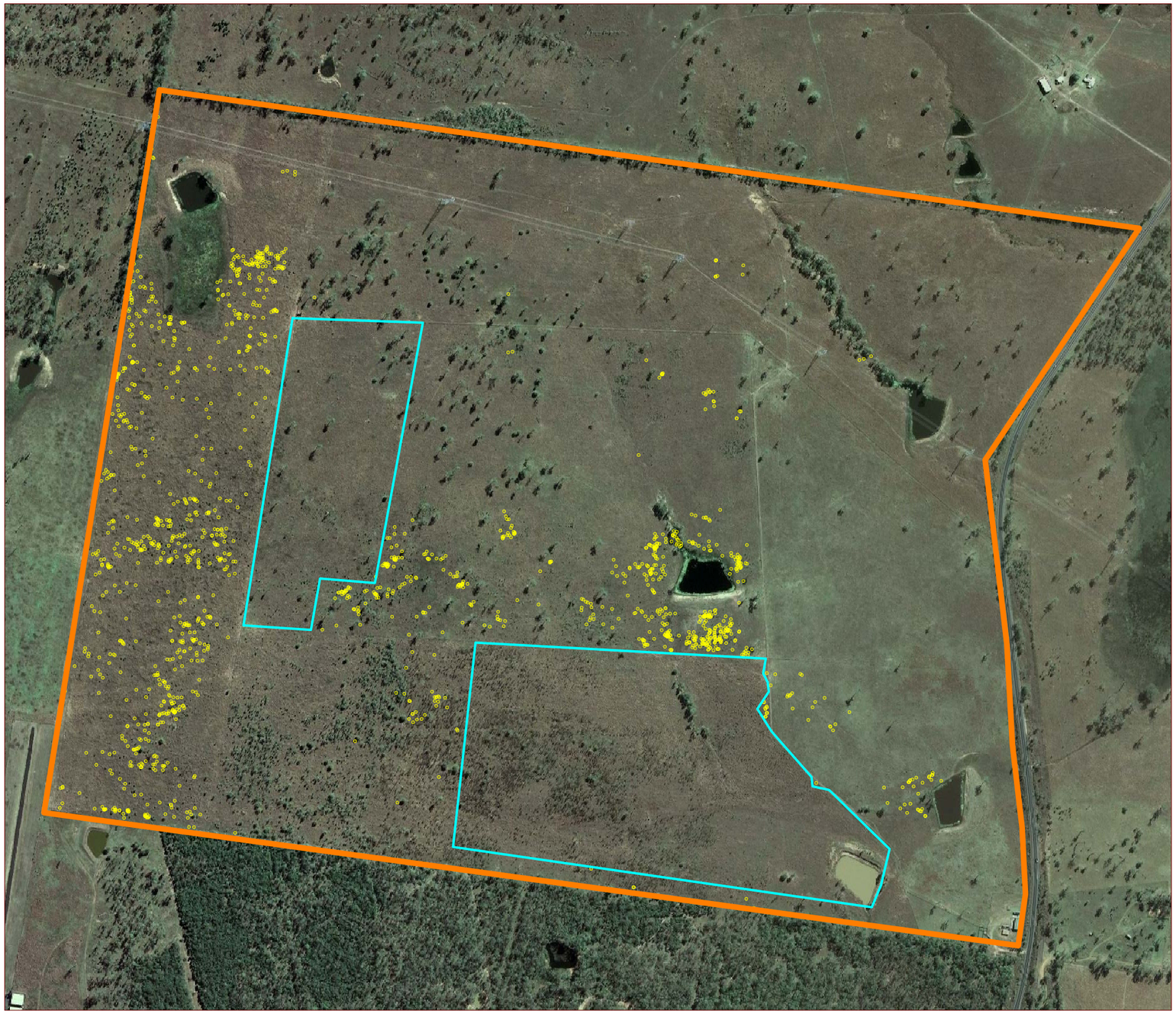


Source: Google Earth (2010), *Lot 226 Cunningham Highway, Mutdapilly, Qld (satellite image)*. GeoEye/MapData Sciences Pty Ltd, PSMA. Image dated 11 August 2009.

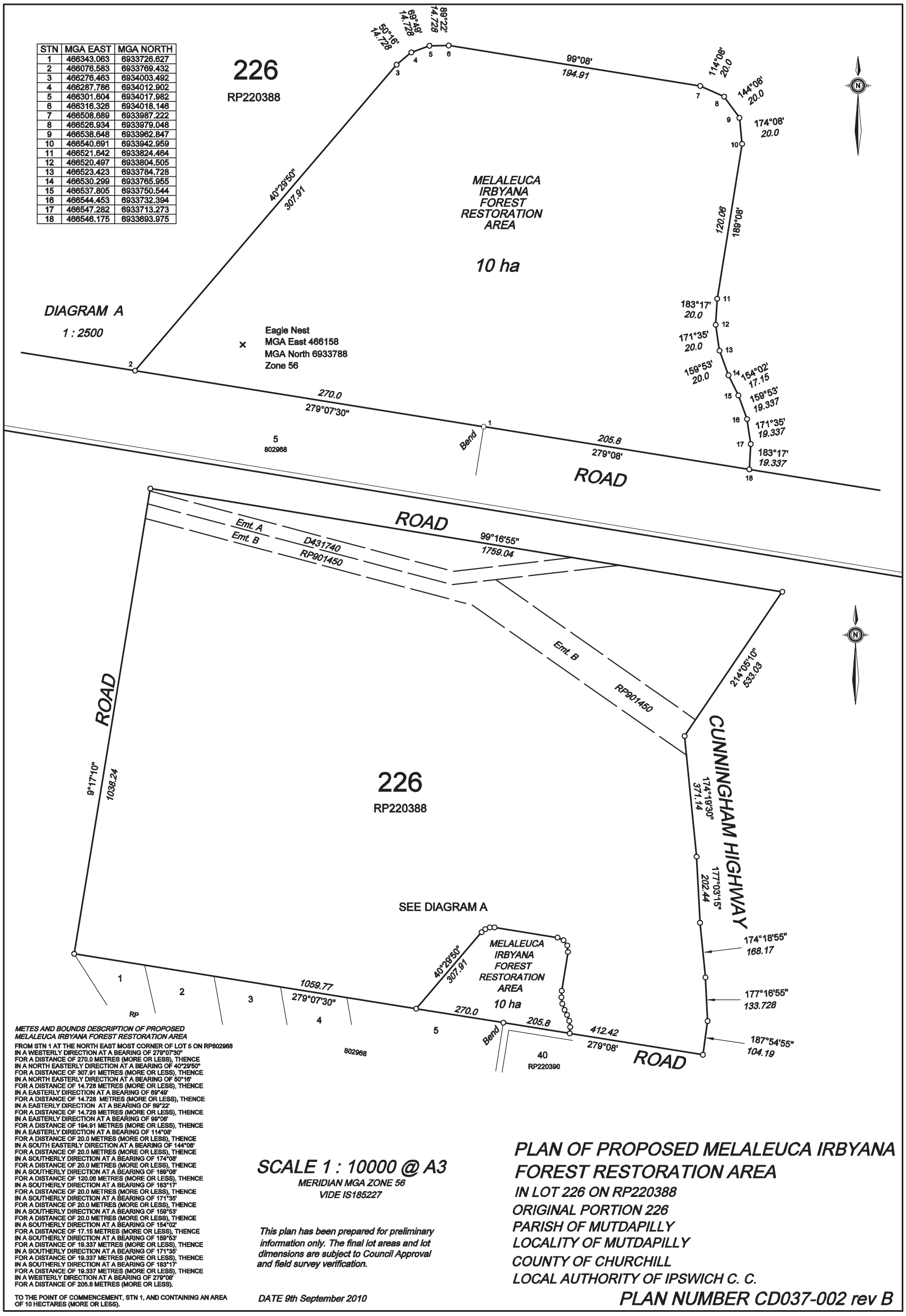
LEGEND

- Site Boundary
- Areas of the site not surveyed for Swamp Tea-tree prior to the wildfire on 16 August 2010
- Swamp Tea-tree *(Melaleuca irbyana)* surveyed on site

NOTES:

1. Map indicative only.
2. Map to be printed in A3.
3. Land management practices have altered vegetation on site. As such, aerial imagery does not accurately reflect current vegetation on site.
4. Survey points for *Melaleuca irbyana* were collected prior to a wildfire that burnt the site on 16 August 2010. While some attrition may have occurred as a result of the fire, it is expected that the majority of trees will re-shoot.
5. As the survey had been completed for approximately 75% of the site prior to the wildfire, the number of Swamp Tea-tree individuals over the remaining 25% of the site (blue outlined area) was estimated based on an Orogen ecologist's knowledge of the site as well as the number of trees counted over the balance of the site. The total number of trees on site was calculated to be 2081.

Figure 3.1 - Swamp Tea-tree (Melaleuca irbyana) Distribution Plan



NOTES:
1. Map indicative only.
2. Map to be printed in A3.

Figure 5.1 - Plan of Proposed *Melaleuca irbyana* Forest Restoration Area