







LEGEND

 Distribution of Freshwater Wetland EEC

Total Area	Retained	Removed
4.12ha	2.72ha	1.40ha

-  RESIDENTIAL
-  RETIREMENT COMMUNITY
-  LOW- MEDIUM DENSITY HOUSING
-  NEIGHBOURHOOD CENTRE

-  COMMUNITY USE
-  PARK/ OPEN SPACE
-  CONSERVATION ZONE 4.9ha
-  REMNANT VEGETATION

-  100m SEPP 26 BUFFER
-  SEPP 14 WETLAND
-  10m BOUNDARY BUFFER
-  SITE BOUNDARY

50 0 50 100 150 200 250m 1:5000

Freshwater wetland EEC mapping provided by GeoLINK, May 2008  
Concept plan sourced from Drawing No. 06115p3A1J  
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Rev: Orig. Date: 9 June 2010

Petrac Lennox Head Pty Ltd

CAD FILE: I:\7801-71\Acad\Environmental Impact Assessment and Mitigation Strategy\Figure 5c - Removal and retention of Freshwater wetland EEC associated with Approved Concept plan.dwg  
XREF's:

Scale 1:5,000 (A3)

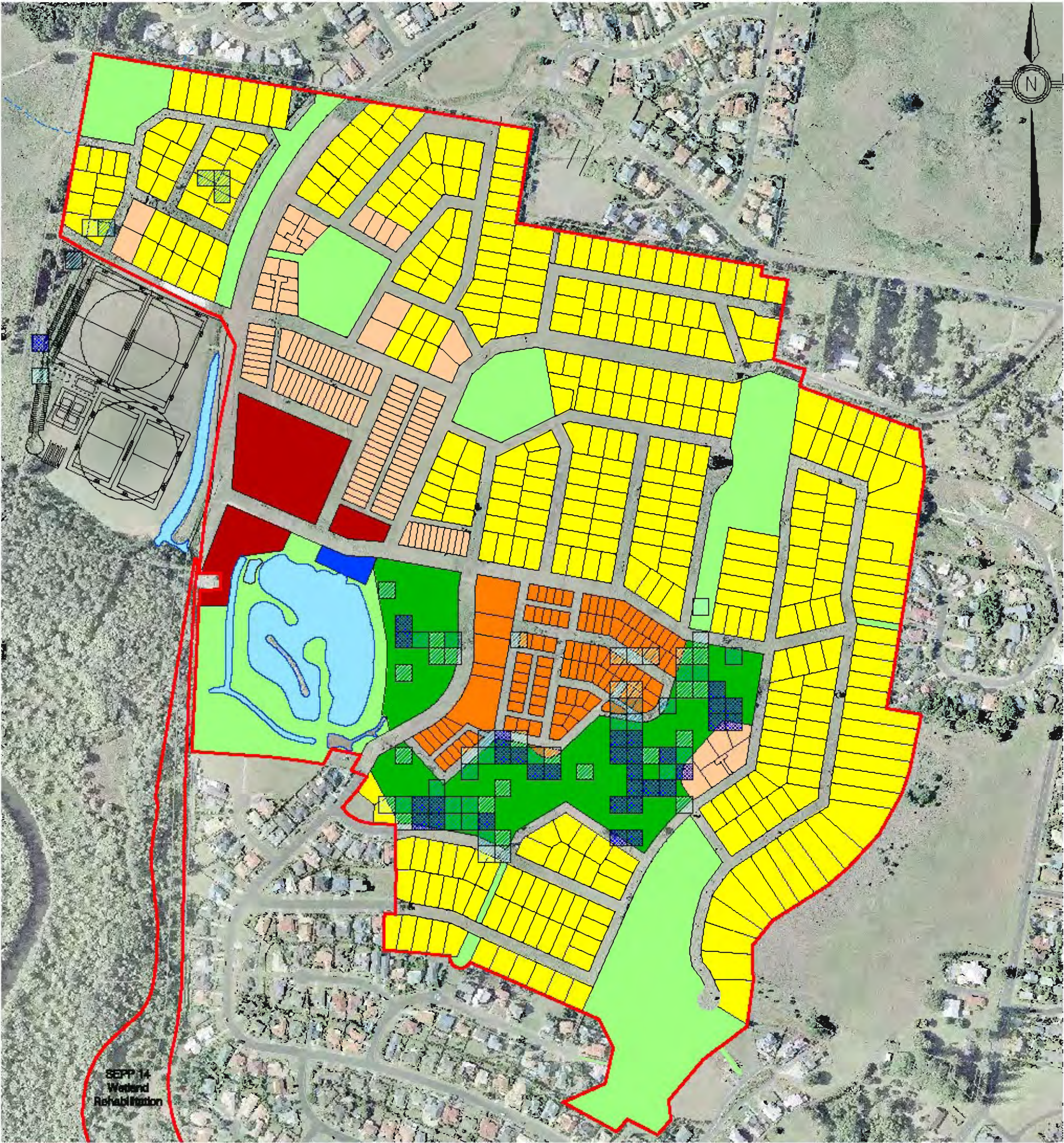
FIGURE 5c

REMOVAL AND RETENTION OF FRESHWATER WETLAND EEC  
ASSOCIATED WITH APPROVED CONCEPT PLAN

Project No.: 7801/71

PRINT DATE: 27 August, 2010 - 11:18am





**Cover of Hairy Joint Grass**

- Very low (0 - 5%)
- Low (5 - 30%)
- Medium (30 - 70%)

Cover	Total Area	Retained	Removed
Very Low	1.32ha	0.75ha	0.56ha
Low	1.08ha	0.71ha	0.37ha
Medium	1.24ha	1.12ha	0.12ha
TOTAL	3.64ha	2.58ha	1.06ha

**LEGEND**

- Residential
- Retirement Community
- Low-Medium Density Housing
- Neighbourhood Centre
- Community Use
- Park / Open Space
- Conservation Zone - 6.5ha
- Site boundary

50 0 50 100 150 200 250m  
1:5000

Scale 1:5,000 (A3)

**FIGURE 6a**

**REMOVAL AND RETENTION OF HAIRY JOINT GRASS ASSOCIATED  
WITH AMENDED CONCEPT PLAN**

Project No.: 7801/71

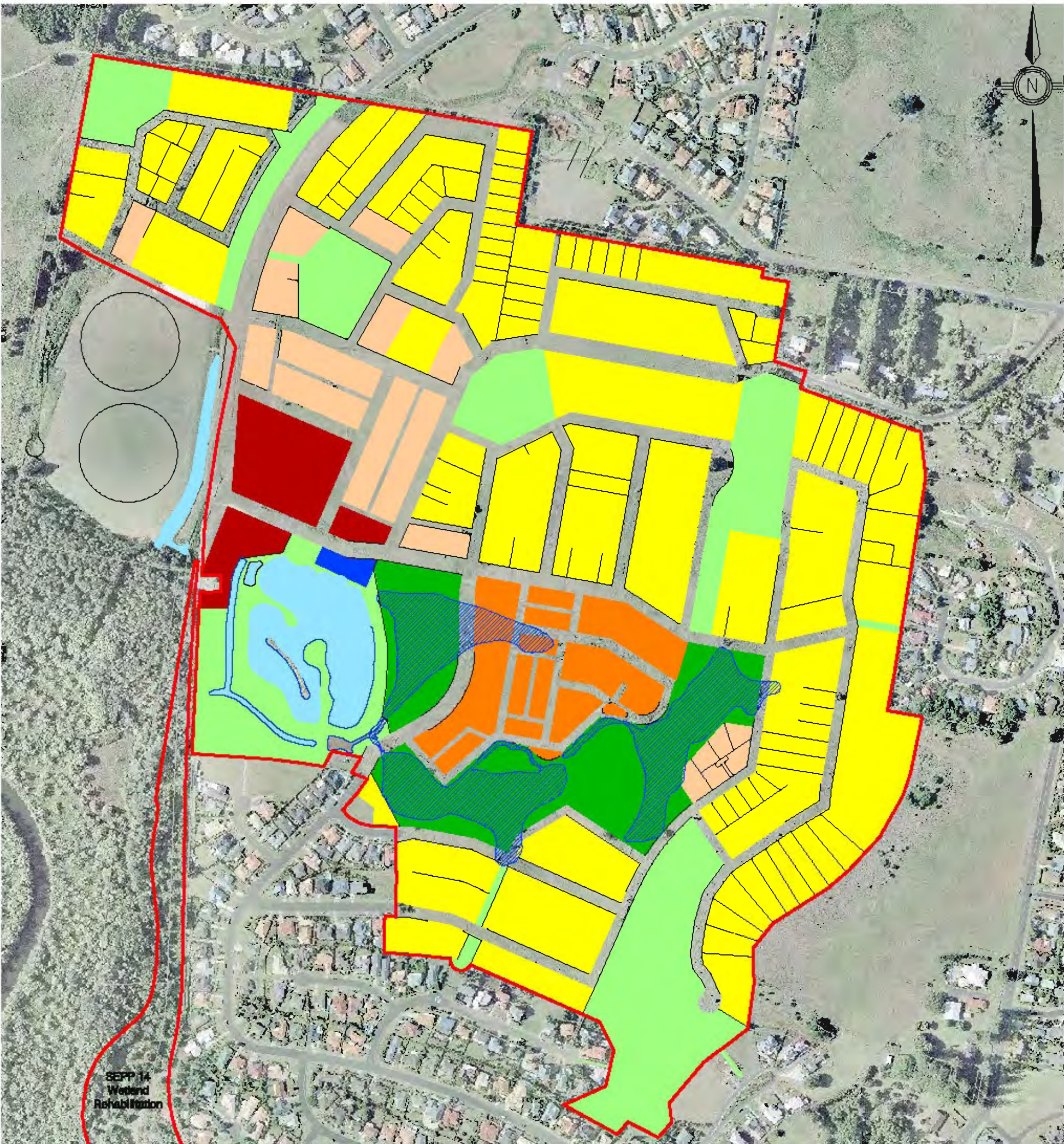
PRINT DATE 27 August, 2010 - 2:31pm

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**LEGEND**

 Distribution of Freshwater Wetland EEC

Total Area	Retained	Removed
4.12ha	3.58ha	0.54ha

-  Residential
-  Retirement Community
-  Low-Medium Density Housing
-  Neighbourhood Centre
-  Community Use
-  Park / Open Space

-  Conservation Zone - 6.6ha
-  Site boundary

50 0 50 100 150 200 250m  
1:5000

Freshwater wetland EEC mapping provided by GeoLINK, May 2008  
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Rev: Orig. Date: 6 July 2010

Pacific Pines Estate Pty Ltd

CAD FILE: L:\7801-TX Aerial Environmental Impact Assessment and Mitigation Strategy\Figure 6c - Removal and Retention of Freshwater Wetland EEC. Associated with Amended Concept plan\_v1.dwg

XREFs:

Scale 1:5,000 (A3)

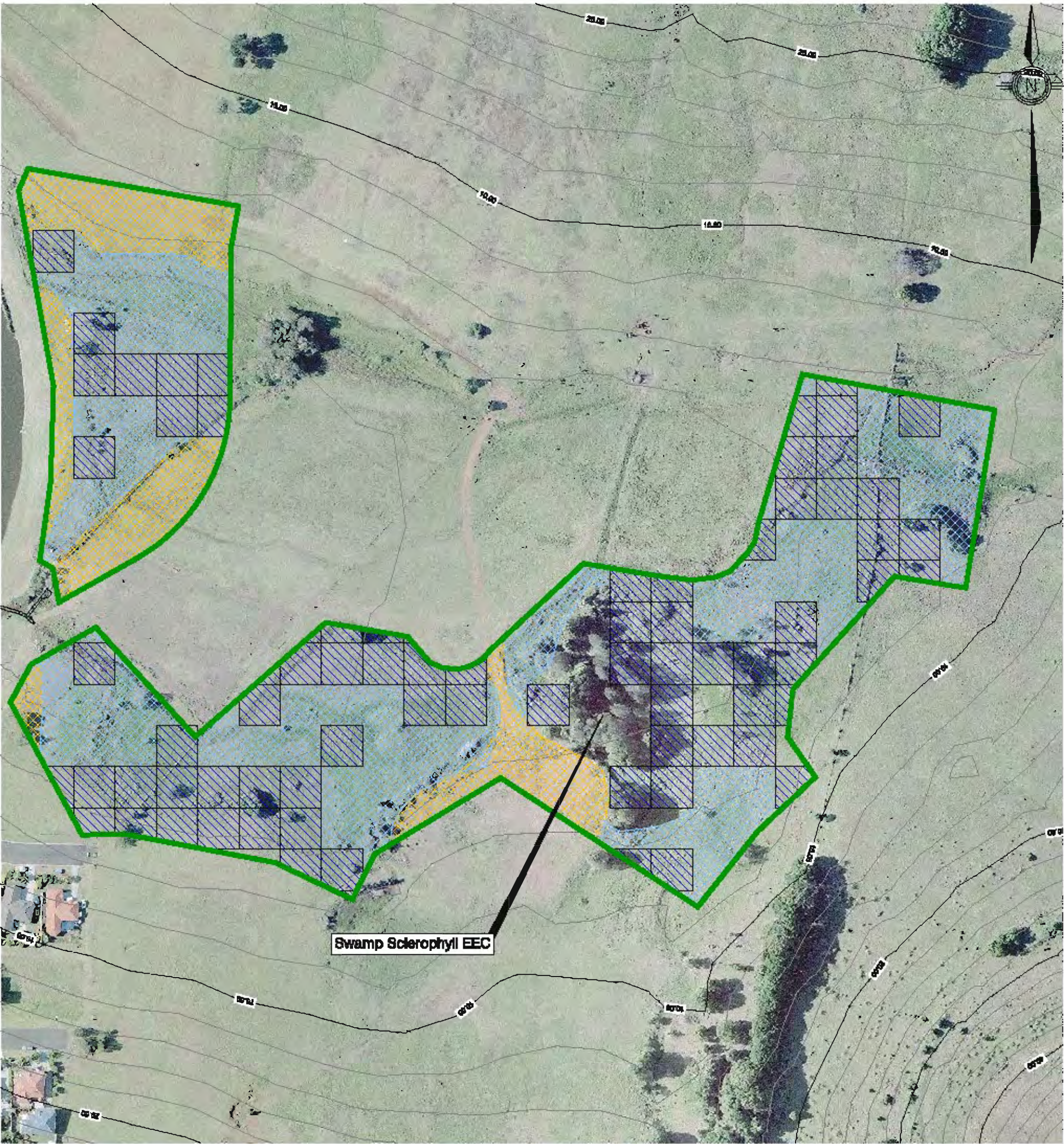
**FIGURE 6c**

**REMOVAL AND RETENTION OF FRESHWATER WETLAND EEC  
ASSOCIATED WITH AMENDED CONCEPT PLAN**





Project No.: 7801/71

PRINT DATE: 27 August, 2010 - 2:32pm





**LEGEND**

-  Hairy Joint Grass
-  Conservation Zone Boundary
-  Potential constructed wetland habitat - 1.02ha
-  Existing wetland habitat - 2.47ha

50 0 50 100 150 200 250m  
1:5000

Scale 1:5,000 (A3)

**FIGURE 7a**

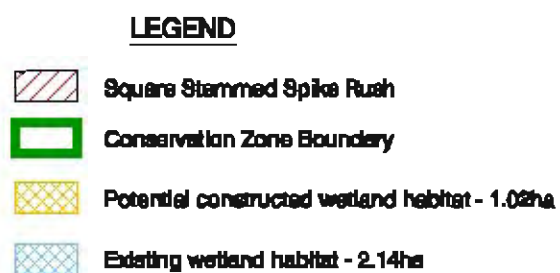
**AREAS OF POTENTIAL ADDITIONAL HAIRY JOINT GRASS IN  
CONSERVATION ZONE**

Project No.: 7801/71

PRINT DATE 07 July, 2010 - 14:54h

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**Scale 1:5,000 (A3)**

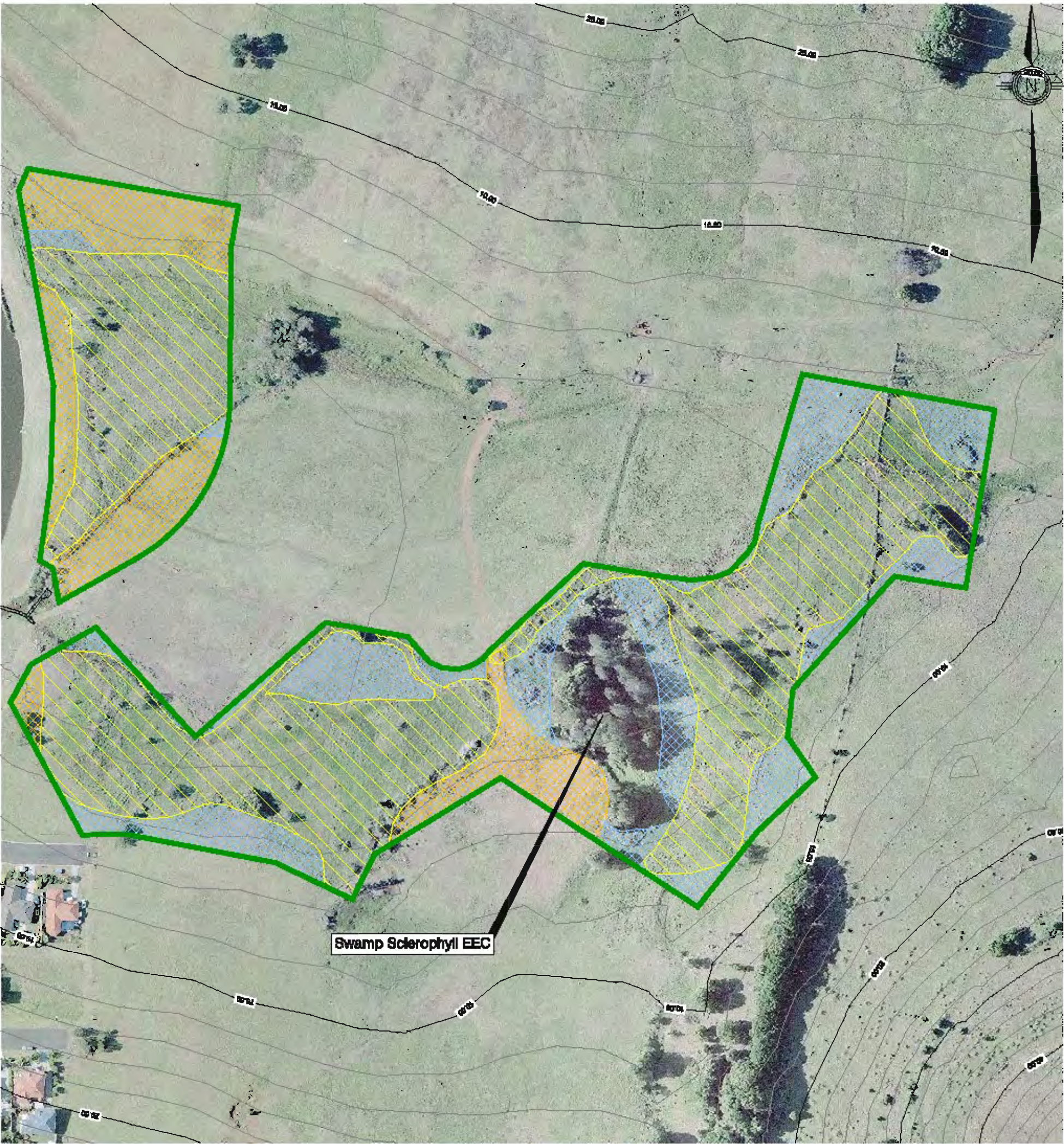
**FIGURE 7b**

## Project No.: 7801/71

Rev. Orig. Date: 7 July 2010

**Petrac Lennox Head Pty Ltd**  
 CAD FILE: \\C001-TR\Acad\Environmental Impact Assessment and Mitigation Strategy\Figure 3 - Areas of potential and additional habitat in conservation zoning.dwg  
 XREF:





**LEGEND**

-  Freshwater Wetland
-  Conservation Zone Boundary
-  Potential constructed wetland habitat - 1.02ha
-  Existing wetland habitat 1.37ha

50 0 50 100 150 200 250m  
1:5000

Scale 1:5,000 (A3)

**FIGURE 7c**

**AREAS OF POTENTIAL ADDITIONAL FRESHWATER WETLAND EEC  
IN CONSERVATION ZONE**

Project No.: 7801/71

PRINT DATE 07 July, 2010 - 5:48pm

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# **APPENDIX A**

## **Current Curriculum Vitae**



## Dr Monica Campbell



**Current Position**  
Senior Ecologist

**Joined Cardno**  
September 2005

**Years of Experience**  
8 years (research)  
2 years (consulting)

**Profession**  
Plant Ecologist

**Qualifications**  
BSc (Hons)  
PhD

**Affiliations**  
Ecological Society of  
Australia  
University of New England  
Australian Network for Plant  
Conservation

**Nationality**  
Australian

**Languages**  
English

### Summary of Experience

Monica is a plant ecologist with approximately 10 years of postgraduate experience in the conduct of ecological research, surveys and assessments. Monica has gained a high level of botanical survey skills, including the identification of rare and threatened plant species, through over eight years of working as a field ecologist in a variety of ecosystems on the New England Tablelands in northern New South Wales. During this time Monica was involved in a number of projects, including her PhD research project, which provided scientific advice to land management agencies such as the NSW National Parks and Wildlife Service, to assist in the development of management guidelines for the conservation of threatened plant species and ecosystems.

Since joining Cardno, Monica has become familiar with many aspects of Commonwealth, State and local government legislation having a biodiversity conservation focus. As a consultant Monica has provided clients with service and advice in the areas of ecological surveys and assessments, vegetation and weed management, Regional Ecosystem mapping and classification, and ecosystem restoration strategies.

### Significant Projects

Some examples of projects that Monica has worked on, prepared reports for or assisted with:

- Rainbow Beach, Bonny Hills – Open Space Habitat and Drainage Corridor Management Strategy, Vegetation Management Plan, Wetland Revegetation Plan
- Northeast Business Park – Terrestrial Ecological Assessment Report
- Pacific Pines Estate – Hairy Joint Grass Management Strategy
- Fitzroy River to Capricorn Coast Pipeline – Property Vegetation Management Plan, Essential Habitat Management and Restoration Plan, and Waterway Vegetation Management and Restoration Plan, Mangrove Clearance and Revegetation Management Plan.
- Extractive Industries, Woongoolba – Fisheries Habitat Management and Restoration Plan

### Summary of Awards

Australian Post Graduate Award Industry (APAI) – Research Linkage Grant between the University of New England, Armidale and New South Wales National Parks and Wildlife Service. Years Awarded: 2000-2005

N. C. W. Beadle Grant in Botany – Internal Research Grant, University of New England, Armidale NSW. Years Awarded: 1999-2005



## Professional History

2005 - Current

### Senior Ecologist – Cardno (QLD) Pty

Responsible for:

- undertaking ecological assessments including flora and fauna surveys;
- preparation of reports (including management plans, restoration and rehabilitation plans, ecological assessments and ecological constraints analyses) and Information Request Responses and Referrals to a variety of Commonwealth, State and Local government agencies;
- client liaison; and
- preparation of job proposals and detailed work cost estimates.

2005

### Expert Botanist – Agricultural Information and Monitoring Services, NSW

*Project Title: Inspection of roadside vegetation Four Mile Creek to Bolivia Hill for presence of any threatened species, noxious weeds and unsound trees.*

- surveyed roadside vegetation marked for realignment, formation widening and bridge replacement by the Roads and Traffic Authority, NSW;
- identified threatened flora and weed species in the road reserve and provided management guidelines; and
- classified trees outside the limits of clearing that were unsound according to RTA specifications.

2000-2005

### Plant Ecologist (APAI) – NSW National Parks and Wildlife Service, Northern Directorate

*Project Title: Plant population dynamics in eucalypt forest understoreys exposed to varying disturbance regimes.*

- conducted full floristic surveys of Wet Sclerophyll Forest in several National Parks;
- designed and implemented detailed demographic studies on key understorey plant species;
- developed guidelines for adaptive management to achieve forest rehabilitation and conservation; and
- prepared annual reports, applications for scientific licenses and research funding.

2000-2004

### Demonstrator/Tutor for undergraduate units: Biology 120, Ecology 210, Ecology 220, Ecology 302 – University of New England, Armidale NSW.

- prepared teaching and laboratory materials;
- demonstrated correct use of equipment and safe practice in a laboratory environment;
- conducted tutorials to improve the understanding of unit content;
- supervised student groups on field excursions; and
- marked first year biology essay and practical exams.

1999-2000

### Research Assistant – A/Prof Peter Clarke, University of New England Armidale NSW

*Project Title: Fire Ecology of rare plants at Torrington State Recreation Reserve and Research on and monitoring of populations of Boronia granitica (Granite Boronia)*

- assessed germinability of the soil-stored seed bank;
- conducted surveys of post-fire response in rare plant species;
- designed and implemented multi-factorial germination trials; and
- collected, collated and analysed experimental data.



Paper/Presentations	
<p>Refereed Journals</p>	<p><b>Campbell, M. L. &amp; Clarke, P.J.</b> (2006) Seed dynamics of resprouting shrubs in grassy woodlands: seed rain, predators and seed loss constrain recruitment potential. <i>Austral Ecology</i> <b>31</b> (8), 1016-1026.</p> <p><b>Campbell, M. L. &amp; Clarke, P.J.</b> (2006) Response of montane wet sclerophyll forest understorey species to fire: evidence from high and low intensity fires. <i>Proceedings of the Linnean Society of New South Wales</i> <b>127</b>, 63-73.</p> <p>Clarke, P.J., Knox, K. J. E., Wills, K. E and <b>Campbell, M. L.</b> (2005) Landscape patterns of woody plant response to crown fire: disturbance and productivity influence sprouting ability. <i>Journal of Ecology</i> <b>93</b> (3), 544-555.</p>
<p>Other Publications</p>	<p><b>Campbell, M. L.</b> (2005) <i>Population dynamics of montane wet sclerophyll forest understorey species</i>. PhD Research Thesis, University of New England, Armidale, NSW.</p> <p>Bell, D. T., <b>Campbell, M. L.</b> &amp; Bruhl, J. J (2000) <i>Population dynamics and disturbance regime of the threatened plant: Square-stemmed spike rush, Eleocharis tetraquetra</i> Nees. Technical Report to the NSW National Parks and Wildlife Service.</p> <p>Clarke, P. J and <b>Campbell, M. L.</b> (2000) <i>Research on and monitoring of populations of Boronia granitica (Granite Boronia)</i>. Technical Report to the NSW National Parks and Wildlife Service.</p> <p><b>Campbell, M. L.</b> (1999) <i>Soil seed bank dynamics of four sympatric species of sub-shrubs in grassy woodlands on the New England Tablelands</i>. Honours Research Thesis, University of New England Armidale NSW.</p>
<p>Examples of Oral and Poster Presentations</p>	<p><b>Campbell, M. L.</b> (2005) <i>Population dynamics of montane wet sclerophyll forest understorey species: Implications for management</i>. Invited Speaker - Queensland Herbarium Seminar Series, Brisbane Botanic Gardens, Mt Coot-tha.</p> <p><b>Campbell, M. L.</b> (2005) <i>Population dynamics of montane wet sclerophyll forest understorey species</i>. Invited Speaker - Department of Environment and Conservation Seminar Series, Hurstville, NSW.</p> <p><b>Campbell, M. L.</b> (2004) <i>Montane wet forest dynamics: the final chapter</i>. School of Environmental Sciences and Natural Resources Management seminar series, University of New England Armidale, NSW.</p> <p><b>Campbell, M. L., Clarke, P. J. &amp; Keith, D. A.</b> (2003) <i>Herbivory limits seedling establishment in montane wet forests</i>. Oral presentation, Ecological Society of Australia Annual Conference, Armidale NSW.</p> <p><b>Campbell, M. L.</b> (2001) <i>Do wet sclerophyll shrubs accumulate a soil seed bank?</i> Poster presentation, Ecological Society Of Australia Annual Conference, Wollongong NSW.</p> <p><b>Campbell, M. L.</b> (2000) <i>What factors regulate the dynamics of montane wet forest shrubs?</i> Poster Presentation, Ecological Society of Australia Annual Conference, Melbourne NSW.</p> <p><b>Campbell, M. L.</b> (1999) <i>Soil seed bank dynamics of four sympatric sub-shrub species in grassy woodlands</i>. School of Environmental Sciences and Natural Resources Management seminar series. University of New England Armidale. NSW.</p>



## Robert Speirs



### Current Position

Ecologist

Years' Experience: 2

Joined Cardno

January 2008

Profession

Ecologist

Qualifications

BAppSc (Ecology &  
Environmental Science)  
University of Canberra 2004

Affiliations

M-EIANZ

Nationality

Australian

### Summary of Experience/ Expertise

Robert is an Ecologist who has worked with Cardno since January 2008. Robert completed his Bachelor of Applied Science in 2004 with a focus on vegetation and wildlife ecology, natural resource management and cultural heritage management.

Robert has since worked in a number of natural resource management roles within government and non-government organisations. In 2007 Robert played an integral role in the design and implementation of the drought management processes and procedures within Brisbane City Council.

Since joining Cardno, Robert has used the legislation and policy interpretation skills gained throughout his government regulatory experience, combined with his extensive knowledge of flora and fauna ecology, to provide superior ecological consultancy services to government and private sector clients. Robert has gained extensive experience in the conduct and preparation of flora and fauna habitat assessments, vegetation community mapping, weed infestation mapping, biodiversity and threatened species impact assessments and ecological constraints and due diligence analyses.

Robert has provided specialist ecological services and advice to the design, approval and construction phases of numerous government and private sector water supply and sewerage projects throughout the coastal bioregions of Queensland and northern NSW.

In 2008 and 2009 Robert completed the 'Queensland Regional Ecosystem Framework and its Application' and the 'Vegetation Structure and Remnant Status under the VMA 1999' training courses at the Queensland Herbarium.

### Significant Projects

- Coppabella-Ingsdon Rail Duplication - Queensland Rail
- Tallowood Close Residential Subdivision - Churches of Christ Care
- Mount Peter Master Planning Project - Cairns Regional Council
- Fitzroy River - Capricorn Coast Potable Water Pipeline - Rockhampton Regional Council
- Sarina - Mackay Potable Water Pipeline - Mackay Infrastructure Alliance
- Mother Teresa Primary School - Brisbane Catholic Education
- Pelican Waters - Pelican Waters Heart Pty Ltd
- Pacific Pines Estate - Price Waterhouse Coopers
- Pelican Point Estate - Norman and Ross Brown
- Progress Road, Kuluin - Sunshine Coast Water



## Professional History

Jan 2008 - Current

### Ecologist - Cardno (Qld) Pty Ltd

Robert's position as Ecologist with Cardno involves the following.

1. Formation and co-ordination of applications and supporting environmental reports for development approvals and permits in relation to:
  - Commonwealth Environment Protection and Biodiversity Conservation Act 1999 - referrals for projects that may impact upon matters of National Environmental Significance;
  - Queensland Vegetation Management Act 1999;
  - Queensland Nature Conservation Act 1992;
  - Queensland Nature Conservation (Koala) Conservation Plan 2006;
  - Queensland Fisheries Act 1994;
  - Queensland Coastal Protection and Management Act 1995;
  - Queensland Sustainable Planning Act 2009 and associated Sustainable Planning Regulation 2009;
  - NSW Threatened Species Conservation Act 1995 and associated State Environmental Planning Policies (SEPPs); and
  - Local government planning and environmental management legislation.
1. Preparation of ecological due diligence and constraints analyses and advice for government, residential, commercial and industrial developments.
2. Co-ordinating and summarising technical reports and other literature to respond to Development Application Information Requests issued by State and local government authorities.
3. Conducting detailed field surveys to assess habitat values for fauna species of recognised conservation significance and to assess on-site biodiversity. These field surveys include visual observations of fauna, fauna trapping, spotlighting, call recording and analysis etc.
4. Conducting detailed field surveys to assess and prepare mapping of remnant / non-remnant status, Endangered Ecological Communities (EEC), threatened flora species distribution, general species composition, vegetation structure and weed encroachment.
5. Conducting detailed assessments of the factors that determine potential bushfire hazard (vegetation composition and structure, slope and aspect) and using these assessments to prepare detailed bushfire management plans.
6. Preparation of various targeted rehabilitation management plans, revegetation plans and environmental impact amelioration strategies.
7. Project management, client/stakeholder liaison and the preparation of work proposals and detailed cost estimates.
8. Assistance with the preparation of expert witness briefs, advice and other judicial work.
9. Various OH&S Officer duties including reviewing hazards, running OH&S update meetings for the Environment Business Unit, processing incident reports and implementing company OH&S policy.

Mar 2007 - Jan 2008

### WEMP Assessor / Assessment Team Leader - Brisbane City Council, Brisbane Water

Robert's position as Water Efficiency Management Plan (WEMP) Assessor / Assessment Team Leader involved:

- reviewing and assessing Water Efficiency Management Plans (WEMP) for commercial premises under the level 5 and 6 water restrictions;
- designing commercial water efficiency assessment templates;
- administering rebate and subsidy funding applications for the Business Water Efficiency Program (BWEP);
- providing overall leadership to a team of eight staff within the WEMP assessment branch;



Sep 2006 - Jan 2007

- interpreting Queensland Government legislation in order to ensure Brisbane Water compliance with state water management procedures and processes;
- carrying out quality assurance monitoring within the assessment process;
- providing detailed reporting to senior management on project progression;
- providing quality customer service and advice to external and internal clients;
- communicating with Brisbane Water customers to obtain WEMP category and compliance details; and
- designing and implementing the ongoing water efficiency reporting and auditing program.

#### Legislation Review Technical Officer - Australian Quarantine & Inspection Services (AQIS), Department of Agriculture, Fisheries & Forestry (DAFF)

This role was primarily involved with the Import Conditions (ICON) Legislation Review. Duties included:

- reviewing current risk assessment provided by Biosecurity Australia and using this information to update the ICON database;
- researching plant species and interrogating department databases;
- carrying out data purges and creating new data sets;
- ascertaining system problems and errors and liaising with ICON administrators to rectify; and
- using ICON information to assess government and private Plant Import Applications.

Nov 2005 - Sep 2006

#### Customer Service Officer / Life Insurance Claims Assessor - Legal & General Assurance Society Ltd (United Kingdom)

The main purpose of Robert's position with Legal & General Assurance Society was to provide quality customer service to the society's policy holders and to prepare the groundwork for, and assess life insurance claims. This involved:

- providing a variety of administrative support to claims assessors;
- developing financial and personal risk assessments on insurance applicants;
- liaising with claimants, various stakeholders and third parties;
- providing a first point of contact for policy holders and dealing with a variety of customer enquires;
- liaising with authority bodies (i.e. Police, Coroners etc.) to confirm the legitimacy of claims.

Sep 2004 - Oct 2005

#### Team Leader - Seeds and Plants Australia Pty Ltd

Robert's main role as Team Leader was to productively and effectively coordinate the operation of native plant revegetation projects. This included:

- researching characteristics of native flora in order to best match species to location and client request;
- implementing sound environmental development practices in order to maximise the incorporation of end product to local ecology;
- training, coordination and supervision of a team of six staff;
- management of company plant and equipment and ordering of necessary materials and native plant stock;
- management and co-ordination of on-site contractors;
- liaising with customers, stakeholders and authority bodies; and
- monitoring, evaluation, reporting and overall administration of projects.



## Training Courses

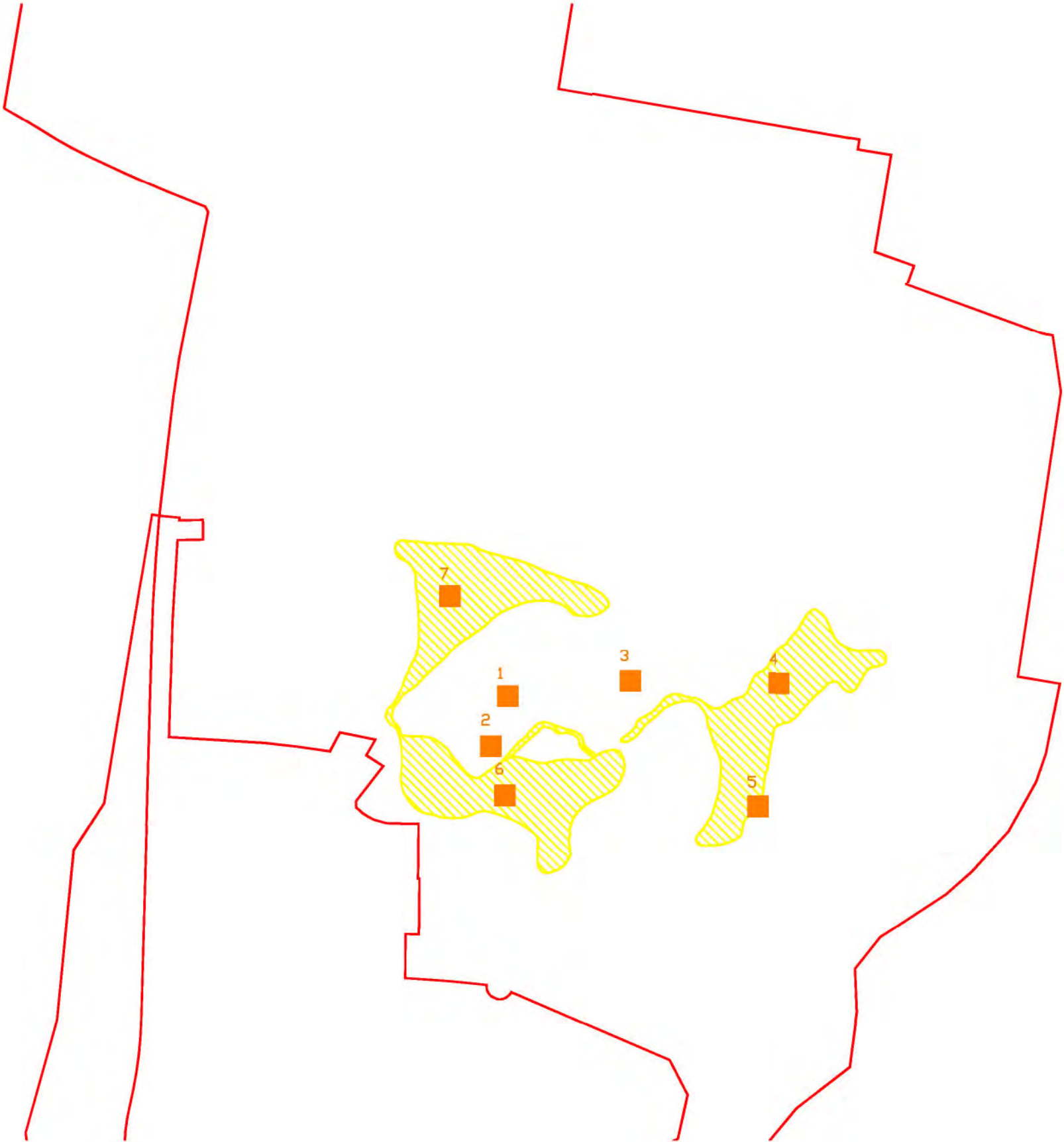
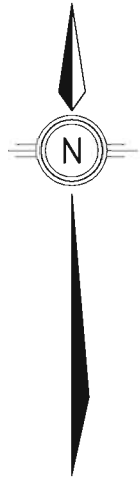
May 2009	Trackside Safety Training (Pink Card) - Queensland Rail
Apr 2009	Vegetation Structure & Remnant Status under the VMA 1999 - Queensland Herbarium
Nov 2008	General Safety Induction (Construction Industry 30215) - Queensland Department of Employment and Industrial Relations
Aug 2008	Acacias of Southeast Queensland - Redland City Council (Indigiscapes)
May 2008	Queensland Regional Ecosystem Framework and its Application - Queensland Herbarium



# **APPENDIX B**

## **Location of wetland flora survey quadrats**





LEGEND

- Site Boundary
- Location and extent of freshwater wetland
- Floristic survey quadrats



Scale 1:5000 (A3)

ILLUSTRATION 1.6 WETLAND SURVEY PLAN

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XREF's

Project No.: 7296/21

PRINT DATE: 30 May, 2008 - 12:30pm