

Tuesday 29th November 2016

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Dear Tony,

**Re: Ecological Assessment for Rezoning of Lot 17 DP576415 Diamond Beach Road,
Diamond Beach.**

As requested, we undertook a site survey at the study site which is located on Lot 17 DP576415 Diamond Beach Road, Diamond Beach.

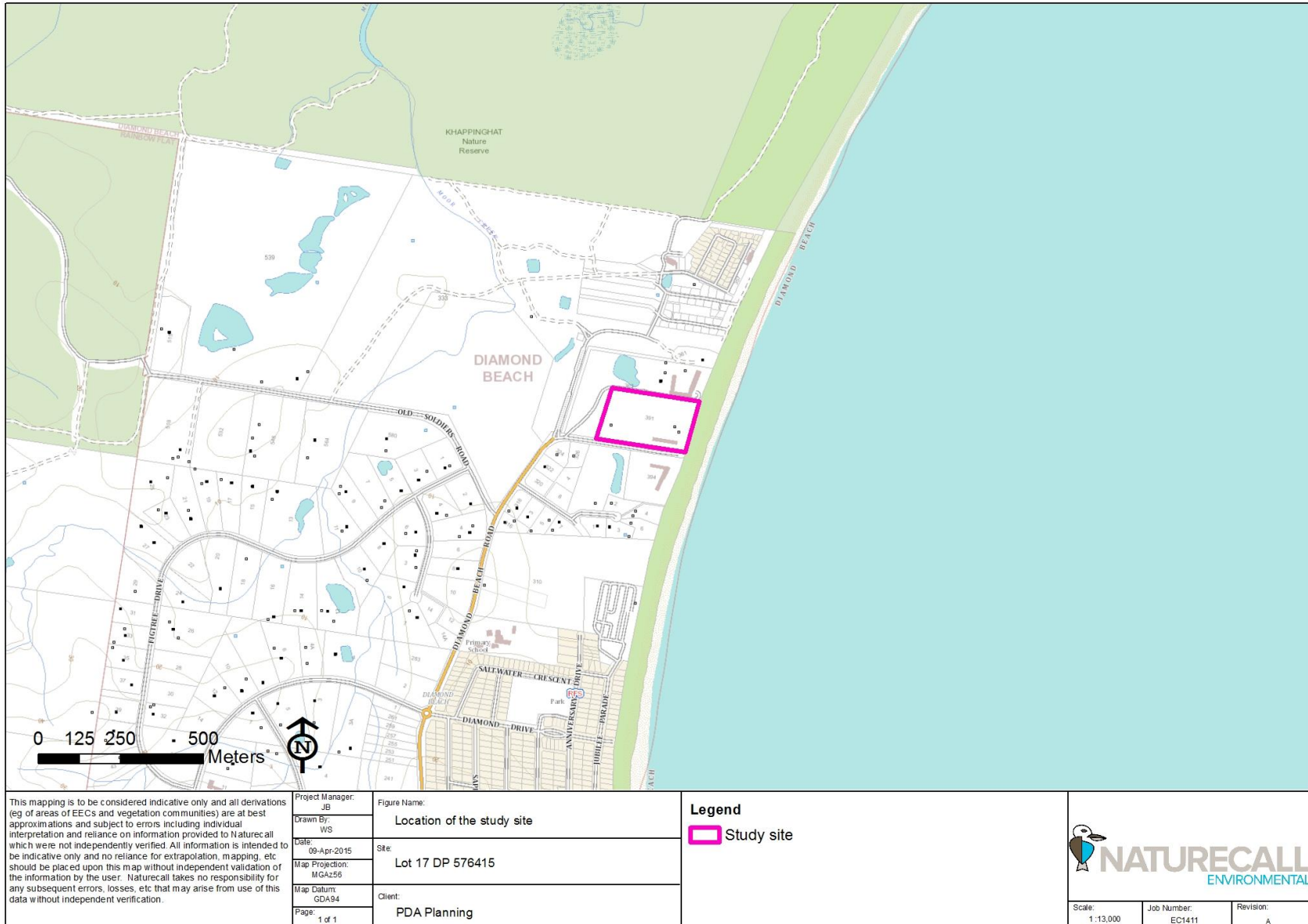
1.0 Background Information

The site is located on Diamond Beach Road as shown in Figure 1. It is largely cleared and maintained aside from two patches of vegetation which comprise 30-35 year regrowth (Tony Fish pers. comm). Holiday units and a dwelling are also present in the east of the site.

A DA for a caravan park over the site has been approved and some works have commenced. Two remaining patches of vegetation are proposed to be retained and managed.

This report focuses on the two retained patches of vegetation in the west of the site. The purpose is to describe and classify these vegetation communities, identify their conservation status and value, and recommend measures for their future use and management.

Figure 1: Location of the subject site



2.0 Ecological Attributes

A site inspection was undertaken on Wednesday 16th November by an ecologist and senior ecologist from Naturecall.

The vegetated areas on site were thoroughly inspected via a random meander survey over 3 hours.

2.1. Site Vegetation Communities

The retained areas of vegetation on site comprise Swamp Forest and Heathland. The remainder of the site largely consists of managed grassland and is not described in this report.

The following table details the vegetation community found on the site. A vegetation map is provided as Figure 2 and photos following the table illustrate the vegetation. A flora list is provided in Appendix 1.

Table 1: Swamp forest description

Vegetation Community	Broad-leaved Paperbark – Swamp Mahogany Tall Swamp Forest
NSW Plant Community Type	No. 1725: Swamp Mahogany - Broad-leaved Paperbark - Swamp Water Fern - Plume Rush swamp forest on coastal lowlands of the Central Coast and Lower North Coast.
Location	This community occurs as a semi-isolated patch in the west of the site. Total area is 2200m ² .
Description	<p>a) Canopy:</p> <p><i>Structure and Species:</i> The canopy is dominated by Broad-leaved Paperbark (<i>Melaleuca quinquenervia</i>) and Swamp Mahogany (<i>Eucalyptus robusta</i>) with occasional Swamp Oak (<i>Casuarina glauca</i>). The canopy ranges in height from 15-20m with DBH ranging from 15-50cm.</p> <p>b) Understorey:</p> <p><i>Structure and Species:</i> Absent aside from a few younger canopy trees.</p> <p>c) Shrub Layer:</p> <p><i>Structure and Species:</i> This layer was moderately dense and comprised a mix of weeds and native shrubs from 1-3m in height. Common species in this layer include Senna (<i>Senna pendula</i> var. <i>glabrata</i>*), Lantana (<i>Lantana camara</i>*) and Mock Olive (<i>Notelaea venosa</i>).</p> <p>d) Ground Layer:</p> <p><i>Structure and Species:</i> Some parts of the community are regularly mown and comprise a low cover of grasses. The unmanaged areas feature a dense cover of herbs, sedges and ferns to 1m in height.</p> <p>Dominant species in the unmanaged areas comprised Harsh Ground Fern (<i>Hypolepis muelleri</i>), Swamp Fern (<i>Blechnum indicum</i>) and Saw Sedge (<i>Gahnia clarkei</i>).</p> <p>e) Lianas, scramblers, etc:</p>

	A range of climbers were present including Monkey Rope (<i>Parsonsia straminea</i>), Snake Vine (<i>Stephania japonica</i>) and Native Jasmine (<i>Pandorea jasminoides</i>).
Condition	This community represents approximately 30-35 year regrowth that has been largely left unmanaged. As a result, it features a high density of environmental weeds which dominate the shrub layer. Native species diversity was however considered to be good and it is showing strong regeneration potential.
Threatened plants recorded or potential habitat	None recorded and none considered potential occurrences.
Conservation Value	Does not qualify as an Endangered Ecological Community as it does not meet geomorphological criteria (see Section 2.3 below).

* Denotes introduced species

Table 2: Heathland description

Vegetation Community	Swamp Paperbark – Tantoon Heathland
NSW Plant Community Type	PCT ID 1730 – Swamp Paperbark – <i>Baumea juncea</i> swamp shrubland on coastal lowlands of the Central Coast and lower North Coast
Location	Occurs in the southeast corner of the site and covers an area of 1000m ² .
Description	<p>a) Emergents:</p> <p>Structure and Species: A sparse emergent tree layer was present ranging from 8-10m in height. Species present in this layer consisted of Swamp Mahogany, Swamp Oak and Broad-leaf Paperbark.</p> <p>b) Canopy/Understorey:</p> <p>Structure and Species: The canopy consisted of a denser layer of shrubs and small trees ranging from approximately 4-6m in height</p> <p>Swamp Paperbark (<i>Melaleuca ericifolia</i>), Fern-leaf Banksia (<i>Banksia oblongifolia</i>), Prickly-leaved Paperbark (<i>Melaleuca nodosa</i>) and Tantoon (<i>Leptospermum polygalifolium</i>) were the dominant species.</p> <p>c) Shrub Layer</p> <p>Structure and Species: A shrub layer only occurred on the edges of this community and along a track in the east. Commonly recorded species in this layer include Hairy Bush-pea (<i>Pultenaea villosa</i>), Prickly Beard-heath (<i>Leucopogon juniperinus</i>), Notched Bush-pea (<i>Pultenaea retusa</i>), Sweet Wattle (<i>Acacia suaveolens</i>), and Coffee Bush (<i>Breynia oblongifolia</i>).</p> <p>d) Ground Cover</p> <p>Structure and Species: Occurs as an open layer generally around the edges of the community or dense patches of Pouched Coral-fern (<i>Gleichenia dicarpa</i>). Grasses and herbs recorded include Wiry Panic (<i>Entolasia stricta</i>), Blady Grass (<i>Imperata cylindrica</i>),</p>

	<p>Blue Dampiera (<i>Dampiera stricta</i>), Creeping Raspwort (<i>Gonocarpus micranthus</i> subsp. <i>micranthus</i>), and Spiny Mat-rush (<i>Lomandra longifolia</i>).</p> <p>e) Lianas, scramblers, etc:</p> <p><i>Structure and Species :</i></p> <p>Occasional vines were present including Monkey Rope, Appleberry (<i>Billardiera scandens</i>), Small-leaf Glycine (<i>Glycine microphylla</i>) and Devils Twine (<i>Cassytha pubescens</i>).</p>
Condition	<p>Condition is good overall with high species diversity and intact structure.</p> <p>It is however a narrow patch of heath and is subject to edge effects eg weed invasion. Nevertheless at present it is only affected by a low abundance of exotic species such as Whiskey Grass (<i>Andropogon virginicus</i>*) and South African Pigeon Grass (<i>Setaria sphacelata</i>*).</p>
Threatened plants recorded or potential habitat	<p>No threatened plants were located during the survey. Potential habitat for Dwarf Heath Casuarina (<i>Allocasuarina defungens</i>).</p>
Conservation Values	<p>Not an EEC as does not meet geomorphological or floristic criteria.</p> <p>This community is part of a larger extent of heathland which is considered to have high conservation value overall and is also a Groundwater Dependiant Ecosystem (GDE).</p>

Photo 1: Swamp forest



Photo 2: High weed cover in interior of swamp forest




Photo 3: Heathland



Figure 2: Site vegetation communities



<p>This mapping is to be considered indicative only and all derivations (eg of areas of EECs and vegetation communities) are at best approximations and subject to errors including individual interpretation and reliance on information provided to Naturecall which were not independently verified. All information is intended to be indicative only and no reliance for extrapolation, mapping, etc should be placed upon this map without independent validation of the information by the user. Naturecall takes no responsibility for any subsequent errors, losses, etc that may arise from use of this data without independent verification.</p>	<p>Project Manager: WS</p>	<p>Figure Name: Vegetation Communities</p>	<p>Legend</p> <ul style="list-style-type: none"> Study site Heathland Swamp Forest 	
	<p>Drawn By: WS</p>	<p>Site: Lot 17 DP 576415</p>		
	<p>Date: 23-Nov-2016</p>	<p>Client: PDA Planning</p>		
	<p>Map Projection: MGAZ56</p>	<p>Map Datum: GDA94</p>		
<p>Page: 1 of 1</p>			<p>Scale: 1:1,000</p>	<p>Job Number: EC1411</p>
			<p>Revision: A</p>	

2.2. Flora of Conservation Significance

No threatened flora species were observed during the survey which recorded only common species. Any threatened species would be expected to be readily detected if present given that the site was open and accessible. Intensive vegetation surveys on the adjoining Lot to the north similarly did not detect any threatened flora (Naturecall 2016).

The heathland qualifies as potential habitat for Dwarf Heath Casuarina (Endangered TSC Act and EPBC Act), however given the above factors, no threatened flora species were considered potential occurrences.

2.3. Endangered Ecological Communities

The entire site is underlain by relic coastal barriers of marine provenance. This has been demonstrated by the geotechnical report prepared for the site (RGS 2013). The coastal barriers, being of marine origin do not qualify as coastal floodplains (NSWSC 2004, *Gales Holdings Pty Limited v Tweed Shire Council [2008] NSWLEC 209*, *Motorplex (Australia) Pty Limited v Port Stephens Council [2007] NSWLEC 74*, Preston and Adam 2004a, 2004b).

As such, while the Swamp Forest may floristically qualify as the EEC *Swamp Sclerophyll Forest on Coastal Floodplains*, it does not meet the key geomorphological criteria listed under the final determination (NSWSC 2004) and hence cannot qualify as the EEC.

The heathland community similarly does not qualify as any EEC.

3.0 Management Recommendations

3.1. Heathland

3.1.1. Future Use

The heathland area is recommend to be retained and left as natural vegetation area. There were no significant weed issues in this community, hence weed control is not considered required.

An area of cleared land in the corner of the Lot behind the heath has been subject to regular slashing. It is understood that this area has been approved by Council for the location of waste and disposal bins.

3.2. Swamp Forest

3.2.1. Future Use

This patch of vegetation is recommended to be retained in its entirety. An appropriate use for this vegetation is a parkland area that would allow passive use and scenic amenity for future use by caravan park residents.

Fencing around this patch of vegetation is not considered to be required.

3.2.2. Weed Control

A high level of weed invasion was recorded in this community. If not controlled, these weeds will continue to flourish and may spread into nearby vegetation.

It is recommended that weed control is undertaken by a qualified bush regenerator and target the following weeds:

- Senna
- Lantana
- Bitou Bush
- Umbrella tree
- Fireweed
- Crofton Weed
- Billygoat Weed

This would require initial treatment and a number of follow-up treatments. It is recommended that hand-pulling of weeds is used where possible. Herbicide should only be used if hand-pulling is not successful and should be used in low quantities to avoid impacts on non-target species.

3.2.3. Slashing

It is recommended that slashing is continued around the perimeter of the Swamp Forest and on existing tracks through the patch. This will allow future use of the area by park residents and prevent overgrowth of the surrounding exotic grasses.

Slashing should not be undertaken in the unmanaged area of the Swamp Forest as many native species are regenerating in the understorey and they would require removal for a tractor or mover to access this area. Weed control will assist this natural regenerative of native species.

4.0 Conclusion

The vegetated areas on site were not found to have significant conservation values in terms of threatened flora or Endangered Ecological Communities. They are still however considered to have some value given the high plant species diversity recorded, as fauna habitat and as scenic amenity.

These remaining patches of vegetation are proposed to be retained and incorporated into the layout of the caravan park to be constructed on the site. Management recommendations have been provided to improve the biodiversity values of these areas and still allow for use by future caravan park residents.

If any additional information is required, please contact Will on 0438 590 961.

Yours faithfully,



Will Steggall

B. Env. Sc. and Mgt, MECANSW

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5.0 References

Regional Geotechnical Solutions (2013). Geotechnical Assessment for Proposed Caravan Park, 391 Diamond Beach Drive, Diamond Beach. RGS, Port Macquarie.

Naturecall (2016). Ecological Assessment for Proposed Rezoning of Lot 18 DP 576414, 363 Diamond Beach Road, Diamond Beach. Naturecall Environmental, Port Macquarie.

NSW Scientific Committee (2004). *Swamp sclerophyll forest on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions - endangered ecological listing.*

Preston, B.J. and Adam, P. (2004a). Describing and listing threatened ecological communities under the *Threatened Species Conservation Act 1995* (NSW): Part 1 – the assemblage of species and the particular area. *Environmental and Planning Law Journal*, **21**:250-263

Preston and Adams (2004b). Describing and listing threatened ecological communities under the *Threatened Species Conservation Act 1995* (NSW): Part 2 – the role of supplementary descriptors and the listing process. *Environmental and Planning Law Journal*, **21**:372-390

Land and Environment Court Citations:

CBD Prestige Holdings Pty Ltd v Lake Macquarie City Council [2005] NSWLEC 367

Gales Holdings Pty Limited v Tweed Shire Council [2008] NSWLEC 209

Motorplex (Australia) Pty Limited v Port Stephens Council [2007] NSWLEC 7474

Appendix 1: Site flora species list

Community Key:

SF - Swamp Forest

H – Heathland

* Denotes and introduced species

Common Name	Scientific Name	Community
Canopy and Understorey		
Bangalow Palm	<i>Archontophoenix cunninghamiana</i>	SF
Hill Banksia	<i>Banksia collina</i>	H
Fern-leaved Banksia	<i>Banksia oblongifolia</i>	SF
Swamp Oak	<i>Casuarina glauca</i>	SF
Camphor Laurel*	<i>Cinnamomum camphora</i>	SF
Swamp Mahogany	<i>Eucalyptus robusta</i>	SF, H
Swamp Paperbark	<i>Melaleuca ericifolia</i>	H
Flax-leaved Paperbark	<i>Melaleuca lineariifolia</i>	H
Prickly-leaved Paperbark	<i>Melaleuca nodosa</i>	SF, H
Broad-leaf Paperbark	<i>Melaleuca quinquenervia</i>	SF, H
Sieber's Paperbark	<i>Melaleuca sieberi</i>	SF
Large-leaved Mock Olive	<i>Notelaea venosa</i>	SF
Umbrella Tree	<i>Schefflera actinophylla (juvenile)</i>	SF
Shrubs		
Coastal Wattle	<i>Acacia longifolia subsp. sophorae</i>	SF
Sweet Wattle	<i>Acacia suaveolens</i>	SF, H
Logan Apple	<i>Acronychia imperforata</i>	SF
Coffee Bush	<i>Breynia oblongifolia</i>	SF, HSF
Wallum Bottlebrush	<i>Callistemon pachyphyllus</i>	H
Bitou Bush*	<i>Chrysanthemoides monilifera*</i>	SF
Tuckeroo	<i>Cupaniopsis anacardioides</i>	SF
Corkwood	<i>Duboisia myoporoides</i>	SF
Blueberry Ash	<i>Eleocarpus reticulatus</i>	SF
Wallum Heath	<i>Epacris pulchella</i>	H
Cheese Tree	<i>Glochidion ferdinandi</i>	SF
Wild Quince	<i>Guioa semiglauca</i>	SF
Rough Guinea Flower	<i>Hibbertia aspera</i>	SF
Lantana	<i>Lantana camara*</i>	SF
Spidery Tea Tree	<i>Leptospermum arachnoides</i>	H
Tantoon	<i>Leptospermum polygalifolium</i>	H
Prickly Beard-heath	<i>Leucopogon juniperinus</i>	SF
Brush Muttonwood	<i>Myrsine howittiana</i>	SF
-	<i>Myrsine variabilis</i>	SF
Sweet Pittosporum	<i>Pittosporum undulatum</i>	SF
Elderberry Panax	<i>Polyscias sambucifolia</i>	SF
Woolly Pomaderris	<i>Pomaderris lanigera</i>	H
Notched Bush-pea	<i>Pultenaea retusa</i>	H
Hairy Bush-pea	<i>Pultenaea villosa</i>	H
Senna	<i>Senna pendula var. glabrata*</i>	SF
Ground Cover		
Crofton Weed	<i>Ageratina adenophora*</i>	SF

Common Name	Scientific Name	Community
Billygoat Weed	<i>Ageratum houstonianum</i> *	SF
Whiskey Grass	<i>Andropogon virginicus</i> *	SF, H
Ground Asparagus Fern	<i>Asparagus aethiopicus</i> *	SF
Carpet Grass	<i>Axonopus fissifolius</i> *	SF
Tassel Cord-rush	<i>Baloskion tetraphyllum</i>	SF
Bare Twig-rush	<i>Baumea juncea</i>	H
Swamp Fern	<i>Blechnum indicum</i>	SF
Quaker Grass	<i>Briza maxima</i> *	SF
Shivery Grass	<i>Briza minor</i> *	SF
Milk Maids	<i>Burchardia umbellata</i>	SF
Gotu-kola	<i>Centella asiatica</i>	SF
Bonnet Orchid	<i>Cryptostylis erecta</i>	SF
Blue Dampiera	<i>Dampiera stricta</i>	SF, H
Blue Flax-lily	<i>Dianella caerulea</i>	SF, H
Bordered Panic	<i>Entolasia marginata</i>	SF
Wiry Panic	<i>Entolasia stricta</i>	SF, H
Nobby headed Club Rush	<i>Ficinia nodosa</i>	H
Tall Saw-sedge	<i>Gahnia clarkei</i>	SF, H
Pouched Coral-fern	<i>Gleichenia dicarpa</i>	H
Creeping Raspwort	<i>Gonocarpus micranthus</i>	SF
Raspwort	<i>Gonocarpus teucroides</i>	SF, H
Swamp Goodenia	<i>Goodenia paniculata</i>	SF
Batswing Fern	<i>Histiopteris incisa</i>	SF
Beach Pennywort*	<i>Hydrocotyle bonariensis</i> *	SF
Harsh ground fern	<i>Hypolepis muelleri</i>	SF
Blady Grass	<i>Imperata cylindrica</i>	SF, H
Sea Rush	<i>Juncus krausii</i>	SF
Slender Twine Rush	<i>Leptocarpus tenax</i>	SF, H
Screw Fern	<i>Lindsaea linearis</i>	SF
-	<i>Lobelia anceps</i>	SF
Spiny-head Mat-rush	<i>Lomandra longifolia</i>	SF, H
Weeping Rice Grass	<i>Microlaena stipoides</i>	SF
Basket Grass	<i>Oplismenus aemulus</i>	SF
Lambs Tongue	<i>Plantago lanceolata</i> *	SF
Pomax	<i>Pomax umbellata</i>	SF
White Root	<i>Pratia purpurascens</i>	SF
Bracken Fern	<i>Pteridium esculentum</i>	SF
Fireweed	<i>Senecio madagascariensis</i> *	SF
*South African Pigeon Grass	<i>Setaria sphacelata</i> *	SF
Blackberry Nightshade	<i>Solanum nigrum</i>	SF
Austral Lady's Tresses	<i>Spiranthes australis</i>	SF
Purple Fringed Lily	<i>Thysanotus tuberosus</i>	SF
Purpletop	<i>Verbena bonariensis</i> *	SF
Ivy-leaved Violet	<i>Viola hederacea</i>	SF
Swamp Grasstree	<i>Xanthorrhoea fulva</i>	SF, H
Vines and Scramblers		
Apple Berry	<i>Billardiera scandens</i>	SF, H
Devils Twine	<i>Cassytha pubescens</i>	SF, H
Wild Yam	<i>Dioscorea transversa</i>	SF
Twining Glycine	<i>Glycine clandestina</i>	SF
Small-leaf Glycine	<i>Glycine microphylla</i>	SF

Common Name	Scientific Name	Community
Climbing Guinea Flower	<i>Hibbertia scandens</i>	SF
Common Milk Vine	<i>Marsdenia rostrata</i>	SF
Sweet Morinda	<i>Morinda jasminoides</i>	SF
Native Jasmine	<i>Pandorea jasminoides</i>	SF
Monkey Rope	<i>Parsonsia straminea</i>	SF
Molucca Bramble	<i>Rubus moluccana</i>	SF
Snake Vine	<i>Stephania japonica</i>	SF
Epiphytes		
Elkhorn	<i>Platynerium bifurcatum</i>	SF