



## BREAK O'DAY COASTAL LAGOON ASSESSMENT

December 2009

For NRM North & Break O'Day Council

## **Table of Contents**

List of Appendices .....	3
Acknowledgements.....	4
1 Introduction.....	5
2 Methods.....	7
3 Moriarty & Windmill Lagoons (#2) .....	15
4 Diana's Basin & Crockers Arm (#3) .....	32
5 Piccaninny Swamp (#4) .....	49
6 Grants Lagoon (#5) .....	60
7 Parkside Lagoon (#7).....	72
8 Chimneys Lagoon (#8) .....	82
9 Oceana Wetland (#9) .....	95
10 Wrinklers Lagoon (#10).....	105
11 Scamander River Mouth Backwater (#11) .....	117
12 Templestowe Lagoon (#12) .....	129
13 Lower Marsh Creek and Chain of Lagoons (#16) .....	142
14 Boggy Creek Wetland (#6) .....	155
15 Yarmouth Creek (#14) .....	160
16 Seymour Swamp (#17) .....	165
17 St Helens Point – other lagoons (#19) .....	170
18 Upper Medeas Cove Marshes (#22) .....	176
19 Onion Creek (#23) & St Helens Point (other) (#19).....	182
20 Dark Hollow Creek (#24) .....	187
21 Four Mile Creek (#25) .....	193
22 Blind Creek & Marsh (#27) .....	198
23 Douglas North Wetland (#28).....	203
24 Douglas River (#29).....	208
25 Generic comments .....	213
26 Generic recommendations .....	213
27 Appendices 1 – 27 on attached CD .....	214

## **List of Appendices**

- Appendix 01 – Threatened Fauna Species and Preferred Habitat
- Appendix 02 – Environmental and Declared Weeds List
- Appendix 03 – Moriarty Windmill Flora Species List
- Appendix 04 – Moriarty Windmill Community Flora Species Lists
- Appendix 05 – Diana's Basin Flora Species List
- Appendix 06 – Diana's Basin Community Flora Species Lists
- Appendix 07 – Piccaninny Swamp Flora Species List
- Appendix 08 – Piccaninny Swamp Community Flora Species Lists
- Appendix 09 – Grants Lagoon Flora Species List
- Appendix 10 – Grants Lagoon Community Flora Species Lists
- Appendix 11 – Parkside Lagoon Flora Species List
- Appendix 12 – Parkside Lagoon Community Flora Species Lists
- Appendix 13 – Chimneys Lagoon Flora Species List
- Appendix 14 – Chimneys Lagoon Community Flora Species Lists
- Appendix 15 – Oceana Wetland Flora Species List
- Appendix 16 – Oceana Wetland Community Flora Species Lists
- Appendix 17 – Wrinklers Flora Species List
- Appendix 18 – Wrinklers Community Flora Species Lists
- Appendix 19 – Scamander River Mouth Backwater Flora Species List
- Appendix 20 – Scamander River Mouth Backwater Community Flora Species Lists
- Appendix 21 – Templestowe Lagoon Flora Species List
- Appendix 22 – Templestowe Lagoon Community Flora Species Lists
- Appendix 23 – Lower Marsh Creek Chain of Lagoons Flora Species List
- Appendix 24 – Lower Marsh Creek Chain of Lagoons Community Flora Species Lists
- Appendix 25 – Landholder Phone Survey
- Appendix 26 – Mail Out & Phone Survey Response
- Appendix 27 – Community Engagement Report

(Appendices 1 – 27 are on attached CD inserted as page 214)

## **Acknowledgements**

Fieldwork - Chris Obst & Phil Barker, North Barker Ecosystem Services (NBES), Lois Koehnken, Technical Advice on Water (TAW)

Community Consultation - Ray Murphy & Carla Mooney, Rural Development Services (RDS)

Report preparation - Chris Obst & Phil Barker (NBES) - Flora and fauna sections, report compilation

- Lois Koehnken (TAW) - Geomorphology, hydrology, sediments, water quality sections

- Ray Murphy & Carla Mooney, (RDS) - Community engagement report

Mapping: Chris Obst (NBES)

Photographs: Chris Obst (NBES), Lois Koehnken (TAW)

Project Management: Phil Barker (NBES)

Assistance with data acquisition, preliminary project decision making and general project facilitation – Polly (Richard) Buchhorn, NRM Facilitator, Break O'Day Council in partnership with NRM North.

Assistance with preliminary project decision making and administration – Emma Williams, Program Manager - Healthy Coasts and Seas, NRM North.



## 1 Introduction

NRM North is the regional natural resource management (NRM) body covering the north-eastern third of Tasmania. In conjunction with the Break O'Day Council, funding has been obtained to assess 22 lagoons and wetlands within the Break O'Day Council area. The purpose of this assessment is to carry out a "health check" on each wetland, identify necessary "first-aid" works and prioritise these tasks. Community consultation and landholder input is an integral part of this process. A list of the wetlands assessed and the level of assessment undertaken is provided in the following table. The distribution of the wetlands within the Break O'Day Council area is shown in Figure 1 on the following page.

**Table 1.1 - Final Wetland List and Level of Assessment**

<b>Wetland Number (NRM North)</b>	<b>Wetland Name</b>	<b>Level of Assessment</b>
2	Moriarity & Windmill Lagoons	High-level
3	Diana's Basin, Little Diana's Basin & Crockers Arm	High-level
4	Piccaninny Swamp	Mid-level
5	Grants Lagoon	Mid-level
7	Parkside Lagoon	Mid-level
8	Chimneys Lagoon	Mid-level
9	Oceana Wetland	Mid-level
10	Wrinklers Lagoon	Mid-level
11	Scamander River Mouth	Mid-level
12	Templestowe Lagoon	Mid-level
16	Lower Marsh Creek & Chain of Lagoons	Mid-level
6	Boggy Creek Wetland	Eye-ball
14	Yarmouth Creek	Eye-ball
17	Seymour Swamp	Eye-ball
19	St Helens Point (4)	Eye-ball
22	Upper Medeas Cove marshes	Eye-ball
23 & 19	Onion Creek & St Helens Pt (1)	Eye-ball
24	Dark Hollow Creek	Eye-ball
25	Four Mile Creek	Eye-ball
27	Blind Creek Marsh	Eye-ball
28	Douglas North wetland	Eye-ball
29	Douglas River & wetlands	Eye-ball



Figure 1 – Location of wetland study areas

## **2 Methods**

### **2.1 Study Areas**

For the purposes of this project, the study area for each wetland/lagoon that was assessed was taken to be the wetland polygon extracted from the CFEV geographic information system plus a 100m buffer around this polygon.

### **2.2 Levels of Site Assessment**

The assessment approach used has been divided into three levels due to funding and time constraints for this project. Three levels of assessment - high-level, mid-level and eye-ball assessments were carried out, with different levels of assessment occurring both in the field and in the reporting process.

High-level Assessment - this level of assessment was allocated the most amount of time in the field, during which the full amount of environmental information was collected, including a desk-top assessment against Ramsar criteria (see Sections 2.2 & 2.3).

Mid-level Assessment - this level of assessment differs from a high-level assessment in that it was allocated less time in the field, the flora species list is not as comprehensive due to being time limited in the field and was not assessed against Ramsar criteria.

Eye-ball Assessment - this level of assessment differs from a high and mid-level assessment in that it was allocated less time again in the field, a flora species list was not compiled, it was not assessed against Ramsar criteria, vegetation community and weed mapping was not carried out, and less time was spent assessing all variables.

At each wetland a geomorphology, hydrology, sediment and water quality assessment was undertaken, in addition to an assessment of the flora and fauna, and an analysis of threats and possible “first-aid” works. The following sections give a brief overview of these assessments.

### **2.3 Geomorphology, hydrology, sediments & water quality**

A range of methods were used to evaluate the geomorphology, hydrology, sediment and water quality characteristics of each water body. Because these processes operate at several time-scales, it is difficult to determine the ‘health’ or ‘naturalness’ of these processes based on one field visit alone. It was also not possible to visit the entire catchment of each water body. For this reason, a desk-top investigation was completed prior to field work.

The desk-top analysis included reviewing topographic and geologic maps to gain an understanding of the large scale characteristics of the catchment. This information was augmented by reviewing the CFEV geomorphic mosaic layer which provides information about relief, climate and surficial processes operating in the area. Google Earth was then used to take a ‘tour’ of the catchment and water body, with particular attention paid to catchment activities and disturbances, and the morphology of the water body. For most of the water bodies, relatively high resolution Google Earth images were available for 2007 and 2004. Both images were examined to identify recent changes in the catchment. The 2007 images

also provided a good contrast compared to field visits, as the images were taken during the extended drought, whereas the site visits were completed following a very high rainfall period.

Following this review, a site visit to the water body was completed. During the visit, the local geomorphology and hydrology was examined, including the inflows and outflows from each water body. The local sediments were investigated, and water quality measurements of pH and salinity were completed. Where possible, the adjacent coast was also visited. A field assessment was made as to the naturalness of each of the characteristics (geomorphology, hydrology, sediments, water quality).

After the field assessment, an additional desk-top analysis was completed, this time using The List to access Coastal Value databases. For the coastline bordering each water body, the condition, geo-conservation, and sensitivity attributes were interrogated. The geo-conservation data base was interrogated to identify any sites or regions of high geo-conservation status. Additional reports, where available, were also consulted.

The evaluation of most sites included a field visit of generally 1 – 2 hours in duration (longer depending on access). Exceptions to this are shown in Table . Extended site visits to Moriarty/ Windmill Lagoons and Diana's Basin/ Little Diana's Basin/ Crockers Arm were completed which involved one-half to a full day at each of the complexes. The following table details the level of assessment, information sources and variables collected at each site.

**Table 1.2 - Summary of geomorphology, hydrology, sediment and water quality evaluation of wetlands.**

	Geological & topographic maps	Extended site visit	Short site visit	Water Quality measurements	Google Earth investigation (2008 & 2004 images)	Coastal Geomorphology databases (LIST)	Geo-conservation database (LIST)	CFEV data base (mosaics, rivers wetlands, salt marshes estuaries)	Additional reports
Moriarty & Windmill Lagoons	✓	✓		✓	✓	✓	✓	✓	✓
Diana's Basin, Little Diana's Basin & Crockers Arm	✓	✓		✓	✓	✓	✓	✓	✓
Piccaninny Swamp	✓		✓	✓	✓	✓	✓	✓	✓
Grants Lagoon	✓		✓	✓	✓	✓	✓	✓	✓
Parkside Lagoon	✓		✓	✓	✓	✓	✓	✓	✓
Chimneys Lagoon	✓		✓	✓	✓	✓	✓	✓	✓
Oceana Wetland	✓		✓	✓	✓	✓	✓	✓	✓
Wrinklers Lagoon	✓		✓	✓	✓	✓	✓	✓	✓
Scamander River Mouth	✓		✓	✓	✓	✓	✓	✓	✓

	Geological & topographic maps	Extended site visit	Short site visit	Water Quality measurements	Google Earth investigation (2008 & 2004 images)	Coastal Geomorphology databases (LIST)	Geo-conservation database (LIST)	CFEV data base (mosaics, rivers wetlands, salt marshes estuaries)	Additional reports
Templestowe Lagoon	✓		✓	✓	✓	✓	✓	✓	✓
Lower Marsh Creek & Chain of Lagoons	✓		✓	✓	✓	✓	✓	✓	✓
Boggy Creek Wetland	✓		✓	✓	✓	✓	✓	✓	✓
Yarmouth Creek	✓				✓	✓	✓	✓	✓
Seymour Swamp	✓		✓	✓	✓	✓	✓	✓	✓
St Helens Point (4)	✓		✓		✓	✓	✓	✓	✓
Upper Medeas Cove marshes	✓		✓	✓	✓	✓	✓	✓	✓
Onion Creek & St Helens Pt (1)	✓				✓	✓	✓	✓	✓
Dark Hollow Creek	✓		✓	✓	✓	✓	✓	✓	✓
Four Mile Creek	✓				✓	✓	✓	✓	✓
Blind Creek Marsh	✓				✓	✓	✓	✓	✓
Douglas North wetland	✓				✓	✓	✓	✓	✓
Douglas River & wetlands	✓				✓	✓	✓	✓	✓

## 2.4 Flora and Fauna

The CFEV database was found to be more useful in assessing the attributes described above, as opposed to the assessment of the flora and fauna. The majority of data used for the flora and fauna analysis was collected during the field survey of each site. Additional data was sourced from the Natural Values Atlas database, from past reports and from discussions with landholders.

Information on the following variables was collected;

- vegetation communities
- vegetation condition
- flora species list
- fauna habitat value
- weeds - abundance and distribution (declared and environmental)
- threatened flora - abundance and distribution
- threatened fauna habitat
- threats
- first aid (on-ground works)

The following table details the level of assessment and variables collected at each site.

**Table 1.3 - Summary of flora and fauna evaluation of wetlands.**

	Extended site visit (high-level)	Medium site visit (mid-level)	Short site visit (eye-ball)	Ramsar Assessment	Vegetation Communities	Vegetation Condition	Flora Species List	Mapping - all natural values	Fauna Habitat Value	Weeds List	Weeds - Area of Occupancy	Threatened Species	Threats	First Aid
Moriarity & Windmill Lagoons	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Diana's Basin, Little Diana's Basin & Crockers Arm	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Piccaninny Swamp		✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Grants Lagoon		✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Parkside Lagoon		✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Chimneys Lagoon		✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Oceana Wetland		✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Wrinklers Lagoon		✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Scamander River Mouth		✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Templestowe Lagoon		✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Lower Marsh Creek & Chain of Lagoons		✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Boggy Creek Wetland			✓		✓	✓			✓	✓		✓	✓	✓
Yarmouth Creek			✓		✓	✓			✓	✓		✓	✓	✓
Seymour Swamp			✓		✓	✓			✓	✓		✓	✓	✓
St Helens Point (4)			✓		✓	✓			✓	✓		✓	✓	✓
Upper Medeas Cove marshes			✓		✓	✓			✓	✓		✓	✓	✓
Onion Creek & St Helens Pt (1)			✓		✓	✓			✓	✓		✓	✓	✓
Dark Hollow Creek			✓		✓	✓			✓	✓		✓	✓	✓
Four Mile Creek			✓		✓	✓			✓	✓		✓	✓	✓
Blind Creek Marsh			✓		✓	✓			✓	✓		✓	✓	✓
Douglas North wetland			✓		✓	✓			✓	✓		✓	✓	✓
Douglas River & wetlands			✓		✓	✓			✓	✓		✓	✓	✓

## **2.5 Wetland Condition Rose**

The approach used in this project to indicate wetland condition is based on the concept of a condition “rose”. A condition rose resembles a wind rose which represents wind direction, strength and frequency using radial lines of proportionate length and thickness. The condition rose used represents each of the wetland values variables measured as a radial line with its length representing the attributes contribution to the condition of the wetland.

The scores used to determine the length of each wetland variable on the condition rose have been derived from the raw data, estimated from the knowledge gained during site visits, or derived from an analysis of CFEV values in conjunction with information obtained during the site visits. The scores are intended to be relative measures that can be compared between wetlands. In order to do this the variables have been represented in one of three ways:

1. as an absolute percentage, or
2. standardised by representation as a percentage against the maximum value recorded at any one wetland, or
3. standardised by representation as a percentage based on CFEV attribute values that were used as 'starting points' and modified accordingly based on the findings of field and desktop investigations (also see section 3.5.1 below).

The variables chosen to be represented within the condition rose are considered to be the best representatives of overall wetland health. The list below defines what these variables represent and how they have been derived (indicated by a 1, 2 or 3 as defined above);

- Catchment<sup>3</sup> - estimate of the overall naturalness of the catchment based on CFEV values and modified following field investigations and desk top review
- Geomorphology<sup>3</sup> - Estimate of level of catchment disturbance and extent of riparian vegetation in catchment based on CFEV values and modified following field investigations and desk top review
- Hydrology & Sediment<sup>3</sup> - Estimate of naturalness of hydrology and sediment budget of inflows to water way and outflow from water way. Based on CFEV values and modified following field investigations and desk top review
- Water Quality<sup>3</sup> - Estimate of water quality entering waterbody, within water body and downstream of water body. Based on CFEV values and modified following field investigations and desktop review
- Vegetation in good condition<sup>1</sup> - the percentage of vegetation communities within the study area at condition level 1
- Vegetation community richness<sup>2</sup> - the number of native vegetation communities within the study area
- Species richness<sup>2</sup> - the number of native flora species
- Buffer<sup>1</sup> - the percentage of the 100m buffer containing native vegetation communities

- Threatened flora<sup>2</sup> - the number of threatened flora species currently (during the current survey) or previously recorded within the study area
- Threatened vegetation communities<sup>1</sup> - the percentage of the study area containing threatened native vegetation communities
- Threatened fauna habitat<sup>1</sup> - the percentage of the study area containing potential threatened fauna habitat
- Weeds<sup>2</sup> - the number of declared and environmental weeds (as listed in Appendix 2) within the study area
- Weeds AO<sup>2</sup> - the area of occupancy of declared and environmental weeds within the study area

### 2.5.1 Geomorphology, hydrology, sediment and water quality values

A two-step process was used to derive the condition rose scores for these variables. Firstly, the CFEV data base was interrogated, with relevant attributes for each wetland extracted. This included extracting information for wetlands, estuaries, rivers and salt marshes. The extracted CFEV wetland values were used to derive catchment, geomorphology, hydrology & sediment, and water quality 'scores' which were used as a starting point for the condition rose. Then, the scores were modified based on evidence found during the site visit, or during the desk-top analysis. Some of the water bodies did not have CFEV 'wetland' information. Where this occurred, similar scores for corresponding rivers, estuary and/ or salt marsh were used in conjunction with field observations.

**It should be stressed that the condition rose scores reflect the condition of the water body with respect to natural conditions.** Some of the water bodies are in very good condition with respect to the present hydrology of the catchment or geomorphology of the lagoon outlet, but because the Condition Score uses 'natural' as the reference point, these scores may be somewhat low even though the present health of the water way is good.

Table .4 summarises how theses 'starting points' were calculated using CFEV attribute scores. In the CFEV database all scores vary from 0 to 1 with '1' reflecting natural conditions. The CFEV scores were compared with the findings of the field and desktop investigations and varied accordingly. The final scores are presented as percentages.

**Table 1.4 - Derivation of condition rose scores based on CFEV attributes for wetlands. These scores were used as 'starting points' and modified accordingly based on the findings of field and desktop investigations.**

Condition Rose Characteristic	CFEV Score 'Starting Point'	Comment	Reasons to modify CFEV score for condition rose
Catchment	Naturalness (NSCORE) * 100	Reflects overall characteristic of the catchment which will affect naturalness of wetland.	Some CFEV scores did not reflect recent clearing or damming of inflows.
Geomorphology	(Catchment Disturbance + Riparian Veg)/2*100	These attributes exert large scale control over the geomorphic processes operating in a water body.	CFEV geomorphology scores did not reflect impact of modification to lagoon mouths on

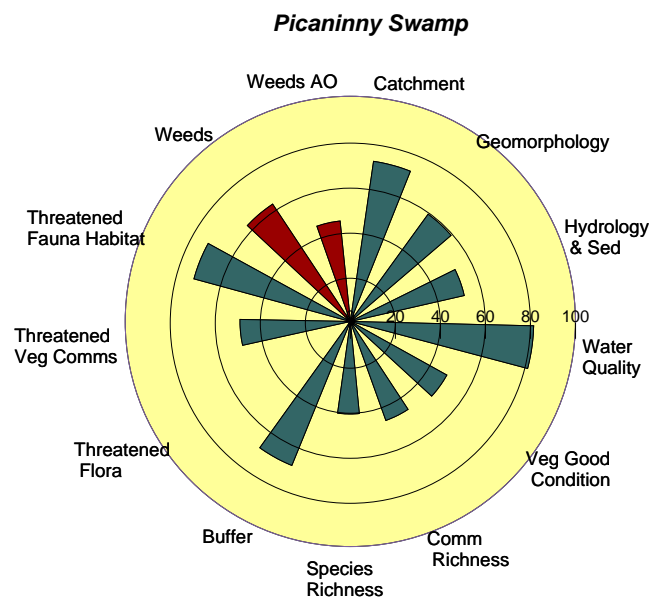


Condition Rose Characteristic	CFEV Score 'Starting Point'	Comment	Reasons to modify CFEV score for condition rose
		The link between the riparian vegetation and geomorphology is very strong .	geomorphology of water bodies.
Hydrology & Sediments	(Hydrology + Sediment_in)/2*100	These attributes reflect changes from natural for the hydrology and sediments affecting the wetland.	CFEV scores did not reflect impact of modification to lagoon mouths on hydrology of water bodies.
Water quality	(Water Quality + Nutrient Input)/2*100	Scores reflect estimated water quality and sediment input from accumulated upstream catchment to wetland.	Some scores did not reflect current conditions.

An example of a wetland condition rose is shown below in Figure 2. Variables represented in green are considered to be “goods”, where a high value or longer radial line, is considered to be a positive for the wetland, in other words, the higher the better. Variables represented in red are considered to be “bads”, where a high value or longer radial line, is considered to be a negative for the wetland, in other words, the lower the better.

Condition roses for the eye-ball assessments differ from the high and mid-level assessments. This is due to the difference in time available for the assessment, some of the variables have had to be estimated rather than be more accurately measured or determined from a more comprehensive survey. Some variables - species richness, threatened flora, area of occupancy of weeds, were not able to be accurately estimated for the eye-ball assessments and have therefore been left off these roses. This needs to be considered when looking at these condition roses.

**Figure 2 - Example of wetland condition rose**



## **2.6 Wetland Health Score**

Following on from the condition rose, the concept of a “wetland health score” is also being used to give another indication of wetland health. The wetland health score is an unweighted addition of the variables that make up the condition rose to give an assessment out of a possible 100 points. These variables represent the current condition and natural values recorded historically and during the current survey. Due to the different levels of survey undertaken at each site, this score should not be used as a comparative value between wetlands. It is likely to be most useful in monitoring the condition change within a wetland over time. Due to incomplete data sets for the eye-ball sites, wetland health scores are only given for the high and mid-level sites.

## **2.7 Community Consultation**

The community consultation phase of this project involved several phases. Key landholders for each wetland were initially identified and subsequently engaged through a mail out. This was followed by a telephone survey of those willing to participate, where a pre-prepared list of questions (see Appendix 25) was discussed with each landholder. A spreadsheet of the results (see Appendix 26) of the telephone survey and the initial mail out, and a summary report of the community consultation process and results (see Appendix 27) were prepared. The key threats and issues identified within the interview process have also been extracted and included for each wetland within this report.

## **25 Generic comments**

The major alterations to the wetlands as compared to 'natural' condition include:

- Alterations to hydrology, either through draining or regulation of inflows, and / or alteration of the mouths of the water bodies. Alterations to the mouths include constriction due to road and bridge construction, channelization due to placement of culverts, and restriction due to the stabilising effect of marram grass on the coastal fore dunes.
- The alterations to hydrology have sometimes lead to a reduction in the fluctuations of water levels within the water body which in turn have allowed vegetation to become established (which provides additional stability).
- Clearing has likely altered the hydrology and sediment budget in some wetland catchments. This combined with restrictions in lagoon outflows leads to sediment accumulation in the lagoon systems. This is especially true where the lagoon system has been altered by road / bridge / culvert construction.
- Water quality in the wetlands and lagoons is generally good, but observations and measurements were completed following a period of high rainfall and lagoon breakout events. Water quality monitoring may be warranted during the warm, dry summer period in lagoons which have residential development nearby and are used extensively for recreation, such as Diana's Basin and Grants Lagoon.

## **26 Generic recommendations**

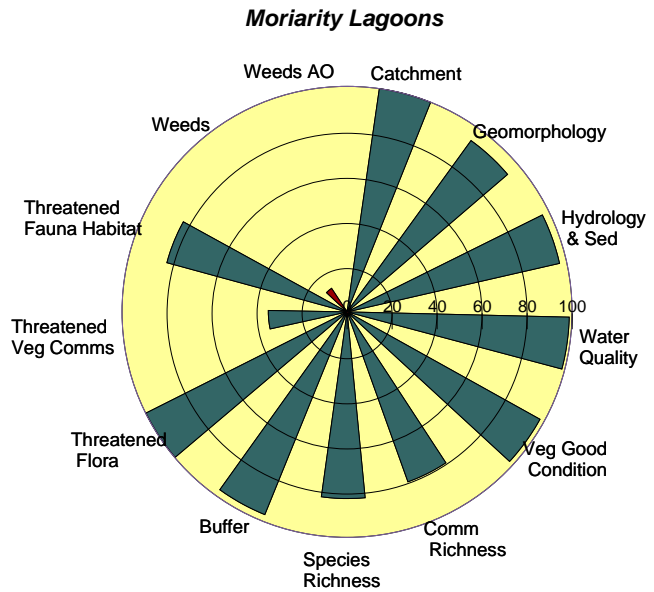
- Improve community understanding of lagoon systems – why they are important, why variability in flows, water levels etc are important for maintaining a dynamic, robust environment.
- Complete an historic aerial photo and map (parish plans, etc) analysis of the lagoons which have had outflows altered by roads and marram grass to get a better understanding of the 'natural' conditions of these systems. This information would be useful in evaluating whether marram grass removal is warranted in some lagoonal areas and for informing stakeholders of changes which have occurred to the systems.
- In the lagoons where outflow is controlled by culverts, try and maintain clear channels to maximise flow and exchange between lagoon and the bay or sea.
- Water quality monitoring over the summer months would provide a better indication of how recreational activities and the increase in local population are affecting the lagoons.

### 3 Moriarty & Windmill Lagoons (#2)

#### Wetland Health Score:

**88/ 100**

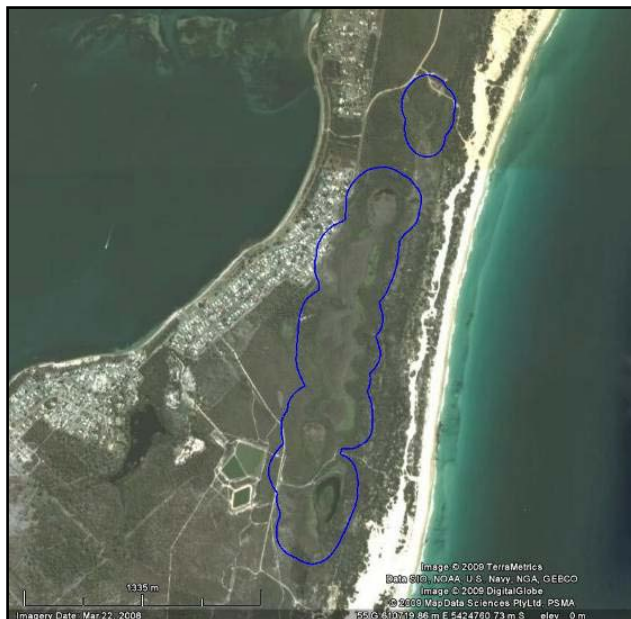
N.B. - This number is an unweighted addition of the variables that make up the adjacent condition rose to give an assessment out of a possible 100 points. These variables represent the current condition and natural values recorded historically and during the current survey. Due to the different levels of survey undertaken at each site, this score should not be used as a comparative value between wetlands.



**Photo 3.1. Moriarty Lagoon south from dunes on eastern margin looking south-west.**



**Photo 3.2. Google Earth aerial photo of Moriarty/ Windmill Lagoon study area.**



### **3.1 Introduction**

The Moriarty and Windmill Lagoons include four water bodies occupying four distinct basins. Moriarty Lagoon is comprised of the two northern lagoons, Moriarty North and Moriarty South, with Moriarty South being the largest of the four water bodies at 24.4ha in surface area, and Moriarty North being the smallest at 0.1ha. Windmill Lagoon is comprised of the two southern lagoons, Windmill North and Windmill South, with Windmill South being 8.2ha in surface area, and Windmill North being 2.0ha.

For the purposes of this study all four lagoons, including a 100m buffer around each wetland will be considered as the Moriarty/ Windmill Lagoon complex. The total surface area of the water bodies mentioned above is 34.7ha, and including the 100m buffer around them equates to an area of approximately 106.1ha.

### **3.2 Geomorphology**

#### **3.2.1 Setting**

The Moriarty and Windmill Lagoons are a series of four lowland dune lakes which extend approximately 2.9 km in a north-northeast direction on St Helens Point. The lagoons are bounded on the east by well vegetated (stable) 10 – 20 m high sand dunes. These older stable dunes lie parallel to a second set of less vegetated, younger dunes, and create a barrier of approximately 0.5 km wide between the lagoons and the sea. All dunes support marram grass which has likely affected dune processes to varying degrees. The dune barrier is continuous, and there are no breaks through which the lagoons can connect with the sea.

The western boundary of the lagoons is created by a predominantly sandy ridge 10 – 20 m high underlain by granite near Akaroa. This western ridge increases in elevation towards the south. The dune complex occupies an area of the St Helens peninsula which narrows towards the north, such that the most southerly lake, (Windmill south) lies ~1.5 km from George's Bay with the most northern lake (Moriarty north) being only ~0.4 km from the bay. The lagoon catchments are limited to the lagoonal basin with no surface drainage established.

The adjoining east coast is largely undisturbed (with the exception of marram grass) and has high conservation value. The lagoons occupy broad shallow basins separated by a sand ridge. Small undulations in the topography create small, locally lower areas which are subjected to longer periods of inundation. Inflow is limited to direct precipitation with no natural channelized inflow.

#### **3.2.2 Local processes**

The predominant geomorphic processes within the lagoons include aeolian sand input from the coastal dune complex and the retention of internally derived organic matter. In the most northern basin (Moriarty North), where the area of inundation is relatively small compared to the basin, there is a higher content of sand in the underlying soils. In the other lagoons, the area prone to inundation occupies most of the basin and the thick organic rich soils are widespread. The long periods of inundation in some areas of the lagoons have lead to anoxic subsurface conditions characterised by black sediments with a strong sulphidic odour.

### **3.3 Hydrology & sediments**

#### **3.3.1 Inflows**

Hydrologically the lagoons are predominantly fed by direct rainfall and groundwater, with no natural surface water inflows. The lack of surface inflows also results in very low fluvial sediment loads being delivered to the lagoons. Although low lying and near sea level there is no evidence of tidal influence on water levels in the lagoon. Aeolian sands and autochthonous organic matter are the predominant inputs to the system. The low sediment input results in a highly organic rich environment with black highly organic rich soils.

One small drainage line enters the larger Moriarty Lagoon from the east. This channel was created to reduce water levels in the nearby Shaft Lagoon by excavating a channel through the ridge separating the two water bodies (REFXX). This channel shows signs of erosion in the vicinity of Shaft lagoon, but is largely vegetated near Moriarty Lagoon. In the southern most Windmill Lagoon, the proximity of the road to the edge of the lagoon has resulted in runoff and sediment from the road entering the northern end of the lagoon.

#### **3.3.2 Internal**

The lack of channelized flow within the lagoons is a fundamental characteristic of the water bodies, and results in a hydrologic 'mosaic' with vegetation growth creating small, narrow interconnected 'channels' within the lagoon. Due to the lack of channelized flow the water bodies are a very low energy depositional environment. Winds drive surface water movements, but the presence of vegetation limits surface water velocities.

Apart from aeolian sands there are no sediment sources entering the lagoons. This, combined with the very low energy environment has resulted in the development of thick, organic rich soils in the bottom of the basins, with the proportion of sand increasing towards the higher margins.

#### **3.3.3 Outflow**

Outflow from the lagoons is limited to evaporation and losses to groundwater. There is no outflow of water to the sea due to the continuous stable coastal dunes. The lagoons do not appear to be affected by tidal movements.

### **3.4 Water quality**

#### **3.4.1 Inflow**

Inflows include precipitation and groundwater with very minor surface flow. No data is available on groundwater quality in the region, but it is presumed to be good. The presence of elevated salinity relative to fresh water suggests that marine aerosols enter the lagoon via sea spray and rainfall and possibly minor volumes of sea water enter via groundwater.

#### **3.4.2 Internal**

The water in the lagoons is characterised by low turbidity and a strong brown coloration due to the presence of dissolved organic compounds. pH values in the lagoons ranged from 4.6 to 6.8, with the lowest value associated with the smallest water way (Moriarty north). The low

pH values are attributable to the inflow of organic rich groundwater derived from the acidic organic rich soils. Salinity ranged from 0.2 ppt to 2.8 ppt and generally increased from west to east (towards the coast). This increase is likely due to the delivery of marine aerosols via wind and rain.

Following a prolonged wet period, water depths over most of the lagoons were <1 m with the exception of the northern end of the large Moriarty lagoon and the most southern lagoon where deeper areas with very soft sediment were present. The water column was thermally stratified by mid-afternoon with a difference of over 2°C between surface and deeper waters. The organic rich sediments indicate that recycling of internally derived organic matter within the lagoon is a predominant process.

### **3.4.3 Outflow**

Evaporation and groundwater exchange are the major outflows from the lagoons. Evaporation can lead to an increase in the concentrations of parameters during prolonged dry periods. Because there is no flushing mechanism within the lagoon, any change to water quality can persist for long periods.

### **3.5 Geomorphology, hydrology and water quality condition**

Field observations found the Moriarty and Windmill lagoons to be in good to excellent condition. This is consistent with the CFEV ratings for the wetlands and these scores are shown in the condition roses.



**Photo 3.2. Left -Moriarty Lagoon south from dunes on eastern margin looking southwest. Note ridge forming eastern boundary of lagoonal basin.**

**Photo 3.3. Right - Vegetated stable dunes (including abundant marram grass) on eastern side of Moriarty & Windmill lagoons.**





**Photo 3.4 Left - Moriarty Lagoon north showing small area of prolonged inundation.**

**Photo 3.5. Right - Sandy organic rich soils characteristic of Moriarty Lagoon north.**



**Photo 3.6. Left -Northern section of Moriarty Lagoon south showing area of extended inundation.**

**Photo 3.7. Right - Organic rich soils characteristic of Moriarty Lagoon south and Windmill Lagoons.**



**Photo 3.8 & 3.9. Typical hydrologic pattern in Moriarty South (Left) and Windmill North (Right). Note lack of defined channels.**



### 3.6 Flora and Fauna

#### 3.6.1 Overview

The Moriarty/ Windmill Lagoon complex study area covers approximately 106.1 hectares, with 98% of the vegetation communities being native. A total of 12 native vegetation communities were recorded, covering a variety of habitats including forest and woodland, scrub, heathland, grassland, sedgeland and fresh water aquatic habitats. All native vegetation communities were in very good condition.

The most abundant vegetation community in the Moriarty/ Windmill Lagoon complex is Fresh water aquatic sedgeland and rushland (ASF), dominated by bare twigsedge (*Baumea juncea*) and spreading swordspike (*Lepidosperma longitudinale*), which covers almost one third of the study area. Together with smaller areas of Fresh water aquatic hermland (AHF), *Leptospermum* scrub (SLW) and *Melaleuca ericifolia* swamp forest (NME) (at Moriarty North), this makes up the wetland component of the native vegetation communities. This wetland component occupies the low-lying broad shallow basin areas within the study area, and this area was comprehensively inundated at the time of this survey.

Immediately surrounding the wetland area there is an ecotone between the lower lying wetland area, and the higher ground that rises out of the wetland. The ecotone is comprised of wetter soils than the higher ground, and is dominated by *Melaleuca squarrosa* scrub (SMR) and *Melaleuca ericifolia* swamp forest (NME). Beyond this zone on the higher ground the vegetation is dominated by drier scrubby vegetation communities, including Coastal scrub (SSC), Coastal heathland (SCH) and *Eucalyptus amygdalina* coastal forest and woodland (DAC). Smaller patches of other vegetation communities also occur in parts of the study area.

The study area incorporates a 100m buffer surrounding the wetland portions of the Moriarty/ Windmill Lagoon complex. This buffer area occupies 71.4ha of which approximately 97% is native vegetation, with the remainder being urban areas and other urban infrastructure. This high proportion of native vegetation within the buffer area assists in protecting the wetland vegetation itself and in filtering and maintaining the quality of the water that enters.

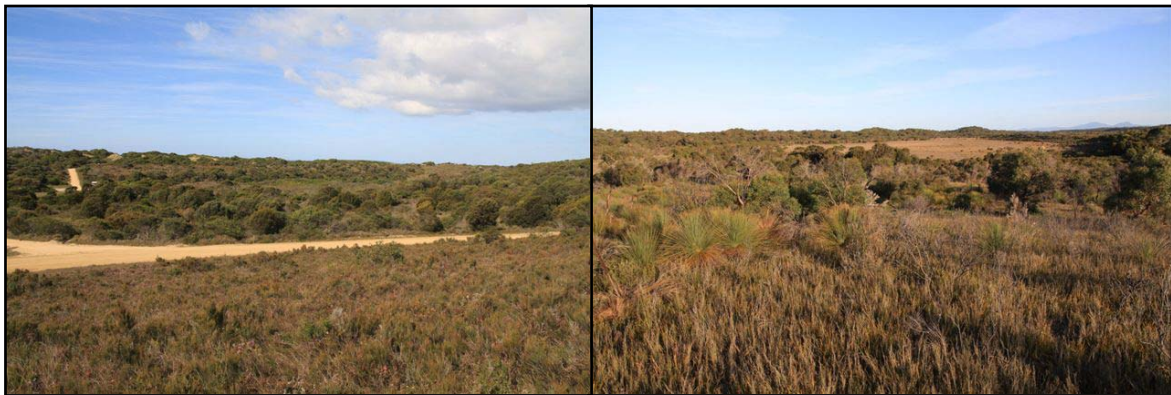


Photo 3.10. Left - Moriarty Lagoon north lagoon general view of native vegetation.

Photo 3.11. Right - Moriarty Lagoon south lagoon general view of native vegetation.



Photo 3.12. Windmill Lagoon south general view of lagoon area.

### 3.6.2 Vegetation Condition

The majority of the vegetation communities within the Moriarty/ Windmill Lagoon complex are in an excellent condition overall with 98% of them being at Condition Level 1. This condition level is characterised by no or very low levels of weed invasion, with the vegetation being structurally and floristically intact. Condition Level's 2 and 3 were not recorded within the study area. Condition Level 4 comprised 2% of the vegetation communities, and is made up of urban areas and other urban infrastructure, where the native vegetation areas have been destroyed or the natural values have been grossly altered. See Table 3.1 below for details.

Table 3.1 – Vegetation Condition within the study area.

Condition	Condition Description	Area (ha)	% of study area
1	Vegetation structurally and floristically intact and weed invasion less than 1% cover	104.1	98.2
2	Vegetation structurally and floristically altered and/or weed invasion > 1% and < 10% cover	0	0
3	Vegetation structurally and floristically altered and weed invasion > 10% and < 50% cover	0	0
4	Grossly altered vegetation structure in otherwise weed infested vegetation (> 50% weeds cover)	2.0	1.8
<b>Total</b>		106.1	100.0

### 3.6.3 Vegetation Community Richness

Of the 14 vegetation communities recorded in the study area 12 are native, with the remaining two being exotic or anthropogenic communities. At Moriarty/ Windmill Lagoon the most common vegetation community is Fresh water aquatic sedgeland and rushland (ASF), followed by Coastal Scrub (SSC), *Eucalyptus amygdalina* coastal forest and woodland (DAC) and *Melaleuca squarrosa* scrub (SMR).

Of the native vegetation communities recorded three are considered to be threatened under the Tasmanian *Nature Conservation Act 2002*. They are Fresh water aquatic sedgeland and rushland (ASF), Fresh water aquatic herbland (AHF) and *Melaleuca ericifolia* swamp forest (NME). Together they cover 35% of the vegetated area (excluding open water/sea (OAQ)).

Full details of vegetation communities recorded, their threatened status and their condition is provided below in Table 3.2, and their distribution is shown in Figure 3. Full species lists for each vegetation community are provided in Appendix 4.

**Table 3.2 – Vegetation Communities recorded in the study area, including their conservation priority, reservation status and condition.**

Veg Code <sup>1</sup>	Vegetation Community Description	Area (ha)	State-wide Conservation Priority and Reservation Status <sup>2,3</sup>	Bioregional Conservation Priority and Reservation Status <sup>2,3</sup>	Condition
AHF	Fresh water aquatic herbland	3.7	Threatened	Threatened	1
ASF	Fresh water aquatic sedgeland and rushland	30.6	Threatened	Threatened	1
DAC	Eucalyptus amygdalina coastal forest and woodland	16.8	Not threatened adequately reserved	Not threatened and adequately reserved	1
FUM	Extra-urban miscellaneous	0.8	-	-	4
FUR	Urban areas	1.2	-	-	4
GSL	Lowland sedgy grassland	0.5	Not threatened	Not threatened	1
NAV	Allocasuarina verticillata forest	0.4	Not threatened and adequately reserved	Not threatened and adequately reserved	1
NME	Melaleuca ericifolia swamp forest	2.9	Threatened and inadequately reserved	Threatened and inadequately reserved	1
SAC	Acacia longifolia coastal scrub	0.8	Not threatened	Not threatened	1
SCH	Coastal heathland	12.4	Not threatened	Not threatened	1
SHW	Wet heathland	2.1	Not threatened	Not threatened	1
SLW	Leptospermum scrub	0.1	Not threatened	Not threatened	1
SMR	Melaleuca squarrosa scrub	15.7	Not threatened	Not threatened	1
SSC	Coastal Scrub	18.1	Not threatened	Not threatened	1
	<b>Total Area (ha)</b>	<b>106.1</b>			

### 3.6.4 Flora Species Richness

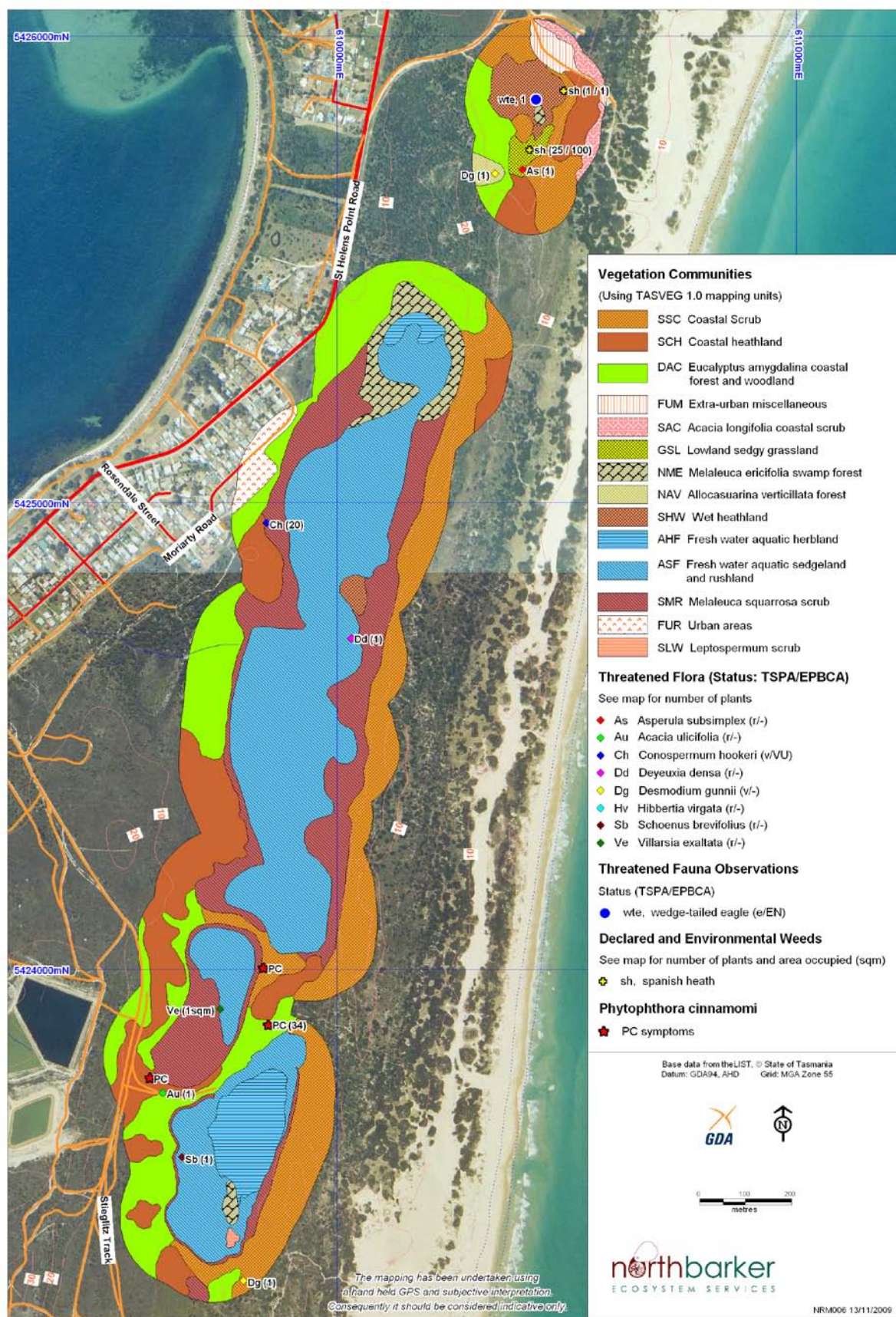
A total of 144 flora species were recorded within the study area. Of these 139 were native, with the remaining five being weed species. A full species list for the Moriarty/ Windmill Lagoon complex is included in Appendix 3.

<sup>1</sup> As per Tasveg 2.0 Vegetation Classification System, DPIPW

<sup>2</sup> Nature Conservation Act 2002

<sup>3</sup> FCF 2007. Note there is no recent analysis of reservation status of non forest communities





**Figure 3 – Vegetation Communities, Weeds, Threatened Flora, Threatened Fauna and PC symptoms for Moriarty Windmill Lagoon**



### 3.6.5 Threatened Flora

Eleven flora species listed under either the Tasmanian *Threatened Species Protection Act 1995* (TSPA) or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBCA) have been recorded within the study area. Five of these flora species were previously recorded within the study area<sup>4</sup>, while six additional species were recorded during the current survey. These additional species are *Acacia ulicifolia* (juniper wattle), *Asperula subsimplex* (water woodruff), *Conospermum hookeri* (Tasmanian smokebush), *Desmodium gunnii* (southern ticktrefoil), *Deyeuxia densa* (heath bentgrass) and *Hibbertia virgata* (twiggy guineaflower). All species of conservation significance recorded within the study area are listed in Table 3.3, and their distribution is shown in Figure 3.

**Table 3.3 – Flora species of conservation significance within the study area. Records are historical records from the Natural Values Atlas and records found during this survey.**

Species	Status <sup>5</sup> TSPA/EPBCA	Recorded this survey <sup>6</sup>
<i>Acacia ulicifolia</i> (juniper wattle)	r/-	Yes
<i>Asperula subsimplex</i> (water woodruff)	r/-	Yes
<i>Baumea articulata</i> (jointed twigsedge)	r/-	-
<i>Conospermum hookeri</i> (Tasmanian smokebush)	v/VU	Yes
<i>Desmodium gunnii</i> (southern ticktrefoil)	v/-	Yes
<i>Deyeuxia densa</i> (heath bentgrass)	r/-	Yes
<i>Eutaxia microphylla</i> var. <i>microphylla</i> (spiny bushpea)	r/-	-
<i>Hibbertia virgata</i> (twiggy guineaflower)	r/-	Yes
<i>Schoenus brevifolius</i> (zigzag bogsedge)	r/-	Yes
<i>Utricularia australis</i> (yellow bladderwort)	r/-	Yes
<i>Villarsia exaltata</i> (erect marshflower)	r/-	Yes



**Photo 3.12. Left - *Conospermum hookeri* (Tasmanian smokebush) close-up view.**

**Photo 3.13. Right - *Acacia ulicifolia* (juniper wattle) close-up view.**

<sup>4</sup> Natural Values Atlas, DPIPWE

<sup>5</sup> TSPA - Tasmanian *Threatened Species Protection Act 1995*; EPBCA - Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*

<sup>6</sup> Threatened species that were not recorded during the current survey are likely to still be present at this site. Seasonal and survey limitations are likely to be responsible for some threatened species not being recorded during the current survey.

### 3.6.6 Threatened Fauna

A total of three fauna species listed under either the Tasmanian *Threatened Species Protection Act 1995* (TSPA) or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBCA) have been recorded within the study area. Two of these fauna species were previously recorded within the study area<sup>4</sup>. One species, the wedge-tailed eagle (*Aquila audax ssp. fleayi*) was recorded during the current survey, flying overhead indicating that the land is probably productive in terms of hunting prey species. Quoll scats were present but in this habitat are more likely to be those of Eastern quoll than the spotted-tailed quoll. All species of conservation significance recorded within the study area are listed in Table 3.4, and the location of the wedge-tailed eagle sighting is shown in Figure 3.

**Table 3.4 – Fauna species of conservation significance within the study area. Records are historical records from the Natural Values Atlas and records found during this survey.**

Species	Status <sup>7</sup> TSPA/EPBCA	Recorded this survey <sup>8</sup>
wedge-tailed eagle ( <i>Aquila audax ssp. fleayi</i> )	e/EN	Yes
green and golden frog ( <i>Litoria raniformis</i> )	v/VU	-
Tasmanian devil ( <i>Sarcophilus harrisii</i> )	e/EN	-



**Photo 3.14. Left - Wedge-tailed Eagle over Moriarty North lagoon.**

### 3.6.7 Fauna Habitat Value

The vegetation of the study area provides a diverse range of habitat opportunities for fauna species. A large variety of habitats are present including forest and woodland, scrub, heathland, grassland, sedgeland and fresh water aquatic habitats. Approximately 98% of the study area was in an excellent condition (Condition Level 1), thus providing high quality foraging and nesting habitat for many fauna species. A variety of species are likely to be present including small mammals, reptiles, birds, amphibians and invertebrates.

At the time of the survey the aquatic habitat was in good condition, following good rains, with a resulting abundance of frogs, with the calls of the banjo frog (*Limnodynastes dumerili*

<sup>7</sup> TSPA - Tasmanian *Threatened Species Protection Act 1995*; EPBCA - Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*

<sup>8</sup> Natural Values Atlas, DPIPWE

*subsp. insularis*) and the brown froglet (*Crinia signifera*) being particularly abundant. More prominent fauna sightings included a swamp harrier (*Circus approximans*) and a common brushtail possum (*Trichosurus vulpecula* subsp. *fuliginosus*), and there were abundant macropod scats.

### 3.6.8 Threatened Fauna Habitat

Approximately 83% of the study area is habitat that is potentially suitable for threatened fauna. Twelve threatened fauna species are known to use the habitat types that are present within the study area. Additionally one species listed under the JAMBA and CAMBA<sup>9</sup> migratory bird agreements also has potential habitat within the study area. Details of the species of threatened fauna and migratory birds that may occur at the Moriarty Windmill Lagoon complex and their preferred habitats are in Appendix 1. The habitats within the study area that are preferred by at least one threatened fauna species include;

- Fresh water aquatic herbland (AHF)
- Fresh water aquatic sedgeland and rushland (ASF)
- *Eucalyptus amygdalina* coastal forest and woodland (DAC)
- *Melaleuca ericifolia* swamp forest (NME)
- *Acacia longifolia* coastal scrub (SAC)
- Coastal heathland (SCH)
- Wet heathland (SHW)
- *Leptospermum* scrub (SLW)
- Coastal Scrub (SSC)

### 3.7 Weeds

A total of five weed species were recorded within the study area, with only one being a “declared” weed species listed on the schedules of the *Tasmanian Weed Management Act 1999* (see Table 3.5 below). The one recorded species is Spanish heath (*Erica lusitanica*), which was recorded in two locations at the Moriarty North wetland. These two locations occur in Wet heathland (SHW) and Lowland sedgy grassland (GSL), with 1 and 25 plants being recorded at these locations respectively. This infestation is currently at an ideal stage for eradication as it is small and localised. The habitat throughout this reserve is considered highly suitable for Spanish heath, and therefore failure to control this species now will allow it to inevitably spread and dominate the ecosystem. The four other weed species that were recorded are considered to be species that do not pose significant environmental problems. See figure 3 for weed location and infestation details.

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<sup>9</sup> Japan Australia Migratory Bird Agreement (1974) and China Australia Migratory Bird Agreement (1986)

**Table 3.5 – Declared or environmental weed species recorded within the study area.**

Weed Species	Declared <sup>10</sup> / Environmental
Spanish heath ( <i>Erica lusitanica</i> )	Declared

**Photo 3.16. Left - Spanish heath (*Erica lusitanica*) close-up view.**

### 3.8 Ramsar Criteria

The Convention on Wetlands of International Importance, called the Ramsar Convention, is an intergovernmental treaty that provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources. The information detailed in the above sections allows an assessment of the Moriarty/ Windmill Lagoon complex to be made against Ramsar criteria. The Ramsar criteria have been created to identify wetlands of international importance that are to be listed on the Ramsar Convention.

Table 3.6 below lists the Ramsar criteria, and makes an assessment on whether or not this wetland meets that criteria, or if further information is needed. A wetland should be considered internationally important if it meets one or more of these criteria.

**Table 3.6 – Ramsar criteria and assessment.**

Ramsar Criteria	Does it meet the criteria?
<b>1. Criteria for representative or unique wetlands</b>	
1a - It is a particularly good representative example of a natural or near-natural wetland, characteristic of the appropriate biogeographical region; or	Yes
1b - It is a particularly good representative example of a natural or near-natural wetland, common to more than one biogeographical region; or	Needs further research/ information
1c - It is a particularly good representative example of a wetland which plays a substantial hydrological, biological or ecological role in the natural functioning of a major river basin or coastal system, especially where it is located	No

<sup>10</sup> Declared under the Tasmanian *Weed Management Act 1999*



Ramsar Criteria	Does it meet the criteria?
in a trans-border position; or	
1d - It is an example of a specific type of wetland, rare or unusual in the appropriate biogeographical region.	No
<b>2. General criteria based on plants or animals</b>	
2a - It supports an appreciable assemblage of rare, vulnerable or endangered species or subspecies of plant or animal, or an appreciable number of individuals of any one or more of these species; or	Needs further research/ information
2b - It is of special value for maintaining the genetic and ecological diversity of a region because of the quality and peculiarities of its flora and fauna; or	No
2c - It is of special value as the habitat of plants or animals at a critical stage of their biological cycle; or	Needs further research/ information
2d - It is of special value for one or more endemic plant or animal species or communities.	Needs further research/ information
<b>3. Specific criteria based on waterfowl</b>	
3a - It regularly supports 20,000 waterfowl; or	Unlikely
3b - It regularly supports substantial numbers of individuals from particular groups of waterfowl, indicative of wetland values, productivity or diversity; or	Needs further research/ information
3c - Where data on populations are available, it regularly supports 1% of the individuals in a population of one species or subspecies of waterfowl.	Needs further research/ information
<b>4. Specific criteria based on fish</b>	
4a - It supports a significant proportion of indigenous fish subspecies, species or families, life-history stages, species interactions and/or populations that are representative of wetland benefits and/or values and thereby contributes to global biological diversity; or	Needs further research/ information
4b - It is an important source of food for fishes, spawning ground, nursery and/or migration path on which fish stocks, either within the wetland or elsewhere, depend.	Needs further research/ information

### 3.9 Landholder Survey

No responses to the survey were received from landholders for Moriarty/ Windmill Lagoon.

### 3.10 Threats

The lack of surface water or sediment inflows, low energy environment and internal recycling of organic matter are the key characteristics of the Moriarty and Windmill lagoon complex. Any disturbance to these attributes could significantly alter the present quality of the lagoons. The overall condition of the Moriarty Windmill Lagoon complex is very good, indicating that the pressures and threats that it faces are currently low, or the system is resilient enough to withstand the current level of threatening processes. However, this does not mean that this will continue into the future, as several threats were identified during the current survey. The key threats identified include;

- **Urban development – High Threat.** Appears to be increasing on the St Helens Point peninsula, which could increase the impacts associated with an increase in human activities, such as rubbish, pollution, weeds, vegetation loss etc. It is important that the crown land areas that surround this wetland be maintained as natural areas, and not be allowed to be developed for residential, industrial or agricultural purposes.
- **Channelisation of surface flows – Moderate Threat.** Channelisation of surface flows into the lagoons or within the lagoons. Storm water drains or other channelized inflows would alter the surface hydrology, increase the energy of the system and lead to the deposition of material including any introduced solids into the lagoon. Channelisation within the lagoon basins due to dirt bikes, dune buggies, walking tracks etc could lead to the development of distinct flow channels which could change the inundation patterns (spatial and temporal) of the lagoon.
- **Increased nutrient inflow – Moderate Threat.** Increased nutrient inflow could alter water quality and potentially lead to eutrophication as nutrients are not readily flushed from the system and would continue to be internally recycled. A spill or leaching from the nearby sewage treatment system could increase nutrient input to the lagoon.
- **Off road vehicle access – Moderate Threat.** Evidence of off road vehicles accessing the wetland flats of the Windmill South lagoon were observed, with deep tracks being cut into the wetland surface (see photo 3.16). This type of activity damages surface vegetation, potentially changes surface water flows and hydrology, as well as potentially disturbing fauna species and perhaps limiting breeding success. It is currently considered an occasional moderate threat that could be reduced by fencing off the crown land area and thereby restricting access. If off road vehicle access increases this will become a major threat to the wetlands natural values.



Photo 3.16. Left - Off road vehicle damage in Windmill South lagoon.

- **Phytophthora – Moderate Threat.** Symptomatic evidence of this plant pathogen was found in several locations in coastal heath. Management of 4WD access will have the added benefit of reducing the potential spread of *Phytophthora*.
- **Weeds – Moderate Threat.** Spanish heath was the most serious weed observed, however it is currently in low numbers. This infestation is currently at an ideal stage

for eradication as it is small and localised. Even at low numbers Spanish heath is considered a very serious threat as within the study area it has the ability to rapidly spread and dominate the ecosystem. If allowed to do this there will be a displacement and loss of flora species, with a subsequent decline in fauna abundance as food plants and habitat values are decreased.

- **Acid sulphate soils – Low Threat.** The area has been identified as having the potential for acid sulphate soils. The sulphide smell associated with the inundated sediments is consistent with this assessment. If acid sulphate soils are present, any draining of the lagoons could lead to sulphide oxidation and acidification of the water way.
- **Tracks/Roads – Low Threat.** Several vehicle tracks cut through the buffer area of this wetland, but do not cut across the wetland areas themselves. Most tracks occur on the eastern and northern side of the study area, and St Helens Point Road and another residential street cut through the buffer area near the northern end of Moriarty South. Several unsealed tracks associated with the Stieglitz Track occur within the buffer area to the west of Windmill Lagoon. These tracks are currently allowing access for detrimental activities such as rubbish dumping and off road vehicle access and access needs to be restricted. There are several minor foot tracks that traverse parts of the lagoon and these currently appear to be not impacting in a negative way. Proximity of the road to the southern Windmill Lagoon has also resulted in runoff from the road, vehicular access causing erosion and the deposition of rubbish near the shore of the lagoon.
- **Rubbish dumping – Low Threat.** Garden waste was noted as being dumped at the end of the access track that runs between the two Windmill wetlands. It appears to be a minor problem at the moment, however it is a good way to introduce weeds to a site, attract other rubbish dumpers and obviously impacts on the visual amenity of the site. Restricting vehicle access to out of the way tracks could reduce this problem particularly in to central areas of the wetland. However this could just shift the problem to other areas.
- **Rabbits – Low Threat.** Rabbit dung was observed in several locations. Damage to vegetation was not obvious indicating that rabbits are probably present in low numbers and currently pose a minor threat. This will need to be monitored however, and a control program put in place if numbers and consequent vegetation damage or erosion problems start to occur.

### 3.11 First Aid

Several actions could be undertaken to reduce the threats that are currently facing the Moriarty Windmill Lagoon complex. Listed in priority order they include the following;

1. Immediate weed control program, including several years of follow up work, targeting Spanish heath.

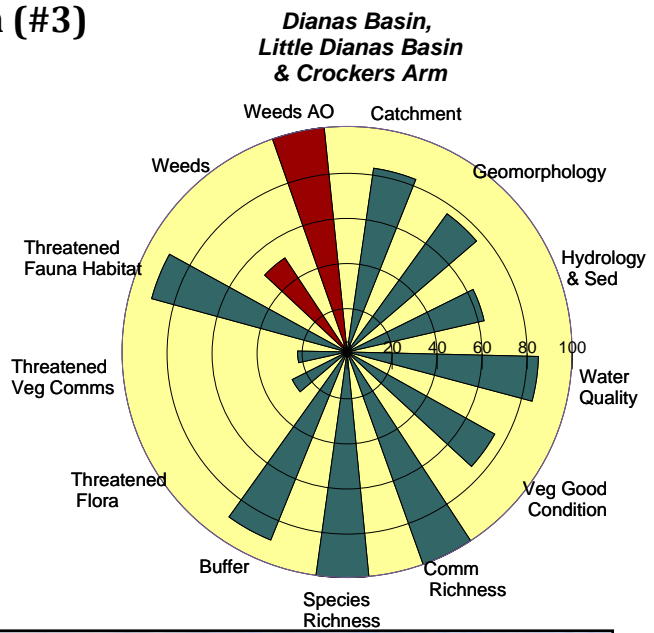
2. Maintain vegetation between the houses and lagoons in order to diffuse surface flows and reduce nutrient and sediment input.
3. Prevent access to all vehicles and eliminate current vehicular access to Windmill lagoon. Prevent vehicular access via Stieglitz Track.
4. Install educational signs highlighting the ecological values of the area and discouraging damaging activities.
5. Maintain walking track around northern end of lagoon so hat it doesn't become a 'channel' leading to the lagoon.
6. Establishment of vegetation along the northern edge of Windmill Lagoon South to separate the road from the lagoon.
7. Rehabilitation of channel draining the adjacent Shaft lagoon.
8. Undertake educational activities within the local community highlighting the ecological values and sensitivity of the area and encouraging local stewardship.
9. Monitor rabbit numbers and their impacts, and implement a control program if unacceptable levels of damage are occurring.

## 4 Diana's Basin & Crockers Arm (#3)

### Wetland Health Score:

**72/ 100**

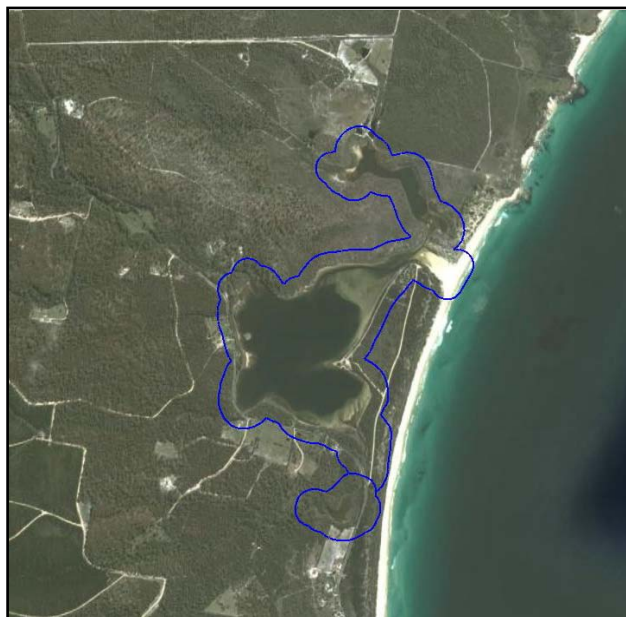
N.B. - This number is an unweighted addition of the variables that make up the adjacent condition rose to give an assessment out of a possible 100 points. These variables represent the current condition and natural values recorded historically and during the current survey. Due to the different levels of survey undertaken at each site, this score should not be used as a comparative value between wetlands.



**Photo 4.9. Diana's Basin from northern hills looking south-west.**



**Photo 4.2. Google Earth aerial photo of Diana's Basin study area.**



## **4.1 Introduction**

Diana's Basin is made up of three linked wetland areas which include Diana's Basin, Little Basin and Crockers Arm. The central wetland area is Diana's Basin, which at 82.3ha in surface area is the largest of the three wetlands. To the north of Diana's Basin, is Little Basin at 10.6ha in surface area, while to the south of Diana's Basin is Crockers Arm at 3.4ha in surface area. Crockers Arm is divided from the main body of Diana's Basin by the Tasman Hwy, while Little Basin is connected to Diana's Basin by a narrow channel of water.

For the purposes of this study all three wetlands, including a 100m buffer around each wetland will be considered as Diana's Basin. The total surface area of the water bodies mentioned above is 96.3ha, and including the 100m buffer around them equates to an area of approximately 194.3ha.

## **4.2 Geomorphology**

### **4.2.1 Setting**

The Diana's Basin complex is situated behind Diana's Beach and is fed by runoff from the Scamander Tiers. The eastern boundary of the complex is composed of dunes which have been colonised by marram grass, with a break in the dunes through which the lagoon periodically connects to the sea. The marram grass has stabilised the dunes, and it is likely that in the past the lagoons drained to the sea through a wider and more variable mouth. Aside from the marram grass, the coast is generally unmodified and considered to be of high conservation value.

Diana's Basin is bounded on the west by granitic and sedimentary bedrock creating the foothills of the Scamander Tier. The basins mark the contact between the bedrock and the large Quaternary sand unit which extends to St Helens Point. The catchment draining to Crockers Arm has been highly modified through clearing and the establishment of extensive pine plantations. The catchments entering Diana's Basin and Little Diana's Basin have limited catchment clearing.

The shores of the basins have been modified to varying degrees; the western shore of Diana's Basin has been moderately altered where the Tasman Highway parallels the shoreline, and especially at the mouth of Basin Creek and where Crockers Arm enters the lagoon. The eastern shore of Diana's has been slightly modified due to vehicular access and campsite development. Little Diana's Basin has been modified by clearing and alterations to the creeks entering the lagoon.

## **4.3 Local processes**

The predominant geomorphic processes within the lagoons include the Aeolian input of sand from the dunes, sediment input from the entering creeks, and the *in situ* generation and retention of organic material. Sediment re-suspension and transport due to wind is also common in shallow areas. Periodic flushing of the basins due to lagoon 'breakout' following high rainfall is important for the flushing of water and accumulated sediment out of the lagoons. Stabilisation of the coastal dunes by marram grass has likely reduced the area

through which the lagoon connects to the sea, and increased the stability and relief of the dunes neighbouring the lagoons.

## **4.4 Hydrology & sediments**

### **4.4.1 Inflows**

Each of the three water bodies in the lagoon complex is fed by different creeks (Crockers Arm Ck, Basin Cr and an unnamed creek entering Little Diana's Basin). The hydrology and sediment budget of Crocker Arm Creek has likely been altered due to the extensive conversion of native forests to pine plantations in the Scamander Pine Plantation. The inflows to Diana's Basin remain largely 'natural', whilst inflows to Little Diana's basin have been modified through damming. The hydrology of the area is characterised by episodic very high flows which drive the lagoon breakout cycle.

The inflow of Crockers Arm into Diana's Basin has been substantially modified by construction of the highway and placement of culverts between the two water bodies. Downstream of the culverts in Diana's Basin there has been widespread sedimentation and the associated establishment of fringing reed beds. Other impacts of the culverts are discussed under 'Outflows'.

### **4.4.2 Internal processes**

Sediment accumulation from inflows, and the accumulation of internally derived organic matter are the main sediment processes occurring within the water bodies. Deeper channels near the mouth of the lagoon and leading into Little Diana's basin are characterised by the organic matter, with shallower areas typically consisting of sands and gravels. During dry summer periods, it is likely that water bodies stratify with respect to both temperature and salinity. Observations for this report were completed following a period of very high rainfall which had resulted in the lagoon connecting to the sea, and the lagoon was well mixed with a salinity of ~24 ppt. Lower salinities (<10 ppt) were present where Crockers Arm enters the main lagoon. There was no evidence of algal growth or anoxic sediments in Diana's Basin or Little Diana's Basin on the day of investigation, but given the high inflows and exchange with the ocean which had recently occurred, none would be expected. It is likely that towards the end of warm, dry summers there would be anoxic organic rich sediments in the deeper areas of the lagoon.

Sediments in Diana's Basin and Little Diana's basin have been identified as potentially acid sulphate soils (Gurung, 2001) which could lead to acidification if exposed through disturbance or draining.

### **4.4.3 Outflows**

Outflows from the water bodies include Crockers Arm flowing into Diana's Basin, and the lower basins flowing into the sea. Between periods when the lagoons are connected to the sea, evaporation and ingress to ground water are the main outflows from the lagoons.

The outflow of Crockers Arm has been modified by highway construction and the placement of culverts at the downstream end of the water body. This has reduced the rate at which the

Arm can be flushed during high flows, and promoted the retention of fine sediments. The increased sediment load has possibly lead to a reduction in volume due to sedimentation and increased vegetation growth.

The outflow of the lagoon complex at the beach has been modified by the stabilisation of dunes due to marram grass, which has restricted the area through which the lagoon can flow to the sea.

## **4.5 Water quality**

### **4.5.1 Inflows**

The freshwater inflows to the lagoon are similar to other waters in the region being acidic with a high dissolved organic content. Electrical conductivity values reflect the proximity of the coast, with marine aerosols a predominant source of salt to the rivers. On the day of inspection, Crockers Arm had higher turbidity, which may reflect catchment activities.

The sea water entering the lagoons when connected to the sea is of high quality, and results in the elevated salinity values observed throughout the lagoons following closure of the mouth through sand deposition. The inflowing sea water can also transport marine derived organic matter into the lagoon.

### **4.5.2 Internal**

The main internal processes affecting water quality in the lagoon include wind mixing, stratification due to temperature and/ or salinity differences and the decomposition of organic matter.

In Crockers Arm, the high retention of fine-grained sediments and associated nutrients can impact water quality and promote the growth of nuisance algae. The high loading of organic material in the Arm can also lead to reduced oxygen concentrations through decomposition.

In the larger water bodies, water quality is closely linked to the hydrology of the system, with extended dry periods leading to stratification and a possible build up in nutrients due to the decomposition of organic material. During the high energy periods when connected to the sea, water quality is largely governed by the tides, with the inflow of ocean water followed by the outflow of riverine waters.

On the day of observations, water quality in Diana's Basin and Little Diana's Basin was good, with no evidence of algal growth or odour associated with decomposing organic matter. Water quality in Crockers Arm was more turbid, and the sediments showed signs of low oxygen (odour, black, bubbles) in spite of the recent very high rainfall.

## **4.6 Condition**

Diana's Basin and Little Diana's Basin are in better condition with respect to geomorphology, hydrology, sediment and water quality than Crockers Arm. The CFEV ratings for each of the water bodies is considered to be consistent with the field observation and an average of these values are displayed in the condition rose.





**Photo 4.3. Left - Mouth of lagoon showing well vegetated dunes separating Diana's Basin from Little Diana's Basin.**

**Photo 4.4. Right - Little Diana's Basin with Scamander Tier in background.**



**Photo 4.5. Left - Shows wide mouth of lagoon and relationship with ocean.**

**Photo 4.6. Right - Entrance to Little Diana's Basin from Diana's Basin.**



**Photo 4.7. Left - Vegetation choked outflow of Crockers Arm.**

**Photo 4.8. Right - Culverts linking Crockers Arm with Diana's Basin.**



Photo 4.9. Deposition where culverts enter Diana's has resulted in fringing reeds.

## 4.7 Flora and Fauna

### 4.7.1 Overview

The Diana's Basin study area covers approximately 194.3 hectares, with 96% of the vegetation communities being native. A total of 15 native vegetation communities were recorded, covering a variety of habitats including forest and woodland, scrub, heathland, sedgeland, sand/mud and saline aquatic habitats. The majority of native vegetation communities were in good condition.

The most abundant vegetation community at Diana's Basin is *Eucalyptus amygdalina* coastal forest and woodland (DAC), which covers approximately 10% of the study area. The wetland component of Diana's Basin covers 96.3ha or almost 50% of the study area, and it is made up of 89.5ha of Water, sea (OAQ) and 6.9ha of Saline sedgeland/rushland (ARS). The water level at the time of this survey was very high.

Immediately surrounding the wetland, the vegetation quickly changes to be dominated by drier forests and woodlands or coastal scrubs. On the western side of the basin the vegetation communities are dominated by *Eucalyptus amygdalina* coastal forest and woodland (DAC), *Eucalyptus globulus* dry forest and woodland (DGL), and *Eucalyptus viminalis* - *Eucalyptus globulus* coastal forest and woodland (DVC). On the eastern side of the basin the vegetation communities are dominated by Coastal Scrub (SSC) and *Acacia longifolia* coastal scrub (SAC). Smaller patches of other vegetation communities also occur in parts of the study area.

The study area incorporates a 100m buffer surrounding the wetland portions of Diana's Basin. This buffer area occupies 104.8ha of which approximately 90% is native vegetation, with the remainder being agricultural areas, weed infestations and other urban infrastructure. This high proportion of native vegetation within the buffer area assists in protecting the wetland vegetation and in filtering and maintaining the quality of the water that enters.





Photo 4.10. Left - General view of Crockers Arm wetland.

Photo 4.11. Right - Upper end of Crockers Arm where creek enters and surrounding *Eucalyptus globulus* forest and woodland (DGL).



Photo 4.13. Right - Elevated view of Little Basin to the north of Diana's, with connecting channel on the left hand side of photo.

#### 4.7.2 Vegetation Condition

Approximately half of the vegetation communities within Diana's Basin are in an excellent condition overall with 55% of them being at Condition Level 1. This condition level is characterised by no or very low levels of weed invasion, with the vegetation being structurally and floristically intact. Condition Level 2 comprised 20% of the vegetation communities, and is mainly made up of areas of *Eucalyptus globulus* dry forest and woodland (DGL), and *Eucalyptus viminalis* - *Eucalyptus globulus* coastal forest and woodland (DVC), where weed invasion is occurring. Condition Level 3 comprised 15% of the vegetation communities, and is made up of *Acacia longifolia* coastal scrub (SAC) where heavy weed invasion is occurring. Condition Level 4 comprised 10% of the study area, and is made up of agricultural areas, weed infestations and other urban infrastructure, where the native vegetation areas have been destroyed or the natural values have been grossly altered. See Table 4.1 below for details.

**Table 4.1 – Vegetation Condition within the study area.**

Condition	Condition Description	Area (ha)	% of study area
1	Vegetation structurally and floristically intact and weed invasion less than 1% cover	58.0	55.3
2	Vegetation structurally and floristically altered and/or weed invasion > 1% and < 10% cover	20.9	19.9
3	Vegetation structurally and floristically altered and weed invasion > 10% and < 50% cover	15.5	14.8
4	Grossly altered vegetation structure in otherwise weed infested vegetation (> 50% weeds cover)	10.4	9.9
<b>Total</b>		104.8*	100.0

\* Condition ratings were not given to areas of Water, sea (OAQ)

#### 4.7.3 Vegetation Community Richness

Of the 20 vegetation communities recorded in the study area 15 are native, with the remainder being exotic or anthropogenic communities. At Diana's Basin the most common vegetation community is *Eucalyptus amygdalina* coastal forest and woodland (DAC), followed by *Eucalyptus globulus* dry forest and woodland (DGL), *Acacia longifolia* coastal scrub (SAC) and Coastal Scrub (SSC).

Of the native vegetation communities recorded, four of them - Wetland (undifferentiated) (AWU), *Eucalyptus globulus* dry forest and woodland (DGL), *Eucalyptus ovata* forest and woodland (DOV), *Eucalyptus viminalis* - *Eucalyptus globulus* coastal forest and woodland (DVC) are considered to be threatened under the Tasmanian *Nature Conservation Act 2002*. Together they cover 22% of the vegetated area (excluding open water/sea (OAQ)). Full details of vegetation communities recorded, their threatened status and their condition is provided below in Table 4.2, and their distribution is shown in Figure 4. Full species lists for each vegetation community are provided in Appendix 6.

**Table 4.2 – Vegetation Communities recorded in the study area, including their conservation priority, reservation status and condition.**

Veg Code <sup>11</sup>	Vegetation Community Description	Area (ha)	State-wide Conservation Priority and Reservation Status <sup>12 13</sup>	Bioregional Conservation Priority and Reservation Status <sup>2 3</sup>	Condition
ARS	Saline sedgeland/rushland	6.9	Not threatened and adequately reserved	Not threatened and adequately reserved	1
AWU	Wetland (undifferentiated)	0.3	Threatened	Threatened	1

<sup>11</sup> As per Tasveg 2.0 Vegetation Classification System, DPIPWE

<sup>12</sup> Nature Conservation Act 2002

<sup>13</sup> FCF 2007. Note there is no recent analysis of reservation status of non forest communities

<b>Veg Code<sup>11</sup></b>	<b>Vegetation Community Description</b>	<b>Area (ha)</b>	<b>State-wide Conservation Priority and Reservation Status<sup>12, 13</sup></b>	<b>Bioregional Conservation Priority and Reservation Status<sup>2, 3</sup></b>	<b>Condition</b>
DAC	Eucalyptus amygdalina coastal forest and woodland	24.6	Not threatened and adequately reserved	Not threatened and adequately reserved	1
DGL	Eucalyptus globulus dry forest and woodland	16.5	Threatened and inadequately reserved	Threatened and inadequately reserved	2
DOV	Eucalyptus ovata forest and woodland	1.8	Threatened and inadequately reserved	Threatened and inadequately reserved	1
DSO	Eucalyptus sieberi forest and woodland not on granite	3.7	Not threatened and adequately reserved	Not threatened and adequately reserved	1
DVC	Eucalyptus viminalis - Eucalyptus globulus coastal forest and woodland	4.4	Threatened and inadequately reserved	Threatened and inadequately reserved	2
FAG	Agricultural land	2.8	-	-	4
FMG	Marram grassland	2.1	-	-	4
FRG	Regenerating cleared land	2.6	-	-	4
FUM	Extra-urban miscellaneous	2.7	-	-	4
FWU	Weed Infestation	0.2	-	-	4
NAV	Allocasuarina verticillata forest	0.9	Not threatened	Not threatened	1
OAQ	Water, sea	89.5	Not threatened	Not threatened	-
OSM	Sand, mud	4.1	Not threatened	Not threatened	1
SAC	Acacia longifolia coastal scrub	15.5	Not threatened	Not threatened	3
SCH	Coastal heathland	1.5	Not threatened	Not threatened	1
SHW	Wet heathland	0.6	Not threatened	Not threatened	1
SMR	Melaleuca squarrosa scrub	0.4	Not threatened	Not threatened	1
SSC	Coastal Scrub	13.2	Not threatened	Not threatened	1
	<b>Total Area (ha)</b>	<b>194.3</b>			

#### 4.7.4 Flora Species Richness

A total of 174 flora species were recorded within the study area. Of these 168 were native, with the remaining six being weed species. A full species list for Diana's Basin is included in Appendix 5.



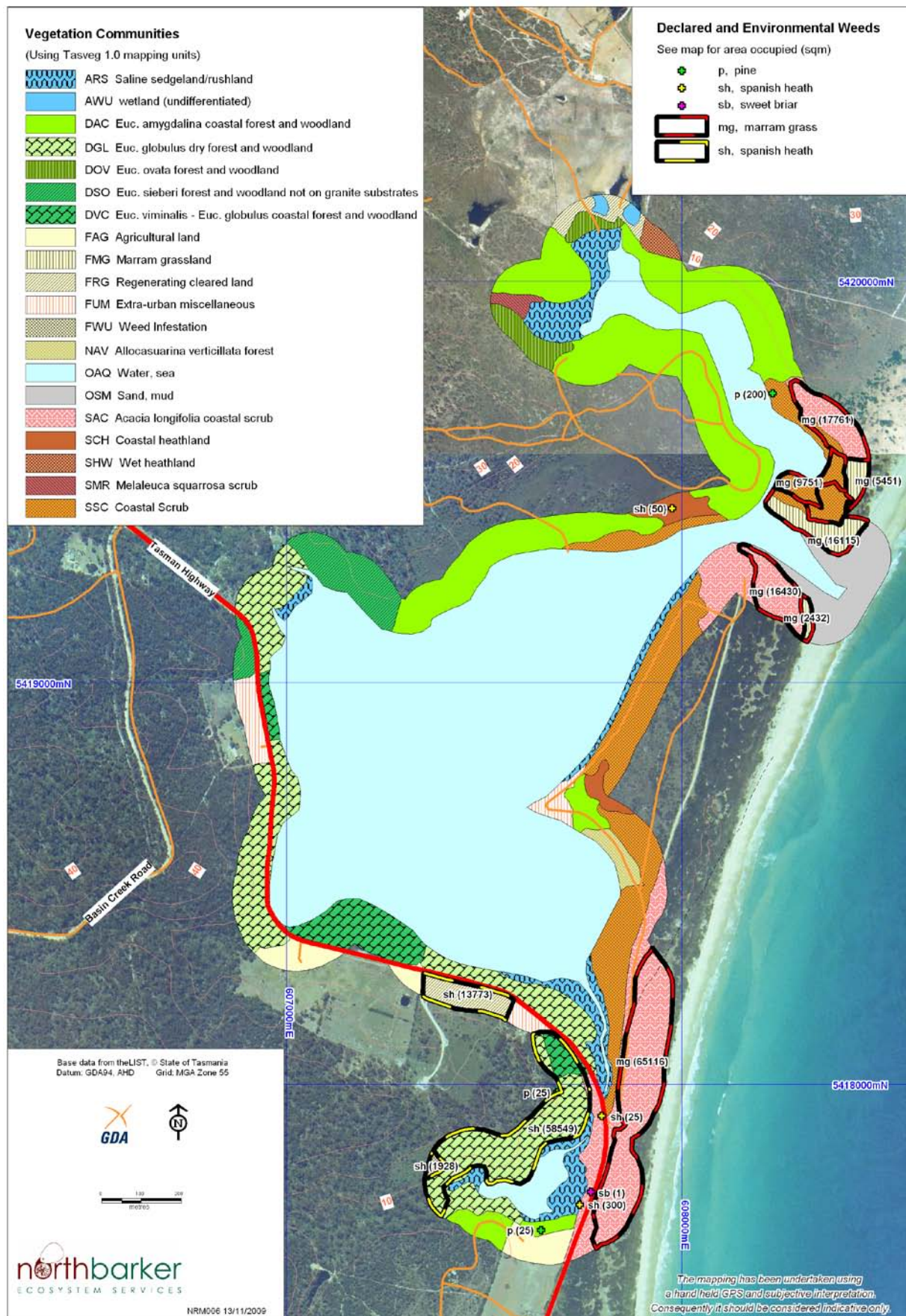


Figure 4 – Vegetation Communities and Weeds for Diana's Basin



#### 4.7.5 Threatened Flora

Three flora species listed under either the Tasmanian *Threatened Species Protection Act 1995* (TSPA) or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBCA) have been recorded within the study area. Two of these flora species were previously recorded within the study area<sup>14</sup>, while one additional species - *Hibbertia virgata* (twiggy guineaflower), was recorded during the current survey. All species of conservation significance recorded within the study area are listed in Table 4.3.

**Table 4.3 – Flora species of conservation significance within the study area. Records are historical records from the Natural Values Atlas and records found during this survey.**

Species	Status <sup>15</sup> TSPA/EPBCA	Recorded this survey <sup>16</sup>
<i>Conospermum hookeri</i> (Tasmanian smokebush)	v/VU	-
<i>Hibbertia virgata</i> (twiggy guineaflower)	r/-	Yes
<i>Sporobolus virginicus</i> (salt couch)	r/-	-

#### 4.7.6 Threatened Fauna

A total of five fauna species listed under either the Tasmanian *Threatened Species Protection Act 1995* (TSPA) or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBCA) have been recorded within the study area. All of these fauna species were previously recorded within the study area<sup>14</sup>. No threatened fauna species were recorded during the current survey. All species of conservation significance recorded within the study area are listed in Table 4.4.

**Table 4.4 – Fauna species of conservation significance within the study area. Records are historical records from the Natural Values Atlas and records found during this survey.**

Species	Status <sup>17</sup> TSPA/EPBCA	Recorded this survey <sup>18</sup>
fairy tern ( <i>Sternula nereis</i> )	(v/-)	-
little tern ( <i>Sternula albifrons</i> )	(e/-)	-
swift parrot ( <i>Lathamus discolor</i> )	(e/EN)	-
white-bellied sea-eagle ( <i>Haliaeetus leucogaster</i> )	(v/-)	-
great crested grebe ( <i>Podiceps cristatus</i> )	(v/-)	-

#### 4.7.7 Fauna Habitat Value

The vegetation of the study area provides a diverse range of habitat opportunities for fauna species. A large variety of habitats are present including forest and woodland, scrub,

<sup>14</sup> Natural Values Atlas, DPIPWE

<sup>15</sup> TSPA - Tasmanian *Threatened Species Protection Act 1995*; EPBCA - Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*

<sup>16</sup> Threatened species that were not recorded during the current survey are likely to still be present at this site. Seasonal and survey limitations are likely to be responsible for some threatened species not being recorded during the current survey.

<sup>17</sup> TSPA - Tasmanian *Threatened Species Protection Act 1995*; EPBCA - Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*

<sup>18</sup> Natural Values Atlas, DPIPWE

heathland, grassland, sedgeland, sand/mud and fresh water aquatic habitats. Approximately 55% of the study area was in an excellent condition (Condition Level 1), with the remainder being affected by weeds to varying levels, or modified by human activities. The area is still considered to provide high quality foraging and nesting habitat for many fauna species. A variety of species are likely to be present including small mammals, reptiles, birds, amphibians and invertebrates.

At the time of the survey the aquatic habitat was in good condition, following good rains, and water levels were very high. Frogs were common outside of the main lagoon, with the calls of the banjo frog (*Limnodynastes dumerili subsp. insularis*), Tasmanian froglet (*Crinia tamaniensis*) and the brown froglet (*Crinia signifera*) being heard. More prominent fauna sightings included a pademelon (*Thylogale billardierii*) and scats of wombats (*Vombatus ursinus tasmaniensis*) and macropods were also observed.

#### **4.7.8 Threatened Fauna Habitat**

Approximately 90% of the study area is habitat that is potentially suitable for threatened fauna. Seventeen threatened fauna species are known to use the habitat types that are present within the study area. An additional fourteen species listed under the JAMBA and CAMBA<sup>19</sup> migratory bird agreements also have potential habitat within the study area. Details of the species of threatened fauna and migratory birds that may occur at Diana's Basin and their preferred habitats are in Appendix 1. The habitats within the study area that are preferred by at least one threatened fauna species include;

- *Eucalyptus amygdalina* coastal forest and woodland (DAC)
- *Eucalyptus globulus* dry forest and woodland (DGL)
- *Eucalyptus ovata* forest and woodland (DOV)
- *Eucalyptus sieberi* forest and woodland not on granite (DSO)
- *Eucalyptus viminalis* - *Eucalyptus globulus* coastal forest and woodland (DVC)
- Water, sea (OAQ)
- Sand, mud (OSM)
- *Acacia longifolia* coastal scrub (SAC)
- Coastal heathland (SCH)
- Wet heathland (SHW)
- Coastal Scrub (SSC)

#### **4.8 Weeds**

A total of six weed species were recorded within the study area, with one being a “declared” weed species listed on the schedules of the *Tasmanian Weed Management Act 1999* (see Table 4.5 below), and three being considered environmental weeds. The one declared species is Spanish heath (*Erica lusitanica*), which was recorded extensively in vegetation and

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<sup>19</sup> Japan Australia Migratory Bird Agreement (1974) and China Australia Migratory Bird Agreement (1986)

agricultural land at the southern end of the Basin, and in particular around Crockers Arm. Other small infestations were also recorded, and it was also recorded in adjacent areas outside of the study area, indicating that it will be an ongoing problem. The habitat throughout this reserve is considered highly suitable for Spanish heath, and therefore failure to control this species now will allow it to spread further and dominate the ecosystem. Further larger infestations occur immediately outside of the study area.

Marram grass was found extensively in the coastal dunes dominated by *Acacia longifolia* coastal scrub (SAC), and has grossly altered the structure and habitat value of this part of the ecosystem, perhaps irretrievably. Several smaller point infestations of pine (*Pinus* sp.) and sweet briar (*Rosa rubiginosa*) were also recorded. The two other weed species that were recorded are considered to be species that do not pose significant environmental problems. See figure 4 for weed location and infestation details.

**Table 4.5 – Declared or environmental weed species recorded within the study area.**

Weed Species	Declared <sup>20</sup> / Environmental
marram grass ( <i>Ammophila arenaria</i> )	Environmental
pine ( <i>Pinus</i> sp.)	Environmental
Spanish heath ( <i>Erica lusitanica</i> )	Declared
sweet briar ( <i>Rosa rubiginosa</i> )	Environmental



**Photo 4.14. Left - Extensive spanish heath infestation at Crockers Arm.**

**Photo 4.15. Right - Extensive marram grass infestation at Diana's Basin in coastal dunes.**

## 4.9 Ramsar Criteria

The Convention on Wetlands of International Importance, called the Ramsar Convention, is an intergovernmental treaty that provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources. The information detailed in the above sections allows an assessment of Diana's Basin to be made

<sup>20</sup> Declared under the Tasmanian *Weed Management Act 1999*

against Ramsar criteria. The Ramsar criteria have been created to identify wetlands of international importance that are to be listed on the Ramsar Convention.

Table 4.6 below lists the Ramsar criteria, and makes an assessment on whether or not this wetland meets that criteria, or if further information is needed. A wetland should be considered internationally important if it meets one or more of these criteria.

**Table 4.6 – Ramsar criteria and assessment.**

<b>Ramsar Criteria</b>	<b>Does it meet the criteria?</b>
<b>1. Criteria for representative or unique wetlands</b>	
1a - It is a particularly good representative example of a natural or near-natural wetland, characteristic of the appropriate biogeographical region; or	Yes
1b - It is a particularly good representative example of a natural or near-natural wetland, common to more than one biogeographical region; or	Needs further research/ information
1c - It is a particularly good representative example of a wetland which plays a substantial hydrological, biological or ecological role in the natural functioning of a major river basin or coastal system, especially where it is located in a trans-border position; or	No
1d - It is an example of a specific type of wetland, rare or unusual in the appropriate biogeographical region.	No
<b>2. General criteria based on plants or animals</b>	
2a - It supports an appreciable assemblage of rare, vulnerable or endangered species or subspecies of plant or animal, or an appreciable number of individuals of any one or more of these species; or	Needs further research/ information
2b - It is of special value for maintaining the genetic and ecological diversity of a region because of the quality and peculiarities of its flora and fauna; or	No
2c - It is of special value as the habitat of plants or animals at a critical stage of their biological cycle; or	Needs further research/ information
2d - It is of special value for one or more endemic plant or animal species or communities.	Needs further research/ information
<b>3. Specific criteria based on waterfowl</b>	
3a - It regularly supports 20,000 waterfowl; or	Unlikely
3b - It regularly supports substantial numbers of individuals from particular groups of waterfowl, indicative of wetland values, productivity or diversity; or	Needs further research/ information
3c - Where data on populations are available, it regularly supports 1% of the individuals in a population of one species or subspecies of waterfowl.	Needs further research/ information
<b>4. Specific criteria based on fish</b>	
4a - It supports a significant proportion of indigenous fish subspecies, species or families, life-history stages, species interactions and/or populations that are representative of wetland benefits and/or values and thereby contributes to	Needs further research/ information

Ramsar Criteria	Does it meet the criteria?
global biological diversity; or	
4b - It is an important source of food for fishes, spawning ground, nursery and/or migration path on which fish stocks, either within the wetland or elsewhere, depend.	Needs further research/ information

#### 4.10 Landholder Survey

Two responses to the survey was received from landholders for Diana's Basin. The main concerns raised by the respondent were;

- forestry operations - occurring in the catchment running in to Crockers Arm were silting up the creek and wetland.
- rubbish - litter being discarded along the Tasman Highway was making its way into the wetland.
- water quality - needs regular flushing

#### 4.11 Threats

The overall condition of the Diana's Basin is good, however, several threatening processes were identified during the current survey. The key threats identified include;

- **Weeds – High Threat.** Spanish heath (*Erica lusitanica*) was recorded extensively in vegetation and agricultural land at the southern end of the Basin, and in particular around Crockers Arm. Other small infestations were also recorded, and it was also recorded in adjacent areas outside of the study area, indicating that it will be an ongoing problem. The habitat throughout this reserve is considered highly suitable for Spanish heath, and therefore failure to control this species now will allow it to spread further and dominate the ecosystem. Marram grass was found extensively in the coastal dunes dominated by *Acacia longifolia* coastal scrub (SAC), and has grossly altered the structure and habitat value of this part of the ecosystem, perhaps irretrievably. Increased marram grass colonisation could also restrict lagoon breakouts.
- **Adjacent Land Use – Moderate Threat.** Forestry operations occurring in the catchment running in to Crockers Arm have been suggested by a concerned landholder in the area to be silting up the creek and wetland.
- **Increased input of nutrients – Moderate Threat.** From the high use of the area by people especially over summer or through a change in catchment activities. Could promote algal growth and health problems.
- **Sedimentation – Moderate Threat.** On-going sedimentation combined with restricted outflow will lead to infilling of lagoon. Vegetation clearance could also lead to increase sedimentation to lagoon.
- **Lagoon flushing – Moderate Threat.** Poor flushing where Crockers Arm enters Diana's basin will continue to increase sedimentation in Crockers Arm.

- **Urban development – Low Threat.** Pressure from urban development is currently low, with low numbers of houses and other developments occurring. It is important that the crown land areas that surround this wetland be maintained as natural areas, and not be allowed to be developed for residential, industrial or agricultural purposes. Restrictions on what type and scale of development should be put in place within a buffer around Diana's Basin, to help protect the habitat values, water quality and other natural values of the area.
- **Tracks/Roads – Low Threat.** Several vehicle tracks cut through the buffer area of this wetland, but do not cut across the wetland areas themselves. Most tracks occur on the eastern and northern side of the study area, and the Tasman Highway cuts through the buffer area on the southern and western side of the basin. Most of the tracks in their current state do not appear to be having negative impacts, aside from the usual problems associated with unrestricted human access to the wetland and its surrounds. Runoff from the Tasman Highway is impacting on water quality within the basin and discarded rubbish is also entering from here.
- **Recreational Use – Low Threat.** Use of the area for recreational activities such as camping, boating and fishing is high particularly in summer. Problems associated with human use of an area include pollution, water quality issues, rubbish, destruction of habitat, and impacts to fauna. These problems currently appear to be low, but may need to be managed in future if use of the area increases.
- **Rubbish dumping – Low Threat.** Garden waste was noted as being dumped at several locations around the camping areas and tracks on the eastern side of the basin. It appears to be a minor problem at the moment, however it is a good way to introduce weeds to a site, attract other rubbish dumpers and obviously impacts on the visual amenity of the site. Restricting vehicle access is probably not possible at Diana's Basin, as it is a popular camping site. Encouraging people to do the right thing is probably the only solution, and removing rubbish quickly would also be beneficial.

#### 4.12 First Aid

Several actions could be undertaken to reduce the threats that are currently facing Diana's Basin. Listed in priority order they include the following;

1. Maintain vegetation between the houses and lagoons in order to diffuse surface flows and reduce nutrient and sediment input.
2. Immediate weed control program, including several years of follow up work, targeting Spanish heath, and minor environmental weeds, excluding marram grass. Marram grass control is considered to require far too many resources for too long a time to be able to be viably controlled using current techniques. Removal of marram grass near lagoon mouth should be considered if it is found to be restricting lagoon breakouts.
3. Increase flushing of Crockers Arm.



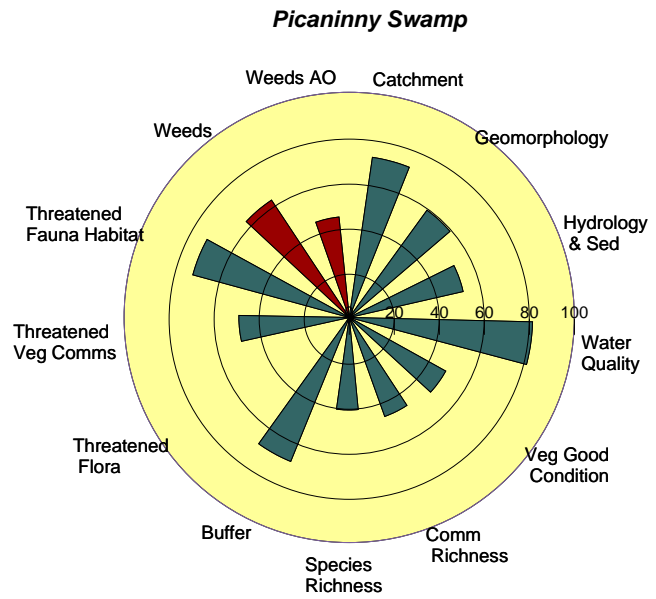
4. Given the high use of Diana's Basin during the summer, water quality monitoring during extended dry periods may be warranted to protect peoples health.
5. Install educational signs highlighting the ecological values of the area and discouraging damaging activities.
6. Undertake educational activities within the local community highlighting the ecological values and sensitivity of the area and encouraging local stewardship.
7. Maintain vehicle tracks around the basin so that "channels" leading to the lagoon are not formed.
8. Improve or maintain water quality at catchment scale.

## 5 Piccaninny Swamp (#4)

### Wetland Health Score:

**53/ 100**

N.B. - This number is an unweighted addition of the variables that make up the adjacent condition rose to give an assessment out of a possible 100 points. These variables represent the current condition and natural values recorded historically and during the current survey. Due to the different levels of survey undertaken at each site, this score should not be used as a comparative value between wetlands.



**Photo 5.10. Piccaninny Swamp looking east towards coastal dunes.**



**Photo 5.2. Google Earth aerial photo of Piccaninny Swamp study area.**



## **5.1 Introduction**

Piccaninny Swamp is made up of two water bodies, one being the culmination of Piccaninny Creek before it drains into the sea, the other being the main water body of Piccaninny Swamp. The Piccaninny Creek section is approximately 1.7ha in surface area, and Piccaninny Swamp being the larger of the two water bodies, is approximately 2.2ha in surface area.

For the purposes of this study both water bodies, including a 100m buffer around each wetland will be considered as the Piccaninny Swamp complex. The total surface area of the water bodies mentioned above is 3.9ha, and including the 100m buffer around them equates to an area of approximately 45.9ha.

## **5.2 Geomorphology**

### **5.2.1 Setting**

Piccaninny Swamp is situated at the southern end of Lagoons Beach, with the southern end of the swamp abutting the higher Piccaninny Point headland. The swamp is bounded on the east by vegetated fore dunes of the Lagoons Beach Conservation Area, and inland by low hills. There are two distinct water bodies in the swamp complex, one fed by Piccaninny Creek and the other with no defined surface inflows. The lagoon fed by Piccaninny Creek has the potential to connect with the sea, but the ingress of salt water into the lagoon appears limited to the most downstream reach of the creek. The other water body is isolated from the ocean by vegetated dunes.

In Piccaninny Creek there has been moderate clearing of the lower catchment, including areas immediately adjacent to the creek.

### **5.2.2 Local processes**

Major geomorphic processes include the deposition of riverine sediments and occasional connection to the ocean resulting in flushing and the ingress of marine waters and sands. Aeolian processes are important for the delivery of beach sands and marine aerosols to the catchment. The swamp and salt marsh appear highly stable due to the presence of thick vegetation and extensive fringing reeds in the downstream area of the main water body. These characteristics may be related to historic draining of the swamp combined with increased sediment input due to land clearing in the lower catchment, and / or runoff from a quarry adjacent to Piccaninny Creek.

The mouth of the lagoon is limited to a break in the vegetated dunes. Prior to stabilisation of the dunes by marram grass, it is probable that the location of the mouth of the lagoon was more variable and mobile.

### **5.2.3 Hydrology and sediment**

Piccaninny Swamp receives freshwater inflows from rainfall, Piccaninny Creek and a second unnamed tributary entering the wetland. Piccaninny Creek has a catchment of about 13 km<sup>2</sup> and extends into the hilly State Forest to the west. The hydrology of Piccaninny Swamp has been modified by historic draining of the swamp, and alterations to the outflow of the lagoon due to the establishment of marram grass on the fore dunes. Changes to the natural flow

regime due to catchment activities, such as forestry and agriculture are also likely to have occurred. Marine inflows to the lagoon are limited to periods when there is a connection to the sea. On the day of observation, there was no evidence of recent salt water inflows to the swamp, unlike other lagoons on the same beach which showed clear evidence of bi-directional flow into the lagoon. It is possible that the swamp has in-filled to the point that fresh water drains out, but marine water no longer enters the lagoon.

The presence of extensive fringing reed beds may be indicative of an increased sediment supply to the lagoon in combination with a modified flow regime. Organic matter increased in the bed of the lagoon with distance from the beach, suggesting that incomplete flushing may occur during lagoon breakout (observations made following period of high rainfall and lagoon breakout).

Sands in the lagoon were sulphur rich below the low-tide level and the area has the potential for acid sulphate soils if drained.

### **5.3 Water quality**

Fresh water quality in the swamp is controlled by the quality of water entering from the catchment, and internal processes such as the decomposition of organic matter. On the day of investigation, the water was brackish near the mouth, with a salinity of ~4 ppt, and decreased upstream. Turbidity was moderate and higher than other lagoons observed in the area on the same day which may reflect sediment inputs or increased nutrient input from the catchment fuelling increased biological productivity.

### **5.4 Condition**

The condition rose shows an average condition for the two water bodies. The lagoon is considered to have better condition than the wetland which has been subjected to draining and grazing pressures in the past.



## 5.5 Flora and Fauna

### 5.5.1 Overview

The Piccaninny Swamp complex study area covers approximately 45.9 hectares, with 73% of the vegetation communities being native. A total of seven native vegetation communities were recorded, covering a variety of habitats including forest and woodland, swamp forest, coastal scrub, sand/mud and fresh water aquatic habitats. The condition of native vegetation communities varied from very good to poor, dependent on levels of weed invasion.

The most abundant vegetation community in the Piccaninny Swamp complex is *Melaleuca ericifolia* swamp forest (NME) which covers approximately one third of the study area. The wetland component of Piccaninny Swamp covers 3.9ha or just under 10% of the study area, and it is made up of 2.2ha of Fresh water aquatic herbland (AHF) and 1.7ha of Water, sea (OAQ). The water level at the time of this survey was very high.

Immediately surrounding and between the wetland areas, there is a large area of wet low-lying ground that supports *Melaleuca ericifolia* swamp forest (NME). As the elevation increases and the ground becomes drier, the vegetation changes on the western side to Agricultural land (FAG) and remnants of *Eucalyptus globulus* dry forest and woodland (DGL). On the eastern coastal side of the wetland, the vegetation is dominated by *Acacia longifolia* coastal scrub (SAC). Smaller patches of other vegetation communities also occur in parts of the study area.

The study area incorporates a 100m buffer surrounding the wetland portions of the Piccaninny Swamp complex. This buffer area occupies 42ha of which approximately 69% is native vegetation, with the remainder being agricultural land and other urban infrastructure.



Photo 5.5. Left - Fresh water aquatic herbland (AHF).

Photo 5.6. Right - *Melaleuca ericifolia* swamp forest (NME).

### 5.5.2 Vegetation Condition

Approximately half of the vegetation communities within Piccaninny Swamp are in an excellent condition overall with 49.3% of them being at Condition Level 1. This condition level is characterised by no or very low levels of weed invasion, with the vegetation being structurally and floristically intact. Condition Level 2 was not recorded during the current survey. Condition Level 3 comprised 21.3% of the vegetation communities, and is made up of *Acacia longifolia* coastal scrub (SAC), and *Eucalyptus globulus* dry forest and woodland (DGL) where heavy weed invasion is occurring. Condition Level 4 comprised 29.4% of the study area, and is made up of agricultural areas, regenerating cleared land, *Pteridium esculentum* fernland and other urban infrastructure, where the native vegetation areas have been destroyed or the natural values have been grossly altered. See Table 5.1 below for details.

**Table 5.1 – Vegetation Condition within the study area.**

Condition	Condition Description	Area (ha)	% of study area
1	Vegetation structurally and floristically intact and weed invasion less than 1% cover	21.8	49.3
2	Vegetation structurally and floristically altered and/or weed invasion > 1% and < 10% cover	0	0
3	Vegetation structurally and floristically altered and weed invasion > 10% and < 50% cover	9.4	21.3
4	Grossly altered vegetation structure in otherwise weed infested vegetation (> 50% weeds cover)	13.0	29.4
<b>Total</b>		44.2	100.0

\* Condition ratings were not given to areas of Water, sea (OAQ)

### 5.5.3 Vegetation Community Richness

Of the 11 vegetation communities recorded in the study area seven are native, with the remaining four being exotic or anthropogenic communities. At Piccaninny Swamp the most common vegetation community is *Melaleuca ericifolia* swamp forest (NME) which covers approximately one third of the study area. This is followed by Agricultural land (FAG) and *Acacia longifolia* coastal scrub (SAC).

Of the native vegetation communities recorded four are considered to be threatened under the Tasmanian *Nature Conservation Act 2002*. They are Fresh water aquatic herbland (AHF), *Eucalyptus globulus* dry forest and woodland (DGL), *Eucalyptus viminalis* - *Eucalyptus globulus* coastal forest and woodland (DVC) and *Melaleuca ericifolia* swamp forest (NME). Together they cover 49% of the vegetated area (excluding open water/sea (OAQ)). Full details of vegetation communities recorded, their threatened status and their condition is provided below in Table 5.2, and their distribution is shown in Figure 5. Full species lists for each vegetation community are provided in Appendix 8.



**Table 5.2 – Vegetation Communities recorded in the study area, including their conservation priority, reservation status and condition.**

Veg Code <sup>21</sup>	Vegetation Community Description	Area (ha)	State-wide Conservation Priority and Reservation Status <sup>22, 23</sup>	Bioregional Conservation Priority and Reservation Status <sup>2, 3</sup>	Condition
AHF	Fresh water aquatic herbland	2.2	Threatened	Threatened	1
DGL	<i>Eucalyptus globulus</i> dry forest and woodland	3.0	Threatened and inadequately reserved	Threatened and inadequately reserved	3
DVC	<i>Eucalyptus viminalis</i> - <i>Eucalyptus globulus</i> coastal forest and woodland	0.2	Threatened and inadequately reserved	Threatened and inadequately reserved	1
FAG	Agricultural land	10.7	-	-	4
FPF	<i>Pteridium esculentum</i> fernland	0.2	-	-	4
FRG	Regenerating cleared land	0.3	-	-	4
FUM	Extra-urban miscellaneous	1.7	-	-	4
NME	<i>Melaleuca ericifolia</i> swamp forest	16.3	Threatened and inadequately reserved	Threatened and inadequately reserved	1
OAQ	Water, sea	1.7	Not threatened	Not threatened	-
OSM	Sand, mud	3.1	Not threatened	Not threatened	1
SAC	<i>Acacia longifolia</i> coastal scrub	6.4	Not threatened	Not threatened	3
	<b>Total Area (ha)</b>	<b>45.9</b>			

#### 5.5.4 Flora Species Richness

A total of 75 flora species were recorded within the study area, during a time limited survey. Of these 69 were native, with the remaining six being weed species. A full species list for Piccaninny Swamp is included in Appendix 7.

<sup>21</sup> As per Tasveg 2.0 Vegetation Classification System, DPIPW

<sup>22</sup> Nature Conservation Act 2002

<sup>23</sup> FCF 2007. Note there is no recent analysis of reservation status of non forest communities

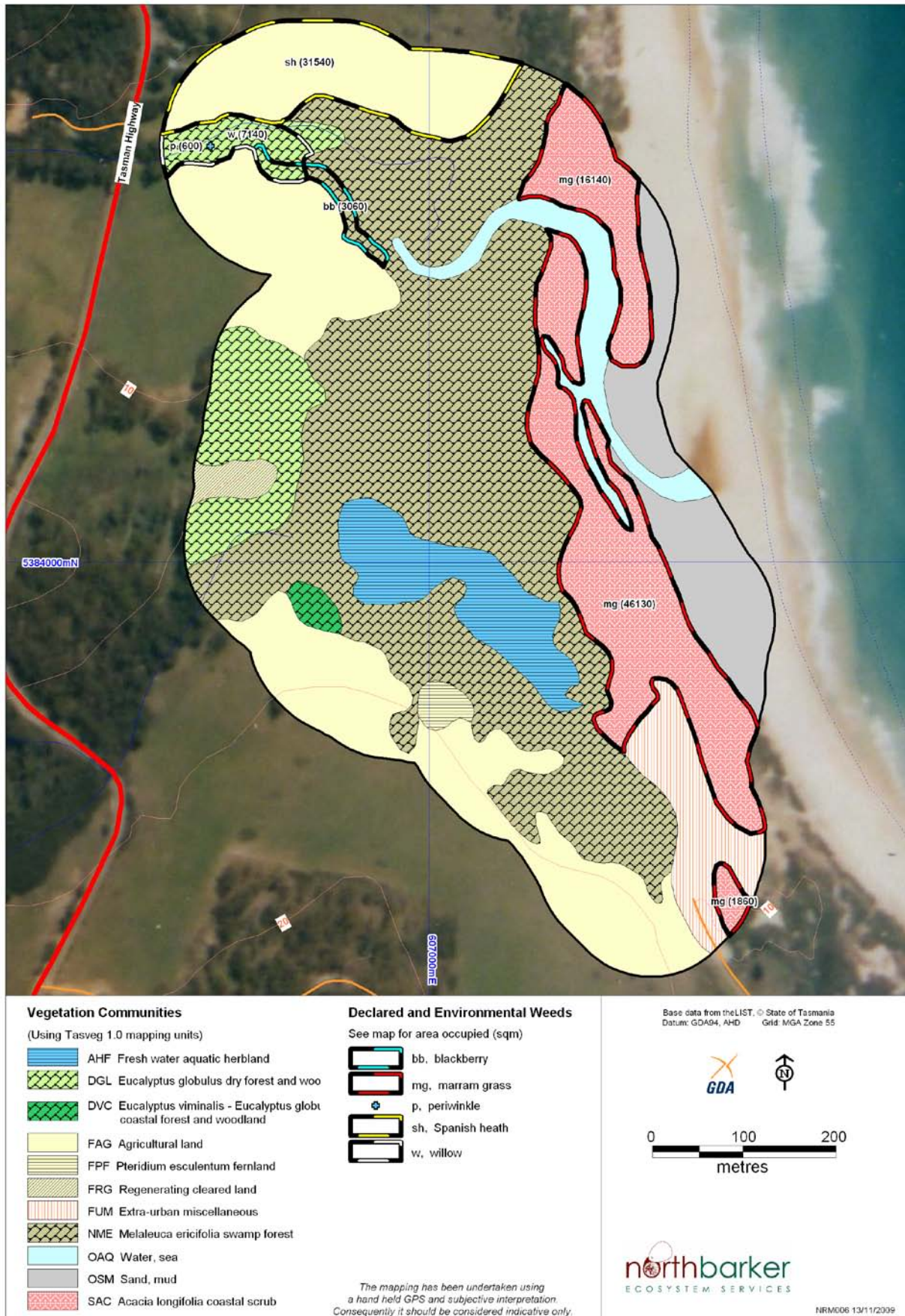


Figure 5 – Vegetation Communities and Weeds for Piccaninny Swamp

### 5.5.5 Threatened Flora

No flora species listed under either the Tasmanian *Threatened Species Protection Act 1995* (TSPA) or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBCA) have been recorded within the study area.

### 5.5.6 Threatened Fauna

No fauna species listed under either the Tasmanian *Threatened Species Protection Act 1995* (TSPA) or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBCA) have been recorded within the study area.

### 5.5.7 Fauna Habitat Value

The vegetation of the study area provides a range of habitat opportunities for fauna species, with a variety of habitats being present including forest and woodland, coastal scrub, sand/mud and swamp forest. Only 49% of the study area was in an excellent condition (Condition Level 1), with the remaining area being quite degraded, with a consequent reduction in habitat value for native fauna species. The habitat that is in good condition though still provides high quality foraging and nesting habitat for fauna species. A variety of species are likely to be present including small mammals, reptiles, birds, amphibians and invertebrates.

At the time of the survey the aquatic habitat was in good condition, following good rains, with a resulting abundance of frogs, with the calls of the banjo frog (*Limnodynastes dumerili subsp. insularis*) and the brown froglet (*Crinia signifera*) being common particularly in the Fresh water aquatic herbland (AHF). More prominent fauna sightings included a Lowland Copperhead Snake (*Austrelaps superbis*) and a flock of Yellow-tailed black cockatoos (*Calyptorhynchus funereus*).

### 5.5.8 Threatened Fauna Habitat

Approximately 72% of the study area is habitat that is potentially suitable for threatened fauna. Fifteen threatened fauna species are known to use the habitat types that are present within the study area. An additional fourteen species listed under the JAMBA and CAMBA<sup>24</sup> migratory bird agreements also have potential habitat within the study area. Details of the species of threatened fauna and migratory birds that may occur at Piccaninny Swamp and their preferred habitats are in Appendix 1. The habitats within the study area that are preferred by at least one threatened fauna species include;

- Fresh water aquatic herbland (AHF)
- *Eucalyptus globulus* dry forest and woodland (DGL)
- *Eucalyptus viminalis* - *Eucalyptus globulus* coastal forest and woodland (DVC)
- *Melaleuca ericifolia* swamp forest (NME)
- Water/sea (OAQ)
- Sand, mud (OSM)

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<sup>24</sup> Japan Australia Migratory Bird Agreement (1974) and China Australia Migratory Bird Agreement (1986)

- *Acacia longifolia* coastal scrub (SAC)

## 5.6 Weeds

A total of ten weed species were recorded within the study area, with three being “declared” weed species listed on the schedules of the *Tasmanian Weed Management Act 1999* (see Table 5.3 below). The declared weed species are Spanish heath (*Erica lusitanica*), blackberry (*Rubus fruticosus*) and willow (*Salix* sp.). Two environmental weed species were also recorded, being marram grass (*Ammophila arenaria*) and blue periwinkle (*Vinca major*).

Spanish heath occurs extensively at the northern end of the study area in cleared agricultural land, and did not appear to be spreading in to the native vegetation communities. Blackberry, willow and blue periwinkle all occur in a degraded area of native vegetation along the Piccaninny Creek, and all were quite extensive populations needing control works to stop their further spread. Marram grass was found in the coastal dunes dominated by *Acacia longifolia* coastal scrub (SAC), and has altered the structure and habitat value of this part of the ecosystem. Further larger infestations occur immediately outside of the study area.

The five other weed species that were recorded are considered to be species that do not pose significant environmental problems. See figure 5 for weed location and infestation details.

**Table 5.3 – Declared or environmental weed species recorded within the study area.**

Weed Species	Declared <sup>25</sup> / Environmental
blackberry ( <i>Rubus fruticosus</i> )	Declared
blue periwinkle ( <i>Vinca major</i> )	Environmental
marram grass ( <i>Ammophila arenaria</i> )	Environmental
Spanish heath ( <i>Erica lusitanica</i> )	Declared
willow ( <i>Salix</i> sp.)	Declared

## 5.7 Landholder Survey

No responses to the survey were received from landholders for Piccaninny Swamp.

## 5.8 Threats

The overall condition of the Piccaninny Swamp is mixed with some areas being in good condition and others being in poor condition. Several threats were identified during the current survey. The key threats identified include;

- **Weeds – High Threat.** Three declared weeds (Spanish heath, blackberry and willow) and two environmental weeds (blue periwinkle and marram grass) were recorded, all of which had serious localised infestations. The native vegetation areas where weeds are invading would benefit from a weed control program. If weeds are not controlled

<sup>25</sup> Declared under the *Tasmanian Weed Management Act 1999*

then they will continue to spread, with a consequent displacement and loss of flora species, and decline in fauna abundance as food plants and habitat values are decreased. Increased colonisation of marram grass could also lead to an additional restriction of water outflow.



Photo 5.7. Extensive spanish heath (*Erica lusitanica*) infestation.

- **Grazing within wetland – Moderate Threat.** Although cattle were not observed on site during the survey, there was evidence of cattle grazing in native vegetation in the northern sections of agricultural land. In this area fences were not erected to keep livestock out of the native vegetation and the wetland itself. Damage in the form of soil pugging, nutrient addition from dung, plant trampling and grazing were all observed, and this grazed area also coincided with the worst areas of weed infestation. This differed from the southern section of agricultural land which was fenced off from livestock.
- **Grazing adjacent wetland – Low Threat.** Although cattle were not observed on site during the survey, the adjacent paddocks are used for grazing. At times when cattle numbers are high, nutrient rich leaching and runoff is likely to result which may affect water quality within the wetland.
- **Rabbits – Low Threat.** Rabbit dung was observed in several locations. Damage to vegetation was not obvious indicating that rabbits are probably present in low numbers and currently pose a minor threat. This will need to be monitored however, and a control program put in place if numbers and consequent vegetation damage or erosion problems start to occur.
- **Adjacent land use – Low Threat.** Adjacent agricultural land, with the associated use of fertilizers, pesticides and other agricultural chemicals may affect water quality within the wetland. This may not be a problem if used at low levels.
- **Changes to water level – Low Threat.** Would expose potentially acid sulphate soils.
- **Increased input of nutrients – Low Threat.** A change in catchment activities could promote algal growth.
- **Increased sediment deposition – Low Threat.** A change in catchment activities could increase sediment input.

## **5.9 First Aid**

Several actions could be undertaken to reduce the threats that are currently facing the Piccaninny Swamp complex. Listed in priority order they include the following;

1. Discuss with landholders the option of keeping cattle out of the wetland and the use of fencing to facilitate this.
2. Following discussions with landholders, install stock proof fencing to keep cattle out of the native vegetation, where fences do not currently exist.
3. Assist landholders with funding and technical advice in order to help protect the natural values of the area and encourage local stewardship.
4. Immediate weed control program, including several years of follow up work, targeting blackberry, willow and blue periwinkle. Spanish heath control should aim to stop its spread from the agricultural land in to the native vegetation. Marram grass control may not be viable given the amount of time and funding that would be necessary. However a reduction in marram grass at the mouth of the lagoon would be beneficial to water outflows.
5. Monitor rabbit numbers and their impacts, and implement a control program if unacceptable levels of damage are occurring.
6. Reduce sediment and nutrient inputs from catchment activities.

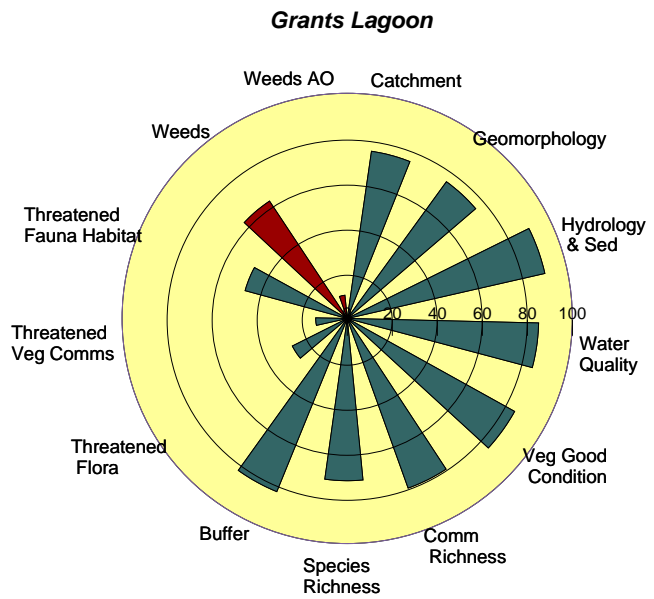


## 6 Grants Lagoon (#5)

### Wetland Health Score:

**67/ 100**

N.B. - This number is an unweighted addition of the variables that make up the adjacent condition rose to give an assessment out of a possible 100 points. These variables represent the current condition and natural values recorded historically and during the current survey. Due to the different levels of survey undertaken at each site, this score should not be used as a comparative value between wetlands.



**Photo 6.11. Grants Lagoon looking east from the north-western arm.**



**Photo 6.2. Google Earth aerial photo of Grants Lagoon study area.**



## **6.1 Introduction**

Grants Lagoon is comprised of one large lagoon which is 46.4ha in surface area. Including the 100m buffer around it, it equates to an area of approximately 111.2ha.

## **6.2 Geomorphology**

### **6.2.1 Setting**

Grants Lagoon is located north of Binalong Bay occupying a coastal basin between granitic headlands. The barred lagoon system is fed primarily by Doctors Creek which drains the foothills of Mt Pearson. The catchment is largely undisturbed, except for development on the banks of the Grants Lagoon which is concentrated on the southern shore near Binalong Bay. Like other lagoons in the region, Grants Lagoon is usually isolated from the sea except following high rainfall periods when freshwater inflows lead to breaching of the sand bar. The lagoon can remain open for extended periods, resulting in the ingress of marine water.

The mouth of Grants Lagoon is narrow and restricted to the southern end of Binalong Beach via a sinuous channel. Although the lagoon extends ~500 m along the beach, it is prevented from 'breaking out' at any other location due to the steep vegetated fore dunes which separate the lagoon from the sea. It is highly likely that in the past the lagoon entered the sea via alternative and probably variable openings.

An internal barway separates a small basin from the main lagoon at the northern end of the lagoon. This barway maybe the result of the internal circulation of the bay and the nearby channel which leads to the mouth of the lagoon and / or it could be due to the internal transport of sands from wind and waves. Over time if the barway becomes vegetated, it could lead to greater isolation of the arm, resulting in the formation of a 'Little Grants Lagoon' similar to Little Diana's Basin.

The lagoon has been modified through the construction of a pedestrian bridge over the channel near the mouth creating a short-cut from the beach to Binalong Bay Road. In the small areas where vegetation has been removed from the banks the underlying sands are prone to wave erosion from wind or boats.

### **6.2.2 Local processes**

The predominant geomorphic processes operating in Grants Lagoon are the deposition of catchment derived material and the episodic flushing events following high rainfall when the lagoon is open to the sea. During these periods, flow is determined by tidal fluctuations with marine water and organic material entering during the incoming tide. Windblown sands contribute to maintenance and growth of the fore dunes which are probably increasing in height over time.

## **6.3 Hydrology and sediments**

Inflows to the lagoon include Doctors Creek, several unnamed tributaries, and direct rainfall. Rain in the area tends to be episodic resulting in ephemeral creeks. Sediment to Grants Lagoon is derived from the highly weathered granitic soils in the area and organic matter, along with marine sands during periods when the lagoon is connected to the sea. The sinuous

channel near the mouth of the lagoon restricts water movement and promotes the deposition and retention of sediments in the lagoon. The establishment of the pedestrian overpass may contribute to this process as evidenced by the deposition of fine grained material upstream of the overpass and establishment of fringing reed beds in the area.

The large-scale hydrology of the lagoon has probably been altered due to the growth of the fore dunes. This has restricted movement of the mouth of the lagoon and resulted in the lagoon being effectively locked into its present configuration. It is possible that the repeated artificial opening of the mouth at its present location has contributed to the stability of the fore dunes by preventing breakouts at other locations.

#### **6.4 Water quality**

Influent water quality from Doctors Creek and the ocean are of high quality. The lagoon is generally well mixed with respect to salinity, but can become stratified following high freshwater inflows. On the day of investigation, salinity values ranged from ~20 ppt to 24 ppt, with the higher values found closer to the entrance, as expected. Turbidity in the lagoon was low, and there was no evidence of algal growth.

Storm water runoff from the developed area of the lagoon and seepage from septic systems present the greatest threats to water quality in the lagoon, as evidenced by moderately elevated chlorophyll *a* and nitrogen levels measured in the lagoon in 2000 (Murphy *et al.*, 2003) following extended dry periods. During periods of extended low water level the decomposition of organic matter can lead to unpleasant odours.

Water quality in Grants Lagoon could be affected by runoff and seepage during the summer months when the population of the area increases and the lagoon is used extensively for recreation. Water quality monitoring of the lagoon could be warranted during dry summer periods.

#### **6.5 Condition**

The condition score for Grants Lagoon is based CFEV Rivers information for Doctors Creek, Estuary scores for the lagoon and field observations.



**Photo 6.3. Left - Closed off mouth of Grants Lagoon.**

**Photo 6.4. Right - Narrow strip of coastal dunes separating Grants Lagoon from the ocean.**

## 6.6 Flora and Fauna

### 6.6.1 Overview

The Grants Lagoon study area covers approximately 111.2 hectares, with 94% of the vegetation communities being native. A total of 12 native vegetation communities were recorded, covering a variety of habitats including forest and woodland, scrub, heathland, sedgeland, sand/mud and saline aquatic habitats. The majority of native vegetation communities were in good condition.

The most abundant vegetation community at Grants Lagoon is *Eucalyptus amygdalina* coastal forest and woodland (DAC), which covers approximately 30% of the study area. The wetland component of Grants Lagoon covers 46.9ha or approximately 42% of the study area, and it is made up of 46.5ha of Water, sea (OAQ) and 0.4ha of Saline sedgeland/rushland (ARS).

Immediately surrounding the wetland, the vegetation quickly changes to be dominated by drier forests and woodlands or coastal scrubs and heathlands. On the northern, southern and western side of the lagoon the vegetation communities are dominated by *Eucalyptus amygdalina* coastal forest and woodland (DAC) and *Eucalyptus globulus* dry forest and woodland (DGL). The southern side of the lagoon has also been impacted by the settlement of Binalong Bay, with urban areas encroaching in to the vegetated areas. On the eastern side of the basin the vegetation communities are dominated by Coastal Scrub (SSC), Coastal heathland (SCH) and *Acacia longifolia* coastal scrub (SAC). Smaller patches of other vegetation communities also occur in parts of the study area.

The study area incorporates a 100m buffer surrounding the wetland portions of Grants Lagoon. This buffer area occupies 64.7ha of which approximately 83% is native vegetation, with the remainder being urban areas. This relatively high proportion of native vegetation within the buffer area assists in protecting the wetland vegetation and in filtering and maintaining the quality of the water that enters, although the urban development that is occurring and has occurred in the past has the potential to negatively impact on the water quality within Grants Lagoon.

### 6.6.2 Vegetation Condition

The majority of the vegetation communities within Grants Lagoon are in an excellent condition overall with 84.4% of them being at Condition Level 1. This condition level is characterised by no or very low levels of weed invasion, with the vegetation being structurally and floristically intact. Condition Level 2 comprised 0.3% of the vegetation communities, consisting of one area of *Melaleuca ericifolia* swamp forest (NME), where weed invasion is occurring. Condition Level 3 comprised 3.0% of the vegetation communities, and is made up of *Acacia longifolia* coastal scrub (SAC) where heavy weed invasion is occurring. Condition Level 4 comprised 12.3% of the study area, and is made up of urban areas, where the native vegetation areas have been destroyed or the natural values have been grossly altered. See Table 6.1 below for details.

**Table 6.1 – Vegetation Condition within the study area.**

Condition	Condition Description	Area (ha)	% of study area
1	Vegetation structurally and floristically intact and weed invasion less than 1% cover	51.5	84.4
2	Vegetation structurally and floristically altered and/or weed invasion > 1% and < 10% cover	0.2	0.3
3	Vegetation structurally and floristically altered and weed invasion > 10% and < 50% cover	1.8	3.0
4	Grossly altered vegetation structure in otherwise weed infested vegetation (> 50% weeds cover)	7.5	12.3
<b>Total</b>		61.0*	100.0

\* Condition ratings were not given to areas of Water, sea (OAQ)

### 6.6.3 Vegetation Community Richness

Of the 14 vegetation communities recorded in the study area 12 are native, with the remainder being anthropogenic communities. At Grants Lagoon the most common vegetation community is *Eucalyptus amygdalina* coastal forest and woodland (DAC), followed by *Eucalyptus globulus* dry forest and woodland (DGL), Coastal scrub (SSC) and Coastal heathland (SCH).

Of the native vegetation communities recorded, three of them - *Eucalyptus ovata* forest and woodland (DOV), *Eucalyptus globulus* dry forest and woodland (DGL) and *Melaleuca ericifolia* swamp forest (NME) are considered to be threatened under the Tasmanian *Nature Conservation Act 2002*. Together they cover only 14% of the vegetated area (excluding open water/sea (OAQ)). Full details of vegetation communities recorded, their threatened status and their condition is provided below in Table 6.2, and their distribution is shown in Figure 6. Full species lists for each vegetation community are provided in Appendix 10.

**Table 6.2 – Vegetation Communities recorded in the study area, including their conservation priority, reservation status and condition.**

Veg Code <sup>26</sup>	Vegetation Community Description	Area (ha)	State-wide Conservation Priority and Reservation Status <sup>27, 28</sup>	Bioregional Conservation Priority and Reservation Status <sup>2, 3</sup>	Condition
ARS	Saline sedgeland/rushland	0.4	Not threatened	Not threatened	1
DAC	<i>Eucalyptus amygdalina</i> coastal forest and woodland	32.9	Not threatened and adequately reserved	Not threatened and adequately reserved	1
DGL	<i>Eucalyptus globulus</i> dry forest	6.2	Threatened and	Threatened and	1

<sup>26</sup> As per Tasveg 2.0 Vegetation Classification System, DPIPW

<sup>27</sup> Nature Conservation Act 2002

<sup>28</sup> FCF 2007. Note there is no recent analysis of reservation status of non forest communities

Veg Code <sup>26</sup>	Vegetation Community Description	Area (ha)	State-wide Conservation Priority and Reservation Status <sup>27, 28</sup>	Bioregional Conservation Priority and Reservation Status <sup>2, 3</sup>	Condition
	and woodland		inadequately reserved	inadequately reserved	
DOV	Eucalyptus ovata forest and woodland	1.9	Threatened and inadequately reserved	Threatened and inadequately reserved	1
DSO	Eucalyptus sieberi forest and woodland not on granite	1.4	Not threatened	Not threatened	1
FRG	Regenerating cleared land	0.9	-	-	4
FUR	Urban areas	6.6	-	-	4
NME	Melaleuca ericifolia swamp forest	0.2	Threatened and inadequately reserved	Threatened and inadequately reserved	2
OAQ	Water, sea	50.2	-	-	-
OSM	Sand, mud	2.6	-	-	1
SAC	Acacia longifolia coastal scrub	1.8	Not threatened	Not threatened	3
SCH	Coastal heathland	2.5	Not threatened	Not threatened	1
SMR	Melaleuca squarrosa scrub	0.4	Not threatened	Not threatened	1
SSC	Coastal Scrub	3.2	Not threatened	Not threatened	1
	<b>Total Area (ha)</b>	<b>111.2</b>			

#### 6.6.4 Flora Species Richness

A total of 130 flora species were recorded within the study area. Of these 121 were native, with the remaining nine being weed species. A full species list for Grants Lagoon is included in Appendix 9.



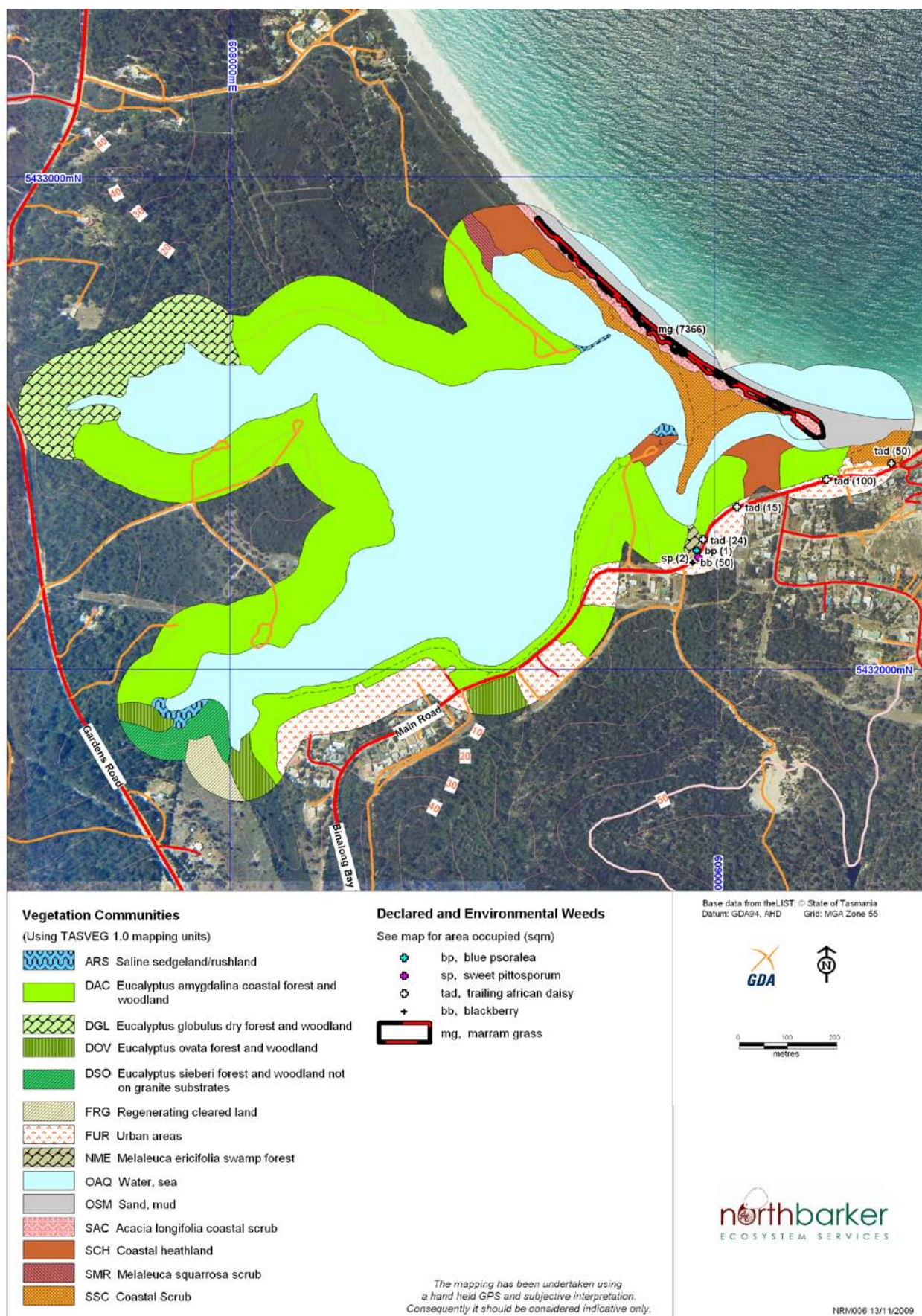


Figure 6 – Vegetation Communities and Weeds for Grants Lagoon

### 6.6.5 Threatened Flora

Three flora species listed under either the Tasmanian *Threatened Species Protection Act 1995* (TSPA) or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBCA) have been recorded within the study area. All three of these flora species were previously recorded within the study area<sup>29</sup>, with no additional species being recorded during the current survey. All species of conservation significance recorded within the study area are listed in Table 6.3.

**Table 6.3 – Flora species of conservation significance within the study area. Records are historical records from the Natural Values Atlas and records found during this survey.**

Species	Status <sup>30</sup> TSPA/EPBCA	Recorded this survey <sup>31</sup>
<i>Acacia ulicifolia</i> (juniper wattle)	r/-	-
<i>Cyrtostylis robusta</i> (large gnat-orchid)	r/-	-
<i>Sporobolus virginicus</i> (salt couch)	r/-	-

### 6.6.6 Threatened Fauna

A total of two fauna species listed under either the Tasmanian *Threatened Species Protection Act 1995* (TSPA) or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBCA) have been recorded within the study area. All of these fauna species were previously recorded within the study area<sup>14</sup>. No threatened fauna species were recorded during the current survey. All species of conservation significance recorded within the study area are listed in Table 6.4.

**Table 6.4 – Fauna species of conservation significance within the study area. Records are historical records from the Natural Values Atlas and records found during this survey.**

Species	Status <sup>32</sup> TSPA/EPBCA	Recorded this survey <sup>33</sup>
green and golden frog ( <i>Litoria reniformis</i> )	(v/VU)	-
southern elephant seal ( <i>Mirounga leonina</i> )	(e/VU)	-

### 6.6.7 Fauna Habitat Value

The vegetation of the study area provides a diverse range of habitat opportunities for fauna species. A large variety of habitats are present including forest and woodland, scrub, heathland, sedgeland, sand/mud and saline aquatic habitats. Approximately 84% of the study area was in an excellent condition (Condition Level 1), with a small proportion being affected

<sup>29</sup> Natural Values Atlas, DPIPW

<sup>30</sup> TSPA - Tasmanian *Threatened Species Protection Act 1995*; EPBCA - Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*

<sup>31</sup> Threatened species that were not recorded during the current survey are likely to still be present at this site. Seasonal and survey limitations are likely to be responsible for some threatened species not being recorded during the current survey.

<sup>32</sup> TSPA - Tasmanian *Threatened Species Protection Act 1995*; EPBCA - Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*

<sup>33</sup> Natural Values Atlas, DPIPW

by weeds to varying levels, or within urban areas. The area is still considered to provide high quality foraging and nesting habitat for many fauna species. A variety of species are likely to be present including small mammals, reptiles, birds, amphibians and invertebrates.

At the time of the survey the aquatic habitat was in good condition, following good rains, and water levels were very high. Frogs were common outside of the main lagoon, with the calls of the banjo frog (*Limnodynastes dumerili subsp. insularis*), Tasmanian froglet (*Crinia tamaniensis*) and the brown froglet (*Crinia signifera*) being heard.

#### 6.6.8 Threatened Fauna Habitat

Approximately 93% of the study area is habitat that is potentially suitable for threatened fauna. Fourteen threatened fauna species are known to use the habitat types that are present within the study area. An additional fourteen species listed under the JAMBA and CAMBA<sup>34</sup> migratory bird agreements also have potential habitat within the study area. Details of the species of threatened fauna and migratory birds that may occur at Grants Lagoon and their preferred habitats are in Appendix 1. The habitats within the study area that are preferred by at least one threatened fauna species include;

- *Eucalyptus amygdalina* coastal forest and woodland (DAC)
- *Eucalyptus globulus* dry forest and woodland (DGL)
- *Eucalyptus ovata* forest and woodland (DOV)
- *Eucalyptus sieberi* forest and woodland not on granite (DSO)
- *Melaleuca ericifolia* swamp forest (NME)
- Sand, mud (OSM)
- *Acacia longifolia* coastal scrub (SAC)
- Coastal heathland (SCH)
- Coastal Scrub (SSC)

#### 6.7 Weeds

A total of nine weed species were recorded within the study area, with one being a “declared” weed species listed on the schedules of the *Tasmanian Weed Management Act 1999* (see Table 6.5 below), and four being considered environmental weeds. The declared weed species is blackberry (*Rubus fruticosus*), while the four environmental weed species are blue butterfly bush (*Psoralea pinnata*), marram grass (*Ammophila arenaria*), sweet pittosporum (*Pittosporum undulatum*) and trailing african daisy (*Osteospermum fruticosum*).

Marram grass was found on the very front edge of the coastal dunes which are dominated by *Acacia longifolia* coastal scrub (SAC). This weed has altered the structure and habitat value

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<sup>34</sup> Japan Australia Migratory Bird Agreement (1974) and China Australia Migratory Bird Agreement (1986)

of this part of the ecosystem. Blackberry, blue butterfly bush, sweet pittosporum and trailing african daisy are scattered in low numbers along the edge of Binalong Bay Road adjacent to the urban areas, and are likely to be garden escapes from the urban area. The four other weed species that were recorded are considered to be species that do not pose significant environmental problems. See figure 6 for weed location and infestation details.

**Table 6.5 – Declared or environmental weed species recorded within the study area.**

Weed Species	Declared <sup>35</sup> / Environmental
blackberry ( <i>Rubus fruticosus</i> )	Declared
blue butterflybush ( <i>Psoralea pinnata</i> )	Environmental
marram grass ( <i>Ammophila arenaria</i> )	Environmental
sweet pittosporum ( <i>Pittosporum undulatum</i> )	Environmental
trailing daisy ( <i>Osteospermum fruticosum</i> )	Environmental

## 6.8 Landholder Survey

Thirteen responses to the survey were received from landholders living adjacent to Grants Lagoon. The main concerns raised by respondents were;

- lagoon flushing - needs to be opened to the sea more regularly to allow the water to be flushed out.
- water quality - claims a family became ill after swimming in the lagoon, and others claiming bacteria levels (E.coli) are rising.
- urban development - increasing levels of urban development may impact on the sensitive vegetation in the area.
- recreational damage - concerns about car parking and boat launching degrading the lagoon edge, and a preference for speed boats and ski boats not to use the lagoon.
- maintenance - landholders should help to maintain areas close to the water and reduce fire risk.

## 6.9 Threats

The overall condition of Grants Lagoon is good, however, several threatening processes were identified during the current survey. The key threats identified include;

- **Urban development – Moderate Threat.** Pressure from urban development is at moderate levels, with the settlement of Binalong Bay occurring along the southern

<sup>35</sup> Declared under the Tasmanian *Weed Management Act 1999*



edge of the lagoon. Further development is also occurring around the lagoon area. It is important that the crown land areas that surround this wetland be maintained as natural areas, and not be allowed to be developed for residential, industrial or agricultural purposes. Restrictions on what type and scale of future development should be put in place within a buffer around Grants Lagoon, to help protect the remaining habitat, the water quality and other natural values of the area. A total of 69 cadastral properties occur within the Grants Lagoon study area, which is considered to be high and indicative of the potential impact of development within the area.



Photo 6.5. Urban development of Binalong Bay on the southern edge of Grants Lagoon.

- **Recreational Use – Moderate Threat.** Use of the area for recreational activities such as camping, boating and fishing is high particularly in summer. Problems associated with human use of an area include pollution, water quality issues, rubbish, destruction of habitat, and impacts to fauna. These problems currently appear to be high in summer and low throughout the rest of the year. Recreational impacts may need to be managed in future if use of the area increases.
- **Sewerage inflows - Moderate Threat.** Increased septic / sewage inflow is possible given the increase in development within the area.
- **Lagoon flushing - Moderate Threat.** Decreased flushing of the lagoon due to highly stabilised fore dunes could occur.
- **Weeds – Low Threat.** Marram grass was the most extensive weed recorded, being found in the coastal dunes dominated by *Acacia longifolia* coastal scrub (SAC), and has altered the structure and habitat value of this part of the ecosystem. Blackberry, blue butterfly bush, sweet pittosporum and trailing african daisy are scattered in low numbers along the edge of Binalong Bay Road, and should be controlled now before being allowed to spread further.
- **Tracks/Roads – Low Threat.** Several vehicle tracks cut through the buffer area of this wetland, but do not cut across the wetland areas themselves. Most tracks exist to access camping areas and boat launching areas, and Binalong Bay Road cuts through the buffer area on the southern side of the basin. Most of the tracks in their current state do not appear to be having negative impacts, aside from the usual problems

associated with unrestricted human access to the wetland and its surrounds. Runoff from Binalong Bay Road may impact on water quality within the lagoon.

- **Rabbits – Low Threat.** Rabbit dung was observed in several locations. Damage to vegetation was not obvious indicating that rabbits are probably present in low numbers and currently pose a minor threat. This will need to be monitored however, and a control program put in place if numbers and consequent vegetation damage or erosion problems start to occur.
- **Storm water inflows - Low Threat.** Increased storm water inflows could affect water quality within the lagoon.
- **Bank erosion - Low Threat.** Bank erosion due to boat wakes could damage vegetation and shore stability.

### **6.10 First Aid**

Several actions could be undertaken to reduce the threats that are currently facing Grants Lagoon. Listed in priority order they include the following;

1. Encourage planning laws which restrict further development within a defined buffer zone around Grants Lagoon.
2. Immediate weed control program, including several years of follow up work, targeting Blackberry, blue butterfly bush, sweet pittosporum and trailing african daisy. Marram grass control may not be viable given the amount of time and funding that would be necessary.
3. Maintain vegetation between the houses and lagoons in order to diffuse surface flows and reduce nutrient and sediment input.
4. Maintain vehicle tracks around the basin so that “channels” leading to the lagoon are not formed.
5. Install educational signs highlighting the ecological values of the area and discouraging damaging activities.
6. Undertake educational activities within the local community highlighting the ecological values and sensitivity of the area and encouraging local stewardship. Include information on residential runoff, impacts of garden waste, impact of boat wakes, etc = ‘Living with lagoons’
7. Monitor rabbit numbers and their impacts, and implement a control program if unacceptable levels of damage are occurring.

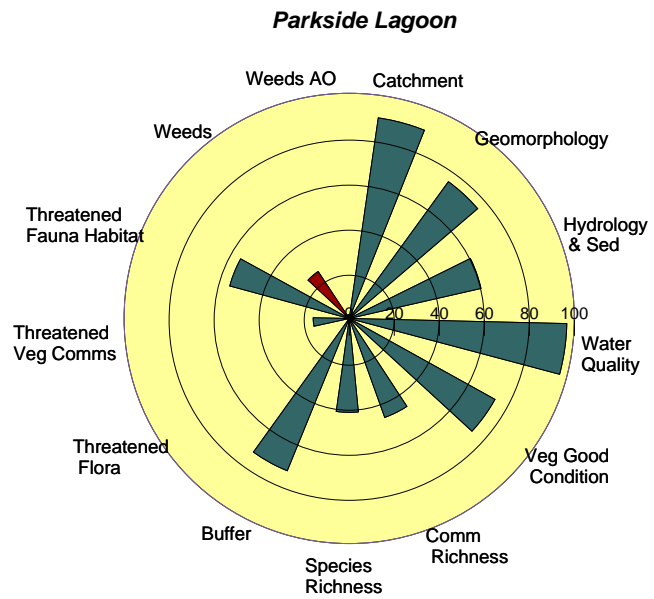


## 7 Parkside Lagoon (#7)

### Wetland Health Score:

**58/ 100**

N.B. - This number is an unweighted addition of the variables that make up the adjacent condition rose to give an assessment out of a possible 100 points. These variables represent the current condition and natural values recorded historically and during the current survey. Due to the different levels of survey undertaken at each site, this score should not be used as a comparative value between wetlands.



**Photo 7.12. Parkside Lagoon from the lagoon edge looking north-east.**



**Photo 7.2. Google Earth aerial photo of Parkside Lagoon study area.**



## **7.1 Introduction**

Parkside Lagoon is comprised of one small lagoon which including sedgeland is 4.4ha in surface area. Including the 100m buffer around it, it equates to an area of approximately 22.3ha.

## **7.2 Geomorphology**

### **7.2.1 Setting**

Parkside Lagoon is one of two lagoons located on the western side of the St Helens 'arm' and draining into Georges Bay. The small catchment (~0.5 km<sup>2</sup>) drains the low rise separating Parkside catchment from the westward flowing Jocks Lagoon catchment. The northern end of Parkside is limited by the flat-topped rise upon which the St Helens Aerodrome is located. The lagoon discharges into Georges Bay via a small beach which has been slightly modified, but considered to be of high conservation value.

The catchment has been partially cleared and developed for agriculture. The 2008 Google aerial photo (above) and 2007 image shows signs of historic draining and/ or cultivation within the lagoon area. The outlet of the lagoon has been highly modified by the construction of the road and restriction of discharge from the lagoon to culverts under the road.

### **7.2.2 Local processes, hydrology and sediments**

Freshwater inflow to Parkside Lagoon is limited to one small (probably ephemeral) creek entering the southern end of the lagoon, rainfall and groundwater inflows. The construction of the road across the mouth of the lagoon and installation of culverts has substantially modified the processes operating within the lagoon by reducing flushing and increasing sedimentation. The road prevents lagoon 'breakout' and discharge from the lagoon is limited to the capacity of the culverts. The low energy environment on the lagoon side of the culverts promotes sedimentation, and the surface sediments in the lagoon consist of fine organic matter overlying coarser quartzose sands.

The placement of culverts have also increased the occurrence of salt water and sediment inflow from Georges Bay, and altered the pattern of inflows. Historically, the lagoon would have been connected to the sea only following periods of high rainfall when freshwater inflows were sufficient to overtop and erode the sand bar at the lagoon's entrance. Now, saline water from Georges Bay enters the lagoon during any period of very high tide. The culverts also regulate the level of fresh water within the lagoon which has probably promoted the expansion of vegetation around the lagoon.

## **7.3 Water quality**

The influent freshwater to the lagoon is probably of high quality given the lack of development in the catchment. Runoff from the road is likely to enter the lower end of the lagoon, and in the past, agricultural activities may have affected water quality.

## **7.4 Condition**

Parkside Lagoon has been highly altered compared to its 'natural' state, primarily due to alterations in the hydrology associated with the road and culverts. The ratings shown on the

condition rose are considerably lower for hydrology & sediment and geomorphology as compared to CFEV ratings which do not take alterations to the outflow into account. In spite of the alterations to the hydrology of the system, present water quality appears good (although it was observed following an extended high rain-fall period).



Figure 7.3. Left - Parkside Lagoon at upstream end.

Figure 7.4. Right - Outflow of Parkside Lagoon from beach side of culverts showing restriction of flow. Trees in background are in southern end of Parkside Lagoon.

## 7.5 Native Vegetation

### 7.5.1 Overview

The Parkside Lagoon study area covers approximately 22.3 hectares, with 84% of the vegetation communities being native. A total of seven native vegetation communities were recorded, covering a variety of habitats including forest and woodland, scrub, sedgeland, sand/mud and saline aquatic habitats. Most of the native vegetation communities were in very good condition.

The most abundant vegetation community in the Parkside Lagoon is *Eucalyptus sieberi* forest and woodland not on granite substrates (DSO), which covers almost one third of the study area. The wetland component of Parkside Lagoon covers 4.4ha or approximately 20% of the study area, and it is made up of 2.5ha of Water, sea (OAQ) and 1.9ha of Saline sedgeland/rushland (ARS). The wetland component was comprehensively inundated at the time of this survey.

Immediately surrounding the wetland area there is an ecotone between the lower lying wetland area, and the higher ground that rises out of the wetland. The ecotone is comprised of wetter soils than the higher ground, and is dominated by *Melaleuca squarrosa* scrub (SMR) and *Melaleuca ericifolia* swamp forest (NME). Beyond this zone on the higher ground the vegetation is dominated by drier forest and woodland communities, being mainly *Eucalyptus sieberi* forest and woodland not on granite substrates (DSO), and a smaller area of *Eucalyptus viminalis* - *Eucalyptus globulus* coastal forest and woodland (DVC). Smaller patches of other anthropogenic vegetation communities also occur in parts of the study area.

The study area incorporates a 100m buffer surrounding the wetland portions of Parkside Lagoon. This buffer area occupies 17.8ha of which approximately 73% is native vegetation, with the remainder being agricultural land, urban areas and other urban infrastructure. This relatively high proportion of native vegetation within the buffer area assists in protecting the wetland vegetation and in filtering and maintaining the quality of the water that enters.



Figure 7.5. Left - View of Parkside Lagoon from adjacent agricultural land (within 100m buffer).

Figure 7.6. Right - Saline sedgeland/ rushland (ARS) in foreground looking towards hillside of *Eucalyptus sieberi* forest and woodland not on granite substrates (DSO).

### 7.5.2 Vegetation Condition

Approximately two thirds of the vegetation communities within Parkside Lagoon are in an excellent condition overall with 68.4% of them being at Condition Level 1. This condition level is characterised by no or very low levels of weed invasion, with the vegetation being structurally and floristically intact. Condition Level 2 comprised 5.9% of the vegetation communities, and is made up *Eucalyptus viminalis* - *Eucalyptus globulus* coastal forest and woodland (DVC), where a low level of weed invasion is occurring. Condition Level 3 comprised 6.3% of the vegetation communities, and is made up of *Pteridium esculentum* fernland. Condition Level 4 comprised 19.4% of the study area, and is made up of agricultural land, urban areas and other urban infrastructure, where the native vegetation areas have been destroyed or the natural values have been grossly altered. See Table 7.1 below for details.

**Table 7.1 – Vegetation Condition within the study area.**

Condition	Condition Description	Area (ha)	% of study area
1	Vegetation structurally and floristically intact and weed invasion less than 1% cover	12.9	68.4
2	Vegetation structurally and floristically altered and/or weed invasion > 1% and < 10% cover	1.1	5.9
3	Vegetation structurally and floristically altered and weed invasion > 10% and < 50% cover	1.2	6.3
4	Grossly altered vegetation structure in otherwise weed infested vegetation (> 50% weeds cover)	3.7	19.4
<b>Total</b>		18.9	100.0



### 7.5.3 Vegetation Community Richness

Of the 11 vegetation communities recorded in the study area seven are native, with the remaining four being anthropogenic communities. At Parkside Lagoon the most common vegetation community is *Eucalyptus sieberi* forest and woodland not on granite substrates (DSO), followed by Agricultural land (FAG), *Melaleuca ericifolia* swamp forest (NME) and Saline sedgeland/rushland (ARS).

Of the native vegetation communities recorded two are considered to be threatened under the Tasmanian *Nature Conservation Act 2002*. They are *Eucalyptus viminalis* - *Eucalyptus globulus* coastal forest and woodland (DVC) and *Melaleuca ericifolia* swamp forest (NME). Together they cover 16% of the vegetated area (excluding open water/sea (OAQ)). Full details of vegetation communities recorded, their threatened status and their condition is provided below in Table 7.2, and their distribution is shown in Figure 7. Full species lists for each vegetation community are provided in Appendix 12.

**Table 7.2 – Vegetation Communities recorded in the study area, including their conservation priority, reservation status and condition.**

Veg Code <sup>36</sup>	Vegetation Community Description	Area (ha)	State-wide Conservation Priority and Reservation Status <sup>37, 38</sup>	Bioregional Conservation Priority and Reservation Status <sup>2, 3</sup>	Condition
ARS	Saline sedgeland/ rushland	1.9	Not threatened	Not threatened	1
DSO	<i>Eucalyptus sieberi</i> forest and woodland not on granite substrates	7.0	Not threatened	Not threatened	1
DVC	<i>Eucalyptus viminalis</i> - <i>Eucalyptus globulus</i> coastal forest and woodland	1.1	Threatened and inadequately reserved	Threatened and inadequately reserved	2
FAG	Agricultural land	2.1	-	-	4
FPF	<i>Pteridium esculentum</i> fernland	1.2	-	-	3
FUM	Extra-urban miscellaneous	0.8	-	-	4
FUR	Urban areas	0.8	-	-	4
NME	<i>Melaleuca ericifolia</i> swamp forest	1.9	Threatened and inadequately reserved	Threatened and inadequately reserved	1
OAQ	Water, sea	3.4	-	-	-

<sup>36</sup> As per Tasveg 2.0 Vegetation Classification System, DPIPW

<sup>37</sup> Nature Conservation Act 2002

<sup>38</sup> FCF 2007. Note there is no recent analysis of reservation status of non forest communities

<b>Veg Code<sup>36</sup></b>	<b>Vegetation Community Description</b>	<b>Area (ha)</b>	<b>State-wide Conservation Priority and Reservation Status<sup>37, 38</sup></b>	<b>Bioregional Conservation Priority and Reservation Status<sup>2, 3</sup></b>	<b>Condition</b>
OSM	Sand, mud	0.3	-	-	1
SMR	Melaleuca squarrosa scrub	1.8	Not threatened	Not threatened	1
<b>Total Area (ha)</b>		<b>22.3</b>			

#### 7.5.4 Flora Species Richness

A total of 73 flora species were recorded within the study area. Of these 70 were native, with the remaining three being weed species. A full species list for Parkside Lagoon is included in Appendix 11.



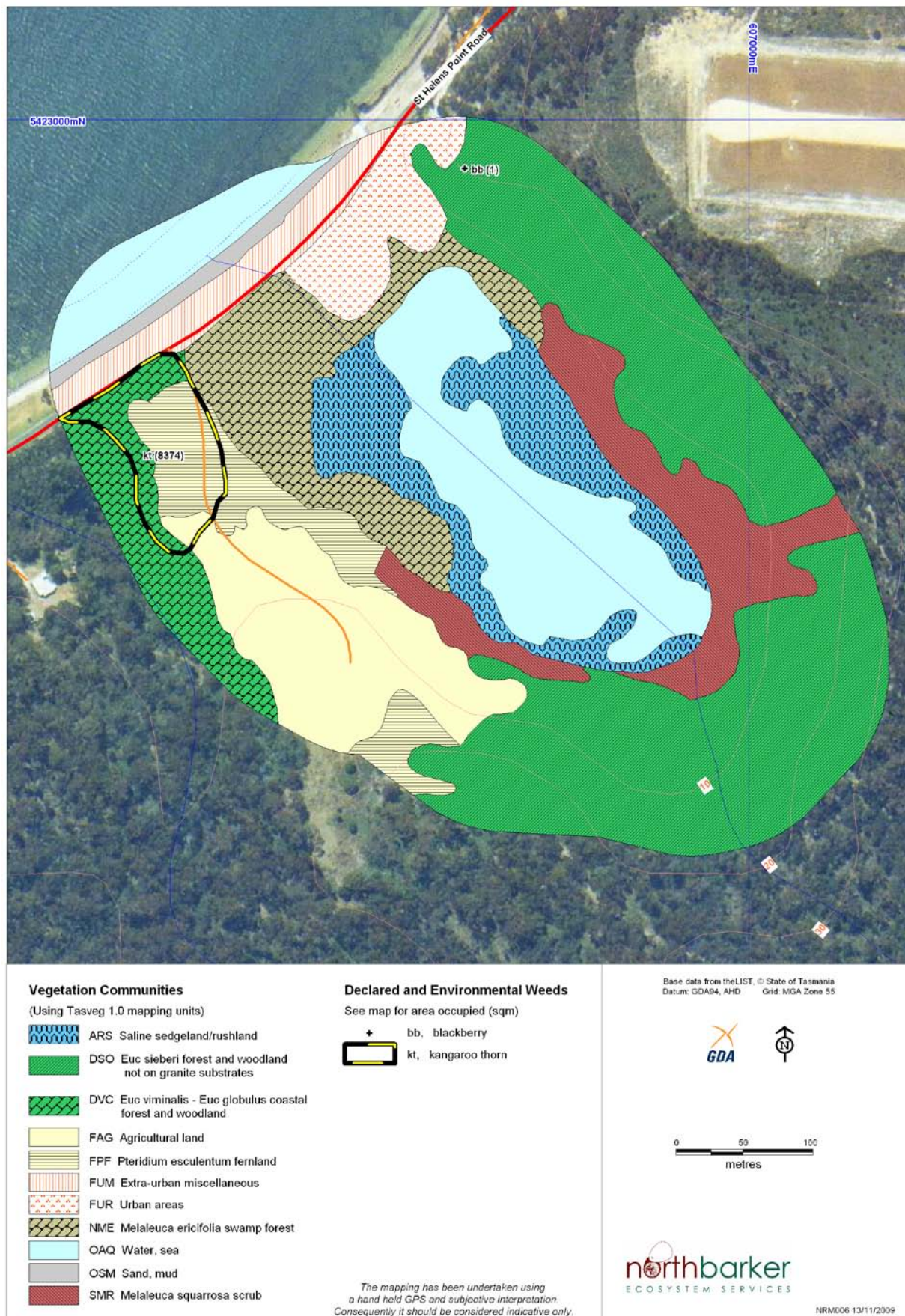


Figure 7 – Vegetation Communities and Weeds for Parkside Lagoon

### 7.5.5 Threatened Flora

No flora species listed under either the Tasmanian *Threatened Species Protection Act 1995* (TSPA) or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBCA) have been recorded within the study area.

### 7.5.6 Threatened Fauna

No fauna species listed under either the Tasmanian *Threatened Species Protection Act 1995* (TSPA) or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBCA) have been recorded within the study area.

### 7.5.7 Fauna Habitat Value

The vegetation of the study area provides a diverse range of habitat opportunities for fauna species. A large variety of habitats are present including forest and woodland, scrub, swamp forest, sedgeland, sand/mud and saline aquatic habitats. Approximately 68% of the study area was in an excellent condition (Condition Level 1), with the remainder being affected by weeds at low levels, or within agricultural and urban areas. The area is still considered to provide high quality foraging and nesting habitat for many fauna species. A variety of species are likely to be present including small mammals, reptiles, birds, amphibians and invertebrates.

At the time of the survey the aquatic habitat was in good condition, following good rains, and water levels were very high. Calls of the brown froglet (*Crinia signifera*) were relatively common on the edges of the lagoon, and macropod scats were observed.

### 7.5.8 Threatened Fauna Habitat

Approximately 70% of the study area is habitat that is potentially suitable for threatened fauna. Thirteen threatened fauna species are known to use the habitat types that are present within the study area. Additionally fourteen species listed under the JAMBA and CAMBA<sup>39</sup> migratory bird agreements also has potential habitat within the study area. Details of the species of threatened fauna and migratory birds that may occur at Parkside Lagoon and their preferred habitats are in Appendix 1. The habitats within the study area that are preferred by at least one threatened fauna species include;

- *Eucalyptus sieberi* forest and woodland not on granite substrates (DSO)
- *Eucalyptus viminalis* - *Eucalyptus globulus* coastal forest and woodland (DVC)
- *Melaleuca ericifolia* swamp forest (NME)
- Saline sedgeland/ rushland (ARS)
- Sand, mud (OSM)

## 7.6 Weeds

A total of three weed species were recorded within the study area, with only one being a “declared” weed species listed on the schedules of the *Tasmanian Weed Management Act*

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<sup>39</sup> Japan Australia Migratory Bird Agreement (1974) and China Australia Migratory Bird Agreement (1986)

1999 (see Table 7.3 below). The one recorded species is blackberry (*Rubus fruticosus*), which appeared to have been planted within *Eucalyptus sieberi* forest and woodland not on granite substrates (DSO) on the edge of the urban areas. A blackberry plant in this location is a very high risk of spreading into the surrounding bushland, and ideally it should be removed. In the north-eastern corner of the study area, a relatively large area of kangaroo thorn (*Acacia paradoxa*) is invading the *Eucalyptus viminalis* - *Eucalyptus globulus* coastal forest and woodland (DVC), the *Pteridium esculentum* fernland (FPF) and the Agricultural land (FAG). The one other weed species that was recorded is considered to be a species that does not pose significant environmental problems. See figure 7 for weed location and infestation details.

**Table 7.3 – Declared or environmental weed species recorded within the study area.**

Weed Species	Declared <sup>40</sup> / Environmental
blackberry ( <i>Rubus fruticosus</i> )	Declared

## 7.7 Landholder Survey

Two responses to the survey were received from landholders for Parkside Lagoon. The main concerns raised by the respondents were;

- rubbish - rubbish is being discarded or dumped in to the wetland.

## 7.8 Threats

The overall condition of Parkside Lagoon is very good, indicating that the pressures and threats that it faces are currently low, or the system is resilient enough to withstand the current level of threatening processes. However, this does not mean that this will continue into the future, as several threats were identified during the current survey. The key threats identified include;

- **Sedimentation – Moderate Threat.** On-going sedimentation combined with restricted outflow will lead to infilling of lagoon. Vegetation clearance could also lead to increase sedimentation to lagoon.
- **Weeds – Low Threat.** A blackberry plant has been planted on the edge of the forested area, and is a very high risk of spreading into the surrounding bushland. Following discussions with the landholder it should be removed. Kangaroo thorn was found to be spreading in the area and could increase in abundance given time. It could be a nasty weed problem if allowed to get out of control, and therefore should be controlled now.
- **Tracks/Roads – Low Threat.** A vehicle track cuts through the buffer area of this wetland across the agricultural land, but does not cut across the wetland area itself. The St Helens Point Road cuts through the buffer area on the northern side of the

<sup>40</sup> Declared under the Tasmanian *Weed Management Act 1999*

basin. Most of the tracks in their current state do not appear to be having negative impacts. Runoff from St Helens Point Road may impact on water quality within the lagoon.

- **Adjacent land use – Low Threat.** Adjacent agricultural land, with the associated use of fertilizers, pesticides and other agricultural chemicals may affect water quality within the wetland. This may not be a problem if used at low levels.

## **7.9 First Aid**

Several actions could be undertaken to reduce the threats that are currently facing Parkside Lagoon. Listed in priority order they include the following;

1. Initiate discussions with the landholder who has planted a blackberry plant within the native vegetation area, with the aim of removing it.
2. Immediate weed control program, including several years of follow up work, targeting blackberry and kangaroo thorn.
3. Maintain vegetation between the houses and lagoons in order to diffuse surface flows and reduce nutrient and sediment input.
4. Improve flushing at mouth.
5. Undertake educational activities (eg a field site visit and walk) with the local landholders highlighting the ecological values and sensitivity of the area and encouraging local stewardship.
6. Monitor rabbit numbers and their impacts, and implement a control program if unacceptable levels of damage are occurring.

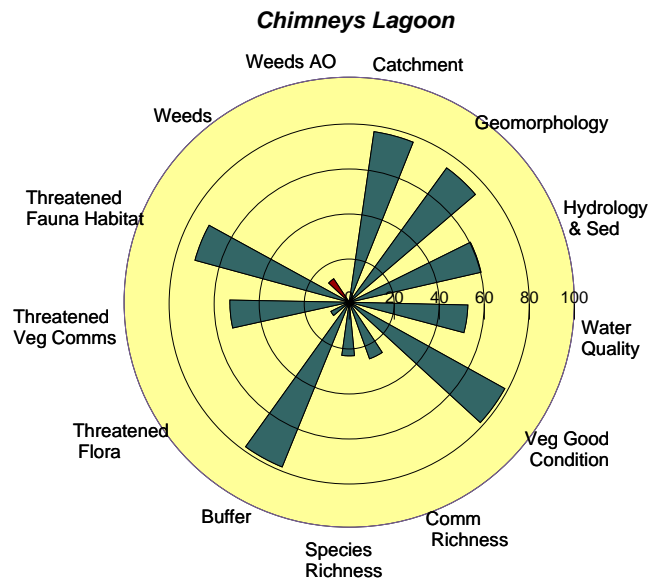


## 8 Chimneys Lagoon (#8)

### Wetland Health Score:

**56/ 100**

N.B. - This number is an unweighted addition of the variables that make up the adjacent condition rose to give an assessment out of a possible 100 points. These variables represent the current condition and natural values recorded historically and during the current survey. Due to the different levels of survey undertaken at each site, this score should not be used as a comparative value between wetlands.



**Photo 8.13. Chimneys Lagoon looking in to *Melaleuca ericifolia* swamp forest.**



**Photo 8.2. Google Earth aerial photo of Chimneys Lagoon study area.**



## **8.1 Introduction**

Chimneys Lagoon is comprised of one small lagoon which is 4.3ha in surface area. Including the 100m buffer around it, it equates to an area of approximately 23.6ha.

## **8.2 Geomorphology**

### **8.2.1 Setting**

Chimneys Lagoon is situated on the western side of the St Helens Peninsula, approximately 1 km west of the southern end of Windmill Lagoon. Unlike the coastal lagoons, Chimneys has a catchment area of approximately 2.5 km<sup>2</sup>, with a well defined drainage system which enters the lagoon from the south. The catchment is bounded on the north and east by the rise which creates the western boundary of the Moriarty – Windmill lagoons and consists of non-marine Tertiary sediments. The southern side of the lagoon is created by granitic hills which outcrop as cliffs along St Helens Point Rd. The southern extent of the catchment extends to the Parkside Lagoon and Onion Creek catchments.

The mouth of Chimneys Lagoon has been modified by construction of St Helens Point Road and is now confined to small culverts. Based on aerial photos, the natural mouth of the lagoon appears to have occupied the adjacent beach area, and was probably intermittently connected to Georges Bay. It is plausible that the large vegetated swampy area between the road and the open water of the lagoon has been created since road construction due to through infilling. Restricted outflow from the lagoon now occurs via an under road culvert and overgrown channel. Water level in the lagoon is controlled by the level of the outlet, which probably leads to more stable water levels as compared to pre-road conditions.

The coast of Georges Bay south of Chimney Lagoon has been significantly modified and is of low conservation value. The beach and coastal heath north of the mouth is less modified and of high conservation value. Recent catchment clearing has occurred in the Parnella Heights.

### **8.2.2 Local processes**

Water and sediment inflow from the catchment and the internal production and retention of organic matter are the predominant geomorphic process occurring in Chimneys Lagoon. The restricted outflow from the lagoon prevents transport of these materials out of the lagoon, leading to infilling of the lagoon.

## **8.3 Hydrology and sediments**

Hydrologically the lagoon is fed via surface water and ground water inflow, with direct precipitation a lesser source due to the relatively large size of the catchment compare to area of the lagoon. Clearing of the catchment associated with existing and future housing developments and other works has likely increased sediment loads to the water body.

Sediments entering the lagoon include sands from the catchment, runoff from the surrounding developed area and the internal production of organic matter. The organic input leads to soft organic rich sediments present in much of the lagoon.



All of this material is effectively trapped within Chimneys Lagoon due to the restricted and highly modified outlet.

#### **8.4 Water quality**

Water entering the lagoon is likely to vary in water quality, from high quality natural runoff from the creeks to poor quality runoff from the surrounding residential development and adjacent roads. The proximity of the sewage treatment pond also poses a risk of leachate or spills entering the lagoon. The lack of flushing of the lagoon combined with possibly nutrient rich inflows leads to stagnation and promotes algal growth, as was apparent in August 2009 following an extended period of rain.

Water in the lagoon is brown, organic rich with low turbidity. The water is acidic (pH 5.5 on day of investigation) and fresh, with a salinity of <0.2 ppt. Upon disturbance of the organic rich sediments in the bed of the lagoon, turbidity increases for an extended period due to the very fine-grained nature of the organic muck.

Rubbish and garden clippings were present within and along the margin of the lagoon which can also affect water quality.

#### **8.5 Geomorphology, hydrology and water quality condition**

The present condition of Chimney Lagoon is moderate however the water body is at high risk due to ongoing and potentially increased development in the catchment. The conditions rose shows lower scores than contained in CFEV due to the poor flushing, poor water quality and increased sedimentation occurring in the lagoon.



**Photo 8.3. Left - Stagnant water near outlet of Chimney Lagoon showing algal growth**

**Photo 8.4. Right - Culvert at outflow of Chimney Lagoon.**

## 8.6 Flora and Fauna

### 8.6.1 Overview

The Chimneys Lagoon study area covers approximately 23.6 hectares, with 83% of the vegetation communities being native. A total of four native vegetation communities were recorded, covering a low variety of habitats including forest woodland and swamp forest. All of the native vegetation communities were in very good condition.

The most abundant vegetation community in the Chimneys Lagoon is *Melaleuca ericifolia* swamp forest (NME), which covers almost one third of the study area. The wetland component of Chimneys Lagoon covers 4.3ha or almost 20% of the study area, and it is made up of Water, sea (OAQ). The wetland component was comprehensively inundated at the time of this survey.

Immediately surrounding the wetland area there is an ecotone between the lower lying wetland area, and the higher ground that rises out of the wetland. The ecotone is comprised of wetter soils than the higher ground, and is dominated by *Melaleuca ericifolia* swamp forest (NME). Beyond this zone on the higher ground the vegetation is dominated by drier forest and woodland communities, being dominated by *Eucalyptus amygdalina* coastal forest and woodland (DAC), Urban areas (FUR) and *Allocasuarina littoralis* forest (NAL). Smaller patches of other anthropogenic vegetation communities also occur in parts of the study area.

The study area incorporates a 100m buffer surrounding the wetland portion of Chimneys Lagoon. This buffer area occupies 19.2ha of which approximately 79% is native vegetation, with the remainder being urban areas and other urban infrastructure. This relatively high proportion of native vegetation within the buffer area assists in protecting the wetland vegetation and in filtering and maintaining the quality of the water that enters, although the urban development that is occurring and has occurred in the past has the potential to negatively impact on the water quality within Chimneys Lagoon.



Photo 8.3. Left - *Melaleuca ericifolia* swamp forest (NME).

Photo 8.4. Right - *Allocasuarina littoralis* forest (NAL).

### 8.6.2 Vegetation Condition

The majority of the vegetation communities within Chimneys Lagoon are in an excellent condition overall with 79% of them being at Condition Level 1. This condition level is characterised by no or very low levels of weed invasion, with the vegetation being structurally and floristically intact. Condition Level 2 and 3 were not recorded in the study area. Condition Level 4 comprised 21% of the study area, and is made up of urban areas and other urban infrastructure, where the native vegetation areas have been destroyed or the natural values have been grossly altered. See Table 8.1 below for details.

**Table 8.1 – Vegetation Condition within the study area.**

Condition	Condition Description	Area (ha)	% of study area
1	Vegetation structurally and floristically intact and weed invasion less than 1% cover	15.2	79.0
2	Vegetation structurally and floristically altered and/or weed invasion > 1% and < 10% cover	0	0
3	Vegetation structurally and floristically altered and weed invasion > 10% and < 50% cover	0	0
4	Grossly altered vegetation structure in otherwise weed infested vegetation (> 50% weeds cover)	4.0	21.0
<b>Total</b>		18.9	100.0

### 8.6.3 Vegetation Community Richness

Of the six vegetation communities recorded in the study area four are native, with the remaining two being anthropogenic communities. At Chimneys Lagoon the most common vegetation community is *Melaleuca ericifolia* swamp forest (NME), followed by *Eucalyptus amygdalina* coastal forest and woodland (DAC), Urban areas (FUR) and *Allocasuarina littoralis* forest (NAL).

Of the native vegetation communities recorded two are considered to be threatened under the Tasmanian *Nature Conservation Act 2002*. They are *Melaleuca ericifolia* swamp forest (NME) and *Allocasuarina littoralis* forest (NAL). Together they cover 53% of the vegetated area (excluding open water/sea (OAQ)). Full details of vegetation communities recorded, their threatened status and their condition is provided below in Table 8.2, and their distribution is shown in Figure 8. Full species lists for each vegetation community are provided in Appendix 14.

**Table 8.2 – Vegetation Communities recorded in the study area, including their conservation priority, reservation status and condition.**

Veg Code <sup>41</sup>	Vegetation Community Description	Area (ha)	State-wide Conservation Priority and Reservation Status <sup>42 43</sup>	Bioregional Conservation Priority and Reservation Status <sup>2 3</sup>	Condition
DAC	Eucalyptus amygdalina coastal forest and woodland	5.0	Not threatened	Not threatened	1
FUM	Extra-urban miscellaneous	0.7	-	-	4
FUR	Urban areas	3.4	-	-	4
NAL	Allocasuarina littoralis forest	2.8	Threatened and inadequately reserved	Threatened and inadequately reserved	1
NME	Melaleuca ericifolia swamp forest	7.4	Threatened and inadequately reserved	Threatened and inadequately reserved	1
OAQ	Water, sea	4.3	-	-	1
<b>Total Area (ha)</b>		<b>23.6</b>			

#### 8.6.4 Flora Species Richness

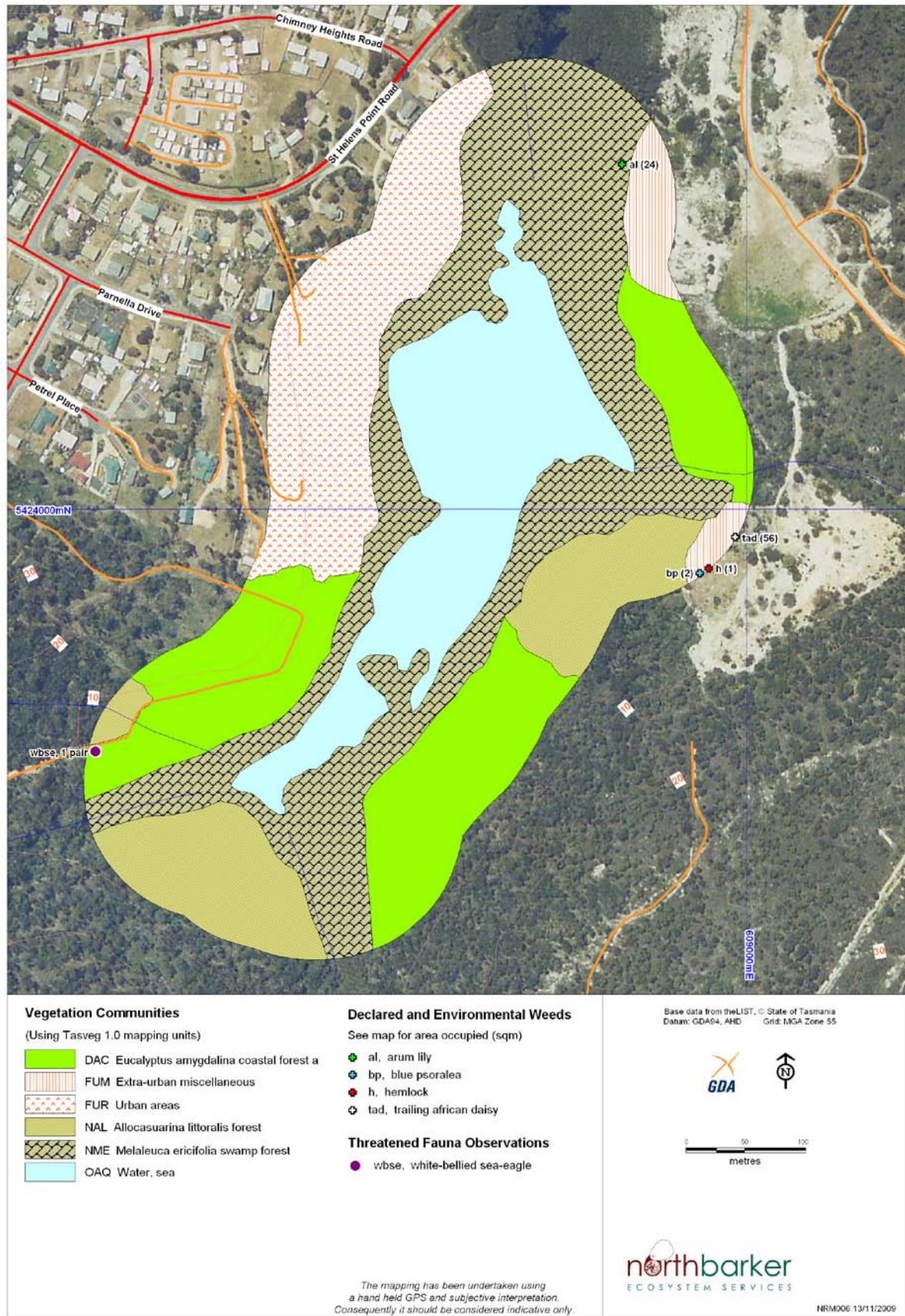
A total of 44 flora species were recorded within the study area. Of these 40 were native, with the remaining four being weed species. A full species list for Chimneys Lagoon is included in Appendix 13.

<sup>41</sup> As per Tasveg 2.0 Vegetation Classification System, DPIPW

<sup>42</sup> Nature Conservation Act 2002

<sup>43</sup> FCF 2007. Note there is no recent analysis of reservation status of non forest communities





**Figure 8 – Vegetation Communities, Weeds and Threatened Fauna for Chimneys Lagoon**

### 8.6.5 Threatened Flora

One flora species listed under either the Tasmanian *Threatened Species Protection Act 1995* (TSPA) or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBCA) has been recorded within the study area. The one flora species was previously recorded within the study area<sup>44</sup>, with no additional species being recorded during the current survey. All species of conservation significance recorded within the study area are listed in Table 8.3.

**Table 8.3 – Flora species of conservation significance within the study area. Records are historical records from the Natural Values Atlas and records found during this survey.**

Species	Status <sup>45</sup> TSPA/EPBCA	Recorded this survey <sup>46</sup>
<i>Pterostylis grandiflora</i> (superb greenhood)	r/-	-

### 8.6.6 Threatened Fauna

One fauna species listed under either the Tasmanian *Threatened Species Protection Act 1995* (TSPA) or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBCA) has been recorded within the study area. No fauna species were previously recorded within the study area<sup>14</sup>. One threatened fauna species, the White-bellied Sea-Eagle (*Haliaeetus leucogaster*) was recorded during the current survey. A pair of these birds were seen flying overhead and also perched at the top of a large, old *Eucalyptus globulus* (Tasmanian Blue Gum) tree. See figure 8 for the location of this sighting. The presence of this species indicates that the land/ water in the area is probably productive in terms of hunting prey species. All species of conservation significance recorded within the study area are listed in Table 8.4.



**Photo 8.5. White-bellied Sea-Eagle (*Haliaeetus leucogaster*) in *Eucalyptus globulus* tree.**

<sup>44</sup> Natural Values Atlas, DPIPW

<sup>45</sup> TSPA - Tasmanian *Threatened Species Protection Act 1995*; EPBCA - Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*

<sup>46</sup> Threatened species that were not recorded during the current survey are likely to still be present at this site. Seasonal and survey limitations are likely to be responsible for some threatened species not being recorded during the current survey.



**Table 8.4 – Fauna species of conservation significance within the study area. Records are historical records from the Natural Values Atlas and records found during this survey.**

Species	Status <sup>47</sup> TSPA/EPBCA	Recorded this survey <sup>48</sup>
White-bellied Sea-Eagle ( <i>Haliaeetus leucogaster</i> )	(v/-)	-

### 8.6.7 Fauna Habitat Value

The vegetation of the study area provides a range of habitat opportunities for fauna species. A small variety of habitats are present including forest, woodland and swamp forest. Approximately 79% of the study area was in an excellent condition (Condition Level 1), with the remainder being urban areas or affected by other human activities. The area is still considered to provide high quality foraging and nesting habitat for many fauna species. A variety of species are likely to be present including small mammals, reptiles, birds, amphibians and invertebrates.

At the time of the survey the aquatic habitat was in good condition, following good rains, and water levels were very high. Calls of the brown froglet (*Crinia signifera*) were relatively common on the edges of the lagoon. More prominent fauna sightings included a Lowland Copperhead Snake (*Austrelaps superbus*).

### 8.6.8 Threatened Fauna Habitat

Approximately 71% of the study area is habitat that is potentially suitable for threatened fauna. Eight threatened fauna species are known to use the habitat types that are present within the study area. No species listed under the JAMBA and CAMBA<sup>49</sup> migratory bird agreements have potential habitat within the study area. Details of the species of threatened fauna and migratory birds that may occur at Chimneys Lagoon and their preferred habitats are in Appendix 1. The habitats within the study area that are preferred by at least one threatened fauna species include;

- *Eucalyptus amygdalina* coastal forest and woodland (DAC)
- *Melaleuca ericifolia* swamp forest (NME)
- Water, sea (OAQ)

## 8.7 Weeds

A total of four weed species were recorded within the study area, with none being a “declared” weed species listed on the schedules of the *Tasmanian Weed Management Act 1999* (see Table 8.5 below). All four weed species recorded are considered to be

<sup>47</sup> TSPA - Tasmanian Threatened Species Protection Act 1995; EPBCA - Commonwealth Environment Protection and Biodiversity Conservation Act 1999

<sup>48</sup> Natural Values Atlas, DPIPW

<sup>49</sup> Japan Australia Migratory Bird Agreement (1974) and China Australia Migratory Bird Agreement (1986)

environmental weeds. The species are - arum lily (*Zantedeschia aethiopica*), blue psoralea (*Psoralea pinnata*), hemlock (*Conium maculatum*) and trailing african daisy (*Osteospermum fruticosum*). All four species recorded occurred in disturbed Extra-urban miscellaneous (FUM) areas or on the edges of the native vegetation areas, and are likely to have established from dumped garden waste in these areas. The current levels of infestation within the study area are low, and should be controlled now before these species are allowed to spread. Further larger infestations of hemlock and trailing african daisy occur immediately outside of the study area. See figure 8 for weed location and infestation details.

**Table 8.5 – Declared or environmental weed species recorded within the study area.**

Weed Species	Declared <sup>50</sup> / Environmental
arum lily ( <i>Zantedeschia aethiopica</i> )	Environmental
blue psoralea ( <i>Psoralea pinnata</i> )	Environmental
hemlock ( <i>Conium maculatum</i> )	Environmental
trailing african daisy ( <i>Osteospermum fruticosum</i> )	Environmental



**Photo 8.6. Left - Extensive hemlock (*Conium maculatum*) infestation just outside of the study area in degraded land.**

**Photo 8.7. Right - Arum lily (*Zantedeschia aethiopica*) infestation.**

## 8.8 Landholder Survey

Five responses to the survey were received from landholders for Chimneys Lagoon. The main concerns raised by the respondents were;

- rubbish - rubbish is being dumped into and adjacent to the wetland. Dumping of garden waste brings in weed seeds/ propagules.
- urban development - concerns about the level of development in the area ruining the area.

<sup>50</sup> Declared under the Tasmanian *Weed Management Act 1999*

- drainage into wetland - solid waste, rubbish and chemical effluent is washed down drains (stormwater) which flow directly into the lagoon. Runoff from road culverts is also affecting water quality. Septic and sewer systems leaking and leaching nutrients into the lagoon.
- adjacent former rubbish dump - possibility of seepage into the lagoon affecting water quality.
- maintenance - lack of maintenance effort by council to remove rubbish, control mosquitoes, and keep out motorbikes.
- off-road vehicles - motorbikes access the wetland around the edge when water levels are low. 4WD access is also causing damage on tracks around the lagoon.
- hunting - local residents shoot swans and other water birds.
- water quality - changes in the water quality from fresh to brackish has affected fauna species. Eels, bream and trout no longer occur in the lagoon.
- land zoning - some of the area is zoned residential, which is inappropriate for this area because of habitat values and presence of threatened species.

## 8.9 Threats

The overall condition of Chimneys Lagoon is very good, indicating that the pressures and threats that it faces are currently low, or the system is resilient enough to withstand the current level of threatening processes. However, this does not mean that this will continue into the future, as several threats were identified during the current survey. The key threats include the following;

- **Urban development – High Threat.** The existing residential development and potential future developments within the catchment pose threats to water quality due to increased sediment and nutrient runoff into the lagoon. Pressure from urban development is at moderate levels, with the housing along St Helens Point occurring within the 100m buffer zone of the lagoon. It is understood that more areas around the lagoon are zoned residential, which if allowed to go ahead would put further pressure on the lagoon. Restrictions on what type and scale of future development should be put in place within a buffer around Chimneys Lagoon, to help protect the remaining habitat, the water quality and other natural values of the area.
- **Lagoon flushing - High Threat.** The lack of flushing within the lagoon traps nutrients and promotes algal growth in the stagnant waters.
- **Adjacent land use – Moderate Threat.** Adjacent sewerage ponds and a former rubbish dump may be leaching nutrients and toxic substances into the lagoon.
- **Rubbish dumping – Moderate Threat.** Garden waste was noted as being dumped in disturbed areas just outside of the study area. It appears to be a minor problem at the moment, however it is a good way to introduce weeds to a site, attract other rubbish dumpers and obviously impacts on the visual amenity of the site. Restricting vehicle

access to out of the way tracks could reduce this problem particularly those that run closer to the wetland.

- **Weeds – Low Threat.** Arum lily, blue psoralea, hemlock and trailing african daisy occur in disturbed areas around the lagoon. The current levels of infestation within the study area are low, and should be controlled now before these species are allowed to spread. Further larger infestations of hemlock and trailing african daisy occur immediately outside of the study area, and will act as a source of recurring infestation.
- **Tracks/Roads – Low Threat.** Only one vehicle track cuts through the buffer area of this wetland, with no tracks accessing the wetland area itself. The tracks in their current state do not appear to be having negative impacts. High water levels may have hidden motorcycle tracks through or adjacent to the wetland. Runoff from St Helens Point Road may impact on water quality within the lagoon.
- **Rabbits – Low Threat.** Rabbit dung was observed in several locations. Damage to vegetation was not obvious indicating that rabbits are probably present in low numbers and currently pose a minor threat. This will need to be monitored however, and a control program put in place if numbers and consequent vegetation damage or erosion problems start to occur.

### 8.10 First Aid

Several actions could be undertaken to reduce the threats that are currently facing Chimneys Lagoon, including:

1. Encourage planning laws which restrict further development within a defined buffer zone around Chimneys Lagoon.
2. Improved flushing of the lagoon would increase its resilience to catchment pressures. This could be accomplished to various degrees by clearing vegetation from the existing culverts to increasing the connection of the lagoon to Georges Bay through modification of the road.
3. Water quality could be improved by establishing healthy vegetation buffers between the houses, road and lagoon to act as storm water filters, reduce nutrient and sediment input and divert stormwater away from the lagoon.
4. Immediate weed control program, including several years of follow up work, targeting Arum lily, blue psoralea, hemlock and trailing african daisy.
5. Remove dumped rubbish from around and within the lagoon. Use trash racks over storm water drains to stop large particles of rubbish from entering the lagoon.
6. Install educational signs highlighting the ecological values of the area and discouraging damaging activities.
7. Undertake educational activities (eg a field site visit and walk) with the local landholders highlighting the ecological values and sensitivity of the area, highlighting threats such as rubbish dumping and encouraging local stewardship.

8. Prevent access to all vehicles and eliminate current vehicular access to out of the way tracks particularly those that run closer to the wetland.
9. Set up a water quality monitoring program to ensure adjacent land uses are not impacting adversely on the water quality within the lagoon.
10. Monitor rabbit numbers and their impacts, and implement a control program if unacceptable levels of damage are occurring.
11. Revegetation of the old tip site.

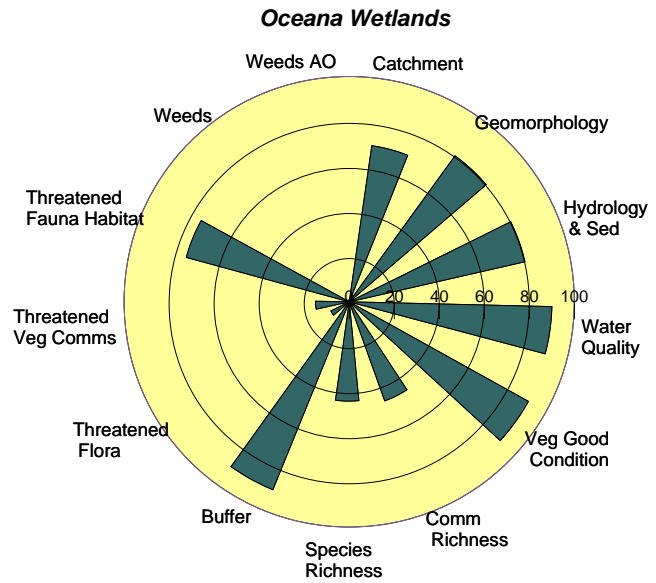


## 9 Oceana Wetland (#9)

### Wetland Health Score:

**64/ 100**

N.B. - This number is an unweighted addition of the variables that make up the adjacent condition rose to give an assessment out of a possible 100 points. These variables represent the current condition and natural values recorded historically and during the current survey. Due to the different levels of survey undertaken at each site, this score should not be used as a comparative value between wetlands.



**Photo 9.14. Oceana Wetland from the wetland edge looking north-east over Fresh water aquatic sedgeland and rushland**



**Photo 9.2. Google Earth aerial photo of Oceana Wetland study area.**



## **9.1 Introduction**

Oceana Wetland is comprised of two water bodies occupying two distinct shallow basins. The northern wetland, “Oceana North”, is the larger of the two wetlands at 2.1ha in surface area, while the southern wetland, “Oceana South”, is the smaller of the two wetlands at 0.2ha in surface area.

For the purposes of this study both wetlands, including a 100m buffer around each wetland will be considered as the Oceana Wetland complex. The total surface area of the water bodies mentioned above is 2.3ha, and including the 100m buffer around them equates to an area of approximately 22.0ha.

## **9.2 Geomorphology**

### **9.2.1 Setting**

The Oceana wetlands are situated on a flat-lying surface at an elevation of approximately 40 m and approximately 1-km inland from the sea. The wetlands are located on Quaternary sediments on what is probably an erosion surface. The flat-lying surface forms the catchment divide between Dark Hollow Creek and Crockers Arm Creek, and there are no surface inflows entering the wetlands resulting in a small surface catchment area associated with the wetlands.

The area surrounding the lagoons has been somewhat modified by clearing, agriculture and residential development, but as the wetlands have no surface inflows, these modifications have minimal impact on the wetlands.

### **9.2.2 Local processes**

The wetlands have no defined inflows or outflows, and are presumably fed by direct rainfall and ground water. The sediments are very organic rich reflecting the lack of sediment input to the system and high internal productivity of the system. The wetlands appear to be infilling through the accumulation of organic material.

## **9.3 Hydrology and sediments**

Rainfall and groundwater inflow are the predominant sources of water to the wetlands, with outflows limited to evaporation and losses to groundwater. As previously noted, the only source of ‘sediment’ to the system is the *in situ* production, deposition and decomposition of organic matter. Due to the lack of inflows and outflows, it is likely that the rate of water change in the wetlands is slow in response to changes to the local ground water table.

## **9.4 Water quality**

The water in the Oceana wetlands is fresh, with the electrical conductivity on the day of investigations being <0.1 ppt salinity (400  $\mu$ S/cm), with the low conductivity attributable to wind borne marine salts. The water is organic-rich with a strong dark colour, and very low turbidity. The high content of organic acids in the water results in low pH (4.95 on day of visit). The water level was high on the day of investigation and was conducive to abundant frog and mosquito activity.

## 9.5 Condition

The larger catchment surrounding the wetlands has been cleared, but the area immediately adjacent to the wetlands remains in fairly natural condition. Because the wetlands are not linked to the catchment via surface drainages, they are somewhat protected from catchment impacts. The condition rose shows higher ratings than suggested by CFEV reflecting catchment attributes as well as local conditions.



Figure 9.3. Oceana Wetland under high water level conditions.

## 9.6 Flora and Fauna

### 9.6.1 Overview

The Oceana Wetland study area covers approximately 22.0 hectares, with 91% of the vegetation communities being native. A total of seven native vegetation communities were recorded, covering a variety of habitats including forest and woodland, scrub, sedgeland and fresh water aquatic habitats. All of the native vegetation communities were in very good condition.

The most abundant vegetation community in the Oceana Wetland is *Eucalyptus sieberi* forest and woodland not on granite substrates (DSO), which covers approximately one third of the study area. The wetland component of the Oceana Wetland complex covers 2.3ha or approximately 10% of the study area, and it is made up of 2.1ha of Fresh water aquatic sedgeland and rushland (ASF), and 0.2ha of Fresh water aquatic herbland (AHF). The wetland component was comprehensively inundated at the time of this survey.

Immediately surrounding the wetland area there is an ecotone between the lower lying wetland area, and the higher ground that rises out of the wetland. The ecotone is comprised of wetter soils than the higher ground, and is dominated by *Melaleuca squarrosa* scrub (SMR). Beyond this zone on the higher ground the vegetation is dominated by drier forest and woodland communities, being mainly *Eucalyptus sieberi* forest and woodland not on granite substrates (DSO), and *Eucalyptus amygdalina* coastal forest and woodland (DAC). Smaller patches of other vegetation communities and anthropogenic communities also occur in parts of the study area.

The study area incorporates a 100m buffer surrounding the wetland portions of Oceana Wetland. This buffer area occupies 19.7ha of which approximately 90% is native vegetation, with the remainder being regenerating cleared land, agricultural land, urban areas and other urban infrastructure. This high proportion of native vegetation within the buffer area assists in protecting the wetland vegetation and in filtering and maintaining the quality of the water that enters.



Figure 9.4. *Eucalyptus sieberi* forest and woodland not on granite substrates (DSO).

Figure 9.5. Fresh water aquatic herbland (AHF).

### 9.6.2 Vegetation Condition

The vegetation communities within Oceana Wetland are in an excellent condition overall with 82.5% of them being at Condition Level 1. This condition level is characterised by no or very low levels of weed invasion, with the vegetation being structurally and floristically intact. Condition Level 2 comprised 8.5% of the vegetation communities, and is made up of an area of regenerating cleared land, which has been structurally altered but is still floristically intact. Condition Level 3 was not recorded within the survey area. Condition Level 4 comprised 9.0% of the study area, and is made up of agricultural land, urban areas and other urban infrastructure, where the native vegetation areas have been destroyed or the natural values have been grossly altered. See Table 9.1 below for details.

**Table 9.1 – Vegetation Condition within the study area.**

Condition	Condition Description	Area (ha)	% of study area
1	Vegetation structurally and floristically intact and weed invasion less than 1% cover	18.2	82.5
2	Vegetation structurally and floristically altered and/or weed invasion > 1% and < 10% cover	1.9	8.5
3	Vegetation structurally and floristically altered and weed invasion > 10% and < 50% cover	0	0.0
4	Grossly altered vegetation structure in otherwise weed infested vegetation (> 50% weeds cover)	2.0	9.0
<b>Total</b>		22.0	100.0

### 9.6.3 Vegetation Community Richness

Of the 10 vegetation communities recorded in the study area seven are native, with the remaining four being anthropogenic communities. At Oceana Wetland the most common vegetation community is *Eucalyptus sieberi* forest and woodland not on granite substrates (DSO), followed by *Eucalyptus amygdalina* coastal forest and woodland (DAC), Fresh water aquatic sedgeland and rushland (ASF) and *Melaleuca squarrosa* scrub (SMR).

Of the native vegetation communities recorded three are considered to be threatened under the Tasmanian *Nature Conservation Act 2002*. They are Fresh water aquatic sedgeland and rushland (ASF), Fresh water aquatic herbland (AHF) and *Eucalyptus ovata* forest and woodland (DOV). Together they cover 15% of the vegetated area. Full details of vegetation communities recorded, their threatened status and their condition is provided below in Table 9.2, and their distribution is shown in Figure 9. Full species lists for each vegetation community are provided in Appendix 16.

**Table 9.2 – Vegetation Communities recorded in the study area, including their conservation priority, reservation status and condition.**

Veg Code <sup>51</sup>	Vegetation Community Description	Area (ha)	State-wide Conservation Priority and Reservation Status <sup>52, 53</sup>	Bioregional Conservation Priority and Reservation Status <sup>2, 3</sup>	Condition
AHF	Fresh water aquatic herbland	0.2	Threatened	Threatened	1
ASF	Fresh water aquatic sedgeland and rushland	2.1	Threatened	Threatened	1
DAC	<i>Eucalyptus amygdalina</i> coastal forest and woodland	5.5	Not threatened	Not threatened	1
DOV	<i>Eucalyptus ovata</i> forest and woodland	0.6	Threatened and inadequately reserved	Threatened and inadequately reserved	1
DSO	<i>Eucalyptus sieberi</i> forest and woodland not on granite substrates	8.0	Not threatened	Not threatened	1
FAG	Agricultural land	1.4	-	-	4
FRG	Regenerating cleared land	1.9	-	-	2
FUM	Extra-urban miscellaneous	0.4	-	-	4
FUR	Urban areas	0.2	-	-	4

<sup>51</sup> As per Tasveg 2.0 Vegetation Classification System, DPIWPE

<sup>52</sup> Nature Conservation Act 2002

<sup>53</sup> FCF 2007. Note there is no recent analysis of reservation status of non forest communities



<b>Veg Code<sup>51</sup></b>	<b>Vegetation Community Description</b>	<b>Area (ha)</b>	<b>State-wide Conservation Priority and Reservation Status<sup>52 53</sup></b>	<b>Bioregional Conservation Priority and Reservation Status<sup>2 3</sup></b>	<b>Condition</b>
SMR	Melaleuca squarrosa scrub	1.7	Not threatened	Not threatened	1
	<b>Total Area (ha)</b>	<b>22.0</b>			

#### 9.6.4 Flora Species Richness

A total of 74 flora species were recorded within the study area. Of these all 74 were native, with no weed species being recorded. A full species list for Oceana Wetland is included in Appendix 15.

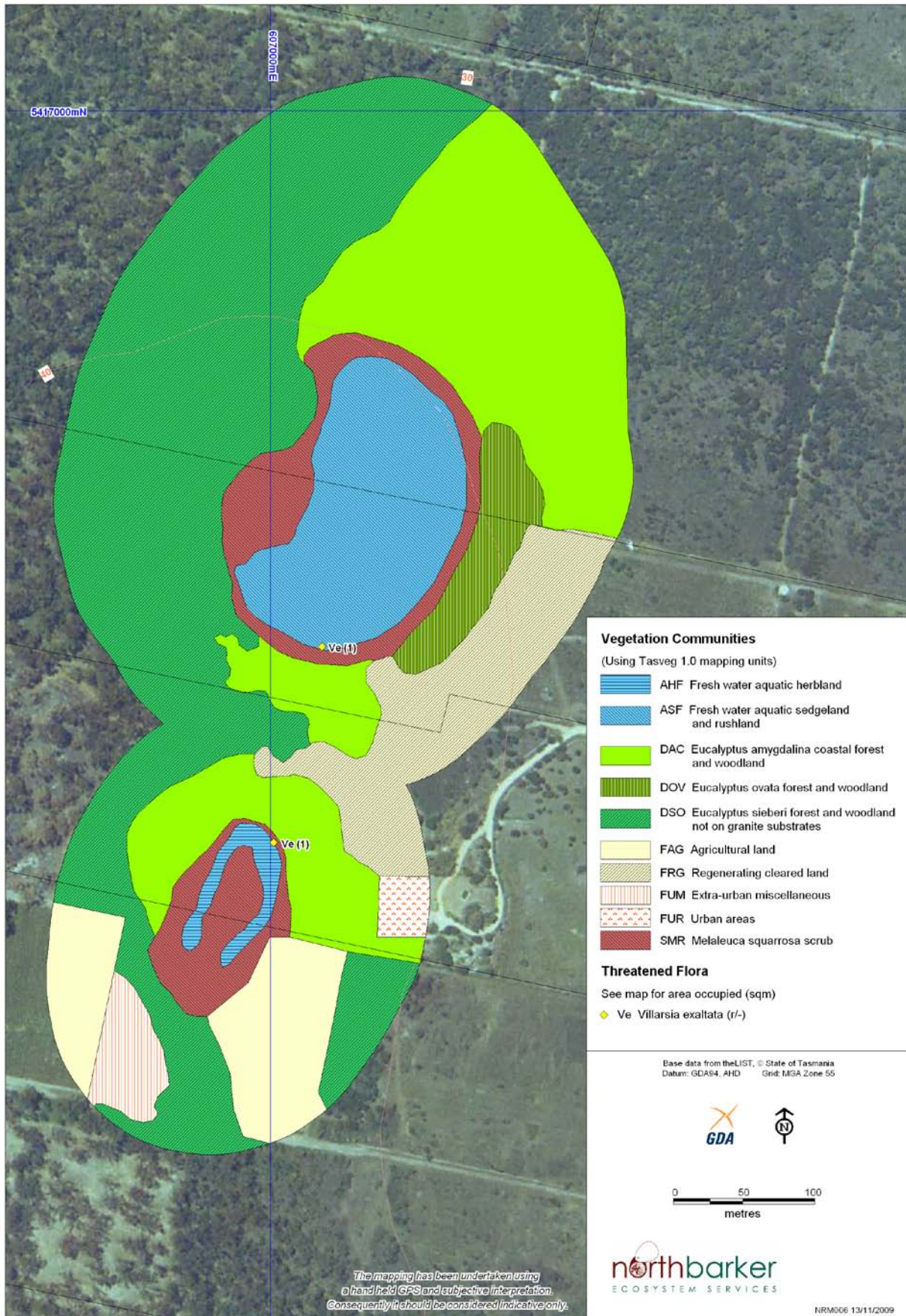


Figure 9 – Vegetation Communities and Threatened Flora for Oceana Wetland

### 9.6.5 Threatened Flora

One flora species listed under either the Tasmanian *Threatened Species Protection Act 1995* (TSPA) or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBCA) has been recorded within the study area. No threatened flora species have previously been recorded within the study area<sup>54</sup>, however one species - *Villarsia exaltata* (erect marshflower), was recorded during the current survey. All species of conservation significance recorded within the study area are listed in Table 9.3, and their distribution is shown in figure 9.

**Table 9.3 – Flora species of conservation significance within the study area. Records are historical records from the Natural Values Atlas and records found during this survey.**

Species	Status <sup>55</sup> TSPA/EPBCA	Recorded this survey <sup>56</sup>
<i>Villarsia exaltata</i> (erect marshflower)	r/-	Yes

### 9.6.6 Threatened Fauna

No fauna species listed under either the Tasmanian *Threatened Species Protection Act 1995* (TSPA) or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBCA) have been recorded within the study area.

### 9.6.7 Fauna Habitat Value

The vegetation of the study area provides a diverse range of habitat opportunities for fauna species. A large variety of habitats are present including forest and woodland, scrub, sedgeland and fresh water aquatic habitats. Approximately 83% of the study area was in an excellent condition (Condition Level 1), with the remainder being affected by structural disturbance, or within agricultural and urban areas. The area is considered to provide high quality foraging and nesting habitat for many fauna species. A variety of species are likely to be present including small mammals, reptiles, birds, amphibians and invertebrates.

At the time of the survey the aquatic habitat was in good condition, following good rains, with a resulting abundance of frogs, with the calls of the banjo frog (*Limnodynastes dumerili subsp. insularis*), the brown froglet (*Crinia signifera*) and the brown tree frog (*Litoria ewingi*) being particularly abundant. More prominent fauna sightings included a swamp harrier (*Circus approximans*) and a common brushtail possum (*Trichosurus vulpecula subsp. fuliginosus*), and there were abundant macropod scats.

### 9.6.8 Threatened Fauna Habitat

Approximately 75% of the study area is habitat that is potentially suitable for threatened fauna. Twelve threatened fauna species are known to use the habitat types that are present

<sup>54</sup> Natural Values Atlas, DPIPW

<sup>55</sup> TSPA - Tasmanian *Threatened Species Protection Act 1995*; EPBCA - Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*

<sup>56</sup> Threatened species that were not recorded during the current survey are likely to still be present at this site. Seasonal and survey limitations are likely to be responsible for some threatened species not being recorded during the current survey.

within the study area. Additionally one species listed under the JAMBA and CAMBA<sup>57</sup> migratory bird agreements also has potential habitat within the study area. Details of the species of threatened fauna and migratory birds that may occur at Oceana Wetland and their preferred habitats are in Appendix 1. The habitats within the study area that are preferred by at least one threatened fauna species include;

- Fresh water aquatic herbland (AHF)
- Fresh water aquatic sedgeland and rushland (ASF)
- *Eucalyptus amygdalina* coastal forest and woodland (DAC)
- *Eucalyptus ovata* forest and woodland (DOV)
- *Eucalyptus sieberi* forest and woodland not on granite substrates (DSO)

### 9.7 Weeds

No weed species were recorded within the study area.

### 9.8 Landholder Survey

No responses to the survey were received from landholders for Oceana Wetland.

### 9.9 Threats

The overall condition of Oceana Wetland is excellent, indicating that the pressures and threats that it faces are currently low, or the system is resilient enough to withstand the current level of threatening processes. A very low level of threats were recorded during the current survey. The key threats identified include;

- **Adjacent land use – Low Threat.** Adjacent agricultural land, while currently at a low level, could pose a possible threat. Agricultural use of fertilizers, pesticides and other agricultural chemicals may affect water quality within the wetland, if leaching or drift occurs. This may not be a problem if used at low levels.
- **Water inputs - Low Threat.** Because there are no inflows or outflows any alterations to water quality can have long term impacts.
- **Changes in surface hydrology - Low Threat.** Alterations to the surface hydrology which lead to the establishment of surface inflows or drains from the lagoon will have a substantial impact on the hydrology and sediment regimes.

### 9.10 First Aid

Due to the low level of threats that are currently facing Oceana Wetland, typical first aid actions are not considered necessary at this stage. However, one option worth considering is for the landowners to enter into a Conservation Covenant, so that the area is protected and managed for conservation into the future. Negotiations with the landholder could be initiated to see if they would be interested. Educational activities (eg a field site visit and walk) with the local landholders highlighting the ecological values and sensitivity of the area and

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<sup>57</sup> Japan Australia Migratory Bird Agreement (1974) and China Australia Migratory Bird Agreement (1986)

encouraging local stewardship could also be undertaken. Support should also be given to the landowners so that Oceana Wetland can be enhanced and maintained in its current state.

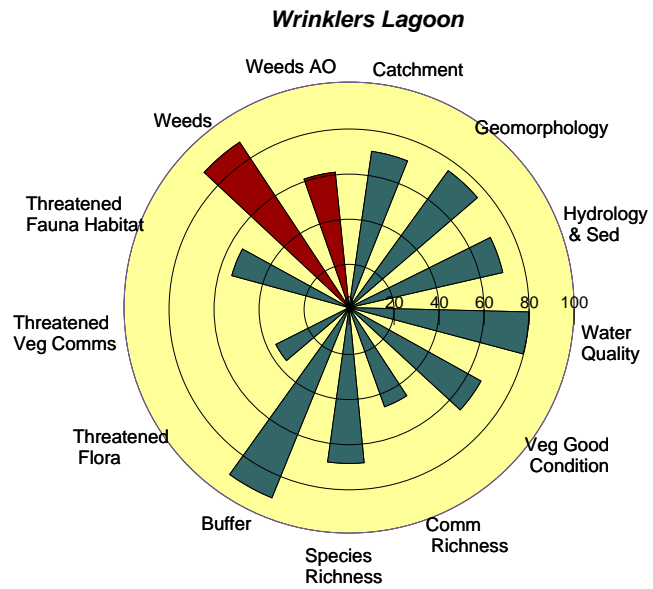


## 10 Wrinklers Lagoon (#10)

### Wetland Health Score:

**59/ 100**

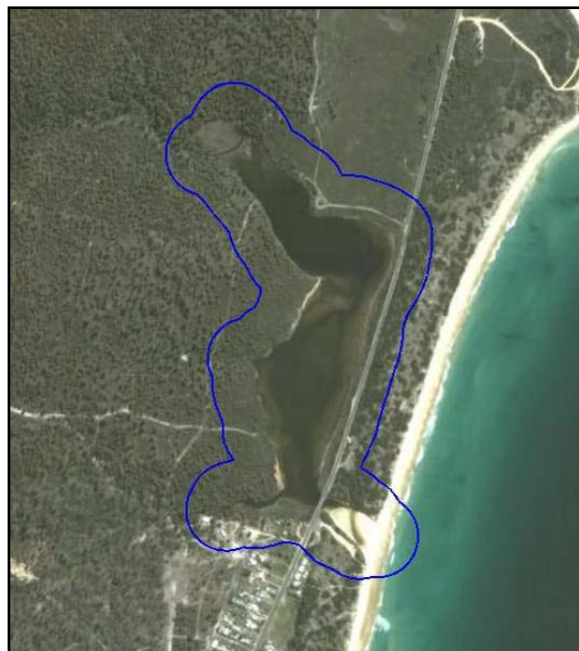
N.B. - This number is an unweighted addition of the variables that make up the adjacent condition rose to give an assessment out of a possible 100 points. These variables represent the current condition and natural values recorded historically and during the current survey. Due to the different levels of survey undertaken at each site, this score should not be used as a comparative value between wetlands.



**Photo 10.15. Wrinklers Lagoon looking south from the northern edge.**



**Photo 10.2. Google Earth aerial photo of Wrinklers Lagoon study area.**



## **10.1 Introduction**

Wrinklers Lagoon is comprised of one large lagoon which is 16.9ha in surface area. Including the 100m buffer around it, it equates to an area of approximately 51.3ha.

## **10.2 Geomorphology**

### **10.2.1 Setting**

Wrinklers Lagoon is the most northern lagoon on the broad arcuate bay delimited by Shelly Point in the north and Henderson point in the north. Scamander River and associated embayment and Henderson Lagoon are also located along this broad bay. Wrinklers is bounded on the east by Wrinklers Beach and on the west by the low hills forming the same erosion surface upon which the Oceana wetlands are located. The mouth of the lagoon is limited by Wrinklers Bridge and the highway which constrict migration of the lagoon opening to the width of the bridge structure. The main source of fresh water to the lagoon is Wrinklers Creek which enters the northern end of the lagoon and extends into the Skyline Tier which has been highly modified by the establishment of pine plantations. A smaller, unnamed tributary enters the southern end of the lagoon which drains the low hills.

The catchment has been modified through construction of the Tasman Highway which defines the eastern boundary of the lagoon, clearing in the headwaters, and a few houses along the southern shore. A sewage treatment plant is located in the headwaters of the small creek entering southern Wrinklers, and storm water enters the lagoon from the road. The fore dunes have been significantly modified through by the presence of marram grass.

### **10.2.2 Local processes**

Wrinklers Lagoon is largely a depositional basin where riverine derived sediment and locally generated organic matter accumulate. Flushing of the lagoon occurs when freshwater inflows are sufficient to 'breakout' and join with the sea. During these periods large volumes of accumulated sediment are discharged from the lagoon, and marine water and organic material enter the lagoon.

This natural cycle has been modified as the mouth of the lagoon is limited to the area under Wrinklers Bridge, with the road embankment and vegetation restricting water exiting the lagoon from any other location.

## **10.3 Hydrology & sediments**

The freshwater and sediment inflows to Wrinklers Lagoon have possibly been modified due to clearing and the establishment of plantations in the catchment, with plantations located within about 1,500 m of the lagoon. These activities may have increased the sediment load to the lagoon, accounting for the widespread deposition of silts and mud in the main lagoon area.

The hydrology of the lagoon outlet has been highly modified due to the construction of the road and bridge. These development result in high velocity bi-directional flows downstream of the bridge when the lagoon is 'open', but limit flushing of the lagoon upstream of the bridge due to reduced flow velocities. This has increased the sedimentation of fine-grained material upstream of the bridge, but not downstream. Together, the increase in sediment input

and reduction in flushing are resulting in infilling of the lagoon area, and establishment of fringing reeds which further promote deposition by trapping sediments. This was evidenced by the continued presence of organic rich material and muds on the shores of the lagoon following a lagoon outbreak. The deeper sections of the lagoon, which had been flushed, were composed of predominantly sands and contained little organic or material or fine grained sediment. At depth, the sediments are dark with a strong sulphide odour, suggesting the potential for acid sulphide soils.

#### **10.4 Water quality**

On the day of investigation, water levels in the lagoon were low due to a recent 'breakout' event and the lagoon had a salinity of 24 ppt, and was well mixed. The presence of algal mats (see photo) on the exposed banks of the lagoon suggests that at times nutrient levels in the lagoon may be sufficient to promote undesirable algal growth.

#### **10.5 Condition**

The moderate scores on the condition rose reflect the large extent of clearing in the catchment and the potential impact this could have on the lagoon, significant modification of the hydrology of the lagoon outflow, and the presence of algal growth in the lagoon.



**Figure 10.3.** Left - Bridge at mouth of lagoon from ocean side.

**Figure 10.4.** Right - Connection of lagoon with the sea.



Figure 10.5. Left - General view of Wrinklers Lagoon.

Figure 10.6. Right - Fringing reeds and algal mats on exposed banks of Wrinklers Lagoon.

## 10.6 Flora and Fauna

### 10.6.1 Overview

The Wrinklers Lagoon study area covers approximately 51.3 hectares, with 94% of the vegetation communities being native. A total of seven native vegetation communities were recorded, covering a variety of habitats including forest and woodland, scrub, heathland, sedgeland, sand/mud and saline aquatic habitats. The majority of native vegetation communities were in good condition.

The most abundant vegetation community at Wrinklers Lagoon is *Eucalyptus sieberi* forest and woodland not on granite (DSO), which covers approximately 25% of the study area. The wetland component of Wrinklers Lagoon covers 19.4ha or approximately 38% of the study area, and it is made up of 16.9ha of Water, sea (OAQ) and 2.5ha of Saline sedgeland/rushland (ARS).

Immediately surrounding the lagoon, the vegetation quickly changes to be dominated by drier forests and woodlands or coastal scrubs and heathlands. On the northern and western side of the lagoon the vegetation communities are dominated by *Eucalyptus sieberi* forest and woodland not on granite (DSO) and Coastal Heathland (SCH). On the eastern side of the lagoon the vegetation communities are dominated by *Acacia longifolia* coastal scrub (SAC). The southern side of the lagoon has been impacted by the urban development of Scamander, with urban areas encroaching in to the vegetated areas within the buffer. Smaller patches of other vegetation communities also occur in parts of the study area.

The study area incorporates a 100m buffer surrounding the wetland portions of Wrinklers Lagoon. This buffer area occupies 34.5ha of which approximately 91% is native vegetation, with the remainder being urban areas and marram grassland. This high proportion of native vegetation within the buffer area assists in protecting the wetland vegetation and in filtering and maintaining the quality of the water that enters, although the urban development that is occurring and has occurred in the past, along with runoff from the Tasman Highway has the potential to negatively impact on the water quality within Wrinklers Lagoon.





Figure 10.7. Left - *Eucalyptus sieberi* forest and woodland not on granite (DSO).

Figure 10.8. Right - Saline sedgeland/rushland (ARS) at northern end of lagoon.

### 10.6.2 Vegetation Condition

Just over half of the vegetation communities within Wrinklers Lagoon are in an excellent condition overall with 59.5% of them being at Condition Level 1. This condition level is characterised by no or very low levels of weed invasion, with the vegetation being structurally and floristically intact. Condition Level 2 comprised 7.3% of the vegetation communities, consisting of Saline sedgeland/rushland (ARS), where minor weed invasion is occurring. Condition Level 3 comprised 24.1% of the vegetation communities, and is made up of *Acacia longifolia* coastal scrub (SAC) where heavy weed invasion is occurring. Condition Level 4 comprised 9.1% of the study area, and is made up of urban areas and marram grassland, where the native vegetation areas have been destroyed or the natural values have been grossly altered. See Table 10.1 below for details.

**Table 10.1 – Vegetation Condition within the study area.**

Condition	Condition Description	Area (ha)	% of study area
1	Vegetation structurally and floristically intact and weed invasion less than 1% cover	19.9	59.5
2	Vegetation structurally and floristically altered and/or weed invasion > 1% and < 10% cover	2.5	7.3
3	Vegetation structurally and floristically altered and weed invasion > 10% and < 50% cover	8.0	24.1
4	Grossly altered vegetation structure in otherwise weed infested vegetation (> 50% weeds cover)	3.1	9.1
<b>Total</b>		33.4*	100.0

\* Condition ratings were not given to areas of Water, sea (OAQ)

### 10.6.3 Vegetation Community Richness

Of the nine vegetation communities recorded in the study area seven are native, with the remainder being urban areas and weed infestations. At Wrinklers Lagoon the most common vegetation community is *Eucalyptus sieberi* forest and woodland not on granite (DSO),



followed by *Acacia longifolia* coastal scrub (SAC), Coastal Heathland (SCH) and Saline sedgeland/rushland (ARS).

Of the native vegetation communities recorded, none are considered to be threatened under the Tasmanian *Nature Conservation Act 2002*. Full details of vegetation communities recorded, their threatened status and their condition is provided below in Table 10.2, and their distribution is shown in Figure 10. Full species lists for each vegetation community are provided in Appendix 18.

**Table 10.2 – Vegetation Communities recorded in the study area, including their conservation priority, reservation status and condition.**

Veg Code <sup>58</sup>	Vegetation Community Description	Area (ha)	State-wide Conservation Priority and Reservation Status <sup>59, 60</sup>	Bioregional Conservation Priority and Reservation Status <sup>2, 3</sup>	Condition
ARS	Saline sedgeland/rushland	2.5	Not threatened	Not threatened	2
DSO	Eucalyptus sieberi forest and woodland not on granite	13.1	Not threatened and adequately reserved	Not threatened and adequately reserved	1
FMG	Marram grassland	0.7	-	-	4
FUR	Urban areas	2.3	-	-	4
OAQ	Water, sea	17.9	-	-	-
OSM	Sand, mud	1.3	-	-	1
SAC	<i>Acacia longifolia</i> coastal scrub	8.0	Not threatened	Not threatened	3
SCH	Coastal heathland	5.4	Not threatened	Not threatened	1
SMR	<i>Melaleuca squarrosa</i> scrub	0.1	Not threatened	Not threatened	1
<b>Total Area (ha)</b>		<b>51.3</b>			

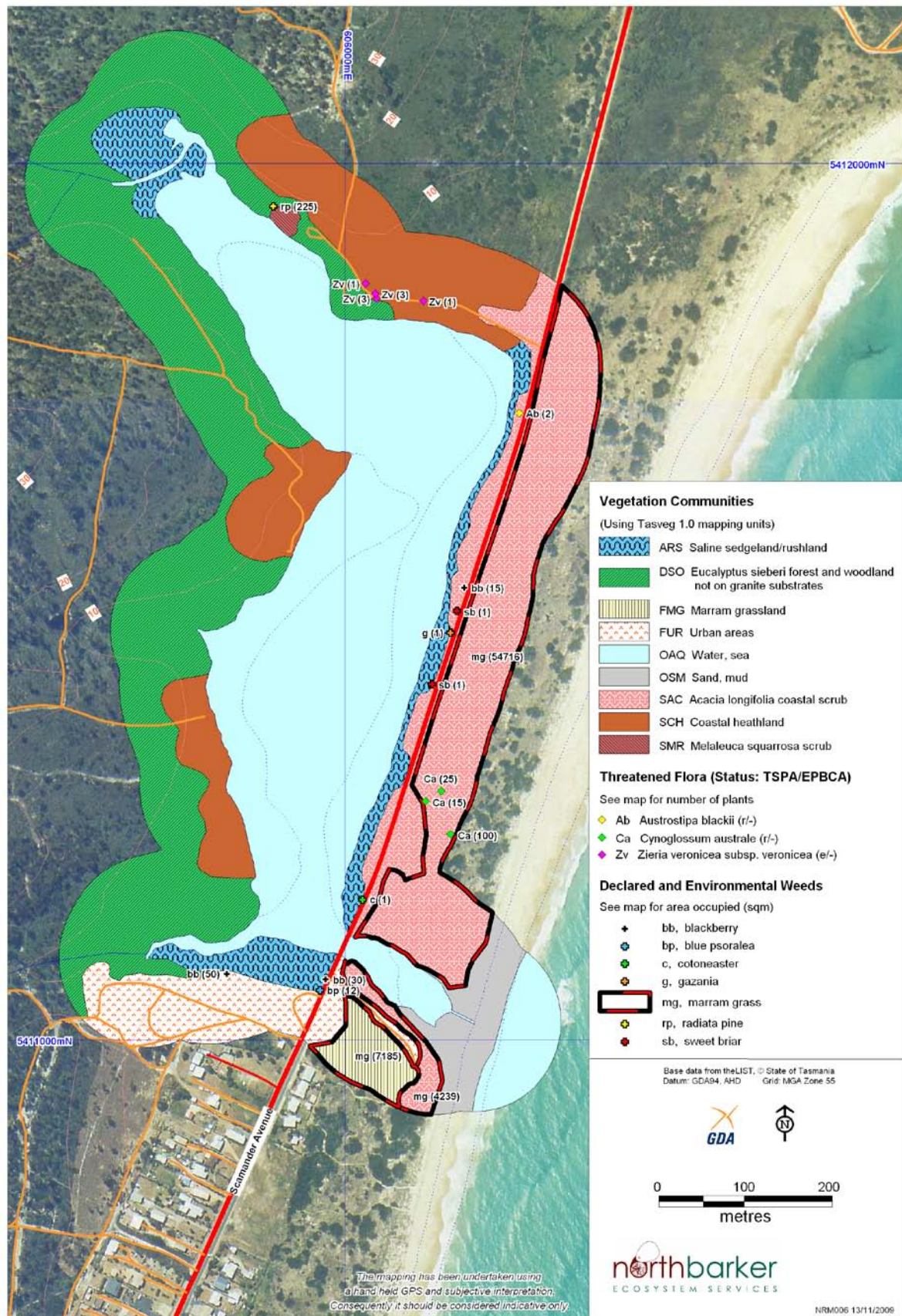
#### 10.6.4 Flora Species Richness

A total of 133 flora species were recorded within the study area. Of these 116 were native, with the remaining 17 being weed species. A full species list for Wrinklers Lagoon is included in Appendix 17.

<sup>58</sup> As per Tasveg 2.0 Vegetation Classification System, DPIPW

<sup>59</sup> Nature Conservation Act 2002

<sup>60</sup> FCF 2007. Note there is no recent analysis of reservation status of non forest communities



**Figure 10 – Vegetation Communities, Weeds and Threatened Flora for Wrinklers Lagoon**

### 10.6.5 Threatened Flora

Three flora species listed under either the Tasmanian *Threatened Species Protection Act 1995* (TSPA) or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBCA) have been recorded within the study area. *Cynoglossum australe* (austral hound's tongue) was previously recorded within the study area<sup>61</sup>, with the two additional species being recorded during the current survey. These additional species are *Austrostipa blackii* (crested spear grass) and *Zieria veronicea* subsp. *veronicea* (pink zieria). *Zieria veronicea* subsp. *veronicea* is currently only known to occur in one location at Mt. William National Park, although there were historic records from the Scamander area. This new record is therefore a rediscovery of an endangered species that was thought to be lost from the area. All species of conservation significance recorded within the study area are listed in Table 10.3, and their distribution is shown in figure 10.

**Table 10.3 – Flora species of conservation significance within the study area. Records are historical records from the Natural Values Atlas and records found during this survey.**

Species	Status <sup>62</sup> TSPA/EPBCA	Recorded this survey <sup>63</sup>
<i>Cynoglossum australe</i> (austral hound's tongue)	r/-	Yes
<i>Austrostipa blackii</i> (crested spear grass)	r/-	Yes
<i>Zieria veronicea</i> subsp. <i>veronicea</i> (pink zieria)	e/-	Yes



**Figure 10.9. *Cynoglossum australe* (austral hound's tongue) close-up view.**

### 10.6.6 Threatened Fauna

A total of three fauna species listed under either the Tasmanian *Threatened Species Protection Act 1995* (TSPA) or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBCA) have been recorded within the study area. All of these fauna species were previously recorded within the study area<sup>14</sup>. No threatened fauna species

<sup>61</sup> Natural Values Atlas, DPIPWE

<sup>62</sup> TSPA - Tasmanian *Threatened Species Protection Act 1995*; EPBCA - Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*

<sup>63</sup> Threatened species that were not recorded during the current survey are likely to still be present at this site. Seasonal and survey limitations are likely to be responsible for some threatened species not being recorded during the current survey.



were recorded during the current survey. All species of conservation significance recorded within the study area are listed in Table 10.4.

**Table 10.4 – Fauna species of conservation significance within the study area. Records are historical records from the Natural Values Atlas and records found during this survey.**

Species	Status <sup>64</sup> TSPA/EPBCA	Recorded this survey <sup>65</sup>
fairy tern ( <i>Sternula nereis</i> )	(v/-)	-
little tern ( <i>Sternula albifrons</i> )	(e/-)	-
white-fronted tern ( <i>Sterna striata</i> )	(v/-)	
white-bellied sea-eagle ( <i>Haliaeetus leucogaster</i> )	(v/-)	

### 10.6.7 Fauna Habitat Value

The vegetation of the study area provides a diverse range of habitat opportunities for fauna species. A large variety of habitats are present including forest and woodland, scrub, heathland, sedgeland, sand/mud and saline aquatic habitats. Approximately 60% of the study area was in an excellent condition (Condition Level 1), with a small proportion being affected by weeds to varying levels, or within urban areas. The area is still considered to provide high quality foraging and nesting habitat for many fauna species. A variety of species are likely to be present including small mammals, reptiles, birds, amphibians and invertebrates.

At the time of the survey the aquatic habitat was in good condition, following good rains, and water levels were very high. More prominent fauna sightings included a musk duck (*Biziura lobata*).

### 10.6.8 Threatened Fauna Habitat

Approximately 89% of the study area is habitat that is potentially suitable for threatened fauna. Nine threatened fauna species are known to use the habitat types that are present within the study area. An additional fourteen species listed under the JAMBA and CAMBA<sup>66</sup> migratory bird agreements also have potential habitat within the study area. Details of the species of threatened fauna and migratory birds that may occur at Wrinklers Lagoon and their preferred habitats are in Appendix 1. The habitats within the study area that are preferred by at least one threatened fauna species include;

- *Eucalyptus sieberi* forest and woodland not on granite (DSO)
- Sand, mud (OSM)
- *Acacia longifolia* coastal scrub (SAC)
- Coastal heathland (SCH)

<sup>64</sup> TSPA - Tasmanian Threatened Species Protection Act 1995; EPBCA - Commonwealth Environment Protection and Biodiversity Conservation Act 1999

<sup>65</sup> Natural Values Atlas, DPIPW

<sup>66</sup> Japan Australia Migratory Bird Agreement (1974) and China Australia Migratory Bird Agreement (1986)

## 10.7 Weeds

A total of 17 weed species were recorded within the study area, with one being a “declared” weed species listed on the schedules of the *Tasmanian Weed Management Act 1999* (see Table 10.5 below), and six being considered environmental weeds. The declared weed species is blackberry (*Rubus fruticosus*), while the six environmental weed species are blue butterfly bush (*Psoralea pinnata*), cotoneaster (*Cotoneaster sp.*), marram grass (*Ammophila arenaria*), radiata pine (*Pinus radiata*), sweet briar (*Rosa rubiginosa*) and tufted gazania (*Gazania linearis*).

Marram grass was found extensively in the coastal dunes which are dominated by *Acacia longifolia* coastal scrub (SAC). This weed has altered the structure and habitat value of this part of the ecosystem, perhaps irretrievably. Blackberry was found in low numbers at the southern end of the lagoon and scattered along the road edge on the Tasman Highway. Radiata pine was found in a small patch at the northern end of the lagoon. Blue butterfly bush, cotoneaster, sweet briar and tufted gazania are scattered in low numbers along the edge of the Tasman Highway, and are likely to be garden escapes from the urban area. The remaining ten weed species that were recorded are considered to be species that do not pose significant environmental problems. See figure 10 for weed location and infestation details.

**Table 10.5 – Declared or environmental weed species recorded within the study area.**

Weed Species	Declared <sup>67</sup> / Environmental
blackberry ( <i>Rubus fruticosus</i> )	Declared
blue butterflybush ( <i>Psoralea pinnata</i> )	Environmental
cotoneaster ( <i>Cotoneaster sp.</i> )	Environmental
marram grass ( <i>Ammophila arenaria</i> )	Environmental
radiata pine ( <i>Pinus radiata</i> )	Environmental
sweet briar ( <i>Rosa rubiginosa</i> )	Environmental
tufted gazania ( <i>Gazania linearis</i> )	Environmental

## 10.8 Landholder Survey

Only one response to the survey was received from landholders for Wrinklers Lagoon.. The main concerns raised by the respondent were;

- water quality - needs regular flushing.
- groundwater contamination - from rubbish dump and sewerage.

## 10.9 Threats

The overall condition of Wrinklers Lagoon is good, however, several threatening processes were identified during the current survey. The key threats identified include;

<sup>67</sup> Declared under the *Tasmanian Weed Management Act 1999*



- **Urban development – Moderate Threat.** Pressure from urban development is at moderate levels, with the suburbs of Scamander occurring along the southern edge of the lagoon. Further development is also occurring to the north and south of the lagoon. It is important that the native vegetation areas that surround this wetland be maintained as natural areas, and not be allowed to be developed for residential, industrial or agricultural purposes. If any of the land is zoned for development purposes then consideration should be given to altering the zoning to allow only for conservation. Restrictions on what type and scale of future development should be put in place within a buffer around Wrinklers Lagoon, to help protect the remaining habitat, the water quality and other natural values of the area.
- **Weeds – Low Threat.** Marram grass was the most extensive weed recorded, being found in the coastal dunes dominated by *Acacia longifolia* coastal scrub (SAC), and has altered the structure and habitat value of this part of the ecosystem. Blackberry and all other environmental weeds are scattered in low numbers along the edge of the Tasman Highway, or found in small patches and should be controlled now before being allowed to spread further.
- **Rubbish – Low Threat.** Rubbish is more of a visual problem than anything else, and is particularly an issue along the Tasman Highway and around car parking areas.
- **Adjacent land use – Low Threat.** Sewerage ponds occur approximately 800m to the west and may be leaching nutrients into waterways and ultimately the lagoon. Forestry operations occurring in the catchment above Wrinklers Lagoon may be adding to silt levels in the creek and wetland.
- **Tracks/Roads – Low Threat.** Several vehicle tracks cut through the buffer area of this wetland, but do not cut across the wetland areas themselves. Most of the tracks in their current state do not appear to be having negative impacts. Runoff from the Tasman Highway may be impacting on water quality within the lagoon.

### 10.10 First Aid

Several actions could be undertaken to reduce the threats that are currently facing Wrinklers Lagoon. Listed in priority order they include the following;

1. Encourage planning laws which restrict further development within a defined buffer zone around Wrinklers Lagoon.
2. Maintain vegetation between the houses and lagoons in order to diffuse surface flows and reduce nutrient and sediment input.
3. Immediate weed control program, including several years of follow up work, targeting all declared and environmental weeds. Marram grass control may not be viable given the amount of time and funding that would be necessary.
4. Install educational signs highlighting the ecological values of the area and discouraging damaging activities.

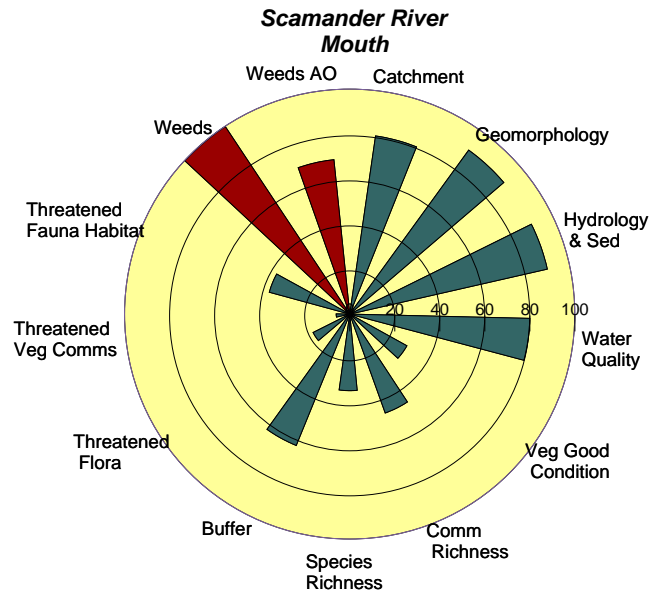
5. Undertake educational activities (eg a field site visit and walk) with the local landholders highlighting the ecological values and sensitivity of the area and encouraging local stewardship.
6. Set up a water quality monitoring program to ensure adjacent land uses are not impacting adversely on the water quality within the lagoon.
7. Remove scattered rubbish from around the lagoon.

## 11 Scamander River Mouth Backwater (#11)

### Wetland Health Score:

**51/ 100**

N.B. - This number is an unweighted addition of the variables that make up the adjacent condition rose to give an assessment out of a possible 100 points. These variables represent the current condition and natural values recorded historically and during the current survey. Due to the different levels of survey undertaken at each site, this score should not be used as a comparative value between wetlands.



**Photo 11.16. Scamander River Mouth Backwater from the southern end looking north**



**Photo 11.2. Google Earth aerial photo of Scamander River Mouth study area.**



### **11.1 Introduction**

The Scamander River Mouth Backwater is comprised of one large lagoon which is 6.0ha in surface area. Including the 100m buffer around it, it equates to an area of approximately 18.5ha.

### **11.2 Geomorphology**

#### **11.2.1 Setting**

This water body is a tidally controlled estuarine embayment extending north from the Scamander River mouth. It is separated from the sea by stable vegetated dunes, and confined along the western boundary by a ridge formed by consolidated iron rich sediments. This water body is in a similar position with respect to the coast and the Scamander River as Henderson Lagoon towards the south. It is likely that both of these water bodies were part of the same estuarine complex prior to infilling and modification.

#### **11.2.2 Local processes**

The north-south trending water body has two parts, a relatively small, highly dynamic channel near the entrance which is shallow, mobile and subjected to high velocity tidal flows. Beyond this entrance area, the estuary deepens and the majority of the basin is a (usually) quiet depositional area with thick, soft organic rich sediments. The accumulation of large piles of storm debris at the northern end and along the western shore indicates the importance of the waterway as a storm surge suppressor, effectively dampening the impact of storms on the coastline. The continuous cover of vegetation around the embayment assists in this storm protection by reducing the velocity of inflowing waters.

The embayment is infilling from the north to the south as evidenced by isolation of a small body of water by vegetation in the northern extreme of the basin. Much of this infilling is due to the deposition of locally produced organic matter in a quiescent environment. The organic rich environment combined with the high sulphate sea water has lead to a reducing environment where sulphides are being created and stored, as evidenced by the dark colour and strong sulphidic smell of the sediments below the low tide level. Above the low water level, and very notably at the entrance to the embayment where the sediments are exposed to air during low tides, the sediments have oxidised.

### **11.3 Hydrology & sediments**

The hydrology of the estuary can be characterised as bi-directional tidal flow with episodic freshwater inflows. Storm water inflows enter the northern end of the embayment via a small drainage line, and through ground water in the permeable coastal sands. On the day of investigation, which followed several days of high rainfall, numerous low salinity seeps were entering the bay from the eastern coastal dunes.

The tidal outflow provides good flushing for surface waters, however the deeper area of the embayment (beyond the entrance channel) are not flushed at low tide. Internal mixing of the embayment is driven by density differences (temperature and salinity) between the inflowing sea water, the resident water and any fresh water inflow to the lagoon. It is probable the

embayment is stratified at times, although measurement of deeper waters was not possible on the day of investigation due to the very soft nature of the organic-rich sediments.

### **11.4 Water quality**

Water quality in the Scamander River mouth is governed by the inflow of clean marine water, mixing with resident fresh and brackish water. On the day of investigation, seawater of 31ppt was flowing into the embayment, but surface waters in the depositional area of the bay were only ~17 ppt, indicating the surface waters were composed of about half seawater and half freshwater. It is likely that the proportion of sea water increases with depth due to its higher density, and the relatively low surface salinity values were attributable to the recent high rain fall. pH throughout the surface waters of the lagoon were good at 7.8 – 8.4.

The presence of sulphide rich sediments in the embayment and surrounding coastal vegetation is consistent with the acid sulphide soil maps of Tasmania which identify the Scamander area as having a high risk of potentially acid sulphate soils (Gurung, 2001). These sediments do not pose a water quality risk as long as they are maintained saturated and not disturbed. Minor sediment disturbances are unlikely to result in environmental damage due to the neutralising capacity of sea water, but large scale exposure through disturbance or draining could lead to sulphide oxidation and acid generation.

Residential development has occurred above the embayment, and storm water drains are directed into the embayment. These are likely to negatively affect water quality in the bay.

### **11.5 Condition**

The physical attributes of the Scamander River mouth are generally in good condition with the exception of the catchment which has been modified through residential development. The scores shown on the condition rose are based on field observations and a desk top analysis as no comparable CFEV information was available.



**Figure 111.3. Left - Tidal channel entering embayment.**

**Figure 111.4. Right - Sulphide rich sediments below the low tide level.**





Figure 11.5. Left - View of Scamander River mouth embayment from upstream end looking towards mouth.

Figure 11.6. Right - Storm debris trapped at upstream end of embayment.

## 11.6 Flora and Fauna

### 11.6.1 Overview

The Scamander River Mouth Backwater study area covers approximately 24.5 hectares, with 72% of the vegetation communities being native. A total of seven native vegetation communities were recorded, covering a variety of habitats including forest and woodland, scrub, sedgeland, herbland, sand/mud and saline aquatic habitats. The majority of native vegetation communities were in average condition.

The most abundant vegetation community at the Scamander River Mouth Backwater is *Acacia longifolia* coastal scrub (SAC), which covers approximately 25% of the study area. The wetland component of Scamander River Mouth Backwater covers 9.3ha or approximately 38% of the study area, and it is made up of 6.0ha of Water, sea (OAQ), 2.6ha of Saline sedgeland/rushland (ARS) and 0.7ha of Succulent saline herbland (ASS).

Immediately surrounding the lagoon, the vegetation quickly changes to be dominated by drier forests and woodlands or coastal scrubs. On the northern and western sides of the lagoon the vegetation communities are dominated by Coastal Scrub (SSC) and *Eucalyptus viminalis* - *Eucalyptus globulus* coastal forest and woodland (DVC). Beyond this narrow band of vegetation urban infrastructure and urban areas replace the native vegetation. On the eastern and southern sides of the lagoon the vegetation communities are dominated by *Acacia longifolia* coastal scrub (SAC). Smaller patches of other vegetation communities also occur in parts of the study area.

The study area incorporates a 100m buffer surrounding the wetland portions of Scamander River Mouth Backwater. This buffer area occupies 18.5ha of which approximately 63% is native vegetation, with the remainder being urban areas and urban infrastructure.

### 11.6.2 Vegetation Condition

Only 5.3% of the vegetation communities within the Scamander River Mouth Backwater are in an excellent condition overall, being at Condition Level 1. This condition level is characterised by no or very low levels of weed invasion, with the vegetation being

structurally and floristically intact. Condition Level 2 comprised 24% of the vegetation communities, consisting of Saline sedgeland/rushland (ARS), Coastal Scrub (SSC) and *Eucalyptus viminalis* - *Eucalyptus globulus* coastal forest and woodland (DVC) where minor weed invasion is occurring. Condition Level 3 was not recorded in the study area. Condition Level 4 comprised 70.7% of the study area, and is made up of urban areas and *Acacia longifolia* coastal scrub (SAC) where heavy weed invasion is occurring, and also where the native vegetation areas have been destroyed or the natural values have been grossly altered. See Table 11.1 below for details.

**Table 11.1 – Vegetation Condition within the study area.**

Condition	Condition Description	Area (ha)	% of study area
1	Vegetation structurally and floristically intact and weed invasion less than 1% cover	1.0	5.3
2	Vegetation structurally and floristically altered and/or weed invasion > 1% and < 10% cover	4.4	24.0
3	Vegetation structurally and floristically altered and weed invasion > 10% and < 50% cover	0	0.0
4	Grossly altered vegetation structure in otherwise weed infested vegetation (> 50% weeds cover)	13.1	70.7
<b>Total</b>		18.5*	100.0

\* Condition ratings were not given to areas of Water, sea (OAQ)

### 11.6.3 Vegetation Community Richness

Of the nine vegetation communities recorded in the study area seven are native, with the remainder being urban areas and urban infrastructure. At Scamander River Mouth Backwater the most common vegetation community is *Acacia longifolia* coastal scrub (SAC) followed by Saline sedgeland/rushland (ARS) and Coastal Heathland (SCH).

Of the native vegetation communities recorded one is considered to be threatened under the Tasmanian *Nature Conservation Act 2002*. It is *Eucalyptus viminalis* - *Eucalyptus globulus* coastal forest and woodland (DVC) and it covers 6% of the vegetated area. Full details of vegetation communities recorded, their threatened status and their condition is provided below in Table 11.2, and their distribution is shown in Figure 11. Full species lists for each vegetation community are provided in Appendix 20.

**Table 11.2 – Vegetation Communities recorded in the study area, including their conservation priority, reservation status and condition.**

<b>Veg Code<sup>68</sup></b>	<b>Vegetation Community Description</b>	<b>Area (ha)</b>	<b>State-wide Conservation Priority and Reservation Status<sup>69 70</sup></b>	<b>Bioregional Conservation Priority and Reservation Status<sup>2 3</sup></b>	<b>Condition</b>
ARS	Saline sedgeland/ rushland	2.6	Not threatened	Not threatened	2
ASS	Succulent saline herbland	0.7	Not threatened	Not threatened	1
DVC	Eucalyptus viminalis - Eucalyptus globulus coastal forest and woodland	0.7	Threatened and inadequately reserved	Threatened and inadequately reserved	2
FUM	Extra-urban miscellaneous	2.7	-	-	4
FUR	Urban areas	4.1	-	-	4
OAQ	Water, sea	6.0	-	-	-
OSM	Sand, mud	0.3	Not threatened	Not threatened	1
SAC	Acacia longifolia coastal scrub	6.3	Not threatened	Not threatened	4
SSC	Coastal Scrub	1.1	Not threatened	Not threatened	2
	<b>Total Area (ha)</b>	<b>24.5</b>			

#### 11.6.4 Flora Species Richness

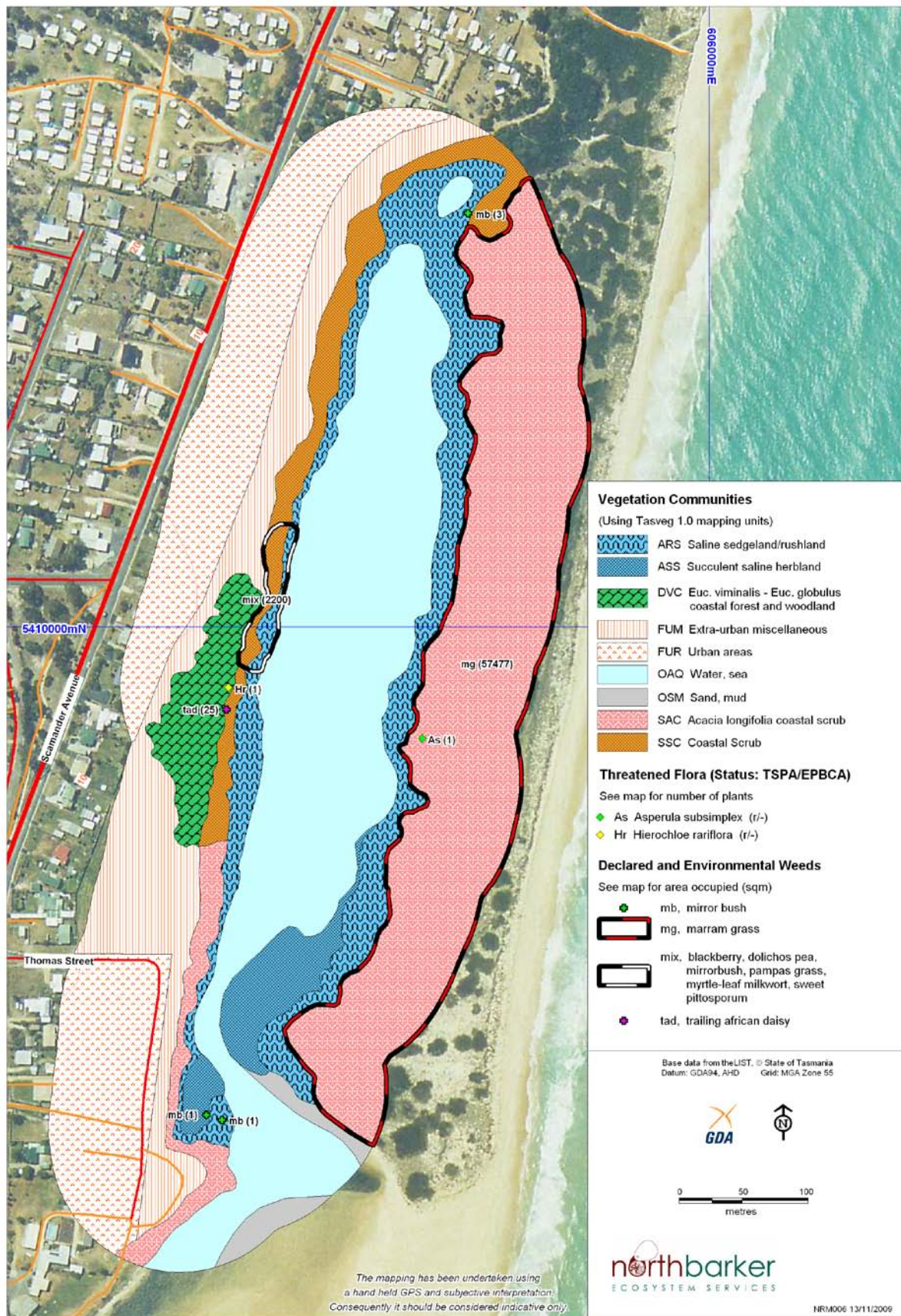
A total of 68 flora species were recorded within the study area. Of these 57 were native, with the remaining eleven being weed species. A full species list for the Scamander River Mouth Backwater is included in Appendix 19.

<sup>68</sup> As per Tasveg 2.0 Vegetation Classification System, DPIPWE

<sup>69</sup> Nature Conservation Act 2002

<sup>70</sup> FCF 2007. Note there is no recent analysis of reservation status of non forest communities





**Figure 11– Vegetation Communities, Weeds and Threatened Flora for Scamander River Mouth Backwater**

### 11.6.5 Threatened Flora

Two flora species listed under either the Tasmanian *Threatened Species Protection Act 1995* (TSPA) or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBCA) have been recorded within the study area. No threatened flora species had previously been recorded within the study area, but two threatened flora species - *Asperula subsimplex* (water woodruff) and *Hierochloe rariflora* (cane holygrass) were recorded in the current survey. All species of conservation significance recorded within the study area are listed in Table 11.3, and their distribution is shown in figure 11.

**Table 11.3 – Flora species of conservation significance within the study area. Records are historical records from the Natural Values Atlas and records found during this survey.**

Species	Status <sup>71</sup> TSPA/EPBCA	Recorded this survey <sup>72</sup>
<i>Asperula subsimplex</i> (water woodruff)	r/-	Yes
<i>Hierochloe rariflora</i> (cane holygrass)	r/-	Yes

### 11.6.6 Threatened Fauna

No fauna species listed under either the Tasmanian *Threatened Species Protection Act 1995* (TSPA) or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBCA) have been recorded within the study area.

### 11.6.7 Fauna Habitat Value

The vegetation of the study area provides a range of habitat opportunities for fauna species. A variety of habitats are present including forest and woodland, scrub, sedgeland, herbland, sand/mud and saline aquatic habitats. Only 5% of the study area was in an excellent condition (Condition Level 1), with a large proportion being affected by weeds to varying levels, or within urban areas. The area is still considered to provide some foraging and nesting habitat for fauna species. A variety of species are likely to be present particularly reptiles, birds, amphibians and invertebrates, with a lower chance of small mammals being present. More prominent fauna sightings included pied oystercatchers (*Haemotopus longirostris*).

### 11.6.8 Threatened Fauna Habitat

Approximately 37% of the study area is habitat that is potentially suitable for threatened fauna. Seven threatened fauna species are known to use the habitat types that are present within the study area. An additional fourteen species listed under the JAMBA and CAMBA<sup>73</sup> migratory bird agreements also have potential habitat within the study area. Details of the species of threatened fauna and migratory birds that may occur at Scamander River Mouth

<sup>71</sup> TSPA - Tasmanian *Threatened Species Protection Act 1995*; EPBCA - Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*

<sup>72</sup> Threatened species that were not recorded during the current survey are likely to still be present at this site. Seasonal and survey limitations are likely to be responsible for some threatened species not being recorded during the current survey.

<sup>73</sup> Japan Australia Migratory Bird Agreement (1974) and China Australia Migratory Bird Agreement (1986)



Backwater and their preferred habitats are in Appendix 1. The habitats within the study area that are preferred by at least one threatened fauna species include;

- *Eucalyptus viminalis* - *Eucalyptus globulus* coastal forest and woodland (DVC)
- Sand, mud (OSM)
- *Acacia longifolia* coastal scrub (SAC)
- Coastal scrub (SSC)
- Succulent saline herbland (ASS)



Figure 111.7. Pied oystercatchers foraging in the shallow waters.

### 11.7 Weeds

A total of eleven weed species were recorded within the study area, with two being a “declared” weed species listed on the schedules of the *Tasmanian Weed Management Act 1999* (see Table 11.4 below), and six being considered environmental weeds. The two declared weed species are blackberry (*Rubus fruticosus*) and pampas grass (*Cortaderia selloana*), while the six environmental weed species are marram grass (*Ammophila arenaria*), mirror bush (*Coprosma repens*), trailing african daisy (*Osteospermum fruticosum*), blackberry (*Rubus fruticosus*), sweet pittosporum (*Pittosporum undulatum*), myrtle-leaf milk wort (*Polygala myrtifolia*) and dolichos pea (*Dipogon lignosus*).

Marram grass was found extensively in the coastal dunes which are dominated by *Acacia longifolia* coastal scrub (SAC). This weed has altered the structure and habitat value of this part of the ecosystem, perhaps irretrievably. A quite weedy patch occurs on the western side of the dunes where most of the recorded weed species occurred. Blackberry, pampas grass, mirror bush, trailing african daisy, sweet pittosporum, myrtle-leaf milk wort and dolichos pea all occurred in this area, and are likely to be garden escapes or have come from dumped garden waste. Mirror bush also occurred in low numbers scattered in parts of the study area.

The remaining three weed species that were recorded are considered to be species that do not pose significant environmental problems. See figure 11 for weed location and infestation details.

**Table 11.4 – Declared or environmental weed species recorded within the study area.**

Weed Species	Declared <sup>74</sup> / Environmental
blackberry ( <i>Rubus fruticosus</i> )	Declared
pampas grass ( <i>Cortaderia selloana</i> )	Declared
dolichos pea ( <i>Dipogon lignosus</i> )	Environmental
marram grass ( <i>Ammophila arenaria</i> )	Environmental
mirror bush ( <i>Coprosma repens</i> )	Environmental
myrtle-leaf milk wort ( <i>Polygala myrtifolia</i> )	Environmental
trailing african daisy ( <i>Osteospermum fruticosum</i> )	Environmental
sweet pittosporum ( <i>Pittosporum undulatum</i> )	Environmental

**Figure 11.8. Marram grass (*Ammophila arenaria*) infestation in coastal dunes.**

### 11.8 Landholder Survey

Eleven responses to the survey were received from landholders for Scamander River Mouth Backwater. The main concerns raised by the respondents were;

- rubbish - dumping of garden waste brings in weed seeds/ propagules. Charges at the local rubbish dump are causing some people to dump garden waste instead.
- sewerage pumping station - leaks and overflows, contaminating the water.
- urban development - concerns about the level of development in the area
- cutting down trees - some local people are cutting down trees to obtain better views.
- drainage into wetland - rubbish and pollution is washed down drains (stormwater) which flow directly into the lagoon. Septic and sewer systems leaking and leaching nutrients into the lagoon.
- weeds
- cats and dogs

<sup>74</sup> Declared under the Tasmanian *Weed Management Act 1999*

- nearby roads
- urban development
- barway management

## 11.9 Threats

The overall condition of Scamander River Mouth Backwater is average, and several threatening processes were identified during the current survey. The key threats identified include;

- **Weeds – High Threat.** Marram grass was the most extensive weed recorded, being found in the coastal dunes dominated by *Acacia longifolia* coastal scrub (SAC), and has altered the structure and habitat value of this part of the ecosystem. A quite weedy patch occurs on the western side of the dunes where most of the recorded weed species occurred. Blackberry, pampas grass, mirror bush, trailing african daisy, sweet pittosporum, myrtle-leaf milk wort and dolichos pea all occurred in this area, and are likely to be garden escapes or have come from dumped garden waste.
- **Urban development – High Threat.** Pressure from urban development is at moderate levels, with the settlement of Scamander surrounding the Scamander River Mouth Backwater. A continuation of urban development is likely to occur in the area. Increased development would increase storm water runoff and possibly septic leaching into the bay. It is important that any remaining native vegetation areas that occur adjacent to this wetland be maintained as natural areas, and not be allowed to be developed further. If any of the land is zoned for development purposes then consideration should be given to altering the zoning to allow only for conservation.
- **Rubbish – Moderate Threat.** Garden waste was noted as being dumped over the low cliffs on the western side of the wetland. It appears to be a moderate problem at the moment, and is more than likely to be responsible for the weed problems on the western edge of the wetland. Dumping of garden waste is a good way to introduce weeds to a site, attract other rubbish dumpers and obviously impacts on the visual amenity of the site. A fair amount of rubbish was also observed in the lagoon itself.
- **Vegetation removal/damage - Moderate Threat.** Damage to or removal of the vegetation along the western shore of the embayment which would expose the cliff faces to wave action during storm events. Some erosion of the cliff face is presently occurring.
- **Sediment movement or disturbance - Moderate Threat.** Sediment movement or disturbance which could lead to oxidation of the sulphide rich sediments.
- **Tracks/Roads – Low Threat.** Several vehicle tracks cut through the buffer area on the western side of this wetland, but do not cut across the wetland areas themselves. Vehicles have access right up to the wetland edge in the southern most part. Most of the tracks in their current state do not appear to be having negative impacts, aside from the usual problems associated with unrestricted human access to areas such as

these. Runoff from the Tasman Highway, and other suburban streets may be impacting on water quality within the lagoon.

- **Rabbits – Low Threat.** Rabbit dung was observed in several locations. Damage to vegetation was not obvious indicating that rabbits are probably present in low numbers and currently pose a minor threat. This will need to be monitored however, and a control program put in place if numbers and consequent vegetation damage or erosion problems start to occur.
- **Disruption of the tidal connection - Low Threat.** Disruption of the tidal connection between the sea and the embayment which would lead to stagnation and reduce the effectiveness of the embayment from buffering storm surges.

### **11.10 First Aid**

Several actions could be undertaken to reduce the threats that are currently facing Scamander River Mouth Backwater. Listed in priority order they include the following;

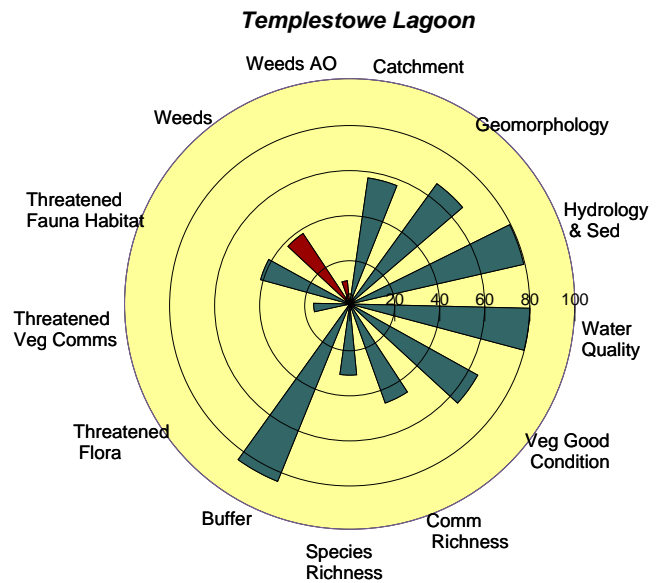
1. Maintain vegetation between the houses and lagoons in order to diffuse surface flows and reduce nutrient and sediment input. Also maintain vegetation cover where storm water enters.
2. Immediate weed control program, including several years of follow up work, targeting all declared and environmental weeds. Marram grass control is unlikely to be viable given the amount of time and funding that would be necessary.
3. Install educational signs highlighting the ecological values of the area and discouraging damaging activities (e.g. dumping of garden waste).
4. Undertake educational activities (eg a field site visit and walk) with the local landholders highlighting the ecological values and sensitivity of the area and encouraging local stewardship.
5. Encourage planning laws which restrict further development within native vegetation areas around the Scamander River Mouth Backwater.
6. Remove scattered rubbish from around and within the lagoon.
7. Monitor rabbit numbers and their impacts, and implement a control program if unacceptable levels of damage are occurring.

## 12 Templestowe Lagoon (#12)

### Wetland Health Score:

**52/ 100**

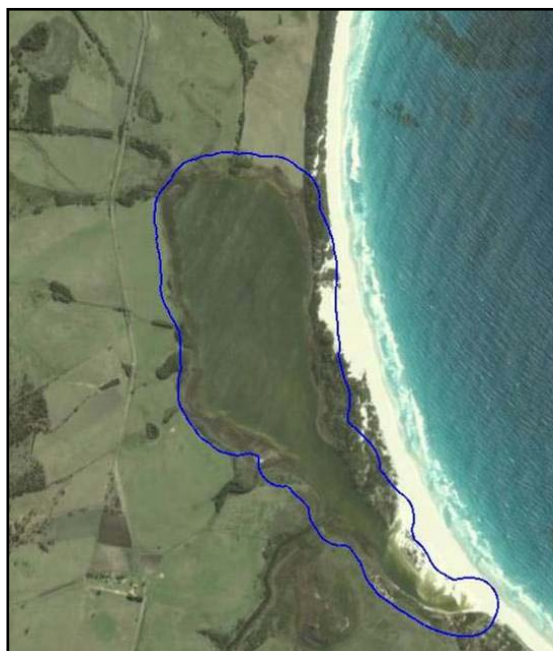
N.B. - This number is an unweighted addition of the variables that make up the adjacent condition rose to give an assessment out of a possible 100 points. These variables represent the current condition and natural values recorded historically and during the current survey. Due to the different levels of survey undertaken at each site, this score should not be used as a comparative value between wetlands.



**Photo 12.17. Templestowe Lagoon from the eastern dunes looking north-west**



**Photo 12.2. Google Earth aerial photo of Templestowe Lagoon study area.**





## **12.1 Introduction**

Templestowe Lagoon is comprised of one large lagoon which is 54.6ha in surface area. Including the 100m buffer around it, it equates to an area of approximately 106.9ha.

## **12.2 Geomorphology**

### **12.2.1 Setting**

Templestowe Lagoon is situated at the southern end of Templestowe Beach, abutting the Long Point bedrock headland. The lagoon parallels the beach extending approximately 2 km in a northerly direction. The water body occupies a narrow coastal plain composed of alluvium derived from the inland dolerite hills. The headwaters of the creeks feeding the lagoon arise in the hills of the Douglas Apsley National Park, before flowing across the cleared coastal flat. Unlike other lagoons along the coast, Templestowe is fed by numerous creeks with the largest being Doctors Creek which enters the southern end of Templestowe Lagoon.

On the seaward side of the lagoon, the dunes have been modified by the establishment of marram grass, but the coast is considered to have high conservation value. The southern side of the lagoon mouth is constrained by an outcrop of indurated sediments which form a low bluff.

Historically, the flat lying area adjacent to the lagoon has been cleared and used extensively for grazing. Doctors Creek has also been modified through channelization, presumably associated with draining. Unlike most of the lagoons investigated, the mouth of Templestowe Lagoon is not affected by a road, bridge or culvert. The mouth is presently confined on the south by an outcrop of

### **12.2.2 Local processes**

Templestowe Lagoon is similar to the other east coast lagoons in that it is characterised by long periods of quiescence, with low freshwater inflows and no connection to the sea, interspersed by short periods of high energy bi-directional flow following high rainfall events which result in 'breaching' of the lagoon.

Catchment derived sediments accumulate in the lagoon when it is not connected to the sea, and are flushed during lagoon breakout. The bi-directional tidal flow which accompanies lagoon-breakout also results in the inflow of marine water, sand and organic matter.

## **12.3 Hydrology & sediments**

The hydrology of the creeks entering Templestowe Lagoon has been modified through catchment clearing and channel works in the lower catchment. Smaller creeks in the catchment are ephemeral and bank erosion is apparent in at road crosses in several channels. In the lower catchment, incised river channels expose the underlying alluvium. Channel incision increases the flow level required for water to enter the floodplain compared to 'natural' condition which decreases the potential for water storage on the flood plain and leads to the rapid delivery of water to the lagoon.

Locally generated organic matter is a major contributor to sediments in the lagoon and the organic content of sediments in the lagoon increased with distance from the mouth demonstrating that during the recent breakout event, not all fine organic material was removed from the lagoon. There were also thick accumulations of soft sediment closer to the mouth in protected pockets and near the mouth of Doctors Creek where reed mats are extending into the lagoon. The sediments are sulphide rich below the low tide level, indicating a risk of acid generation if exposed (Gurung, 2001).

The presence of dolerite in the headwaters of the catchment supplies non-quartzose sediments to the floodplain and the lagoon, which is in contrast to the more northern coastal lagoons which are dominated by quartz rich sediments.

## **12.4 Water quality**

Water quality in the upper part of the catchment, in the Douglas Apsley National Park would be expected to be 'pristine' due to the undisturbed nature of the catchment. In the lower catchment, where clearing is extensive and there is a lack of riparian vegetation on the creeks and lagoon, there is potential for poor water quality resulting from runoff from roads and agricultural areas.

On the day of investigation the water in the lower half of the lagoon was saline (31 ppt), reflecting the recent inflow of marine water, and was slightly fresher near the top of the lagoon (~20ppt). The water was slightly turbid with a greenish tinge which may be attributable to fine suspended solids or possibly algal growth.

## **12.5 Condition**

The condition rose reflects the highly modified nature of the land adjacent to Templestowe Lagoon, channelized creeks and lack of riparian vegetation. Although the hydrology and sediment rating is relatively low due to the poor condition of the catchment, the unmodified nature of the mouth of Templestowe Lagoon is a relatively unique attribute which should be recognised.



**Figure 122.3. Left - Mouth of lagoon flowing between vegetated dunes and outcrop of indurated sediments forming low bluff.**

**Figure 122.4. Right - Reed mats near entrance to Doctors Creek.**



Figure 122.5. Left - Main body of Templestowe Lagoon.

Figure 122.6. Right - Sulphide rich sediments below beach sands.



Figure 122.7. Left - Cleared margin of lagoon.

Figure 122.8. Right - Bank erosion in Doctors Creek downstream of road crossing.

## 12.6 Native Vegetation

### 12.6.1 Overview

The Templestowe Lagoon study area covers approximately 106.9 hectares, with 93% of the vegetation communities being native. A total of seven native vegetation communities were recorded, covering a variety of habitats including forest and woodland, swamp forest, coastal scrub, sedgeland, sand/mud and saline aquatic habitats. The condition of native vegetation communities was quite variable, ranging from average to very good.

The most abundant vegetation community at the Templestowe Lagoon is Saline sedgeland/rushland (ARS), which covers approximately 20% of the study area. The wetland component of Templestowe Lagoon covers 75.0ha or approximately 70% of the study area, and it is made up of 54.6ha of Water, sea (OAQ) and 20.4ha of Saline sedgeland/rushland (ARS).

On the northern, western and southern sides of the lagoon, the vegetation is dominated by Agricultural land (FAG) and *Melaleuca ericifolia* swamp forest (NME). On the eastern side,



where the coastal influence is stronger, the vegetation is dominated by drier forests and woodlands or coastal scrubs, including *Acacia longifolia* coastal scrub (SAC) and *Eucalyptus viminalis* - *Eucalyptus globulus* coastal forest and woodland (DVC). Smaller patches of other vegetation communities also occur in parts of the study area.

The study area incorporates a 100m buffer surrounding the wetland portions of Templestowe Lagoon. This buffer area occupies 52.3ha of which approximately 85% is native vegetation, with the remainder being predominantly agricultural land.



Figure 122.9. Left - Coastal forest and woodland on inner edge of coastal dunes.

Figure 122.10. Right - Saline sedgeland/grassland (ARS) between coastal dunes and lagoon.

### 12.6.2 Vegetation Condition

Only 19.9% of the vegetation communities within the Templestowe Lagoon are in an excellent condition overall, being at Condition Level 1. This condition level is characterised by no or very low levels of weed invasion, with the vegetation being structurally and floristically intact. Condition Level 2 comprised 44.9% of the vegetation communities, consisting of Saline sedgeland/rushland (ARS) and *Melaleuca ericifolia* swamp forest (NME), where minor weed invasion is occurring. Condition Level 3 comprised 22.4% of the study area, is made up of *Pteridium esculentum* fernland (FPF) and *Acacia longifolia* coastal scrub (SAC) where heavier weed invasion is occurring. Condition Level 4 comprised 12.7% of the study area, and is made up of agricultural land and marram grassland where heavy weed invasion is occurring, and also where the native vegetation areas have been destroyed or the natural values have been grossly altered. See Table 12.1 below for details.

Table 12.1 – Vegetation Condition within the study area.

Condition	Condition Description	Area (ha)	% of study area
1	Vegetation structurally and floristically intact and weed invasion less than 1% cover	10.4	19.9
2	Vegetation structurally and floristically altered and/or weed invasion > 1% and < 10% cover	23.5	44.9
3	Vegetation structurally and floristically altered and weed invasion > 10% and < 50% cover	11.7	22.4
4	Grossly altered vegetation structure in otherwise	6.7	12.7

	weed infested vegetation (> 50% weeds cover)		
<b>Total</b>		52.3*	100.0

\* Condition ratings were not given to areas of Water, sea (OAQ)

### 12.6.3 Vegetation Community Richness

Of the nine vegetation communities recorded in the study area six are native, with the remainder being *Pteridium esculentum* fernland (FPF), agricultural land (FAG) and marram grassland (FMG). At Templestowe Lagoon the most common vegetation community is Saline sedgeland/rushland (ARS) followed by *Acacia longifolia* coastal scrub (SAC) and Sand, mud (OSM).

Of the native vegetation communities recorded two are considered to be threatened under the Tasmanian *Nature Conservation Act 2002*. They are *Melaleuca ericifolia* swamp forest (NME) and *Eucalyptus viminalis* - *Eucalyptus globulus* coastal forest and woodland (DVC) and they cover 16% of the vegetated area. Full details of vegetation communities recorded, their threatened status and their condition is provided below in Table 12.2, and their distribution is shown in Figure 12. Full species lists for each vegetation community are provided in Appendix 22.

**Table 12.2 – Vegetation Communities recorded in the study area, including their conservation priority, reservation status and condition.**

Veg Code <sup>75</sup>	Vegetation Community Description	Area (ha)	State-wide Conservation Priority and Reservation Status <sup>76 77</sup>	Bioregional Conservation Priority and Reservation Status <sup>2 3</sup>	Condition
ARS	Saline sedgeland/grassland	20.4	Not threatened	Not threatened	2
DVC	<i>Eucalyptus viminalis</i> - <i>Eucalyptus globulus</i> coastal forest and woodland	3.3	Threatened and inadequately reserved	Threatened and inadequately reserved	1
FAG	Agricultural land	4.9	-	-	4
FMG	Marram grassland	1.7	-	-	4
FPF	<i>Pteridium esculentum</i> fernland	1.2	-	-	3
NAV	<i>Allocasuarina verticillata</i> forest	0.4	Not threatened	Not threatened	1
NME	<i>Melaleuca ericifolia</i> swamp	3.1	Threatened and inadequately	Threatened and inadequately	2

<sup>75</sup> As per Tasveg 2.0 Vegetation Classification System, DPIPWE

<sup>76</sup> Nature Conservation Act 2002

<sup>77</sup> FCF 2007. Note there is no recent analysis of reservation status of non forest communities



<b>Veg Code<sup>75</sup></b>	<b>Vegetation Community Description</b>	<b>Area (ha)</b>	<b>State-wide Conservation Priority and Reservation Status<sup>76, 77</sup></b>	<b>Bioregional Conservation Priority and Reservation Status<sup>2, 3</sup></b>	<b>Condition</b>
	forest		reserved	reserved	
OAQ	Water, sea	54.6	-	-	-
OSM	Sand, mud	6.7	-	-	1
SAC	Acacia longifolia coastal scrub	10.5	Not threatened	Not threatened	3
	<b>Total Area (ha)</b>	<b>106.9</b>			

#### 12.6.4 Flora Species Richness

A total of 65 flora species were recorded within the study area. Of these 53 were native, with the remaining 12 being weed species. A full species list for the Templestowe Lagoon is included in Appendix 21.

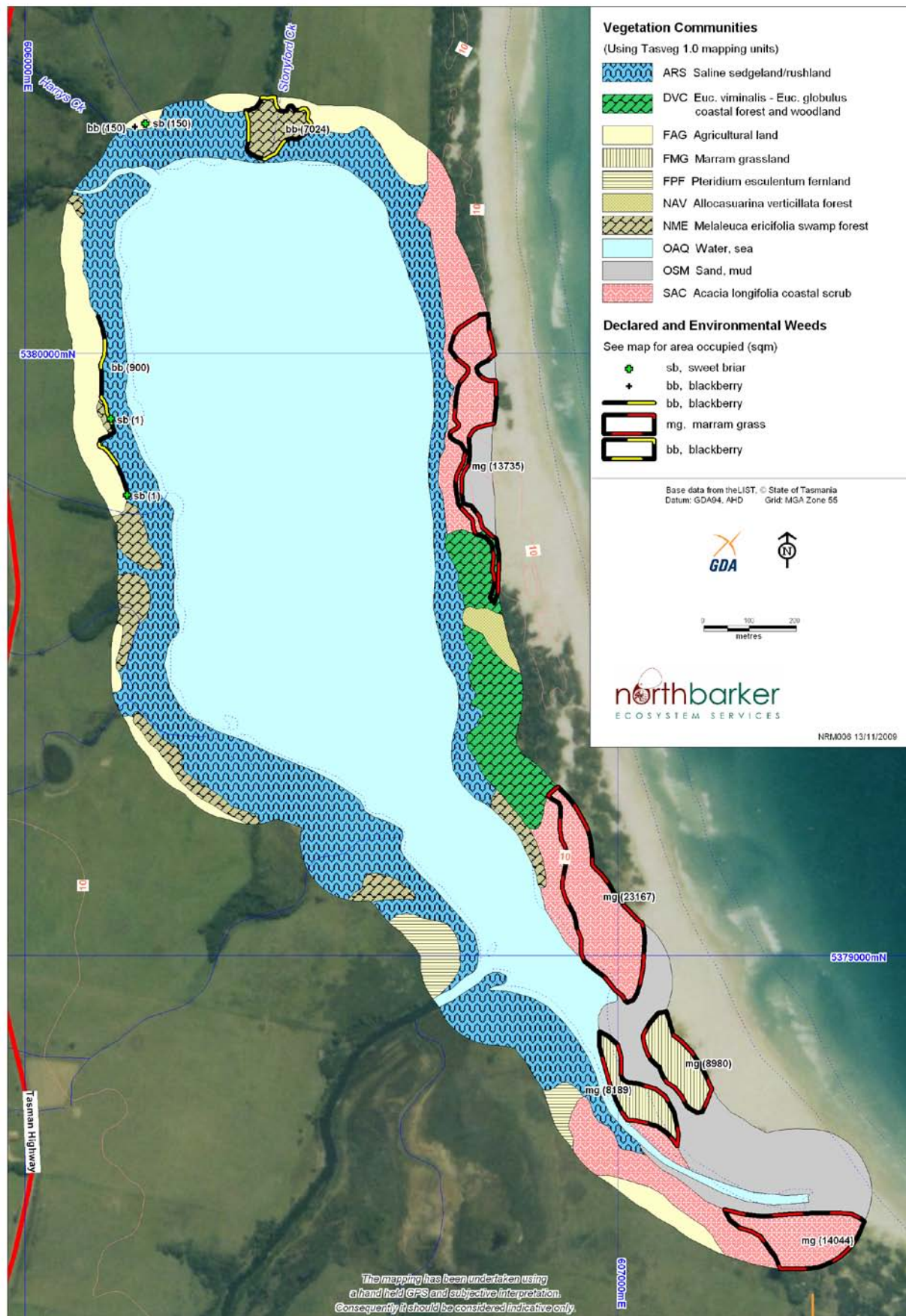


Figure 12 – Vegetation Communities and Weeds for Templestowe Lagoon

### 12.6.5 Threatened Flora

No flora species listed under either the Tasmanian *Threatened Species Protection Act 1995* (TSPA) or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBCA) have been recorded within the study area.

### 12.6.6 Threatened Fauna

A total of four fauna species listed under either the Tasmanian *Threatened Species Protection Act 1995* (TSPA) or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBCA) have been recorded within the study area. All of these fauna species were previously recorded by one of the landholders within the study area<sup>14</sup>. No threatened fauna species were recorded during the current survey. All species of conservation significance recorded within the study area are listed in Table 12.3.

**Table 12.3 – Fauna species of conservation significance within the study area. Records are historical records from the Natural Values Atlas and records found during this survey.**

Species	Status <sup>78</sup> TSPA/EPBCA	Recorded this survey <sup>79</sup>
fairy tern ( <i>Sternula nereis</i> )	(v/-)	-
green and gold frog ( <i>Litoria raniformis</i> )	(v/VU)	-
wedge-tailed eagle ( <i>Aquila audax fleayi</i> )	(e/EN)	
white-bellied sea-eagle ( <i>Haliaeetus leucogaster</i> )	(v/-)	

### 12.6.7 Fauna Habitat Value

The vegetation of the study area provides a range of habitat opportunities for fauna species. A variety of habitats are present including forest and woodland, swamp forest, coastal scrub, sedgeland, sand/mud and saline aquatic habitats. Only 20% of the study area was in an excellent condition (Condition Level 1), with a large proportion being affected by weeds and other disturbances to varying levels, or having been converted to agricultural land. The area is still considered to provide some foraging and nesting habitat for fauna species. A variety of species are likely to be present including small mammals, reptiles, birds, amphibians and invertebrates.

At the time of the survey the aquatic habitat was in good condition, following good rains, with a resulting abundance of frogs, with the calls of the banjo frog (*Limnodynastes dumerili subsp. insularis*), the brown froglet (*Crinia signifera*) and the spotted marsh frog (*Limnodynastes tasmaniensis*) being common in the wet, marshy areas outside of the main lagoon. More prominent fauna sightings included a swamp harrier (*Circus approximans*) and a little ringed plover (*Charadrius dubius*), and macropod scats were common.

<sup>78</sup> TSPA - Tasmanian *Threatened Species Protection Act 1995*; EPBCA - Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*

<sup>79</sup> Natural Values Atlas, DPIPW

### 12.6.8 Threatened Fauna Habitat

Approximately 41% of the study area is habitat that is potentially suitable for threatened fauna. Seven threatened fauna species are known to use the habitat types that are present within the study area. An additional fourteen species listed under the JAMBA and CAMBA<sup>80</sup> migratory bird agreements also have potential habitat within the study area. Details of the species of threatened fauna and migratory birds that may occur at Templestowe Lagoon and their preferred habitats are in Appendix 1. The habitats within the study area that are preferred by at least one threatened fauna species include;

- *Eucalyptus viminalis* - *Eucalyptus globulus* coastal forest and woodland (DVC)
- Sand, mud (OSM)
- *Acacia longifolia* coastal scrub (SAC)
- *Melaleuca ericifolia* swamp forest (NME)
- Saline sedgeland/grassland (ARS)

### 12.7 Weeds

A total of twelve weed species were recorded within the study area, with two being a “declared” weed species listed on the schedules of the *Tasmanian Weed Management Act 1999* (see Table 12.4 below), and one being considered an environmental weed. The two declared weed species are blackberry (*Rubus fruticosus*) and sweet briar (*Rosa rubiginosa*), while the one environmental weed species is marram grass (*Ammophila arenaria*).

Marram grass was found in some large patches in the coastal dunes which are dominated by *Acacia longifolia* coastal scrub (SAC). This weed has altered the structure and habitat value of this part of the ecosystem. Blackberry and sweet briar both occurred in the agricultural land, and on the edge of this land in the native vegetation areas, particularly on the western and northern edge. These areas have been altered by agricultural land use and are currently heavily disturbed by cattle grazing. Blackberry is more abundant, and occurs in patches and on edges, and sweet briar occurred as scattered individual plants. The remaining nine weed species that were recorded are considered to be species that do not pose significant environmental problems. See figure 12 for weed location and infestation details.

**Table 12.4 – Declared or environmental weed species recorded within the study area.**

Weed Species	Declared <sup>81</sup> / Environmental
blackberry ( <i>Rubus fruticosus</i> )	Declared
Sweet briar ( <i>Rosa rubiginosa</i> )	Declared
marram grass ( <i>Ammophila arenaria</i> )	Environmental

<sup>80</sup> Japan Australia Migratory Bird Agreement (1974) and China Australia Migratory Bird Agreement (1986)

<sup>81</sup> Declared under the *Tasmanian Weed Management Act 1999*



Figure 122.11. Marram grass invading coastal dunes.

## 12.8 Landholder Survey

Two responses to the survey were received from landholders for Templestowe Lagoon. The main concerns raised by the respondents were;

- Off road vehicles – 4WD's and trail bikes etc accessing and damaging the shoreline and potentially disturbing shore nesting birds.
- Cattle grazing – cattle from neighbouring properties are accessing and damaging the lagoon and dunes. Need fencing to keep cattle out.
- Weeds

## 12.9 Threats

The overall condition of Templestowe Lagoon is variable, with some parts in poor condition and other parts in good condition. Several threatening processes were identified during the current survey. The key threats identified include;

- **Weeds – High Threat.** Blackberry and sweet briar both occurred in the agricultural land, and on the edge of this land in the native vegetation areas, particularly on the western and northern edge. Blackberry is more abundant, and occurs in patches and on edges, and sweet briar occurred as scattered individual plants. Marram grass was found in some large patches in the coastal dunes which are dominated by *Acacia longifolia* coastal scrub (SAC). Increased colonisation by marram grass could alter the hydrology of the outflow.
- **Off road vehicle access – High Threat.** Landholder reports indicate that off road vehicles access the dunes and beach area, particularly over summer. This type of activity damages dune vegetation, causing erosion and may lead to dune instability as well as potentially disturbing fauna species. Beach access by vehicles can disturb common and threatened shore nesting birds and perhaps limit their breeding success. Threatened shore birds have been recorded in the area.
- **Grazing within wetland – High Threat.** Cattle were observed on site during the survey, and evidence of damage was common particularly in the northern and western parts of the study area. Damage in the form of soil pugging, nutrient addition from



dung, plant trampling and grazing were all observed, and this area also coincided with the worst areas of weed infestation. In this area fences were not erected to keep cattle out of the native vegetation areas, or they were in poor repair and not functioning effectively.



Figure 122.12. Left - Soil pugging in saline sedgeland/grassland (ARS).

Figure 122.13. Right - Cattle grazing in saline sedgeland/grassland (ARS).

- **Catchment Impacts - Moderate Threat.** The lagoon is particularly susceptible to impacts from catchment activities due to the lack of riparian vegetation and incised and channelized creeks which rapidly transport water and sediment into the lagoon. This includes increased sedimentation from land clearing, and potentially high nutrients from runoff of cleared.
- **Grazing adjacent wetland – Low Threat.** Adjacent paddocks are used for grazing, and at times when cattle numbers are high, nutrient rich leaching and runoff is likely to result which may affect water quality within the wetland.
- **Rabbits – Low Threat.** Rabbit dung was observed in several locations. Damage to vegetation was not obvious indicating that rabbits are probably present in low numbers and currently pose a minor threat. This will need to be monitored however, and a control program put in place if numbers and consequent vegetation damage or erosion problems start to occur.
- **Adjacent land use – Low Threat.** Adjacent agricultural land, with the associated use of fertilizers, pesticides and other agricultural chemicals may affect water quality within the wetland. This may not be a problem if used at low levels.
- **Acid sulphate soils – Low Threat.** The area has been identified as having the potential for acid sulphate soils. If acid sulphate soils are present, any draining of the lagoons or exposing of soils could lead to sulphide oxidation and acidification of the water way.

### **12.10 First Aid**

Several actions could be undertaken to reduce the threats that are currently facing Templestowe Lagoon. Listed in priority order they include the following;

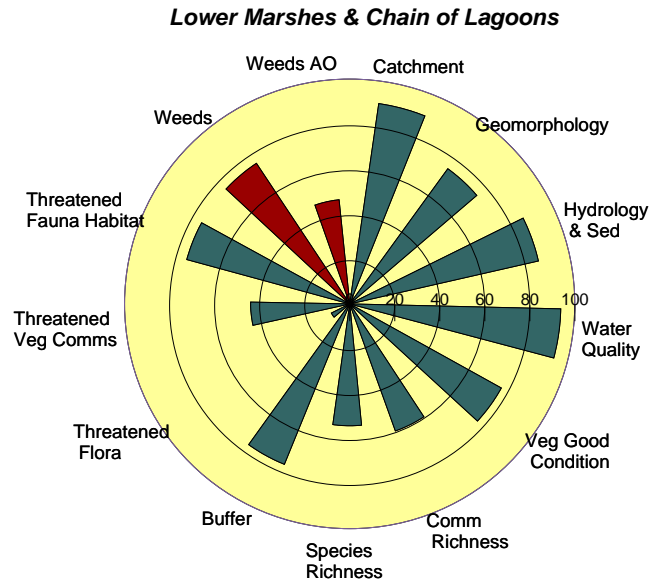
1. Discuss with landholders the option of keeping cattle out of the wetland and the use of fencing to facilitate this.
2. Following discussions with landholders, install stock proof fencing to keep cattle out of the native vegetation, where fences do not currently exist. Repair fences that currently exist.
3. Assist landholders with funding and technical advice in order to help protect the natural values of the area and encourage local stewardship.
4. If possible prevent vehicle access to all native vegetation areas, particularly the dune and beach areas.
5. Immediate weed control program, including several years of follow up work, targeting all declared weeds. Marram grass control is unlikely to be viable given the amount of time and funding that would be necessary.
6. Facilitate the keen interest of local landholders in protecting and rehabilitating parts of the lagoon by offering financial, technical and other support.
7. The relatively unaltered hydrology of the mouth of Templestowe Lagoon makes it a good target for 'first-aid' through catchment improvements. Improving the condition of the creeks and riparian vegetation would be beneficial.
8. Install educational signs highlighting the ecological values of the area and discouraging damaging activities (e.g. off road vehicle access).
9. Monitor rabbit numbers and their impacts, and implement a control program if unacceptable levels of damage are occurring.

### 13 Lower Marsh Creek and Chain of Lagoons (#16)

#### Wetland Health Score:

**66/ 100**

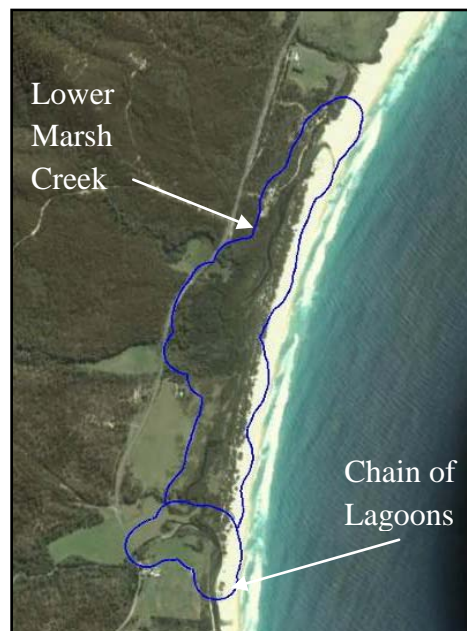
N.B. - This number is an unweighted addition of the variables that make up the adjacent condition rose to give an assessment out of a possible 100 points. These variables represent the current condition and natural values recorded historically and during the current survey. Due to the different levels of survey undertaken at each site, this score should not be used as a comparative value between wetlands.



**Photo 13.18. Chain of Lagoons opening to the sea looking south**



**Photo 13.2. Google Earth aerial photo of Chain of Lagoons and Lower Marsh Creek study area.**



### **13.1 Introduction**

The Chain of Lagoons and Lower Marsh Creek study area consists of two areas which on the ground merge into the one geographical area. Lower Marsh Creek is the larger northern section, while Chain of Lagoons is the smaller southern section. For the purposes of this study both areas, including a 100m buffer around each wetland will be considered as the Chain of Lagoons and Lower Marsh Creek study area.

The surface area of Chain of Lagoons is 19.4ha, while the surface area of Lower Marsh Creek is 79.0ha (both of these areas are inclusive of a 100m buffer). The total surface area of the wetland components of both of these areas is 8.7ha, and including the 100m buffer around them equates to an area of approximately 98.4ha.

### **13.2 Geomorphology**

#### **13.2.1 Setting**

Lower Marsh Creek wetland and Chain of Lagoons is located along the northern half of Lagoons Beach. Piccaninny Swamp occupies the southern end of the beach which is defined by Piccaninny Point in the south and Hughes Point in the north. The ~2 km long Lower Marsh Creek / Chain of Lagoons wetland complex lies between the foothills of Mt Elephant and the coast within the Lagoons Beach Conservation Area. Two main creeks feed the lagoons, Wardlaws Creek in the South (Chain of Lagoons) and Lower Marsh Creek in the north. These creeks drain vegetated hills contained within the Little Beach State Reserve, the Lower Marsh Creek Forest Reserve, and State Forest. The lower catchment of Wardlaws Creek has been cleared and developed for agriculture.

The dunes on the seaward side of the lagoons support marram grass, but continue to have a low profile compared to other marram bearing dunes along the coast. This has allowed the outlets from the lagoon to migrate across and occupy large areas of the beach. Lower Marsh Lagoon flows in a northerly direction, and is forced onto the beach by the presence of bedrock (see photo), while the Chain of Lagoons discharges towards the south. A wetland area north of the main lagoon likely reflects the historic position of the lagoon and shows that the lagoon used to discharge to the sea from a more northern mouth. Geologically, Lagoons Beach marks the area where the occurrence of dolerite hills ends, and the granitic bedrock common in the north east begins.

#### **13.2.2 Local processes**

Like all the coastal lagoons, the long-narrow lagoons in Lower Marsh Creek / Chain of Lagoons receive freshwater inflows and sediment from the upstream catchment, and occasionally flush and receive marine inflows following high flow events which join the lagoons to the sea. The catchment flowing into Chain of Lagoons has been more extensively cleared and developed for agriculture than the northern Lower Marshes Creek Lagoon, which may have increased sedimentation to the lagoon in the recent past.

### **13.3 Hydrology & sediments**

Freshwater inflow to the lagoons is derived from the catchment, with many of the creeks ephemeral. Marine inflows occur when the lagoons are connected to the sea due to high freshwater inflows. Modifications to the hydrology of Marsh Creek and Lower Marsh Creek are limited to changes in the creeks due to road crossings, and the hydrology and sediment regimes of the lagoon should be near 'pristine'. The creeks entering Chain of Lagoons have been somewhat more modified due to land clearing, road placement and agricultural activities.

The outlet of both lagoons have been modified by the presence of marram grass, but this modification is less than at other lagoons in the region where dunes have increased substantially in height due to presence of the grass.

### **13.4 Water quality**

Water quality from the catchment would be expected to be good with the exception of possible agricultural runoff in lower Wardlaws catchment, especially in areas where the riparian vegetation is lacking or limited.

The decomposition of organic matter in the small water bodies during warm dry periods could affect water quality leading to low dissolved oxygen levels. The area is characterised by sulphide rich sediments and has been identified as having a potential for acid sulphate soils.

### **13.5 Condition**

Lower Marsh Creek wetland is in somewhat better condition than the Chain of Lagoon wetlands due to less catchment development.



**Figure 133.3. Left - Mouth of Lower Marshes Lagoon at northern end of Lagoons Beach**

**Figure 133.4. Right - Granitic bedrock outcrop in Lower Marsh Lagoon which controls the geomorphology of the mouth of the lagoon.**





Figure 133.5. Left - Chain of Lagoons showing reed mats.

Figure 133.6. Right - Bank erosion in Chain of Lagoons.

## 13.6 Flora and Fauna

### 13.6.1 Overview

The Chain of Lagoons and Lower Marsh Creek study area covers approximately 98.4 hectares, with 78% of the vegetation communities being native. A total of nine native vegetation communities were recorded, covering a variety of habitats including forest and woodland, swamp forest, coastal scrub, sedgeland, sand/mud, saline and fresh aquatic habitats. The condition of native vegetation communities was generally quite good.

The most abundant vegetation community at the Chain of Lagoons and Lower Marsh Creek is *Melaleuca ericifolia* swamp forest (NME), which covers approximately 25% of the study area. The wetland component of Chain of Lagoons and Lower Marsh Creek covers 9.3ha or approximately 10% of the study area, and it is made up of 7.8ha of Water, sea (OAQ) and 1.5ha of Saline sedgeland/rushland (ARS).

Immediately surrounding the wetland area there is an ecotone between the lower lying wetland area, and the higher ground that rises out of the wetland. The ecotone is comprised of wetter soils than the higher ground, and is dominated by *Melaleuca ericifolia* swamp forest (NME). Beyond this zone, on the eastern side, and as the elevation increases, the vegetation is dominated by drier forests and woodlands including *Eucalyptus globulus* dry forest and woodland (DGL) and *Eucalyptus ovata* heathy woodland (DOW). Further to the south-east Agricultural land (FAG) and *Pteridium esculentum* fernland also become more common. On the western side the vegetation is dominated by coastal scrubs, mainly *Acacia longifolia* coastal scrub (SAC). Smaller patches of other vegetation communities also occur in parts of the study area.

The study area incorporates a 100m buffer surrounding the wetland portions of Chain of Lagoons and Lower Marsh Creek. This buffer area occupies 90.5ha of which approximately 77% is native vegetation, with the remainder being predominantly agricultural land and *Pteridium esculentum* fernland.



Figure 133.7. Left - *Eucalyptus ovata* heathy woodland (DOW).

Figure 133.8. Right - *Melaleuca ericifolia* swamp forest (NME).

### 13.6.2 Vegetation Condition

Only 13.0% of the vegetation communities within the Chain of Lagoons and Lower Marsh Creek are in an excellent condition overall, being at Condition Level 1. This condition level is characterised by no or very low levels of weed invasion, with the vegetation being structurally and floristically intact. Condition Level 2 comprised 63.4% of the vegetation communities, consisting of most of the native vegetation communities where minor weed invasion is occurring. Condition Level 3 was not recorded in the study area. Condition Level 4 comprised 23.5% of the study area, and is made up of agricultural land and other areas where human activities have affected the native ecosystems. These areas are characterised by heavy weed invasion, and also by the destruction of the native vegetation structure and composition. See Table 13.1 below for details.

**Table 13.1 – Vegetation Condition within the study area.**

Condition	Condition Description	Area (ha)	% of study area
1	Vegetation structurally and floristically intact and weed invasion less than 1% cover	11.8	13.0
2	Vegetation structurally and floristically altered and/or weed invasion > 1% and < 10% cover	57.4	63.4
3	Vegetation structurally and floristically altered and weed invasion > 10% and < 50% cover	0	0.0
4	Grossly altered vegetation structure in otherwise weed infested vegetation (> 50% weeds cover)	21.3	23.5
<b>Total</b>		90.5*	100.0

\* Condition ratings were not given to areas of Water, sea (OAQ)

### 13.6.3 Vegetation Community Richness

Of the 13 vegetation communities recorded in the study area nine are native, with the remainder being *Pteridium esculentum* fernland (FPF), agricultural land (FAG) and weed

infestations (FWU) and urban areas (FUR). At Chain of Lagoons and Lower Marsh Creek the most common vegetation community is *Melaleuca ericifolia* swamp forest (NME) followed by *Acacia longifolia* coastal scrub (SAC) and *Eucalyptus globulus* dry forest and woodland (DGL).

Of the native vegetation communities recorded four are considered to be threatened under the Tasmanian *Nature Conservation Act 2002*. They are *Melaleuca ericifolia* swamp forest (NME), *Eucalyptus globulus* dry forest and woodland (DGL), *Eucalyptus viminalis* - *Eucalyptus globulus* coastal forest and woodland (DVC) and *Eucalyptus ovata* heathy woodland (DOW). Together they cover 44% of the vegetated area. Full details of vegetation communities recorded, their threatened status and their condition is provided below in Table 13.2, and their distribution is shown in Figure 13. Full species lists for each vegetation community are provided in Appendix 24.

**Table 13.2 – Vegetation Communities recorded in the study area, including their conservation priority, reservation status and condition.**

Veg Code <sup>82</sup>	Vegetation Community Description	Area (ha)	State-wide Conservation Priority and Reservation Status <sup>83 84</sup>	Bioregional Conservation Priority and Reservation Status <sup>2 3</sup>	Condition
ARS	Saline sedgeland/rushland	1.5	Not threatened	Not threatened	1
DGL	<i>Eucalyptus globulus</i> dry forest and woodland	10.8	Threatened and inadequately reserved	Threatened and inadequately reserved	2
DOW	<i>Eucalyptus ovata</i> heathy woodland	3.1	Threatened and inadequately reserved	Threatened and inadequately reserved	2
DVC	<i>Eucalyptus viminalis</i> - <i>Eucalyptus globulus</i> coastal forest and woodland	1.0	Threatened and inadequately reserved	Threatened and inadequately reserved	2
FAG	Agricultural land	10.6	-	-	4
FPF	<i>Pteridium esculentum</i> fernland	7.2	-	-	4
FUR	Urban areas	0.7	-	-	4
FWU	Weed infestation	2.9	-	-	4
NAD	<i>Acacia dealbata</i> forest	0.7	Not threatened	Not threatened	2
NME	<i>Melaleuca ericifolia</i> swamp forest	24.6	Threatened and inadequately reserved	Threatened and inadequately reserved	2

<sup>82</sup> As per Tasveg 2.0 Vegetation Classification System, DPIPWE

<sup>83</sup> Nature Conservation Act 2002

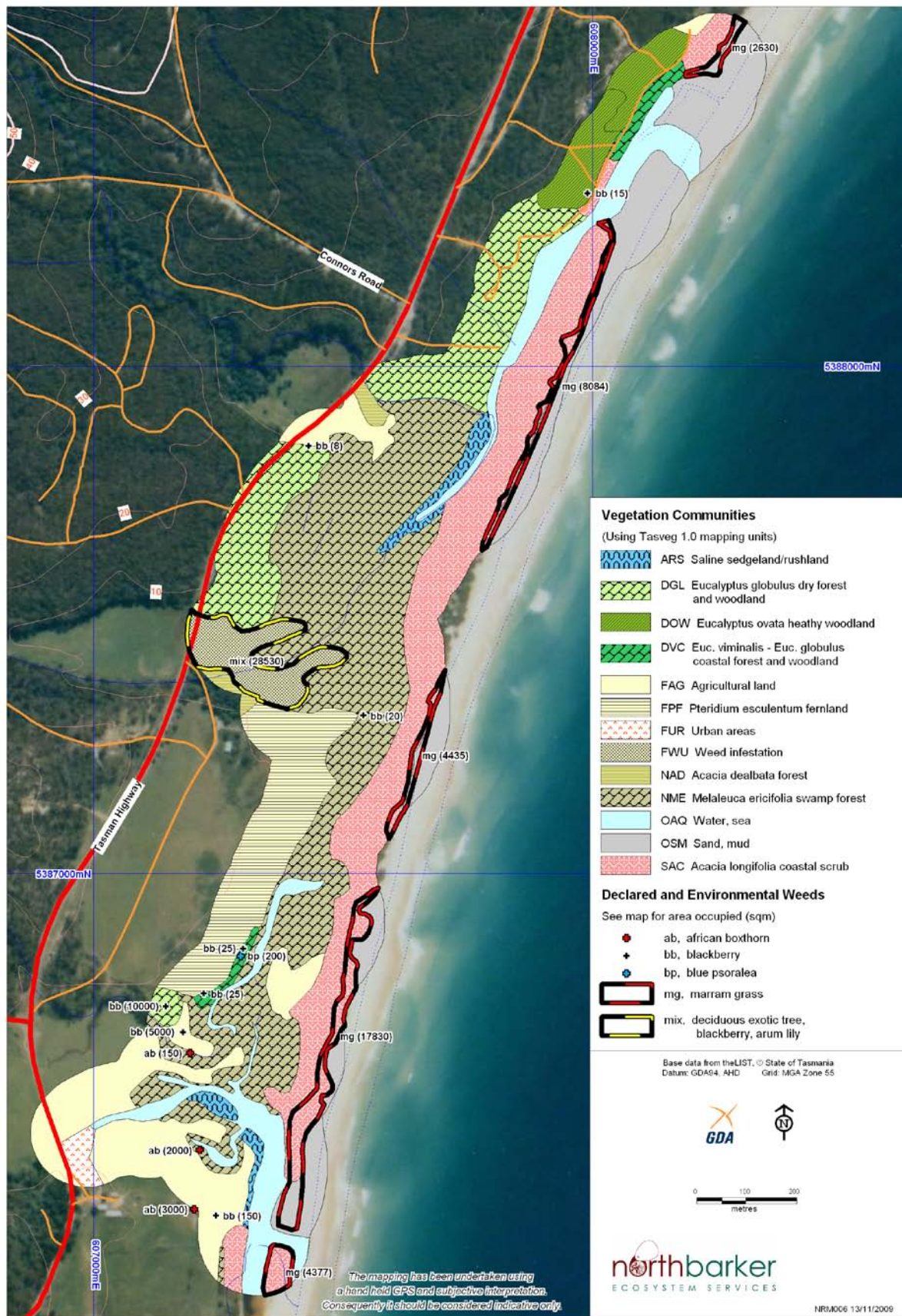
<sup>84</sup> FCF 2007. Note there is no recent analysis of reservation status of non forest communities

<b>Veg Code<sup>82</sup></b>	<b>Vegetation Community Description</b>	<b>Area (ha)</b>	<b>State-wide Conservation Priority and Reservation Status<sup>83, 84</sup></b>	<b>Bioregional Conservation Priority and Reservation Status<sup>2, 3</sup></b>	<b>Condition</b>
OAQ	Water, sea	7.8	-	-	-
OSM	Sand, mud	10.4	Not threatened	Not threatened	1
SAC	Acacia longifolia coastal scrub	17.2	Not threatened	Not threatened	2
	<b>Total Area (ha)</b>	<b>98.4</b>			

#### 13.6.4 Flora Species Richness

A total of 103 flora species were recorded within the study area. Of these 90 were native, with the remaining 13 being weed species. A full species list for the Chain of Lagoons and Lower Marsh Creek is included in Appendix 23.





**Figure 13 – Vegetation Communities and Weeds for Lower Marsh Creek and Chain of Lagoons**



### 13.6.5 Threatened Flora

One flora species listed under either the Tasmanian *Threatened Species Protection Act 1995* (TSPA) or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBCA) has been recorded within the study area. The one flora species was previously recorded within the study area<sup>85</sup>, with no additional species being recorded during the current survey. All species of conservation significance recorded within the study area are listed in Table 13.3.

**Table 13.3 – Flora species of conservation significance within the study area. Records are historical records from the Natural Values Atlas and records found during this survey.**

Species	Status <sup>86</sup> TSPA/EPBCA	Recorded this survey <sup>87</sup>
<i>Caladenia caudata</i> (tailed spider-orchid)	v/VU	-

### 13.6.6 Threatened Fauna

A total of two fauna species listed under either the Tasmanian *Threatened Species Protection Act 1995* (TSPA) or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBCA) have been recorded within the study area. All of these fauna species were previously recorded within the study area<sup>14</sup>. No threatened fauna species were recorded during the current survey. All species of conservation significance recorded within the study area are listed in Table 13.4.

**Table 13.4 – Fauna species of conservation significance within the study area. Records are historical records from the Natural Values Atlas and records found during this survey.**

Species	Status <sup>88</sup> TSPA/EPBCA	Recorded this survey <sup>89</sup>
little tern ( <i>Sternula albifrons</i> )	(e/-)	-
wedge-tailed eagle ( <i>Aquila audax</i> ssp. <i>fleayi</i> )	(e/EN)	-

### 13.6.7 Fauna Habitat Value

The vegetation of the study area provides a diverse range of habitat opportunities for fauna species. A large variety of habitats are present including forest and woodland, swamp forest, coastal scrub, sedgeland, sand/mud, saline and fresh aquatic habitats. Approximately 13% of the study area was in an excellent condition (Condition Level 1), with the remainder being affected by weeds to varying levels, or modified by human activities. The area is still

<sup>85</sup> Natural Values Atlas, DPIPWE

<sup>86</sup> TSPA - Tasmanian *Threatened Species Protection Act 1995*; EPBCA - Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*

<sup>87</sup> Threatened species that were not recorded during the current survey are likely to still be present at this site. Seasonal and survey limitations are likely to be responsible for some threatened species not being recorded during the current survey.

<sup>88</sup> TSPA - Tasmanian *Threatened Species Protection Act 1995*; EPBCA - Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*

<sup>89</sup> Natural Values Atlas, DPIPWE

considered to provide high quality foraging and nesting habitat for many fauna species. A variety of species are likely to be present including small mammals, reptiles, birds, amphibians and invertebrates.

At the time of the survey the aquatic habitat was in good condition, following good rains, and water levels were high. Frogs were common in the freshwater areas, with the calls of the brown froglet (*Crinia signifera*) being heard. More prominent fauna sightings included a swamp harrier (*Circus approximans*), and scats of the eastern quoll (*Dasyurus viverrinus*) and macropods were also observed.

### 13.6.8 Threatened Fauna Habitat

Approximately 75% of the study area is habitat that is potentially suitable for threatened fauna. Fourteen threatened fauna species are known to use the habitat types that are present within the study area. An additional fourteen species listed under the JAMBA and CAMBA<sup>90</sup> migratory bird agreements also have potential habitat within the study area. Details of the species of threatened fauna and migratory birds that may occur at Chain of Lagoons and Lower Marsh Creek study area and their preferred habitats are in Appendix 1. The habitats within the study area that are preferred by at least one threatened fauna species include;

- *Eucalyptus viminalis* - *Eucalyptus globulus* coastal forest and woodland (DVC)
- *Eucalyptus globulus* dry forest and woodland (DGL)
- *Melaleuca ericifolia* swamp forest (NME)
- *Acacia longifolia* coastal scrub (SAC)
- Saline sedgeland/grassland (ARS)
- Sand, mud (OSM)
- Water, sea (OAQ)

### 13.7 Weeds

A total of 13 weed species were recorded within the study area, with two being “declared” weed species listed on the schedules of the *Tasmanian Weed Management Act 1999* (see Table 13.5 below), and four being considered environmental weeds. The two declared weed species are blackberry (*Rubus fruticosus*) and african boxthorn (*Lycium ferocissimum*), while the four environmental weed species are arum lily (*Zantedeschia aethiopica*), blue psoralea (*Psoralea pinnata*), marram grass (*Ammophila arenaria*) and a deciduous exotic tree species (species unknown).

A large area of weed infestation occurs near the centre of the study area adjacent to the Tasman Highway. This area is dominated by weeds, particularly a large deciduous exotic tree species, blackberry and arum lilies. Blackberry also occurs in scattered infestations throughout the study area, while african boxthorn occurs in large patches adjacent to and in the agricultural land at the southern end of the study area. A single small patch of blue psoralea was also located in the southern half of the study area. Marram grass was found in

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<sup>90</sup> Japan Australia Migratory Bird Agreement (1974) and China Australia Migratory Bird Agreement (1986)

some large patches particularly along the front edge of the coastal dunes which are dominated by *Acacia longifolia* coastal scrub (SAC). This weed has altered the structure and habitat value of this part of the ecosystem. The remaining seven weed species that were recorded are considered to be species that do not pose significant environmental problems. See figure 13 for weed location and infestation details.

**Table 13.5 – Declared or environmental weed species recorded within the study area.**

Weed Species	Declared <sup>91</sup> / Environmental
african boxthorn ( <i>Lycium ferocissimum</i> )	Declared
blackberry ( <i>Rubus fruticosus</i> )	Declared
arum lily ( <i>Zantedeschia aethiopica</i> )	Environmental
blue psoralea ( <i>Psoralea pinnata</i> )	Environmental
deciduous exotic tree species (species unknown)	Environmental
marram grass ( <i>Ammophila arenaria</i> )	Environmental

### 13.8 Landholder Survey

Two responses to the survey were received from landholders for Chain of Lagoons and Lower Marsh Creek. The main concerns raised by the respondents were;

- Off road vehicles – vehicles are degrading wetland area while accessing the beach.
- Cattle grazing – stock have unhindered access to coastal wetland and beach.
- Weeds – gorse, blackberry etc.

### 13.9 Threats

The overall condition of Chain of Lagoons and Lower Marsh Creek is variable, with some parts in poor condition and other parts in good condition. Several threatening processes were identified during the current survey. The key threats identified include;

- **Weeds – High Threat.** A large area of weed infestation occurs near the centre of the study area adjacent to the Tasman Highway. This area is dominated by weeds, particularly a large deciduous exotic tree species, blackberry and arum lilies. Blackberry also occurs in scattered infestations throughout the study area, while african boxthorn occurs in large patches adjacent to and in the agricultural land at the southern end of the study area. A single small patch of blue psoralea was also located in the southern half of the study area. Marram grass was found in some large patches particularly along the front edge of the coastal dunes which are dominated by *Acacia longifolia* coastal scrub (SAC). Increased marram grass could also lead to a restriction of lagoon outflow.

<sup>91</sup> Declared under the Tasmanian *Weed Management Act 1999*



Figure 133.9. Left - Blue psoralea (*Psoralea pinnata*).

Figure 133.10. Right - Blackberry (*Rubus fruticosus*) and arum lily (*Zantedeschia aethiopica*) infestation.



Figure 133.11. Left - Deciduous exotic tree species (species unknown) infestation.

- **Grazing within wetland – High Threat.** Cattle were observed on site during the survey, and evidence of damage was common particularly in the southern parts of the study area. Damage in the form of soil pugging, nutrient addition from dung, plant trampling and grazing were all observed. In this area fences were not erected to keep cattle out of the native vegetation areas.
- **Off road vehicle access – Moderate Threat.** Landholder reports indicate that off road vehicles accessing the beach area are damaging the wetland in the process. This type of activity damages vegetation, causing erosion and habitat destruction as well as potentially disturbing fauna species. Beach access by vehicles can disturb common and threatened shore nesting birds and perhaps limit their breeding success.
- **Recreational Use – Moderate Threat.** Use of part of the area for recreational activities such as camping and fishing is high particularly in summer. Problems associated with human use of an area include pollution, water quality issues, rubbish, destruction of habitat, and impacts to fauna. A relatively high level of rubbish was observed scattered around the campground at the northern end of the study area. Human impacts will need to be monitored, and may need to be managed in future if use of the area increases.
- **Grazing adjacent wetland – Low Threat.** Adjacent paddocks are used for grazing, and at times when cattle numbers are high, nutrient rich leaching and runoff is likely to result which may affect water quality within the wetland.

- **Adjacent land use – Low Threat.** Adjacent agricultural land, with the associated use of fertilizers, pesticides and other agricultural chemicals may affect water quality within the wetland. This may not be a problem if used at low levels.
- **Rubbish – Low Threat.** A small area of dumped rubbish on agricultural land was found, and this may be leaching pollutants and chemicals in to the water.
- **Tracks/Roads – Low Threat.** Several vehicle tracks cut through the buffer area of this wetland, but do not cut across the wetland areas themselves. Most tracks occur on the north-western side of the study area, and the Tasman Highway cuts through the buffer area on the southern and western side also. Most of the tracks in their current state do not appear to be having negative impacts, aside from the usual problems associated with unrestricted human access to the wetland and its surrounds. Runoff from the Tasman Highway may be impacting on water quality within the basin.
- **Vegetation clearance - Moderate Threat.** An increase in catchment clearing is likely to lead to an increase in sediment.

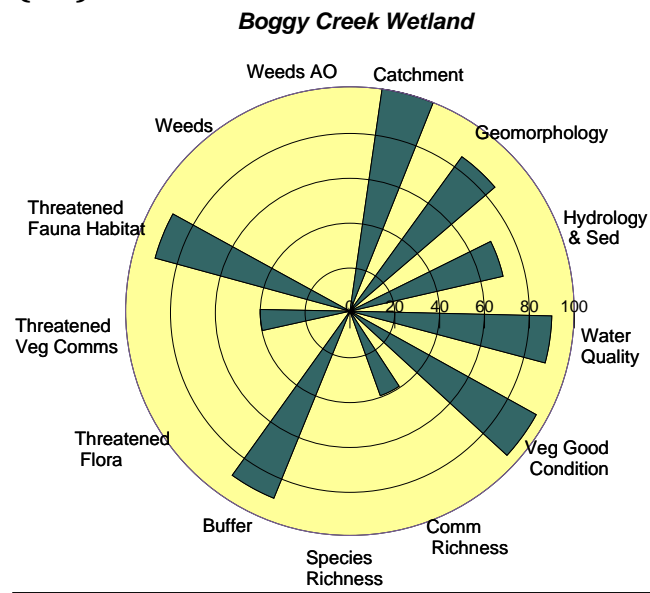
### **13.10 First Aid**

Several actions could be undertaken to reduce the threats that are currently facing Chain of Lagoons and Lower Marsh Creek. Listed in priority order they include the following;

1. Continue discussions with landholders regarding the option of keeping cattle out of the wetland and the use of fencing to facilitate this. This has occurred in the past but needs to be continued and reinvigorated.
2. Following discussions with landholders, install stock proof fencing to keep cattle out of the native vegetation, where fences do not currently exist. Repair fences that currently exist.
3. Assist landholders with funding and technical advice in order to help protect the natural values of the area and encourage local stewardship.
4. Prevent vehicle access to native vegetation areas, especially the dune and beach areas.
5. Immediate weed control program, including several years of follow up work, targeting all declared and environmental weeds. Marram grass control is unlikely to be viable given the amount of time and funding that would be necessary. The large weed infestation may also prove to be unviable to control, so work should initially concentrate on smaller, isolated infestations and on stopping the further spread from these larger areas.
6. Remove scattered rubbish from around the camp ground. Discuss with landowners the removal of the rubbish within the dump area on agricultural land.
7. Good catchment management practices should be encouraged.



## 14 Boggy Creek Wetland (#6)



**Photo 14.19. Boggy Marsh Creek looking south into wetland**



**Photo 14.2. Google Earth aerial photo of Boggy Marsh Creek study area.**



### **14.1 Geomorphology**

Boggy Creek wetland lies at the southern end of George's Bay, and is fed by Boggy Creek. Unlike the other lagoons bordering George's Bay (Chimneys, Parkside), Boggy Creek wetland has a sizeable catchment which extends to Flagstaff Lookout on the Scamander Tier. The catchment is steep, and the wetland occupies a small flat area adjacent to the Tasman Highway.

Similar to the other lagoons draining into Georges Bay, Boggy Creek has a permanent connection to the sea via a channel under the road bridge. The mouth has undergone additional modification more recently through the establishment of the bike / walking track downstream of the road bridge which results in additional constriction of the mouth of the lagoon.

### **14.2 Hydrology & sediments**

The hydrology of the lagoon has been substantially modified by construction of the road, and more recently the pedestrian track. These restrictions at the mouth have likely increased sedimentation upstream of the bridge, with thick accumulations of organic rich mud present even following a recent very high rain events which should have flushed the area. The road and track also restrict the ingress of marine water from Georges Bay, which is likely to alter the natural salinity regime of the saltmarsh.

Prior to modification, the wetland would have experienced very high energy flow following high rainfall due to the large steep catchment upstream. The back water created by the bridge and pedestrian track may lead to increased water levels in the upstream wetland during a rain event relative to 'natural' conditions. The catchment is generally undeveloped, so the organic rich sediment are likely derived from within the wetland / salt marsh complex.

### **14.3 Water quality**

The catchment inflows to the wetland are probably of high quality due to the good condition of the catchment. Runoff from the road, and the degradation of organic matter within the wetland are likely the greatest impacts to water quality.

### **14.4 Wetland Condition**

The upstream wetland in Boggy Creek is in good physical condition. The salt marsh in the lower catchment is in moderate to poor conditions compared to natural due to the major modifications to the hydrology of the outflow.



Figure 144.3. Left - View of downstream end of wetland showing channel

Figure 144.4. Right - Sedimentation upstream of bridge.



Figure 144.4. Restricted flow through pedestrian walkway.

## 14.5 Flora and Fauna

### 14.5.1 Overview

The Boggy Creek Wetland study area covers approximately 9.2 hectares (including a 100m buffer), with an estimated 95% of the buffer area being native vegetation communities. A total of six native vegetation communities were recorded, covering a variety of habitats including wet forest, forest and woodland, swamp forest, sedgeland, and saline aquatic habitats.

### 14.5.2 Vegetation Condition

The condition of the study area was excellent overall, with an estimated 95% being at Condition Level 1. This condition level is characterised by no or very low levels of weed invasion, with the vegetation being structurally and floristically intact. The remaining 5% was in a poor condition due to urban development.

### 14.5.3 Vegetation Community Richness

Seven vegetation communities were recorded in the study area, with six being native. Of the native vegetation communities recorded three are considered to be threatened under the

Tasmanian *Nature Conservation Act 2002*. Full details of vegetation communities recorded, their threatened status and their condition is provided below in Table 14.1.

**Table 14.1 – Vegetation Communities recorded in the study area, including their conservation priority, reservation status and condition.**

Veg Code <sup>92</sup>	Vegetation Community Description	State-wide Conservation Priority and Reservation Status <sup>93, 94</sup>	Bioregional Conservation Priority and Reservation Status <sup>2, 3</sup>	Condition*
ARS	Saline sedgeland/rushland	Not threatened	Not threatened	1
DSO	<i>Eucalyptus sieberi</i> forest and woodland not on granite	Not threatened	Not threatened	1
DVC	<i>Eucalyptus viminalis</i> - <i>Eucalyptus globulus</i> coastal forest and woodland	Threatened and inadequately reserved	Threatened and inadequately reserved	1
FUR	Urban areas	-	-	4
NME	<i>Melaleuca ericifolia</i> swamp forest	Threatened and inadequately reserved	Threatened and inadequately reserved	1
OAQ	Water, sea	-	-	-
WVI	<i>Eucalyptus viminalis</i> wet forest	Threatened and inadequately reserved	Threatened and inadequately reserved	1

\* - Refer to mid and high level assessments for descriptions of the condition levels.

#### 14.5.4 Threatened Flora & Fauna

One threatened flora species listed under either the Tasmanian *Threatened Species Protection Act 1995* (TSPA) or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBCA) has been previously recorded within the study area<sup>95</sup>. No threatened fauna species have been recorded. No additional threatened flora or fauna species were recorded during the current survey. All species of conservation significance recorded within the study area are listed below:

- *Brachyloma depressum* (spreading heath) (r/-)

#### 14.5.5 Threatened Fauna Habitat

An estimated 75% of the study area is habitat that is potentially suitable for threatened fauna. Thirteen threatened fauna species are known to use the habitat types that are present within the study area. No species listed under the JAMBA and CAMBA<sup>96</sup> migratory bird agreements

<sup>92</sup> As per Tasveg 2.0 Vegetation Classification System, DPIPW

<sup>93</sup> Nature Conservation Act 2002

<sup>94</sup> FCF 2007. Note there is no recent analysis of reservation status of non forest communities

<sup>95</sup> Natural Values Atlas, DPIPW

<sup>96</sup> Japan Australia Migratory Bird Agreement (1974) and China Australia Migratory Bird Agreement (1986)

have potential habitat within the study area. Details of the species of threatened fauna and migratory birds that may occur at Boggy Creek Wetland and their preferred habitats are in Appendix 1. The habitats within the study area that are preferred by at least one threatened fauna species include;

- *Eucalyptus sieberi* forest and woodland not on granite substrates (DSO)
- *Eucalyptus viminalis* - *Eucalyptus globulus* coastal forest and woodland (DVC)
- *Eucalyptus viminalis* wet forest (WVI)
- *Melaleuca ericifolia* swamp forest (NME)
- Saline sedgeland/grassland (ARS)

#### **14.6 Weeds**

No declared or environmental weed species were recorded within the study area.

#### **14.7 Threats**

The key threats identified include;

- Development within adjacent native vegetation
- Poor flushing leading to increased sedimentation and infilling
- Rubbish and runoff from road

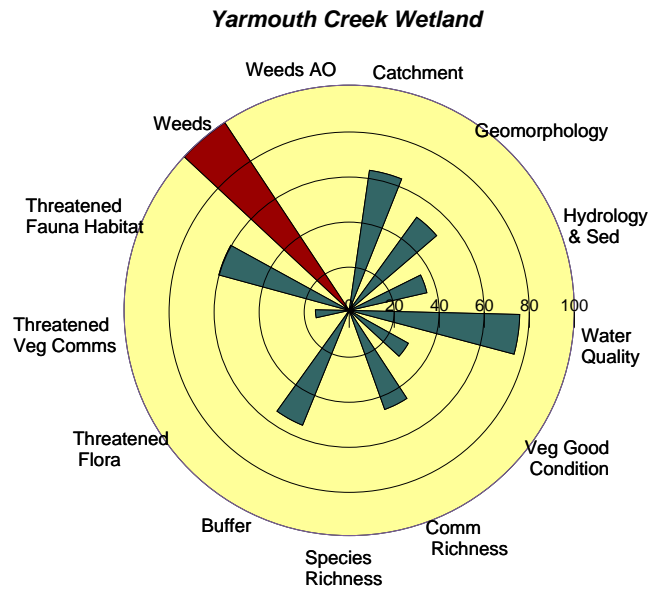
#### **14.8 First Aid**

Suggested first aid actions, listed in priority order, include the following;

1. Encourage planning laws which restrict further development within a defined buffer zone around Boggy Creek Wetland.
2. Undertake educational activities with local residents.
3. Install an information/education sign in adjacent park.
4. Remove scattered rubbish from Tasman Hwy edge.
5. Increase flushing at mouth of salt marsh.



## 15 Yarmouth Creek (#14)



**Photo 15.20. Yarmouth Creek looking west into wetland**



**Photo 15.2. Google Earth aerial photo of Yarmouth Creek study area.**



### **15.1 Geomorphology**

Yarmouth Creek wetland is a long, narrow, sinuous water body behind Beaumaris Beach, approximately 2 km north of Shelly Point. It is fed by two freshwater inflows, Yarmouth Creek in the south and Reedy Creek in the north. Both of these catchments have narrow catchments extending through the low, flat-topped hills common along this coast into the pine plantations on Skyline Tier. The lower catchment has also been modified through agricultural and residential development. The wetland is dissected by the Tasman Highway which crosses both Yarmouth and Reedy Creeks. The dunes which separate the wetland from the sea have been significantly altered through the establishment of marram grass, and the connection between the sea and the wetland is limited to a narrow gap in the dunes. The shore is contained within the Scamander Coastal Reserve and has high conservation value.

### **15.2 Hydrology & sediments**

The hydrology and natural sediment budget of the catchment have been modified through clearing and agricultural and residential development, with sediment loads likely to be higher than compared to 'natural' conditions. Reedy Creek has an in-stream dam less than one km upstream from the wetland, which is likely to alter flow patterns to the wetland, especially under low flow conditions. Both arms of the wetland have road crossings which may also affect water and sediment transport. The connection with the sea has been modified through dune stabilisation and growth associated with the establishment of marram grass.

### **15.3 Water quality**

Increased sediment loads and run-off from agricultural and residential lands are likely to be the greatest threats to water quality in the wetland. The lower catchment may contain acid sulphate soils which could create water quality issues if disturbed or drained.

### **15.4 Condition**

CFEV values shown on condition rose as these are consistent with information obtained during desk top assessment.



**Figure 15.3. Left - Upper end of Yarmouth Creek wetland.**

**Figure 155.4. Right - Mouth of Yarmouth Creek cutting through coastal dunes.**

## 15.5 Flora and Fauna

### 15.5.1 Overview

The Yarmouth Creek study area covers approximately 16.0 hectares (including a 100m buffer), with an estimated 55% of the buffer area being native vegetation communities. A total of seven native vegetation communities were recorded, covering a variety of habitats including forest and woodland, swamp forest, coastal scrub, sedgeland, sand/mud and saline aquatic habitats.

### 15.5.2 Vegetation Condition

The condition of the study area was average overall, with an estimated 30% being at Condition Level 1. This condition level is characterised by no or very low levels of weed invasion, with the vegetation being structurally and floristically intact. The remaining 70% was in a poor condition due to urban development, and weed invasion.

### 15.5.3 Vegetation Community Richness

Nine vegetation communities were recorded in the study area, with seven being native. Of the native vegetation communities recorded two are considered to be threatened under the Tasmanian *Nature Conservation Act 2002*. Full details of vegetation communities recorded, their threatened status and their condition is provided below in Table 15.1.

**Table 15.1 – Vegetation Communities recorded in the study area, including their conservation priority, reservation status and condition.**

Veg Code <sup>97</sup>	Vegetation Community Description	State-wide Conservation Priority and Reservation Status <sup>98, 99</sup>	Bioregional Conservation Priority and Reservation Status <sup>2, 3</sup>	Condition*
ARS	Saline sedgeland/rushland	Not threatened	Not threatened	1
DSO	<i>Eucalyptus sieberi</i> forest and woodland not on granite	Not threatened	Not threatened	1
DGL	<i>Eucalyptus globulus</i> dry forest and woodland	Threatened and inadequately reserved	Threatened and inadequately reserved	1
FUR	Urban areas	-	-	4
FUM	Extra-urban miscellaneous	-	-	4
NME	<i>Melaleuca ericifolia</i> swamp forest	Threatened and inadequately reserved	Threatened and inadequately reserved	1
OAQ	Water, sea	-	-	-
OSM	Sand, mud	-	-	1

\* - Refer to mid and high level assessments for descriptions of the condition levels.

<sup>97</sup> As per Tasveg 2.0 Vegetation Classification System, DPIPW

<sup>98</sup> Nature Conservation Act 2002

<sup>99</sup> FCF 2007. Note there is no recent analysis of reservation status of non forest communities

### 15.5.4 Threatened Flora & Fauna

Two threatened fauna species listed under either the Tasmanian *Threatened Species Protection Act 1995* (TSPA) or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBCA) have been previously recorded within the study area<sup>100</sup>. No threatened flora species have been recorded. No additional threatened flora or fauna species were recorded during the current survey. All species of conservation significance recorded within the study area are listed below:

- swift parrot (*Lathamus discolor*) (e/EN)
- wedge-tailed eagle (*Aquila audax ssp. fleayi*) (e/EN)

### 15.5.5 Threatened Fauna Habitat

An estimated 60% of the study area is habitat that is potentially suitable for threatened fauna. Thirteen threatened fauna species are known to use the habitat types that are present within the study area. An additional fourteen species listed under the JAMBA and CAMBA<sup>101</sup> migratory bird agreements also have potential habitat within the study area. Details of the species of threatened fauna and migratory birds that may occur at Yarmouth Creek and their preferred habitats are in Appendix 1. The habitats within the study area that are preferred by at least one threatened fauna species include;

- *Acacia longifolia* coastal scrub (SAC)
- *Eucalyptus globulus* dry forest and woodland (DGL)
- *Eucalyptus sieberi* forest and woodland not on granite substrates (DSO)
- *Melaleuca ericifolia* swamp forest (NME)
- Saline sedgeland/grassland (ARS)
- Sand, mud (OSM)

### 15.6 Weeds

Weeds are common within the study area, but aside from marram grass in the dunes were scattered and in relatively low numbers. Nine declared or environmental weed species were recorded within the study area. “Declared” weed species are listed on the schedules of the *Tasmanian Weed Management Act 1999*. All declared and environmental weed species recorded within the study area are listed below:

- blackberry (*Rubus fruticosus*) - Declared
- montpellier broom (*Genista monspessulana*) - Declared
- dolichos pea (*Dipogon lignosus*) - Environmental
- gazania (*Gazania linearis*) - Environmental
- spanish heath (*Erica lusitanica*) - Declared

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<sup>100</sup> Natural Values Atlas, DPIPW

<sup>101</sup> Japan Australia Migratory Bird Agreement (1974) and China Australia Migratory Bird Agreement (1986)

- marram grass (*Ammophila arenaria*) - Environmental
- myrtle-leaf milk wort (*Polygala myrtifolia*) - Environmental
- radiata pine (*Pinus radiata*) - Environmental
- trailing african daisy (*Osteospermum fruticosum*) - Environmental

### **15.7 Threats**

The key threats identified include;

- Additional catchment development
- Additional urban development
- Constriction of mouth through dune growth
- Increased sediment input from land clearing
- Lack of inflow due to water extractions/ damming
- Weeds
- Rubbish

### **15.8 First Aid**

Suggested first aid actions, listed in priority order, include the following;

1. Restrict further urban development within wetland buffer and upstream catchment.
2. Maintain/ improve buffers between development in lower catchment and wetland.
3. Implement weed control program and educate local residents on garden escapes.
4. Undertake educational activities with local residents.
5. Install an information/education sign in adjacent park.
6. Remove rubbish from wetland.



## 16 Seymour Swamp (#17)

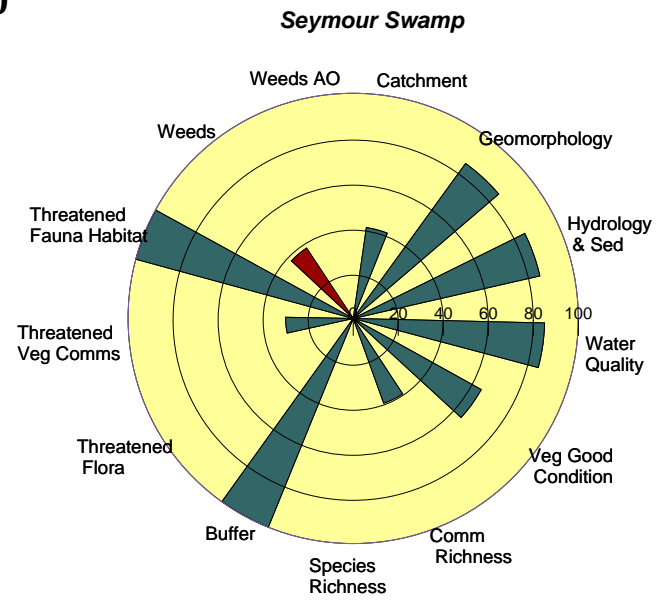


Photo 16.21. Seymour Swamp looking east across wetland



Photo 16.2. Google Earth aerial photo of Seymour Swamp study area.



### **16.1 Geomorphology**

Seymour Swamp is an artificially created wetland which resulted from the excavation of clay in the mid to late 1800s. It is situated in the centre of Long Point, a bedrock point with inland dunes. Long Point is listed on the geo-conservation data base as a feature of regional significance and high sensitivity due to the presence of an active headland bypass dune field system with older stabilised beach ridges. Seymour Swamp is located within the dune field approximately 0.5 km from the northern or southern coast of the point. The swamp is bounded by well vegetated gently sloping sandy slopes which were probably modified during excavation of the pit.

### **16.2 Hydrology and sediments**

Seymour Swamp has a small catchment and no inflowing surface drainage making direct precipitation and shallow groundwater movements the primary inflows. The (likely) presence of clay at depth suggests that the swamp could be a perched lake, with limited connection to regional groundwater. The swamp loses water through evaporation and possibly groundwater movement. It does not appear to be affected by tidal movements.

The bed of the lagoon consisted of highly organic rich material with a strong sulphide smell and are potentially acid forming (Gurung, 2001). Sand was generally absent from the top 20 cm of sediments indicating that Aeolian sand inputs are limited, probably due to the well vegetated (stable) nature of the adjacent dunes.

### **16.3 Water quality**

The water in Seymour Swamp is fresh, dark, organic rich and has low turbidity. Following a period of high rainfall salinity in the lagoon was 0.8 ppt, presumably due to marine aerosols entering via wind and rainfall. Based on the high organic content of the nutrients, nutrient recycling within the swamp is probably an important water quality process.

### **16.4 Geomorphology, hydrology and water quality condition**

The condition of Seymour Swamp compared to natural is poor due to the artificial nature of the geomorphology and hydrology of the swamp. It is also located within a larger catchment which has poor condition due to extensive agricultural development. If the highly modified nature of Seymour Swamp is accepted as the baseline, then the condition of Seymour Swamp is good as its processes are similar to natural lagoons operating in similar settings. The condition rose is based on accepting the modified nature of the swamp and not applying the CFEV results except for Catchment condition. The geomorphology, hydrology and water quality criteria are based on comparing the swamp with other natural small natural lagoons, such as Windmill.



Figure 16.3. Left - General view of swamp.

Figure 16.4. Right - Organic rich sediments.

## 16.5 Flora and Fauna

### 16.5.1 Overview

The Seymour Swamp study area covers approximately 17.2 hectares (including a 100m buffer), with an estimated 100% of the buffer area being native vegetation communities. A total of five native vegetation communities were recorded, covering a variety of habitats including swamp forest, coastal scrub, coastal heathland, sedgeland, grassland and fresh water aquatic habitats.



Figure 16.5. Fresh water aquatic sedgeland and rushland (ASF) and Water, sea (OAQ).

### 16.5.2 Vegetation Condition

The condition of the study area was good overall, with an estimated 65% being at Condition Level 1. This condition level is characterised by no or very low levels of weed invasion, with the vegetation being structurally and floristically intact. The remaining 35% was in an average condition due to weed invasion.

### 16.5.3 Vegetation Community Richness

Six vegetation communities were recorded in the study area, with all six being native. Of the native vegetation communities recorded two are considered to be threatened under the Tasmanian *Nature Conservation Act 2002*. Full details of vegetation communities recorded, their threatened status and their condition is provided below in Table 16.1.

**Table 16.1 – Vegetation Communities recorded in the study area, including their conservation priority, reservation status and condition.**

Veg Code <sup>102</sup>	Vegetation Community Description	State-wide Conservation Priority and Reservation Status <sup>103 104</sup>	Bioregional Conservation Priority and Reservation Status <sup>2 3</sup>	Condition*
ASF	Fresh water aquatic sedgeland and rushland	Threatened and inadequately reserved	Threatened and inadequately reserved	1
GHC	Coastal grass and herbfield	Not threatened	Not threatened	1
NME	<i>Melaleuca ericifolia</i> swamp forest	Threatened and inadequately reserved	Threatened and inadequately reserved	1
OAQ	Water, sea	-	-	-
SAC	<i>Acacia longifolia</i> coastal scrub	Not threatened	Not threatened	3
SCH	Coastal heathland	Not threatened	Not threatened	3

\* - Refer to mid and high level assessments for descriptions of the condition levels.

### 16.5.4 Threatened Flora & Fauna

One threatened fauna species listed under either the Tasmanian *Threatened Species Protection Act 1995* (TSPA) or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBCA) has been previously recorded within the study area<sup>105</sup>. No threatened flora species have been recorded. No additional threatened flora or fauna species were recorded during the current survey. All species of conservation significance recorded within the study area are listed below:

- wedge-tailed eagle (*Aquila audax* ssp. *fleayi*) (e/EN)

### 16.5.5 Threatened Fauna Habitat

An estimated 100% of the study area is habitat that is potentially suitable for threatened fauna. Nine threatened fauna species are known to use the habitat types that are present within the study area. An additional three species listed under the JAMBA and CAMBA<sup>106</sup> migratory

<sup>102</sup> As per Tasveg 2.0 Vegetation Classification System, DPIPWE

<sup>103</sup> Nature Conservation Act 2002

<sup>104</sup> FCF 2007. Note there is no recent analysis of reservation status of non forest communities

<sup>105</sup> Natural Values Atlas, DPIPWE

<sup>106</sup> Japan Australia Migratory Bird Agreement (1974) and China Australia Migratory Bird Agreement (1986)

bird agreements also have potential habitat within the study area. Details of the species of threatened fauna and migratory birds that may occur at Seymour Swamp and their preferred habitats are in Appendix 1. The habitats within the study area that are preferred by at least one threatened fauna species include;

- *Acacia longifolia* coastal scrub (SAC)
- Coastal grass and herbfield (GHC)
- Coastal heathland (SCH)
- Fresh water aquatic sedgeland and rushland (ASF)
- *Melaleuca ericifolia* swamp forest (NME)
- Water, sea (OAQ)

### 16.6 Weeds

Weeds are common in patches within the study area, and are relatively abundant within those patches. Three declared or environmental weed species were recorded within the study area. “Declared” weed species are listed on the schedules of the *Tasmanian Weed Management Act 1999*. All declared and environmental weed species recorded within the study area are listed below:

- blackberry (*Rubus fruticosus*) - Declared
- gorse (*Ulex europaeus*) - Declared
- marram grass (*Ammophila arenaria*) - Environmental

### 16.7 Threats

The key threats identified include;

- increasing nutrient inputs is a potential threat to water quality due to the proximity of agricultural lands and lack of surface outflow
- modification of the hydrology of the system through the creation of an inflow channel could increase sedimentation and alter the organic rich nature of the underlying sediments
- Weeds

### 16.8 First Aid

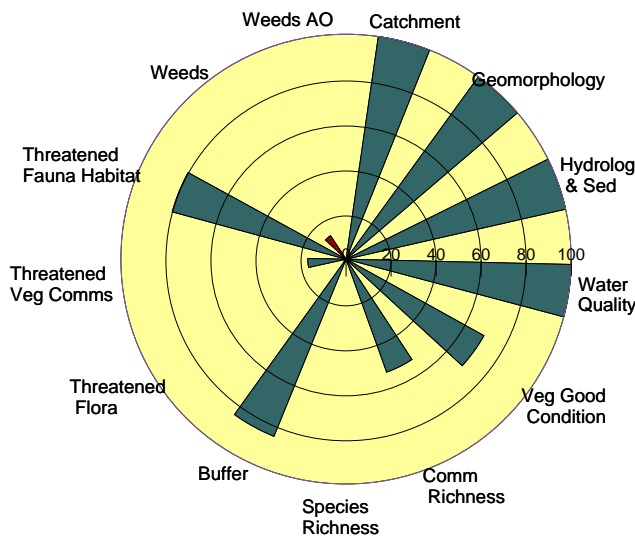
Suggested first aid actions, listed in priority order, include the following;

1. Implement weed control program.

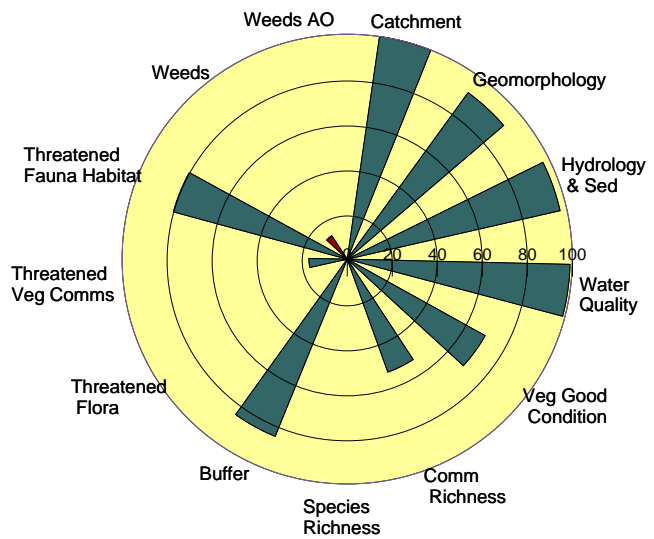


## 17 St Helens Point – other lagoons (#19)

**St Helens Point - Northern Lagoons**



**St Helens Point - Southern Lagoons**



**Photo 17.1. Google Earth aerial photo of St Helens Point study area showing the northern and southern**



**Photo 17.2. Left - St Helens Point North. Photo 17.3. Right - St Helens Point South.**

### **17.1 Geomorphology**

Four small water bodies are situated on St Helens Point north of Moriarty Lagoon. The two 'southern' lagoons are located about 1 km north of Moriarty and are bounded on the east by the vegetated stable coastal dunes. The western boundary of the lagoons is created by a sandy ridge underlain by granitic bedrock which also creates the narrow mouth of Georges Bay. The basins contain organic rich soils (swamp deposits) derived from local material. Similar to the nearby larger Moriarty Lagoon system, the predominant geomorphic processes operating in these lagoons are aeolian inputs and the generation and deposition of organic matter within the basin.

The northern two lagoons are shallow depressions situated within the eastern mobile younger coastal dunes. The depressions are only sparsely vegetated and no soil has developed on the beach sands. Geomorphic processes acting on the small depressions include winds, groundwater inflow through the dunes, and possibly tidal movements and storm surges. Due to the lack of overlying soils and vegetation, the land forms have low resistance to change and are naturally dynamic.

### **17.2 Hydrology & sediments**

The southernmost lagoon has no channelized surface inflow or outflow, so rainfall, evaporation and groundwater exchange are the predominant hydrologic processes. Once inundated, it is likely that the lagoons take an extended period to evaporate or drain. The second of the 'southern' lagoons has a surface channel entering from the southeast, and an outflow discharging to Georges Bay through a low-lying marshy area. It is unknown if these channels are natural or associated with historic land uses; the inflowing channel may have been established to drain neighbouring land, and the outflow to control water levels within the lagoon.

The hydrology of the northern two lagoons consists of precipitation and ground water inflow, with water levels probably tidally controlled. There are no channels entering or exiting the depressions, and water loss is through evaporation and groundwater movement. Due to the high permeability of the underlying sands, any water within the hollows probably drains quickly. On the day of investigation the base of the lagoons was wet but there was no standing water in spite of high rainfall in the preceding days.

The sediments upon which the southern lagoons are located are sulphide rich and have been identified as potentially acid forming (Gurung, 2001).

### **17.3 Water quality**

All four lagoons are within the St Helens Conservation Area and have minimal catchment disturbance (with the exception of the possible hydrologic alterations described above). The water in the southern lagoons would be expected to be fresh, acidic, organic-rich and of high quality similar to the Moriarty & Windmill Lagoons. The water in the northern lagoons, when present, would be expected to have low organic content and higher salinity, due to their proximity to the coast.

## 17.4 Condition

The northern lagoons are considered to be in near natural condition, with the presence of marram grass the only modification to the system. The southern lagoons are slightly more modified (assuming the channels entering and exiting the lagoon are not natural) but overall still in very good condition.



Photo 22. Left - Northern most lagoon occupies damp area at base of vegetated dune.

Photo 23. Right - Coastal dune setting of northern lagoons.

## 17.5 Flora and Fauna

### 17.5.1 Overview

The St Helens Point (other lagoons) study area covers approximately 30.4 hectares (including a 100m buffer), with an estimated 85% of the buffer area being native vegetation communities. A total of eight native vegetation communities were recorded, covering a variety of habitats including forest and woodland, swamp forest, coastal scrub, coastal heathland, sedgeland, grassland, sand/mud and fresh water aquatic habitats.



Photo 245. Left - St Helens Point southern lagoons (northern lagoon).

Photo 256. Right - St Helens Point southern lagoons (southern lagoon).

### 17.5.2 Vegetation Condition

The condition of the study area was good overall, with an estimated 70% being at Condition Level 1. This condition level is characterised by no or very low levels of weed invasion, with the vegetation being structurally and floristically intact. The remaining 30% was in an average condition due to marram grass invasion.

### 17.5.3 Vegetation Community Richness

Ten vegetation communities were recorded in the study area, with eight being native. Of the native vegetation communities recorded two are considered to be threatened under the Tasmanian *Nature Conservation Act 2002*. Full details of vegetation communities recorded, their threatened status and their condition is provided below in Table 17.1.

**Table 17.1 – Vegetation Communities recorded in the study area, including their conservation priority, reservation status and condition.**

Veg Code <sup>107</sup>	Vegetation Community Description	State-wide Conservation Priority and Reservation Status <sup>108 109</sup>	Bioregional Conservation Priority and Reservation Status <sup>2 3</sup>	Condition*
ASF	<i>Fresh water aquatic sedgeland and rushland</i>	Threatened and inadequately reserved	Threatened and inadequately reserved	1
DAC	<i>Eucalyptus amygdalina</i> coastal forest and woodland	Not threatened	Not threatened	1
FMG	Marram grassland	-	-	4
FUM	Extra-urban miscellaneous	-	-	4
NAV	<i>Allocasuarina verticillata</i> forest	Not threatened	Not threatened	1
NME	<i>Melaleuca ericifolia</i> swamp forest	Threatened and inadequately reserved	Threatened and inadequately reserved	1
OSM	Sand, mud	-	-	1
SAC	<i>Acacia longifolia</i> coastal scrub	Not threatened	Not threatened	3
SCH	Coastal heathland	Not threatened	Not threatened	1
SSC	Coastal scrub	Not threatened	Not threatened	1

\* - Refer to mid and high level assessments for descriptions of the condition levels.

### 17.5.4 Threatened Flora & Fauna

One threatened flora species listed under either the Tasmanian *Threatened Species Protection Act 1995* (TSPA) or the Commonwealth *Environment Protection and Biodiversity*

<sup>107</sup> As per Tasveg 2.0 Vegetation Classification System, DPIPW

<sup>108</sup> Nature Conservation Act 2002

<sup>109</sup> FCF 2007. Note there is no recent analysis of reservation status of non forest communities

*Conservation Act 1999* (EPBCA) has been previously recorded within the study area<sup>110</sup>. No threatened fauna species has been recorded. No additional threatened flora or fauna species were recorded during the current survey. All species of conservation significance recorded within the study area are listed below:

- *Villarsia exaltata* (erect marshflower) (r/-)

#### **17.5.5 Threatened Fauna Habitat**

An estimated 80% of the study area is habitat that is potentially suitable for threatened fauna. Ten threatened fauna species are known to use the habitat types that are present within the study area. An additional 14 species listed under the JAMBA and CAMBA<sup>111</sup> migratory bird agreements also have potential habitat within the study area. Details of the species of threatened fauna and migratory birds that may occur at the St Helens Point (other lagoons) study area and their preferred habitats are in Appendix 1. The habitats within the study area that are preferred by at least one threatened fauna species include;

- *Acacia longifolia* coastal scrub (SAC)
- Coastal heathland (SCH)
- Coastal scrub (SSC)
- *Eucalyptus amygdalina* coastal forest and woodland (DAC)
- Fresh water aquatic sedgeland and rushland (ASF)
- *Melaleuca ericifolia* swamp forest (NME)
- Sand, mud (OSM)

#### **17.6 Weeds**

One environmental weed species - marram grass was recorded within the study area. Marram grass was common in the *Acacia longifolia* coastal scrub (SAC), and in some of the Sand, mud (OSM) within the study area, and it is relatively abundant within patches in these areas. All declared and environmental weed species recorded within the study area are listed below:

- marram grass (*Ammophila arenaria*) - Environmental

#### **17.7 Threats**

For the southern lagoons, the key threats identified include;

- Alteration to the hydrology of the systems through the creation of channels, either intentionally or through vehicular access;
- Increased nutrient input leading to a deterioration in water quality
- Draining and exposing potentially acid sulphate soils
- Weeds (marram grass)

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<sup>110</sup> Natural Values Atlas, DPIPW

<sup>111</sup> Japan Australia Migratory Bird Agreement (1974) and China Australia Migratory Bird Agreement (1986)



- Phytophthora
- Urban development

For the northern lagoons, the key threats identified include;

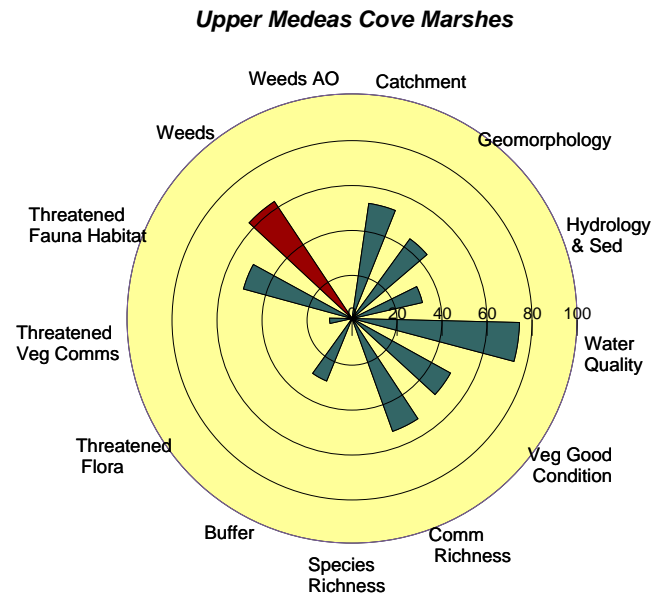
- Disruption of the active dune processes which lead to the creation of dune lakes
- Alteration of the dune structure through erosion (vehicles, dune buggies, sand mining etc)
- Off road vehicle access
- Weeds (marram grass)

### **17.8 First Aid**

Suggested first aid actions, listed in priority order, include the following;

1. Ensure no further development of the St Helens Conservation Area occurs.
2. Prevent off-road vehicle access to beaches and dunes.
3. Undertake educational activities with local residents.
4. Install an information/education sign at strategic locations.
5. Implement weed control program and educate local residents on garden escapes.

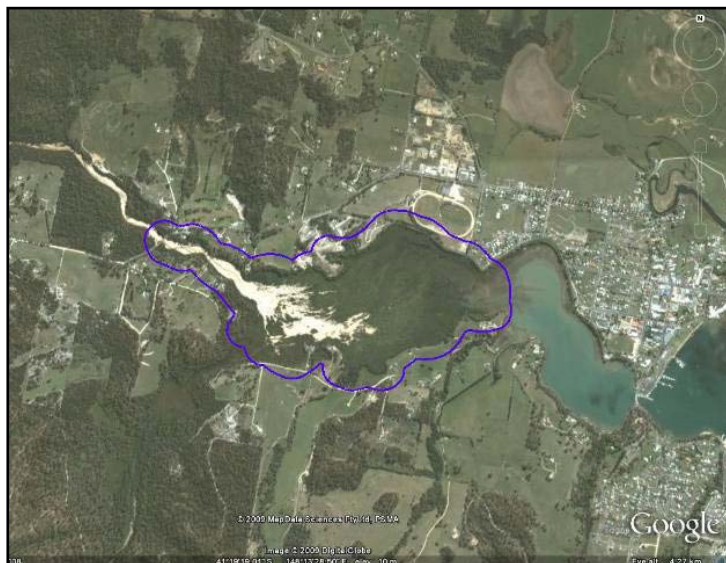
## 18 Upper Medeas Cove Marshes (#22)



**Photo 18.26.** Upper Medeas Cove Marshes looking east down river channel.



**Photo 18.2.** Google Earth aerial photo of Upper Medeas Cove Marshes study area.



### **18.1 Geomorphology & Hydrology**

Upper Medeas Cove Marshes lies at the upstream end of Georges Bay and receives tidally controlled marine input and freshwater inflow. The location of the basin at the upstream end of the estuary is a natural area of deposition, trapping material transported upstream by the tide, and downstream by the Golden Fleece Rivulet and Constable Creek. The catchment feeding the cove has an area of about 43 km<sup>2</sup> and is situated between the larger Georges River to the north and Scamander River to the south. The catchment contains low rolling granitic hills in the upper catchment and a relict erosional surface in the lower catchment, which is dissected by Golden Fleece Rivulet. The upper catchment is forested, with the lower catchment largely cleared for agriculture and residential uses. The area adjacent to the cove has also been cleared and is a residential/ urban area.

The presence of stanniferous-rich gravels on the erosional surface lead to extensive alluvial mining in the catchment beginning in the late 1800s. Large volumes of mining waste, composed of sands and gravels, was discharge directly to the river. Mining waste continues to be transported through the system, and additional sediment is derived from the ongoing erosion of historical mining areas.

The transport of gravels down the creeks is episodic, corresponding to infrequent high flow events in the catchment. The coarse sediment is deposited where the creeks enter Upper Medeas Cove, and the gravels and sands have substantially infilled Upper Medeas Cove. Vegetation has stabilised some areas of the sediments away from the active channel, which continues to transport and re-work material through a deltaic area at the upstream end of the cove. A delta composed of finer-grained material has also developed at the downstream end of the cove, indicating that at least some of the time there is sufficient downstream flow energy to transport fine material out of the cove.

Infilling has substantially altered the sediment and hydrological regimes of the cove, by reducing the volume of the cove and leading to the channelization of water through the gravel deposits.

### **18.2 Water quality**

Water quality in Medeas Cove is governed by the mixing of estuarine and river waters and direct runoff from the surrounding area. Salinity would vary through time depending on the relative input of each source. Following a large rainfall event, most of the cove would likely be fresh, with tidal inflows restricted by the river flow. During dry periods, salinity in the cove is higher. Following a high flow event, the water in Golden Fleece Rivulet was fresh (salinity = 0) and acidic (pH 5.6) with very low turbidity.

Catchment activities in Georges Bay and the river catchment will affect water quality in Medeas Cove. Storm water runoff from the surrounding developed area and high sediment input of historic mining sediments are likely to pose the highest risk to water quality in the cove.

### 18.3 Condition

Due to the highly altered state of the geomorphology and hydrology of the Cove, and extensive land clearing and residential/ urban activities in the catchment the CFEV ratings are quite low. The field observations are consistent with these values, however water quality appeared better than the CFEV values. This may be due to the field visit following a very large rainfall event. In the absence of other information, the CFEV values are presented on the condition rose.



Photo 18.3. Left - Upstream end of Upper Medeas Cove with graded stream reworking historic mining sediments.

Photo 18.4 Right - Middle of Upper Medeas Cove where river enters vegetated area.

### 18.4 Flora and Fauna

#### 18.4.1 Overview

The Upper Medeas Cove Marshes study area covers approximately 138.2 hectares (including a 100m buffer), with an estimated 65% of the buffer area being native vegetation communities. A total of eight native vegetation communities were recorded, covering a variety of habitats including forest and woodland, swamp forest, scrub, heathland, sedgeland, sand/mud and saline and fresh water aquatic habitats.



Photo 18.3. Left - Saline sedgeland/rushland (ARS).

Photo 18.4 Right - Golden Fleece Rivulet sandy channel bounded by forest and woodland communities.

### 18.4.2 Vegetation Condition

The condition of the study area was average overall, with an estimated 50% being at Condition Level 1. This condition level is characterised by no or very low levels of weed invasion, with the vegetation being structurally and floristically intact. The remaining 50% was in an average condition due to weed invasion and urban and agricultural development.

### 18.4.3 Vegetation Community Richness

Eleven vegetation communities were recorded in the study area, with eight being native. Of the native vegetation communities recorded three are considered to be threatened under the Tasmanian *Nature Conservation Act 2002*. Full details of vegetation communities recorded, their threatened status and their condition is provided below in Table 18.1.

**Table 18.1 – Vegetation Communities recorded in the study area, including their conservation priority, reservation status and condition.**

Veg Code <sup>112</sup>	Vegetation Community Description	State-wide Conservation Priority and Reservation Status <sup>113, 114</sup>	Bioregional Conservation Priority and Reservation Status <sup>2, 3</sup>	Condition*
AHF	Fresh water aquatic herbland	Threatened and inadequately reserved	Threatened and inadequately reserved	2
ARS	Saline sedgeland/rushland	Not threatened	Not threatened	1
DVC	<i>Eucalyptus viminalis</i> - <i>Eucalyptus globulus</i> coastal forest and woodland	Threatened and inadequately reserved	Threatened and inadequately reserved	3
FAG	Agricultural land	-	-	4
FUM	Extra-urban miscellaneous	-	-	4
FUR	Urban areas	-	-	4
NME	<i>Melaleuca ericifolia</i> swamp forest	Threatened and inadequately reserved	Threatened and inadequately reserved	2
OAQ	Water, sea	-	-	-
OSM	Sand, mud	-	-	1
SHW	Wet heathland	Not threatened	Not threatened	2
SMR	<i>Melaleuca squarrosa</i> scrub	Not threatened	Not threatened	2

\* - Refer to mid and high level assessments for descriptions of the condition levels.

<sup>112</sup> As per Tasveg 2.0 Vegetation Classification System, DPIPWE

<sup>113</sup> Nature Conservation Act 2002

<sup>114</sup> FCF 2007. Note there is no recent analysis of reservation status of non forest communities



#### 18.4.4 Threatened Flora & Fauna

Two threatened flora species listed under either the Tasmanian *Threatened Species Protection Act 1995* (TSPA) or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBCA) have been previously recorded within the study area<sup>115</sup>. No threatened fauna species have been recorded. No additional threatened flora or fauna species were recorded during the current survey. All species of conservation significance recorded within the study area are listed below:

- *Utricularia australis* (yellow bladderwort) (r/-)
- *Orthoceras strictum* (horned orchid) (r/-)

#### 18.4.5 Threatened Fauna Habitat

An estimated 50% of the study area is habitat that is potentially suitable for threatened fauna. Twelve threatened fauna species are known to use the habitat types that are present within the study area. An additional five species listed under the JAMBA and CAMBA<sup>116</sup> migratory bird agreements also have potential habitat within the study area. Details of the species of threatened fauna and migratory birds that may occur at the Upper Medeas Cove Marshes and their preferred habitats are in Appendix 1. The habitats within the study area that are preferred by at least one threatened fauna species include;

- *Eucalyptus viminalis* - *Eucalyptus globulus* coastal forest and woodland (DVC)
- Fresh water aquatic herbland (AHF)
- *Melaleuca ericifolia* swamp forest (NME)
- Saline sedgeland/grassland (ARS)
- Sand, mud (OSM)
- Wet heathland (SHW)

#### 18.5 Weeds

Weeds are common in patches, particularly on the edges of the study area and are relatively abundant within those patches. Five declared or environmental weed species were recorded within the study area. “Declared” weed species are listed on the schedules of the *Tasmanian Weed Management Act 1999*. All declared and environmental weed species recorded within the study area are listed below:

- blackberry (*Rubus fruticosus*) - Declared
- blue periwinkle (*Vinca major*) - Environmental
- montpellier broom (*Genista monspessulana*) - Declared
- spanish heath (*Erica lusitanica*)- Declared
- trailing african daisy (*Osteospermum fruticosum*) - Environmental

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<sup>115</sup> Natural Values Atlas, DPIPWE

<sup>116</sup> Japan Australia Migratory Bird Agreement (1974) and China Australia Migratory Bird Agreement (1986)

## **18.6 Threats**

The key threats identified include;

- Catchment activities leading to increased nutrient or sediment input or reduced river flow will affect the Cove
- Increased nutrient and pollutant runoff from surrounding developed area and river catchment
- Any threat to water quality in Georges Bay has the potential to affect Upper Medeas Cove
- Weeds
- Rabbits
- Rubbish dumping, particularly off the edge of the cove
- Grazing into native vegetation and marsh areas
- Urban development

## **18.7 First Aid**

Suggested first aid actions, listed in priority order, include the following;

1. Minimise catchment inputs in order to optimise water quality in the highly modified environment.
2. Restrict further urban development within wetland buffer and upstream catchment.
3. Undertake educational activities with local residents.
4. Implement weed control program and educate local residents on garden escapes.
5. Remove rubbish from wetland edge.
6. Install an information/education sign in strategic location in St Helens.
7. Monitor rabbit numbers around cove and if necessary implement control program with surrounding landholders.

## 19 Onion Creek (#23) & St Helens Point (other) (#19)

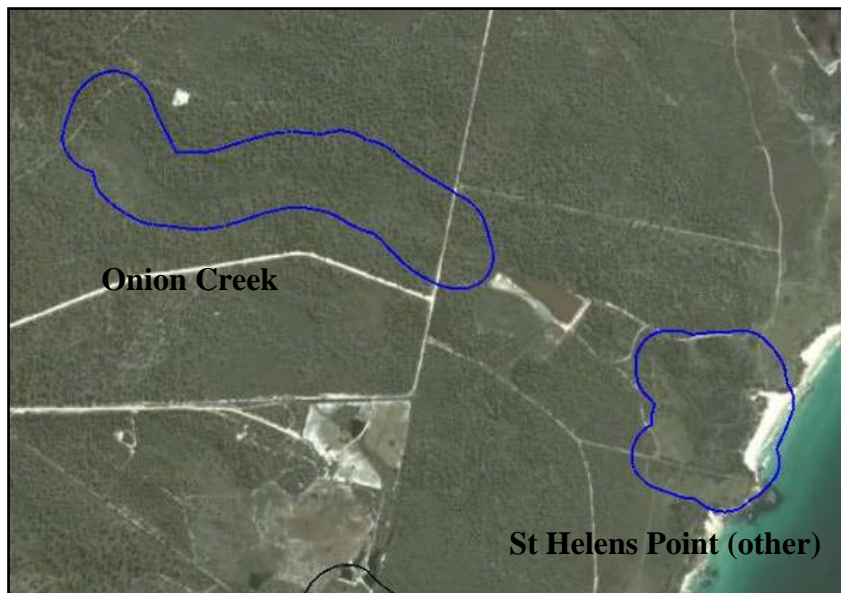
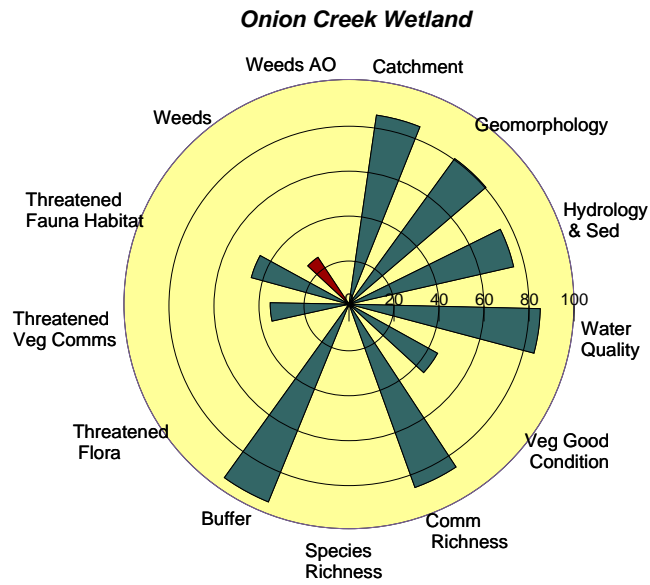


Photo 19.2. Google Earth aerial photo of Onion Creek & St Helens Point (other) study



Photo 19.3. Left - Onion Creek. Photo 19.4 Right - St Helens Point (other) wetland mouth.

### **19.1 Geomorphology – setting & processes**

The Onion Creek catchment lies to the west of Georges Bay and extends from the coast to Brooks Hill, near the Tasman Highway. This short, low lying catchment contains three wetland areas as shown on the 1:25,000 Tasmania Series map, with the upstream and downstream ones outlined in the Google Earth image. There are few tributaries in the catchment, with the porous Tertiary sediment underlying much of the catchment promoting infiltration rather than run-off.

The lower catchment is geologically and geomorphologically interesting, with the headlands north and south of Onion Creek consisting of Ordovician mudstones in which extensive folding is exposed. Thus Diana's Basin folds are considered a geo-conservation feature of world significance. Between the headlands, the river cuts through a block of Devonian granodiorite, which forms the bluff on the north side of the river. The most downstream wetland lies within this bedrock area. The same granodiorite is present in the upper catchment, forming the hills. The upstream wetlands occupy a flat-lying area underlain by Tertiary sediments of non-marine origin.

The beach at the mouth of Onion Creek is narrow, and although the fore dunes have been modified by marram grass, they remain relatively 'natural' with respect to form and function.

### **19.2 Hydrology and sediments**

The hydrology of the catchment has been modified through the damming of the intermediate wetland within the catchment, as evident in the Google Earth image. The area around the dam also appears to have been partially cleared. The water in the dam looks turbid in the image, which may be attributable to disturbance of the underlying sediments. There are numerous unpaved tracks in the catchment, but given the low gradient it is unlikely runoff from the tracks would contribute much sediment to the wetlands. The granitic and low lying sedimentary nature of the catchment provides a low rate of natural sedimentation to the catchment, so sediments within the wetland would be expected to be dominated by locally derived organic matter, similar to the other wetlands on St Helens Point.

### **19.3 Water quality**

The water in the Onion Creek wetlands is presumed to be fresh, possibly with elevated conductivity due to contributions from marine aerosols. Water quality in Onion Creek would be expected to be good upstream of dam. Downstream of the dam water quality may be altered through changes in turbidity, temperature and / or nutrient levels.

### **19.4 Condition**

The ratings reflect the undisturbed nature of the catchment with the exception of hydrology, which reflects the significant impact due to damming.

## 19.5 Flora and Fauna

### 19.5.1 Overview

The Onion Creek and lower St Helens Point wetland study area covers approximately 71.2 hectares (including a 100m buffer), with an estimated 95% of the buffer area being native vegetation communities. A total of 13 native vegetation communities were recorded, covering a variety of habitats including forest and woodland, swamp forest, scrub, coastal scrub, heathland, rock, sand/mud and saline and fresh water aquatic habitats.

### 19.5.2 Vegetation Condition

The condition of the study area was very good overall, with an estimated 45% being at Condition Level 1. This condition level is characterised by no or very low levels of weed invasion, with the vegetation being structurally and floristically intact. The remaining 55% was in an average to good condition due to weed invasion and structural damage to the vegetation.

### 19.5.3 Vegetation Community Richness

Fifteen vegetation communities were recorded in the study area, with 13 being native. Of the native vegetation communities recorded four are considered to be threatened under the Tasmanian *Nature Conservation Act 2002*. Full details of vegetation communities recorded, their threatened status and their condition is provided below in Table 19.1.

**Table 19.1 – Vegetation Communities recorded in the study area, including their conservation priority, reservation status and condition.**

Veg Code <sup>117</sup>	Vegetation Community Description	State-wide Conservation Priority and Reservation Status <sup>118, 119</sup>	Bioregional Conservation Priority and Reservation Status <sup>2, 3</sup>	Condition*
AWU	Wetland undifferentiated	Threatened and inadequately reserved	Threatened and inadequately reserved	1
DAC	<i>Eucalyptus amygdalina</i> coastal forest and woodland	Not threatened	Not threatened	1
DGL	<i>Eucalyptus globulus</i> dry forest and woodland	Threatened and inadequately reserved	Threatened and inadequately reserved	2
DOW	<i>Eucalyptus ovata</i> heathy woodland	Threatened and inadequately reserved	Threatened and inadequately reserved	1

<sup>117</sup> As per Tasveg 2.0 Vegetation Classification System, DPIPWE

<sup>118</sup> Nature Conservation Act 2002

<sup>119</sup> FCF 2007. Note there is no recent analysis of reservation status of non forest communities



Veg Code <sup>117</sup>	Vegetation Community Description	State-wide Conservation Priority and Reservation Status <sup>118 119</sup>	Bioregional Conservation Priority and Reservation Status <sup>2 3</sup>	Condition*
DSO	<i>Eucalyptus sieberi</i> forest and woodland not on granite substrates	Not threatened	Not threatened	1
FPF	<i>Pteridium esculentum</i> fernland	-	-	4
FRG	Regenerating cleared land	-	-	4
NAV	<i>Allocasuarina verticillata</i> forest	Not threatened	Not threatened	2
NME	<i>Melaleuca ericifolia</i> swamp forest	Threatened and inadequately reserved	Threatened and inadequately reserved	1
OAQ	Water, sea	-	-	-
ORO	Lichen lithosphere	-	-	1
OSM	Sand, mud	-	-	1
SAC	<i>Acacia longifolia</i> coastal scrub	Not threatened	Not threatened	3
SHW	Wet heathland	Not threatened	Not threatened	1
SSC	Coastal scrub	Not threatened	Not threatened	2

\* - Refer to mid and high level assessments for descriptions of the condition levels.

#### 19.5.4 Threatened Flora & Fauna

No threatened flora or fauna species listed under either the Tasmanian *Threatened Species Protection Act 1995* (TSPA) or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBCA) have been previously recorded within the study area<sup>120</sup>. No additional threatened flora or fauna species were recorded during the current survey.

#### 19.5.5 Threatened Fauna Habitat

An estimated 40% of the study area is habitat that is potentially suitable for threatened fauna. Thirteen threatened fauna species are known to use the habitat types that are present within the study area. An additional fourteen species listed under the JAMBA and CAMBA<sup>121</sup> migratory bird agreements also have potential habitat within the study area. Details of the species of threatened fauna and migratory birds that may occur at the Onion Creek and lower St Helens Point wetland and their preferred habitats are in Appendix 1. The habitats within the study area that are preferred by at least one threatened fauna species include;

- *Acacia longifolia* coastal scrub (SAC)
- Coastal scrub (SSC)

<sup>120</sup> Natural Values Atlas, DPIPW

<sup>121</sup> Japan Australia Migratory Bird Agreement (1974) and China Australia Migratory Bird Agreement (1986)

- *Eucalyptus amygdalina* coastal forest and woodland (DAC)
- *Eucalyptus globulus* dry forest and woodland (DGL)
- *Eucalyptus sieberi* forest and woodland not on granite substrates (DSO)
- *Melaleuca ericifolia* swamp forest (NME)
- Wet heathland (SHW)
- Sand, mud (OSM)

### 19.6 Weeds

Two declared or environmental weed species were recorded within the study area. “Declared” weed species are listed on the schedules of the *Tasmanian Weed Management Act 1999*. Marram grass was common in the *Acacia longifolia* coastal scrub (SAC), and spanish heath was common along tracks and in the disturbed areas within the lower St Helens Point wetland. All declared and environmental weed species recorded within the study area are listed below:

- marram grass (*Ammophila arenaria*) - Environmental
- spanish heath (*Erica lusitanica*)- Declared

### 19.7 Threats

The key threats identified include;

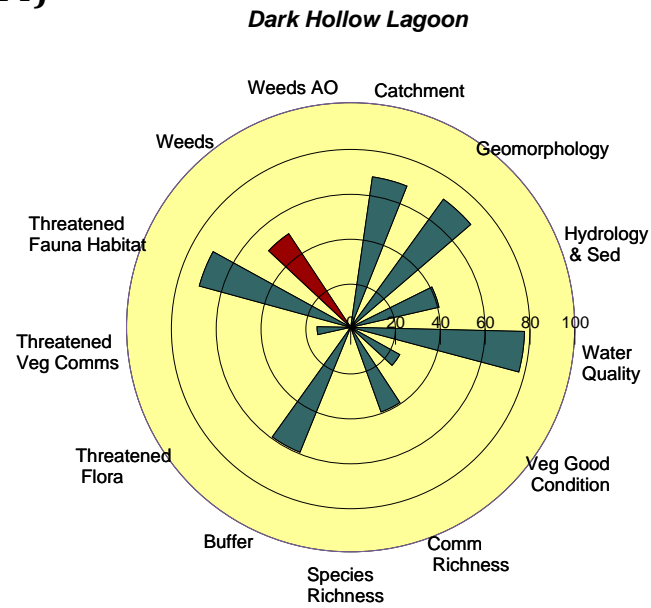
- Additional clearing of native vegetation
- Additional damming of the creek
- Weeds

### 19.8 First Aid

Suggested first aid actions, listed in priority order, include the following;

1. Catchment management to protect upstream wetland.
2. Restrict further urban development within wetland buffer and upstream catchment.
3. Implement weed control program.

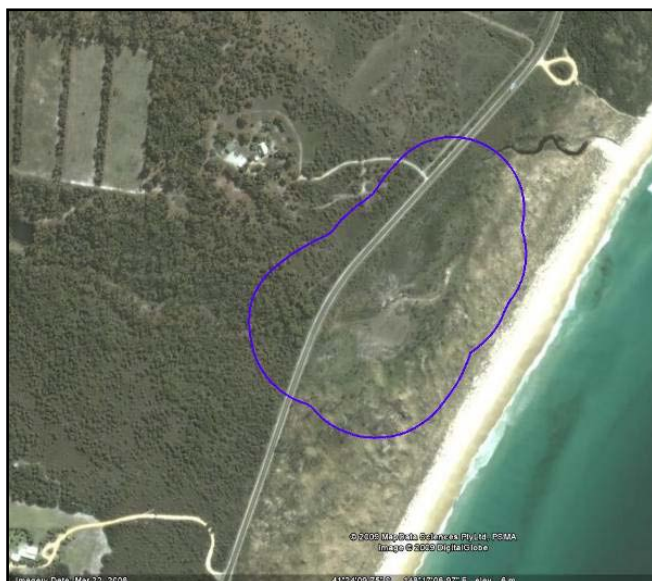
## 20 Dark Hollow Creek (#24)



**Photo 20.27.** Dark Hollow Creek looking east across wetland from Tasman Highway.



**Photo 20.2.** Google Earth aerial photo of Dark Hollow Creek study area.



## **20.1 Geomorphology**

Dark Hollow Lagoon is located behind the stable vegetated dunes parallel to the coast north of Scamander. The dunes have been significantly modified by the establishment of marram grass. The western side of the lagoon is bounded by the Tasman Highway embankment. The lagoon has episodic connection with the sea via a break in the dunes north of the main lagoon area. West of the highway, the water way which feeds the lagoon via under road culverts is a swampy, organic and fine-sediment trapping basin.

The lagoonal basin has a hummocky topography with discontinuous pools occupying lower areas. Soils have low levels of organic material downstream of the culverts due to the trapping of sediment upstream and flushing by sea water. Vegetation is widespread within the basin, indicating stability, and probably infilling. Due to fires in the recent past there is an abundance of woody debris on the slopes and within the pools of the lagoon. A small sediment delta has formed near the outflow of the culverts under the highway.

The natural cycle of the lagoon includes episodic connections with the sea following large rainfall events which increase water levels above the sand bar at the downstream end of the basin. This process has likely been altered by the establishment of marram grass on the dunes which would limit the area through which the lagoon can connect with the sea, and upstream modifications to flow due to the road embankment and catchment activities.

## **20.2 Hydrology & sediments**

The lagoon is fed by Dark Hollow Creek which flows through a narrow catchment extending approximately 3 km inland. The headwaters of Dark Hollow Creek have been modified by extensive forestry activities (clearing and plantations), which have likely altered the runoff and sediment characteristics of the creek.

Above the lagoon, hydrology and sediment transport is modified by the road embankment and culverts which promote sediment deposition on the upstream side of the highway and regulate the flow of water into the lagoon. The relative paucity of fine organic matter in the lagoon compared to other coastal lagoons in the area is probably attributable to the trapping of material upstream of the culverts. The culverts (and upstream vegetation) also limit the maximum flow and velocity which can be delivered to the lagoon during a flood event. This reduction in maximum inflows can over time affect the dynamics at the beach outlet.

Following floods, the lagoon 'breaks out' through the sand bar at the mouth, creating a link with the sea. At the time of field investigation, marine derived seaweed was present in the downstream end of the lagoon indicating that sea water had recently entered the lagoon. Between periods of lagoon breakout, the water outflow from the lagoon would be via groundwater seepage through the sandy soils and dunes.

## **20.3 Water quality**

The water in Dark Hollow Creek is clear, brown and organic rich. Surface water and shallow pools within the lagoon had salinities of ~1 ppt on the day investigated, but deeper waters (>1m) near the mouth had near marine salinities (29 ppt). These deeper waters are likely

associated with the recent lagoon breakout. pH values within the lagoon varied between 6.0 (fresh surface waters) to 7.5 in the saline waters.

## 20.4 Geomorphology, hydrology and water quality condition

The condition rose displays the geomorphology, hydrology and water quality ratings contained in CFEV, as these appear consistent with field observations and the desk top investigation.



**Photo 20.3 Left - Downstream view of lower 'pool' in Dark Hollow Lagoon. Note widespread presence of marram grass and other vegetation on dunes and in lagoon basin.**

**Photo 20.4 Right - Shallow large pool downstream of highway culverts. View looking east with dunes in background**



**Photo 20.5. Mouth of Dark Hollow Lagoon from beach showing seaweed deposition indicative of recent breakout.**

**Photo 20.6. Right - Mouth of Dark Hollow Lagoon looking towards sea. Note marram grass on both sides of opening.**

## 20.5 Flora and Fauna

### 20.5.1 Overview

The Dark Hollow Creek study area covers approximately 11.2 hectares (including a 100m buffer), with an estimated 60% of the buffer area being native vegetation communities. A total of six native vegetation communities were recorded, covering a variety of habitats including forest and woodland, scrub, sedgeland, grassland and saline aquatic habitats.



### 20.5.2 Vegetation Condition

The condition of the study area was poor overall, with an estimated 25% being at Condition Level 1. This condition level is characterised by no or very low levels of weed invasion, with the vegetation being structurally and floristically intact. The remaining 75% was in an poor to average condition due to weed invasion.

### 20.5.3 Vegetation Community Richness

Eight vegetation communities were recorded in the study area, with six being native. Of the native vegetation communities recorded two are considered to be threatened under the Tasmanian *Nature Conservation Act 2002*. Full details of vegetation communities recorded, their threatened status and their condition is provided below in Table 20.1.

**Table 20.1 – Vegetation Communities recorded in the study area, including their conservation priority, reservation status and condition.**

Veg Code <sup>122</sup>	Vegetation Community Description	State-wide Conservation Priority and Reservation Status <sup>123, 124</sup>	Bioregional Conservation Priority and Reservation Status <sup>2, 3</sup>	Condition*
ARS	Saline sedgeland/grassland	Not threatened	Not threatened	1
DOV	<i>Eucalyptus ovata</i> forest and woodland	Threatened and inadequately reserved	Threatened and inadequately reserved	2
DVC	<i>Eucalyptus viminalis</i> - <i>Eucalyptus globulus</i> coastal forest and woodland	Threatened and inadequately reserved	Threatened and inadequately reserved	2
FMG	Marram grassland	-	-	4
FUM	Extra-urban miscellaneous	-	-	4
GSL	Lowland grassy sedgeland	Not threatened	Not threatened	1
SSC	Coastal scrub	Not threatened	Not threatened	2
SMR	<i>Melaleuca squarrosa</i> scrub	Not threatened	Not threatened	2

\* - Refer to mid and high level assessments for descriptions of the condition levels.

### 20.5.4 Flora & Fauna

No threatened flora or fauna species listed under either the Tasmanian *Threatened Species Protection Act 1995* (TSPA) or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBCA) have been previously recorded within the study area<sup>125</sup>. No additional threatened flora or fauna species were recorded during the current survey.

<sup>122</sup> As per Tasveg 2.0 Vegetation Classification System, DPIPW

<sup>123</sup> Nature Conservation Act 2002

<sup>124</sup> FCF 2007. Note there is no recent analysis of reservation status of non forest communities

<sup>125</sup> Natural Values Atlas, DPIPW

### 20.5.5 Threatened Fauna Habitat

An estimated 70% of the study area is habitat that is potentially suitable for threatened fauna. Eight threatened fauna species are known to use the habitat types that are present within the study area. No species listed under the JAMBA and CAMBA<sup>126</sup> migratory bird agreements have potential habitat within the study area. Details of the species of threatened fauna and migratory birds that may occur at Dark Hollow Creek and their preferred habitats are in Appendix 1. The habitats within the study area that are preferred by at least one threatened fauna species include;

- Coastal scrub (SSC)
- *Eucalyptus ovata* forest and woodland (DOV)
- *Eucalyptus viminalis* - *Eucalyptus globulus* coastal forest and woodland (DVC)
- Lowland grassy sedgeland (GSL)
- Saline sedgeland/grassland (ARS)

### 20.6 Weeds

Weeds are common along the edge of the Tasman Highway, and marram grass was abundant in the coastal dunes. Four declared or environmental weed species were recorded within the study area. “Declared” weed species are listed on the schedules of the *Tasmanian Weed Management Act 1999*. All declared and environmental weed species recorded within the study area are listed below:

- blackberry (*Rubus fruticosus*) - Declared
- marram grass (*Ammophila arenaria*) - Environmental
- trailing african daisy (*Osteospermum fruticosum*) - Environmental
- watsonia (*Watsonia meriana*) - Environmental



Photo 20.7. Extensive marram grass in coastal dunes.

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<sup>126</sup> Japan Australia Migratory Bird Agreement (1974) and China Australia Migratory Bird Agreement (1986)

## **20.7 Threats**

The key threats identified include;

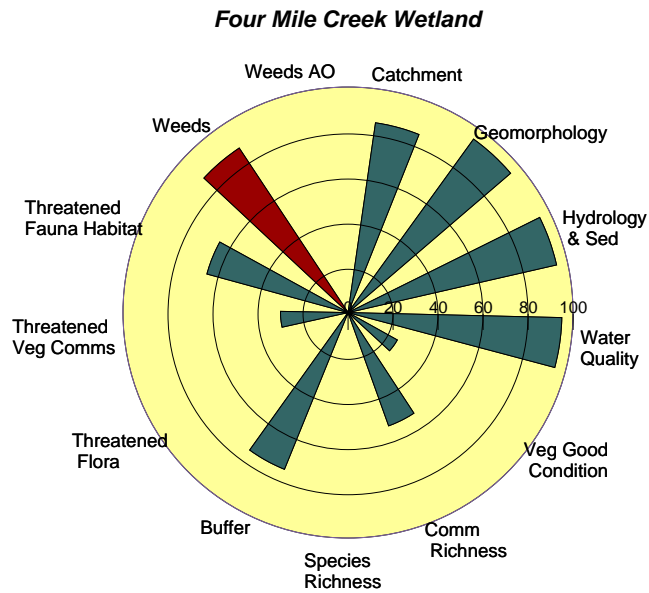
- Modification of the hydrology through impoundment of inflows, extractions, ongoing deposition or vegetation growth upstream of the culverts such that insufficient water enters the lagoon to create a 'break-out'.
- Establishment of marram grass such that the bar confining the lagoon increases in stability reducing the ability of the lagoon to break out following high rainfall events.
- Either of these threats would increase the risk of the basin becoming a stagnant depositional environment without any means of flushing accumulated material. During the investigation there appeared to be fewer signs of flood in Dark Hollow Lagoon as compared to other lagoons in the area suggesting the culverts and or catchment activities may be diminishing the impact of episodic flood events.
- Catchment activities which can affect water and sediment quality.
- Weeds
- Rabbits

## **20.8 First Aid**

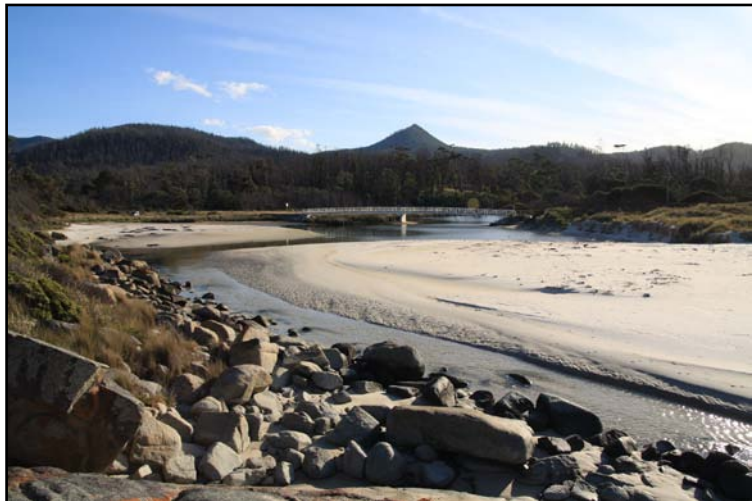
Suggested first aid actions, listed in priority order, include the following;

1. Improve water flow through the culverts by reducing vegetation upstream of the culverts.
2. General improvements to catchment activities to improve catchment water quality.
3. Ensure mouth of lagoon remains free of marram grass.
4. Implement weed control program.
5. Monitor rabbit numbers around creek and if necessary implement control program with surrounding landholders.

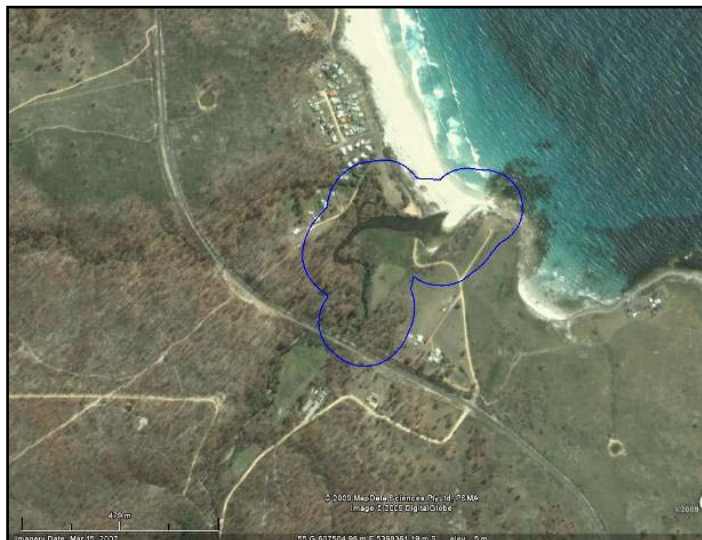
## 21 Four Mile Creek (#25)



**Photo 21.28.** Four Mile Creek looking west into wetland from mouth.



**Photo 21.2.** Google Earth aerial photo of Four Mile Creek study area.



### **21.1 Geomorphology – setting & processes**

The small Four Mile Creek wetland is located at the southern end of Four Mile Creek Beach, adjacent to the Burial Point Headland. The catchment feeding the wetland comprises two creeks, Four Mile Creek and the more northern Bantick Creek. The catchments are long, narrow and steep, and originate on Mount Elephant and St Patricks Head, respectively. The creeks have down cut through quartz rich volcanic rock, and the wetland occupies a small basin near the mouth of the river. The beach separating the wetland from the sea is narrow, and the dunes have been significantly modified by road and residential development. The coasts north and south of Four Mile Creek are within the Four Mile Creek Coastal Reserve.

The Bantick Creek catchment is largely undisturbed except for residential development near the coast. Four Mile Creek has been altered by forestry operations and some clearing in the upper catchment, and road construction, clearing and agricultural and residential development in the lower catchment, including immediately adjacent to the wetland. In the past, the mouth of Four Mile Creek was modified by a vehicular bridge. That bridge was lost in a flood and now a pedestrian bridge spans the lagoon. A major bushfire affected the catchment in December 2006.

### **21.2 Hydrology and sediments**

Similar to the larger coastal lagoons in the region, Four Mile Creek is not typically connected to the sea, but following the intense rainfall events characteristic of the region the river floods into the sea. The river and sea remain connected until river flow reduces such that the sand transported during the incoming tides blocks the river mouth. The two creeks entering the wetland are hydrologically unaltered, but the mouth of the wetland is modified by the bridge.

Sediment input to the wetland is derived from catchment inputs, which may be increased from cleared areas or where riparian vegetation is lacking, organic material of local origin, and marine sands and organic matter when the wetland is connected to the sea.

### **21.3 Water quality**

Water quality entering the wetland would be expected to be good due to the relatively low level of catchment development. Potential water quality inputs include runoff from residential and agricultural activities.

### **21.4 Condition**

CFEV gives a low rating for the wetland and a high rating for Four Mile Creek and Bantick Creek. The values shown on the condition rose reflect the overall good conditions of the catchment and hydrology, and moderate changes to the lower catchment.



## 21.5 Flora and Fauna

### 21.5.1 Overview

The Four Mile Creek study area covers approximately 19.4 hectares (including a 100m buffer), with an estimated 75% of the buffer area being native vegetation communities. A total of eight native vegetation communities were recorded, covering a variety of habitats including forest and woodland, coastal scrub, sedgeland, rock, sand/mud, and fresh and saline aquatic habitats.



Figure 221.3. Off main channel section of Four Mile Creek.

### 21.5.2 Vegetation Condition

The condition of the study area was poor overall, with an estimated 25% being at Condition Level 1. This condition level is characterised by no or very low levels of weed invasion, with the vegetation being structurally and floristically intact. The remaining 75% was in a poor condition due to weed invasion, agricultural land uses and urban development.

### 21.5.3 Vegetation Community Richness

Twelve vegetation communities were recorded in the study area, with eight being native. Of the native vegetation communities recorded three are considered to be threatened under the Tasmanian *Nature Conservation Act 2002*. Full details of vegetation communities recorded, their threatened status and their condition is provided below in Table 21.1.

**Table 21.1 – Vegetation Communities recorded in the study area, including their conservation priority, reservation status and condition.**

Veg Code <sup>127</sup>	Vegetation Community Description	State-wide Conservation Priority and Reservation Status <sup>128 129</sup>	Bioregional Conservation Priority and Reservation Status <sup>2 3</sup>	Condition*
ARS	Saline sedgeland/rushland	Not threatened	Not threatened	1

<sup>127</sup> As per Tasveg 2.0 Vegetation Classification System, DPIPW

<sup>128</sup> Nature Conservation Act 2002

<sup>129</sup> FCF 2007. Note there is no recent analysis of reservation status of non forest communities

Veg Code <sup>127</sup>	Vegetation Community Description	State-wide Conservation Priority and Reservation Status <sup>128 129</sup>	Bioregional Conservation Priority and Reservation Status <sup>2 3</sup>	Condition*
DSO	<i>Eucalyptus sieberi</i> forest and woodland not on granite	Not threatened	Not threatened	3
DGL	<i>Eucalyptus globulus</i> dry forest and woodland	Threatened and inadequately reserved	Threatened and inadequately reserved	3
FAG	Agricultural land	-	-	4
FMG	Marram grassland	-	-	4
FUR	Urban areas	-	-	4
FUM	Extra-urban miscellaneous	-	-	4
NAD	<i>Acacia dealbata</i> forest	Not threatened	Not threatened	2
OAQ	Water, sea	-	-	-
OSM	Sand, mud	-	-	1
ORO	Lichen lithosphere	-	-	1
SAC	<i>Acacia longifolia</i> coastal scrub	Not threatened	Not threatened	2

\* - Refer to mid and high level assessments for descriptions of the condition levels.

#### 21.5.4 Flora & Fauna

One threatened fauna species listed under either the Tasmanian *Threatened Species Protection Act 1995* (TSPA) or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBCA) has been previously recorded within the study area<sup>130</sup>. No threatened flora species have been recorded. No additional threatened flora or fauna species were recorded during the current survey. All species of conservation significance recorded within the study area are listed below:

- swift parrot (*Lathamus discolor*) (e/EN)

#### 21.5.5 Threatened Fauna Habitat

An estimated 65% of the study area is habitat that is potentially suitable for threatened fauna. Eleven threatened fauna species are known to use the habitat types that are present within the study area. An additional fourteen species listed under the JAMBA and CAMBA<sup>131</sup> migratory bird agreements also have potential habitat within the study area. Details of the species of threatened fauna and migratory birds that may occur at Four Mile Creek and their preferred habitats are in Appendix 1. The habitats within the study area that are preferred by at least one threatened fauna species include;

- *Acacia longifolia* coastal scrub (SAC)

<sup>130</sup> Natural Values Atlas, DPIPWE

<sup>131</sup> Japan Australia Migratory Bird Agreement (1974) and China Australia Migratory Bird Agreement (1986)

- *Eucalyptus globulus* dry forest and woodland (DGL)
- *Eucalyptus sieberi* forest and woodland not on granite substrates (DSO)
- Lichen lithosphere (ORO)
- Saline sedgeland/grassland (ARS)
- Sand, mud (OSM)

## 21.6 Weeds

Weeds are abundant within the study area, particularly in the forest and woodland areas and also the coastal dunes. Many of these weeds appear to be garden escapes. Seven declared or environmental weed species were recorded within the study area. “Declared” weed species are listed on the schedules of the *Tasmanian Weed Management Act 1999*. All declared and environmental weed species recorded within the study area are listed below:

- arum lily (*Zantedeschia aethiopica*)- Environmental
- blackberry (*Rubus fruticosus*) - Declared
- blue periwinkle (*Vinca major*) - Environmental
- boneseed (*Chrysanthemoides monilifera*) - Declared
- cape Ivy (*Delairea odorata*) - Environmental
- marram grass (*Ammophila arenaria*) - Environmental
- watsonia (*Watsonia meriana*) - Environmental

## 21.7 Threats

The key threats identified include;

- Clearing of native vegetation within the catchment
- Abstractions within the catchment
- Weeds
- Urban development
- Rabbits

## 21.8 First Aid

Suggested first aid actions, listed in priority order, include the following;

1. Implement weed control program and educate local residents on garden escapes.
2. Restrict further urban development and clearance of native vegetation within wetland buffer and upstream catchment.
3. Undertake educational activities with local residents.
4. Install an information/education sign in adjacent park.
5. Monitor rabbit numbers around creek and if necessary implement control program with surrounding landholders.

## 22 Blind Creek & Marsh (#27)

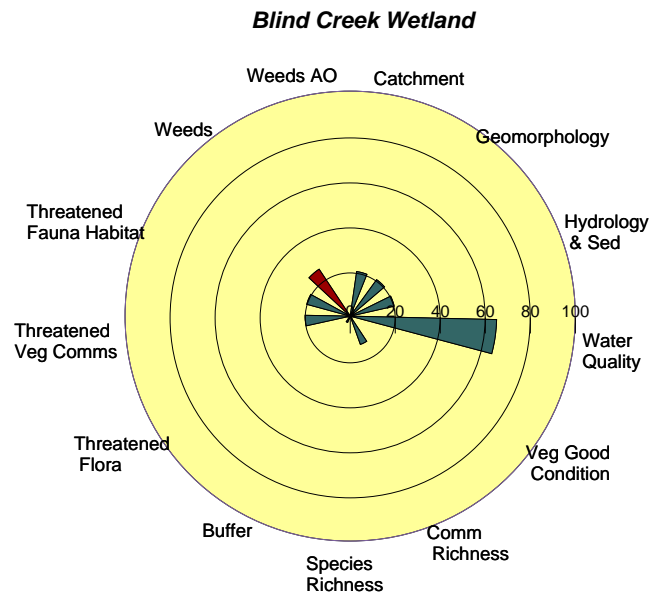
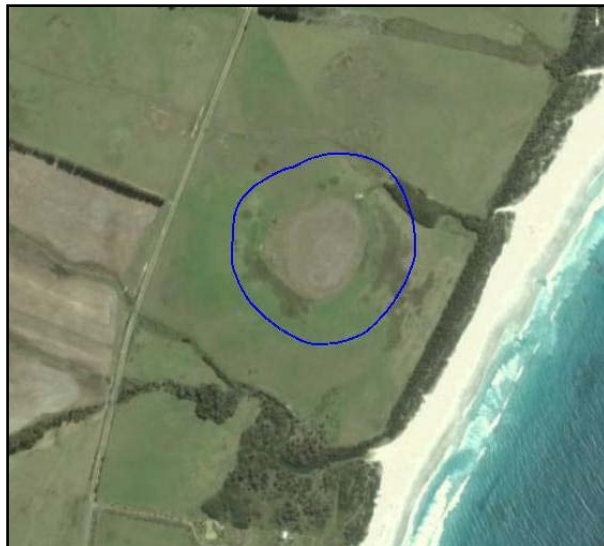


Photo 22.29. Blind Creek looking west into wetland from eastern side.



Photo 22.2. Google Earth aerial photo of Blind Creek study area.



## **22.1 Geomorphology – setting & processes**

Blind Creek wetland is situated behind Seymour Beach on a coastal plain composed of Quaternary sediments. The wetland is at an elevation of greater than 10 m, so it is unlikely that there has been a bidirectional connection with the sea in the recent past. The catchment has been highly modified through clearing and agricultural development, but the coast and adjacent dunes are considered to be in good condition, with dune form and structure not significantly modified by marram grass. The coastal area forms part of the Seymour Coastal Reserve which extends from the Douglas River to Long Point.

## **22.2 Hydrology & sediments**

The hydrology of the wetland has been highly altered by the establishment of a channel linking the wetland with a drainage line to the north. Naturally, the wetland probably behaved like a big sponge, with the size greatly changing through the year depending on rainfall. Evaporation and ground water exchange would have been the main water outflows before alteration. The extensive clearing in the catchment has also likely modified the hydrology of the area.

Sediment input to the wetland is probably dominated by locally derived organic matter, but inputs from agricultural activities may also occur due to the clearing and lack of riparian vegetation.

## **22.3 Water quality**

Due to the elevated location of the wetland, water quality in the lagoon would be expected to be fresh, with minor salinity associated with marine aerosols. The present water quality in the system would depend on inflows and the quality of any runoff entering the wetland.

### **22.3.1 Condition**

The CFEV results for the Blind Creek wetland are very low, with the 'Catchment', 'Geomorphology' and 'Hydrology & Sediments' scores all <10%. These have been increased to 20% for ease of viewing on the condition rose.

## **22.4 Flora and Fauna**

### **22.4.1 Overview**

The Blind Creek and Marsh study area covers approximately 16.1 hectares (including a 100m buffer), with an estimated 3% of the buffer area being native vegetation communities. A total of two native vegetation communities were recorded, covering a limited variety of habitats including swamp forest and fresh water aquatic habitats.

### **22.4.2 Vegetation Condition**

The condition of the study area was very poor overall, with none of the study area being at Condition Level 1 (characterised by no or very low levels of weed invasion, with the vegetation being structurally and floristically intact). 100% of the study area was in a very



poor condition due to weed invasion, agricultural land use, and an almost total loss of vegetation structure and composition.

### 22.4.3 Vegetation Community Richness

Four vegetation communities were recorded in the study area, with two being native. Of the native vegetation communities recorded both are considered to be threatened under the Tasmanian *Nature Conservation Act 2002*. Full details of vegetation communities recorded, their threatened status and their condition is provided below in Table 22.1.

**Table 22.1 – Vegetation Communities recorded in the study area, including their conservation priority, reservation status and condition.**

Veg Code <sup>132</sup>	Vegetation Community Description	State-wide Conservation Priority and Reservation Status <sup>133 134</sup>	Bioregional Conservation Priority and Reservation Status <sup>2 3</sup>	Condition*
AHF	Fresh water aquatic herbland	Threatened and inadequately reserved	Threatened and inadequately reserved	4
FAG	Agricultural land	-	-	4
FPP	<i>Pteridium esculentum</i> fernland	-	-	4
NME	<i>Melaleuca ericifolia</i> swamp forest	Threatened and inadequately reserved	Threatened and inadequately reserved	4

\* - Refer to mid and high level assessments for descriptions of the condition levels.

### 22.4.4 Flora & Fauna

No threatened flora or fauna species listed under either the Tasmanian *Threatened Species Protection Act 1995* (TSPA) or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBCA) have been previously recorded within the study area<sup>135</sup>. No additional threatened flora or fauna species were recorded during the current survey.

### 22.4.5 Threatened Fauna Habitat

An estimated 2% of the study area is habitat that is potentially suitable for threatened fauna. One threatened fauna species is known to use the habitat types that are present within the study area. However given the condition of the habitat, it is considered extremely unlikely that it would occur there. No species listed under the JAMBA and CAMBA<sup>136</sup> migratory bird agreements have potential habitat within the study area. Details of the species of threatened

<sup>132</sup> As per Tasveg 2.0 Vegetation Classification System, DPIPWE

<sup>133</sup> Nature Conservation Act 2002

<sup>134</sup> FCF 2007. Note there is no recent analysis of reservation status of non forest communities

<sup>135</sup> Natural Values Atlas, DPIPWE

<sup>136</sup> Japan Australia Migratory Bird Agreement (1974) and China Australia Migratory Bird Agreement (1986)

fauna and migratory birds that may occur at Blind Creek and Marsh and their preferred habitats are in Appendix 1. The habitats within the study area that are preferred by at least one threatened fauna species include;

- *Melaleuca ericifolia* swamp forest (NME)

## 22.5 Weeds

Weeds are common in scattered patches and isolated individuals within the study area, and are relatively abundant within those patches.. Two declared or environmental weed species were recorded within the study area. “Declared” weed species are listed on the schedules of the *Tasmanian Weed Management Act 1999*. All declared and environmental weed species recorded within the study area are listed below:

- blackberry (*Rubus fruticosus*) - Declared
- gorse (*Ulex europaeus*) - Declared

## 22.6 Threats

Blind Creek and Marsh is a highly modified environment which has probably undergone a threshold change which would be difficult to ever reverse. Therefore most threats that have occurred or are currently still affecting the study area are perhaps now irrelevant.

The key threats identified include;

- Grazing within and adjacent to the wetland
- Agricultural land use
- Weeds
- Tracks through wetland



Figure 22.3. Left - Damage caused by cattle grazing to *Melaleuca ericifolia* swamp forest (NME).

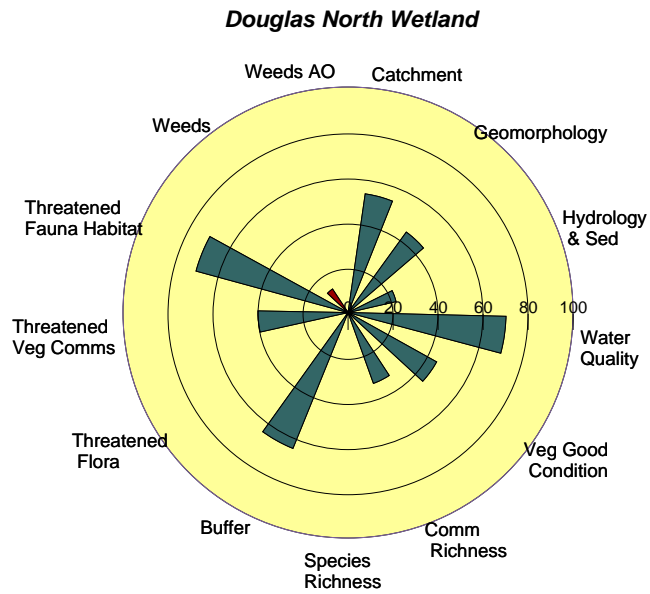
Figure 22.4. Right - Cattle grazing within *Pteridium esculentum* fernland (FPF).

## **22.7 First Aid**

Due to the highly modified and degraded nature of Blind Creek and Marsh, it is considered that it would be better to invest funding in other lagoons and wetlands which are presently in better condition. However, suggested first aid actions, listed in priority order, include the following;

1. Implement weed control program.
2. Rehabilitation of the Fresh water aquatic herbland (AHF) section may be possible given landholder interest and commitment, even though results may not be guaranteed given the degraded nature of the site. Activities would include fencing off the AHF section (including a buffer area), revegetating the buffer area, and removing grazing from within the fenced area. Weed control and other maintenance would then be an ongoing commitment.

## 23 Douglas North Wetland (#28)



**Photo 23.30. Douglas North Wetland looking south into wetland from mouth.**



**Photo 23.2. Google Earth aerial photo of Douglas North Wetland study area.**



### **23.1 Geomorphology – setting & processes**

Douglas North wetland is situated behind Seymour beach south of the Blind Creek wetland and north of the Douglas River. The wetland has developed on Quaternary sediments, and is at a lower level than Blind Creek. The adjoining beach, part of the Seymour Coastal Reserve, is in good condition.

The wetland retains vegetation around most of its perimeter, but the catchment has been highly modified by clearing and agricultural development.

### **23.2 Hydrology, water quality & sediments**

The hydrology of the wetland has been modified through the clearing and draining of the catchment. There are no channelized inflows or outflow from the wetland, so direct inflows from rain and groundwater are the main inflows, and evaporation and groundwater exchange the predominant outflows. Water would be expected to be fresh.

Sediment inputs to the wetland are likely to include runoff from the surrounding cleared land and the internally derived organic matter.

### **23.3 Condition**

Due to the highly modified catchment, the lagoon is considered to be in poor condition relative to natural conditions. The CFEV ratings are shown in the condition rose.

## **23.4 Flora and Fauna**

### **23.4.1 Overview**

The Douglas North Wetland study area covers approximately 11.7 hectares (including a 100m buffer), with an estimated 65% of the buffer area being native vegetation communities. A total of five native vegetation communities were recorded, covering a variety of habitats including forest and woodland, coastal scrub, sedgeland, and fresh water aquatic habitats.

### **23.4.2 Vegetation Condition**

The condition of the study area was variable overall, with some average to very good areas. An estimated 45% of the study area was at Condition Level 1 (being characterised by no or very low levels of weed invasion, with the vegetation being structurally and floristically intact). The remaining 55% was in a poor condition due to weed invasion and agricultural land uses.

### **23.4.3 Vegetation Community Richness**

Six vegetation communities were recorded in the study area, with five being native. Of the native vegetation communities recorded three are considered to be threatened under the *Tasmanian Nature Conservation Act 2002*. Full details of vegetation communities recorded, their threatened status and their condition is provided below in Table 23.1.





Figure 23.3. Left - Fresh water aquatic herbland (AHF).

Figure 23.3. Right - Fresh water aquatic sedgeland and rushland (ASF), Fresh water aquatic herbland (AHF) and Coastal scrub (SSC).

**Table 23.1 – Vegetation Communities recorded in the study area, including their conservation priority, reservation status and condition.**

Veg Code <sup>137</sup>	Vegetation Community Description	State-wide Conservation Priority and Reservation Status <sup>138 139</sup>	Bioregional Conservation Priority and Reservation Status <sup>2 3</sup>	Condition*
AHF	Fresh water aquatic herbland	Threatened and inadequately reserved	Threatened and inadequately reserved	1
ASF	Fresh water aquatic sedgeland and rushland	Threatened and inadequately reserved	Threatened and inadequately reserved	2
DOV	<i>Eucalyptus ovata</i> forest and woodland	Threatened and inadequately reserved	Threatened and inadequately reserved	3
FAG	Agricultural land	-	-	4
OSM	Sand, mud	-	-	1
SSC	Coastal scrub	Not threatened	Not threatened	1

\* - Refer to mid and high level assessments for descriptions of the condition levels.

<sup>137</sup> As per Tasveg 2.0 Vegetation Classification System, DPIPWE

<sup>138</sup> Nature Conservation Act 2002

<sup>139</sup> FCF 2007. Note there is no recent analysis of reservation status of non forest communities

#### 23.4.4 Flora & Fauna

One threatened flora species listed under either the Tasmanian *Threatened Species Protection Act 1995* (TSPA) or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBCA) has been previously recorded within the study area<sup>140</sup>. No threatened fauna species has been recorded. No additional threatened flora or fauna species were recorded during the current survey. All species of conservation significance recorded within the study area are listed below:

- *Amphibromus neesii* (southern swampgrass) (r/-)

#### 23.4.5 Threatened Fauna Habitat

An estimated 70% of the study area is habitat that is potentially suitable for threatened fauna. Eleven threatened fauna species are known to use the habitat types that are present within the study area. An additional fourteen species listed under the JAMBA and CAMBA<sup>141</sup> migratory bird agreements also have potential habitat within the study area. Details of the species of threatened fauna and migratory birds that may occur at Douglas North Wetland and their preferred habitats are in Appendix 1. The habitats within the study area that are preferred by at least one threatened fauna species include;

- Coastal scrub (SSC)
- *Eucalyptus ovata* forest and woodland (DOV)
- Fresh water aquatic herbland (AHF)
- Fresh water aquatic sedgeland and rushland (ASF)
- Sand, mud (OSM)

#### 23.5 Weeds

Weeds are common in patches within the study area, and are relatively abundant within those patches. One declared or environmental weed species was recorded within the study area. “Declared” weed species are listed on the schedules of the *Tasmanian Weed Management Act 1999*. All declared and environmental weed species recorded within the study area are listed below:

- blackberry (*Rubus fruticosus*) - Declared

#### 23.6 Threats

The key threats identified include;

- Runoff from catchment and surrounding agricultural land
- Weeds
- Grazing (sheep) within and adjacent wetland

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<sup>140</sup> Natural Values Atlas, DPIPW

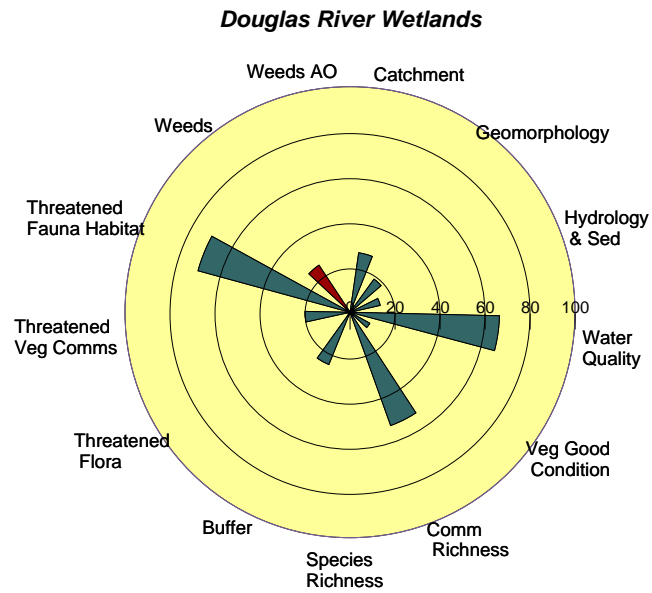
<sup>141</sup> Japan Australia Migratory Bird Agreement (1974) and China Australia Migratory Bird Agreement (1986)

### **23.7 First Aid**

Suggested first aid actions, listed in priority order, include the following;

1. Following discussions with landholders, install stock proof fencing to keep stock out of the wetland area. This proposal is not currently supported by the landholders, but would be of benefit to the wetland condition. The wetland is currently used by the landholders for stock grazing and shelter.
2. Assist landholders with funding and technical advice in order to help protect the natural values of the area and encourage local stewardship.
3. Implement weed control program.
4. Maintaining present riparian vegetation and allowing growth of additional riparian vegetation to reduce impact from catchment runoff on wetland.

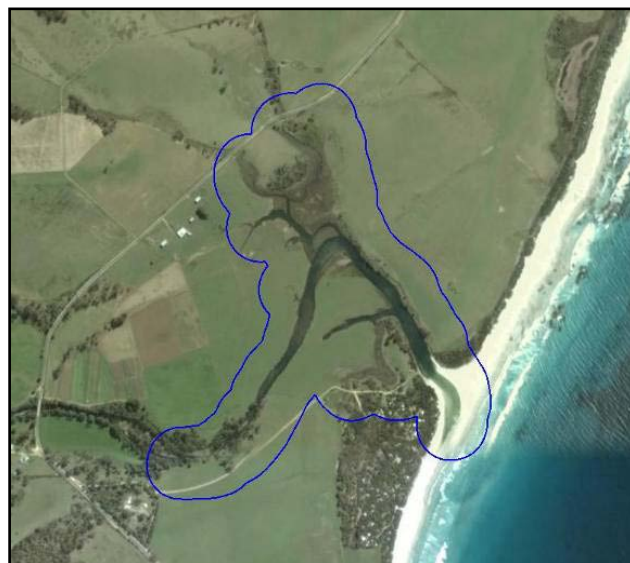
## 24 Douglas River (#29)



**Photo 24.31.** Douglas River Wetland looking north-west up the river from the south-east.



**Photo 24.2.** Google Earth aerial photo of Douglas River Wetland study area.



### **24.1 Geomorphology – setting & processes**

Several wetlands occur near the mouth of the Douglas River, which drains the steep northern peaks of the Douglas Apsley National Park.. The Douglas River emerges from the mountains approximately 2 km from the coast, and the wetlands occur in the last km of the river as it flows through the flat coastal plain (the same plain upon which Blind Creek and Douglas North wetlands occur). The wetlands to the north of the main channel correspond to an area where multiple creeks and drains enter the river. The wetland on the south of the river may be the remnants of an old river channel. The river connects to the sea via a short break in the coastal dunes.

The Douglas River catchment is unmodified within the upper catchment, but highly modified within the floodplain through agricultural and residential development. The coast has been slightly modified due to marram grass, but is of high geo-conservation value.

### **24.2 Hydrology, sediments, water quality**

The hydrology of the wetlands have been highly modified due to channelization and draining of the surrounding area. This has likely lead to an overall reduction in the size of the wetlands, and an increase in inflows and through-flow to the northern wetlands compared to natural conditions. Sediment delivery to the wetlands would also be expected to be higher than ‘natural’ due to the drains and widespread clearing of the surrounding area.. The hydrology of the southern wetland has also been modified through the establishment of channels linking it to the main river.

Water quality in the Douglas River is likely close to pristine upstream of the coastal plain. Sediment and nutrient inputs from catchment activities are likely to occur during rain events.

### **24.3 Condition**

An average of the CFEV condition for the northern and southern wetlands is shown on the condition rose. The southern wetland is considered to be in slightly better condition as compared to the northern one.



**Figure 24.3. Left - Douglas River mouth and coastal scrub.**

**Figure 24.4. Right - Douglas River inland section.**



## 24.4 Flora and Fauna

### 24.4.1 Overview

The Douglas River Wetlands study area covers approximately 60.7 hectares (including a 100m buffer), with an estimated 25% of the buffer area being native vegetation communities. A total of eight native vegetation communities were recorded, covering a variety of habitats including forest and woodland, coastal scrub, sedgeland, grassland and saline and fresh water aquatic habitats.

### 24.4.2 Vegetation Condition

The condition of the study area was average to poor overall, with an estimated 10% being at Condition Level 1 (characterised by no or very low levels of weed invasion, with the vegetation being structurally and floristically intact). The remaining 90% was in an average to poor condition due to weed invasion, and agricultural land uses.

### 24.4.3 Vegetation Community Richness

Nine vegetation communities were recorded in the study area, with eight being native. Of the native vegetation communities recorded two are considered to be threatened under the Tasmanian *Nature Conservation Act 2002*, with an additional one being listed under the Commonwealth *Environmental Protection & Biodiversity Conservation Act 1999*. Full details of vegetation communities recorded, their threatened status and their condition is provided below in Table 24.1.

**Table 24.1 – Vegetation Communities recorded in the study area, including their conservation priority, reservation status and condition.**

Veg Code <sup>142</sup>	Vegetation Community Description	State-wide Conservation Priority and Reservation Status <sup>143 144</sup>	Bioregional Conservation Priority and Reservation Status <sup>2 3</sup>	Condition*
ARS	Saline sedgeland/grassland	Not threatened	Not threatened	2
DOV	<i>Eucalyptus ovata</i> forest and woodland	Threatened and inadequately reserved	Threatened and inadequately reserved	2
DVC	<i>Eucalyptus viminalis</i> - <i>Eucalyptus globulus</i> coastal forest and woodland	Threatened and inadequately reserved	Threatened and inadequately reserved	2
FAG	Agricultural land	-	-	4
GTL	Lowland <i>Themeda triandra</i> grassland	Threatened ( <i>EPBC Act</i> listed)	Threatened ( <i>EPBC Act</i> listed)	2

<sup>142</sup> As per Tasveg 2.0 Vegetation Classification System, DPIPW

<sup>143</sup> Nature Conservation Act 2002

<sup>144</sup> FCF 2007. Note there is no recent analysis of reservation status of non forest communities

Veg Code <sup>142</sup>	Vegetation Community Description	State-wide Conservation Priority and Reservation Status <sup>143 144</sup>	Bioregional Conservation Priority and Reservation Status <sup>2 3</sup>	Condition*
NAV	<i>Allocasuarina verticillata</i> forest	Not threatened	Not threatened	2
OAQ	Water, sea	-	-	-
OSM	Sand, mud	-	-	1
SSC	Coastal scrub	Not threatened	Not threatened	2

\* - Refer to mid and high level assessments for descriptions of the condition levels.

#### 24.4.4 Flora & Fauna

No threatened flora or fauna species listed under either the Tasmanian *Threatened Species Protection Act 1995* (TSPA) or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBCA) have been previously recorded within the study area<sup>145</sup>. However, one threatened fauna species was recorded during the current survey. All species of conservation significance recorded within the study area are listed below:

- white-bellied sea-eagle (*Haliaeetus leucogaster*) (v/-) - one pair observed



Figure 24.4. Right - Pair of white-bellied sea-eagles above the Douglas River.

#### 24.4.5 Threatened Fauna Habitat

An estimated 55% of the study area is habitat that is potentially suitable for threatened fauna. Ten threatened fauna species are known to use the habitat types that are present within the study area. An additional fourteen species listed under the JAMBA and CAMBA<sup>146</sup> migratory bird agreements also have potential habitat within the study area. Details of the species of threatened fauna and migratory birds that may occur at the Douglas River Wetlands and their preferred habitats are in Appendix 1. The habitats within the study area that are preferred by at least one threatened fauna species include;

<sup>145</sup> Natural Values Atlas, DPIPW

<sup>146</sup> Japan Australia Migratory Bird Agreement (1974) and China Australia Migratory Bird Agreement (1986)

- Coastal scrub (SSC)
- *Eucalyptus ovata* forest and woodland (DOV)
- *Eucalyptus viminalis* - *Eucalyptus globulus* coastal forest and woodland (DVC)
- Saline sedgeland/grassland (ARS)
- Sand, mud (OSM)
- Water, sea (OAQ)

## 24.5 Weeds

Weeds are common in scattered patches and isolated individuals within the study area, and are relatively abundant within those patches. Two declared or environmental weed species were recorded within the study area. “Declared” weed species are listed on the schedules of the *Tasmanian Weed Management Act 1999*. All declared and environmental weed species recorded within the study area are listed below:

- blackberry (*Rubus fruticosus*) - Declared
- marram grass (*Ammophila arenaria*) - Environmental

## 24.6 Threats

The key threats identified include;

- Grazing within and adjacent to the wetland
- Nutrient inputs from adjacent agricultural land use
- Weeds
- Rabbits

## 24.7 First Aid

Suggested first aid actions, listed in priority order, include the following;

1. Following discussions with landholders, install stock proof fencing to keep stock out of the wetland area. This proposal is not currently supported by the landholders, but would be of benefit to the wetland condition. It is currently used by the landholders for stock grazing and shelter.
2. Revegetate the buffer area (landholders are not in favour of this).
3. Remove grazing from within the fenced area (landholders are not in favour of this).
4. Assist landholders with funding and technical advice in order to help protect the natural values of the area and encourage local stewardship.
5. Implement weed control program.
6. Monitor rabbit numbers around wetland and if necessary implement control program with surrounding landholders.



## **Break O'Day Coastal Lagoon Assessment**

# **Wetland Healthcare Community Engagement Report**

For NRM North & Break O'Day Council

Rural Development Services  
December, 2009

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# Contents

Contents.....	ii
1 Introduction.....	1
2 Methods.....	2
3 Results.....	3
3.1 Mail out and engagement .....	3
3.2 Phone survey and engagement .....	5
3.3 Conclusion.....	12
Attachment 1 – Mail Out Survey.....	1
Attachment 2 – Phone Survey .....	2
Attachment 3 – Landholders interested in ‘on-ground’ works.....	7



# I Introduction

Rural Development Services (RDS) was engaged by North Barker to undertake the community engagement aspects of the Wetland Condition Value and Significance Assessment commissioned by NRM North.

The primary outcomes of the “Community engagement” aspect of the project (as identified by RDS based on the information contained in the Consultancy Brief documentation and discussions with the relevant NRM North and Break O’Day Council Coordinators) were that:

- The Wetland Condition Value and Significance Assessment component of the project establishes effective landholder engagement whereby subsequent ‘first aid’ on-ground works can be successfully implemented through NRM North and the Break O’Day municipality.
- NRM North and the Break O’Day NRM community utilise the Wetland Condition Value and Significance Assessment Report to focus delivery of on-ground works in the Break O’Day municipality.
- Landholders and ‘lagoon and wetland catchment communities’ increase their awareness of, and commitment to, maintaining or improving the health, condition and management of identified wetlands in the Break O’Day municipality.

All the activities undertaken as part of this project were aimed at increasing the awareness of landholders and the catchment communities of the importance of wetlands and the work being undertaken by NRM North. All identified landholders were mailed a letter informing them of the project and an information sheet on wetland management. This initial contact was an important component of the overall engagement strategy. The second phase involved a phone survey in which participating landholders were provided with information about the project and asked a number of questions about their wetland. This contact with landholders helped raise awareness of the project and provided an opportunity for interest in works or activities to be expressed. With very few exceptions the response to this contact was very positive. The third phase of the engagement strategy reaches out to the broader local community through an article in the regional press reporting on the results of the project.

In addition to the outcomes of the project, i.e. increased awareness of the importance of wetlands and the issues that affect them, several primary outputs were identified.

The primary outputs are:

- A list of primary landholder contacts, prioritising likelihood of success in ‘on-ground’ works (Attachment 3). This list is made up of landholders who said that they were interested in undertaking on-ground works – including leaving the wetland ‘as is’ or ‘as natural as possible’.
- Collated landholder information that is incorporated in the Condition Assessment (primary data provided to North Barker for incorporation into their assessment).
- An article in the regional press reporting findings to the wider public.

The final output from the project is **this report** which summarises the results of the mail out survey and phone survey. A better understanding of the issues and concerns of landholders who manage wetlands will assist NRM North target their engagement and activities. Care should be taken in reading this report not to generalise the results to the broader community. Largely (with

the exception of the final wave of phone surveys) this is a self selected group – not a random sample of the broader community. This means that the group reported here have chosen to participate in the project because they have at least some interest in wetland condition. The results from the phone surveys indicate that this group is very committed to the management and care of the wetlands for which they are responsible or have an interest.

## **2 Methods**

### **Identify key landholders**

Identification of key landholders was undertaken by Rural Development Services (RDS) in collaboration with the Break O'Day NRM facilitator. Using a map generated by North Barker of priority wetlands, key landholders were identified. These landholders had a property either - inclusive of all or part of a wetland, or with boundary within 100 m of the mapped wetland area. Contact information was generated from the Break O'Day Council rates database using the property identification number (PID). A contact list was compiled and was used as the basis for the initial mail out. A total of 272 landholders were identified.

### **Mail out and engagement**

The key landholders were mailed a letter from Break O'Day Council introducing the project and the project team; a brief one-page questionnaire (see Attachment 1); and an information brochure produced by NRM North in collaboration with RDS.

### **Phone survey and engagement**

A phone survey instrument was designed by RDS in collaboration with North Barker and NRM North (see Attachment 2). The objective of the phone survey was to:

- collect data to support the condition assessment being undertaken by North Barker;
- establish effective landholder engagement whereby subsequent 'first aid' on-ground works can be successfully implemented through NRM North and the Break O'Day municipality; and
- increase landholder awareness of, and commitment to, maintaining or improving the health, condition and management of identified wetlands in the Break O'Day municipality.

Landholders who had volunteered to be surveyed by phone in the mail out survey were contacted. Of the 45 volunteers 32 were surveyed by phone. The remainder were unable to be contacted or able to find a suitable time for the phone survey in the time available. The phone surveys took place in the late afternoon or early evening and lasted for between 10 and 30 minutes.

A second round of phone surveys was conducted in early December. Landholders on high and medium priority wetlands for which there had been a low or nil response in the first wave of surveys were targeted to improve the spread of responses. However, given those contacted to be involved in the phone survey had not responded to the initial mail out, a number of those

contacted did not wish to participate (or did not return a phone message to participate in the phone survey). Thirteen additional phone surveys were completed.

### **Use of the data**

The results of the survey and phone surveys were entered into an excel spreadsheet by RDS. The raw results from the mail out survey and phone survey were provided to North Barker for incorporation into their wetland condition value and significance assessment. This report provides a summary of the data collected through the survey and phone survey.

## **3 Results**

### ***3.1 Mail out and engagement***

There was a response rate of 30% to the mail out with 82 of a possible 272 returning the survey. Of this, the majority (78%) of respondents gave permission for a consultant to enter their property and undertake a visual inspection of the coastal lagoon or wetland. Forty five respondents indicated their willingness to participate in a short phone survey. Nearly three quarters of respondents wanted more information on the management of coastal lagoons or wetlands.

The response rate to the mail out survey reflects a relatively high level of interest in the subject matter.

Only 73 of the 82 survey respondents identified the wetland that was on or near their property (Table 1). There are 35 wetlands and coastal lagoons in the Break O'Day area and about half of them were identified by respondents to the survey.

<b>Wetland</b>	<b>Number</b>
Boggy Creek Wetland	1
Chain of Lagoons	2
Chimneys Lagoon	6
Denison River	2
Dianas Basin	2
Douglas River	2
Four Mile Creek	4
Grants Lagoon	14
Hendersons Lagoon	8
Jocks Lagoon	1
Moriarty Lagoon	1
Parkside Lagoon	2
Scamander River	11
Templestowe	2
Unnamed	1

Upper Medeas Cove Marshes	9
Yarmouth Creek	5
TOTAL	73

**Table 1 : Survey respondents by wetland name**

A number of the survey respondents (29) had concerns about the condition of the coastal lagoon or wetland. The scope of these concerns was wide ranging. The most common issues raised were ‘weeds’, ‘rubbish and illegal dumping particularly green waste’, ‘off road vehicle impacts’ and a variety of water quality issues. Water quality concerns included:

- impact of stormwater inflows,
- the use of chemicals by public authorities,
- biological contamination from septic tanks and rubbish,
- impact of lack of flow due to closure to the sea,
- siltation and sand erosion.

There was some concern about the potential impacts of development including car parking, boat launching facilities and coastal development. Other threats were identified to include stock accessing lagoons and wetlands, rabbits, tree removal and fire. Finally, concern about reduction in fish numbers and water birds was identified.

Only 3 responses to the mail out survey were received from landholders associated with high priority wetlands. Of these, one landholder was concerned that Forestry Tasmania has made a mess of the land behind Dianas Basin and was silting up Crockers Arm Creek. In addition this landholder was concerned about litter bugs discarding plastic objects onto the Tasman Highway around Dianas Basin. A landholder at Moriarty Lagoon valued the lagoon for the scenery but “didn’t like snakes”.

Of the medium priority wetlands, a proportionally high level of response was received with respect to Chimneys Lagoon. Rubbish, storm water and chemical seepage were of greatest concern at Chimneys Lagoon with management by local council of these issues being identified as a particular concern. Degradation of the dunes area by motor cycles and dune buggies were also of concern.

At the Chain of Lagoons, Templestowe Lagoon and Piccaninny Swamp areas, two respondents had concerns about stock having unhindered access to coastal wetlands and the beach and vehicle degradation of the wetland area while accessing beach. Weeds such as gorse and blackberries were noted as problems.

Of the medium priority wetlands, a large number of responses were received from landholders around Grants Lagoon. Health issues associated with water quality, particularly in regard to bacterial levels that may not be safe for swimming, were reported by several landholders. One landholder reported that their family had become ill after swimming in Grants Lagoon, with the area near Binalong Bay Beach being the main concern. Some people wanted to know whether the council tested the safety of the water, although one respondent noted that they had no concerns as “Grants Lagoon has been tested and was found to be healthy”. Several landholders indicated that they thought the lagoon was open too infrequently to the sea and that the lagoon should be artificially opened every couple of years. One landholder was concerned about degradation caused by car parking and boat launching and indicated that the lagoon should not be used by speedboats.

One landholder expressed concern about rubbish in Parkside Lagoon. Another respondent noted groundwater contamination of Wrinklers Lagoon from the tip and sewerage.

Although over 10 responses were received from landholders associated with the Scamander River Mouth Backwater, only one landholder expressed any concerns; these being the spread of weeds from the dumping of garden waste and people cutting down trees to get a better view.

## **3.2 Phone survey and engagement**

A total of 46 landholders were interviewed for the phone survey. The characteristics of these landholders were quite diverse. They came from a range of sizes of property with a variety of landuses.

Most landholders reported property size in acres. Size ranged from 0.2 to 6500 acres.

Property size (acres)	Number surveyed
< 1	20
1 to 9	8
10 to 99	10
100 to 999	4
>1000	1

Of those surveyed, over 45% were solely a residence. In total, about 80% were a residence (or shed) or residence with some other activity, which was generally either grazing or native vegetation/bush. Those properties that did not have a residence were currently used either for animal grazing (with and without native bush), as fenced bush or were covenanted for their natural values.

Animal grazing was reported from 8 respondents, for the following wetlands: Denison Rivulet, Douglas River, Chain of Lagoons (including Templestowe and Piccaninny), Chimneys Lagoon, Four Mile Creek, Parkside Lagoon and the Upper Medeas Cove Marshes.

Wetlands where native forest/bush was included as a current activity were Boggy Creek, Yarmouth Creek, Oceana Lagoon, Upper Medeas Cove Marshes, Hendersons Lagoon, Templestowe, and Parkside Lagoon.

One landholder reported having a covenant on land at Templestowe Lagoon and another at Chimneys Lagoon indicated that they wished to covenant their land (and then resell).

There are 35 wetlands and coastal lagoons in the Break-o-Day area and about half of them were identified by respondents to the survey. The table below shows the names of wetlands that were provided by landholders.



Wetland Name	Number
(North of) Douglas North Wetland and (South of) Blind Creek	1
(south of) Diana's Basin	1
Boggy Creek	1
Chain of Lagoons; (plus Templestowe and Piccaninny)	1
Chimneys Lagoon	4
Diana's Basin	2
Denison Rivulet	1
Douglas River	1
Four Mile Creek	1
Grants Lagoon	5
Hendersons Lagoon	4
Moriarty Lagoon	1
Parkside Lagoon	5
Piccaninny	1
Scamander River Backwater	6
Templestowe Lagoon	2
Upper Medeas Cove Marshes	5
Wrinkers Lagoon	3

Only 3 phone surveys were able to be undertaken for high priority wetlands; 2 for Dianas Basin and 1 for Moriarty Lagoon. No phone surveys were able to be conducted for the other high priority wetlands of Windmill Lagoon or Crockers Arm.

Of the medium priority wetlands, phone surveys were undertaken at : Chain of Lagoons & Piccaninny & Templestowe area (4); Grants Lagoon (5); Parkside Lagoon (5); Chimneys Lagoon (4); Wrinklers Lagoon (3); and Scamander River Mouth Backwater (6).

Landholders were asked the size of their wetland, however very few people were able to provide this detail. Only 2 properties reported that the wetland was entirely within their property boundary. This means that the majority of wetlands have multiple landholders with some responsibility for management of the foreshore. Over half of respondents to this question reported that they had 4 or less neighbours. Most other respondents to this question said there were between 5 and 10 neighbours. Three people said they had 'lots' or 'many' neighbours.

Landholders were asked how they currently used the wetland. Nearly all reported using their wetland for either recreation (walking, boating, fishing) or other uses such as bird watching, visual amenity, aural amenity (frog calls, bird calls), revegetation or for its natural values. Only

two landholders stated that they used the wetland for grazing; at Douglas River and Four Mile Creek. This result reflects that the majority of respondents to the phone survey said that their land use was mainly residential.

Landholders were asked some questions about the history of use of the wetland. Less than one third of respondents to this question said that the wetland had been drained or dammed in the past. Most of these responses related to draining the lagoon through artificial opening of the bar way. Of the high and medium priority wetlands, it was reported that Dianas Basin and Wrinklers Lagoon were both drained when water levels went over the highway. Smaller 'spoon drains' were reported for Templestowe Lagoon and Parkside Lagoon.

Only three landholders reported that water was extracted from the wetland. Two landholders stated that water was extracted for domestic or garden use using either pumps or gravity fed, and one of these was on the medium priority Oceana wetland.

Landholders were asked about activities they might undertake adjacent to the wetland. Over half of the landholders actively manage their properties by either weed control, fire management or vegetation clearing. Most landholders undertook more than one of the activities listed, with weed control and fire management the most common responses.

### **Vegetation**

Landholders were asked a series of questions about the vegetation surrounding or adjacent to the wetland, as well as in it. Nearly all landholders stated that there was vegetation around the edge of the wetland. Landholders commonly described vegetation types such as tea-tree and reeds. Only four landholders reported that the vegetation condition as being poor. Interestingly, these were all at high and medium priority wetlands: Oceana Lagoon, Dianas Basin; Moriarty Lagoon; and Wrinklers Lagoon. However, in contrast, other landholders at Dianas Basin and Wrinklers Lagoon stated the condition of the vegetation as being excellent.

Landholders were less likely to respond that there was vegetation in the wetland. Where vegetation was noted in the wetland, commonly described vegetation types were rushes, sedges, grasses and reeds. Five landholders reported that the vegetation condition in the wetland was poor. Again, these were all at high and medium priority wetlands: Oceana Lagoon, Dianas Basin; Moriarty Lagoon; Parkside Lagoon; and the Scamander River Backwater.

Landholders were asked if they had noticed any changes in species composition over the last five years. About half those who responded, stated that the number of plant species had not changed in the last 5 years. Of those who felt the number of species had changed, this was generally attributed to a decrease caused by the recent dryness, with two landholders also reporting an increase with recent rain. Some changes in vegetation were also attributed to an increase to weeds.

It is of concern that nearly 50% of landholders reported weeds in the wetland area. Species included, Spanish heath, gorse, boxthorn, radiata pine, boneseeds, thistles and blackberries. However, of these, more than half thought that the number of weeds had not changed in the last 5 years while over a 1/3 thought that the number of weeds had increased. Of the high and medium priority wetlands weed were reported for Chimneys Lagoon; Parkside Lagoon; Scamander River Backwater; Templestowe Lagoon (Spanish heath, gorse); Grants Lagoon; and Wrinklers Lagoon. Several landholders reported that the number had decreased because of active management.

Less than half the landholders reported rare or unusual animals or plants. These were often the green and gold frog or sea-eagles. Of the high and medium priority wetlands, rare or unusual

animals were reported for: Chimneys Lagoon (Antechinus); Grants Lagoon (quoll, black cockatoo); Parkside Lagoon (musk water rat); Chain of Lagoons, Templestowe, Piccaninny (green and gold frog); Chimneys (sea eagle, wedge tailed eagle); and Dianas Basin (bandicoots; sea eagles).

### **Water Quality**

Landholders were asked a number of questions about the quality of water in the wetland. Most respondents said that the wetland was salty or brackish but were aware that salinity could be quite changeable. The Chain of Lagoons, Chimneys Lagoon, Upper Medeas Cove (some responses) and Piccaninny Lagoon were recorded as being fresh only.

About half of respondents to the questions on water quality said it was either average or excellent. Poor water quality was reported for the high and medium priority wetlands of Moriarty Lagoon; Oceana Lagoon; Parkside Lagoon; Chimneys Lagoon; Wrinklers Lagoon; the Scamander River Backwater. Poor water quality was also reported for the Upper Medeas Cove. Over half the respondents reported that there had been no change in water quality in last 5 years. Where positive changes were noted, it was linked with either rainfall or a bar way being open, particularly at Grants Lagoon and Hendersons Lagoon.

Landholders were asked whether they had observed a green colour in the water, a smell (rotten eggs, rotting seaweed etc) or bubbles coming up from the sediment. A green colour or a smell, or both combined, was reported by 19 respondents. Smell was often attributed to when lagoons were either recently drained (Wrinklers Lagoon) or when the bar way was not open (Grants Lagoon and Hendersons Lagoon).

Three respondents said that they had observed bubbles coming from the sediment and these were both from medium priority wetlands; Parkside Lagoon and the Scamander River Backwater

The activities that respondents identified as having an impact on water quality were:

Wetland	Activities that may affect water quality
Chimneys Lagoon	Septic seepage; motorbikes around edge of wetland; drainage from road culvert down property boundary
Dianas Basin	Tas Forestry harvest timber behind wetland
Grants Lagoon	septics, nitrate rich; speedboats, waterskiing, noise, safety
Hendersons Lagoon	Farming, cattle and runoff from fertilisers; Agricultural runoff, when not open to sea there must be a build up of nutrients as fertilised close by
Scamander River Backwater	Sewage pumping station, septic seepage; storm water drainage; road run off and sewerage spill
Upper Medeas Cove Marshes	siltation - pushing wetland further south encroaching on his land, therefore water doesn't run away as freely as it did; trail bikes on rivulet; septic seepage in area; historic sand mining
Yarmouth Creek	Falling trees in catchment

### **Water Quantity**

Landholders were asked a number of questions about the water quantity in the wetland. Over half of respondents said that the wetland was currently full. The vast majority of respondents said that the water levels changed in response to rain. Over half of respondents said that the water levels were higher than normal and/or the highest observed during the recent high rainfall.

Water levels in the Upper Medeas Cove Marshes, Hendersons Lagoon, Douglas River, Chimneys Lagoon, Templestowe; Parkside Lagoon, Wrinklers Lagoon and the Scamander River Backwater were described as not being significantly affected by the recent high rainfall. About half of those who participated in the phone survey indicated that the water level in their wetland did not change with the tide. It was noted that Yarmouth Creek and Templestowe Lagoon only respond

when the bar way is open, suggesting that mouth opening is quite variable with these two wetlands.

Landholders were asked if they thought any particular activities were affecting water quantity. Just over half of those who responded to this question, did not think that there were activities affecting quantity of water in the wetland. Activities described as affecting the water quantity were rainfall, upstream take and damming, or where some channel or drainage was present.

### **Fish and birds**

Landholders were asked a number of questions about the wildlife, specifically fish and birds that they observed on the wetlands. Information about fish and birds can provide some insight into the overall condition and functioning of the wetland.

Over 80% of respondents said that water birds used the wetland. Of the few respondents who indicated that swans or waterbirds did not use their wetland, these were the wetlands listed: Denison Rivulet; Boggy Creek; Oceana Lagoon; Upper Medea Cove Marshes; Templestowe Lagoon; Moriarty Lagoon, Piccaninny Lagoon; and an unnamed wetlands near the Douglas North Wetland.

A diverse range of birds were recognised. Birds listed for the wetlands from the phone survey were: swans, ducks (including wood & mountain), swamp hens, native hens, egrets, cranes, cormorants, parrots, bittern, pelicans, sandpipers, herons, cockatoos, coots, sea eagles, sea gulls, plovers, wedge-tailed eagles, swamp harriers, oyster catchers, falcons and fairy terns.

Almost  $\frac{3}{4}$  of respondents said that their wetland contained fish. Species of fish reported to occur in the wetlands were bream, galaxia, eels, prawns, baitfish, mullet, trevally, cockie salmon, luderick, skate, flounder, shrimps, crabs and starfish.

### **Future management**

Landholders were asked if the condition of the wetland was affected by a range of activities. Nearly all landholders responded to this question and most stated that at least one activity affected the condition of the wetland. Only 2 respondents did not think the condition of the wetland was affected by any of the activities identified and these were at Yarmouth Creek and Oceana Lagoon.

Effluent seepage from septic tanks, 4WD and motor bike usage, rubbish dumping and weeds were most commonly noted as affecting condition. Less common activities identified were recreational boating, grazing & farming practices, dogs and cats (including dog droppings), nearby roads, stormwater, bar way management, artificial drains, urban development and (potentially) acid sulphate soils.

The activities that respondents identified that may affect the condition of the wetland were:

Wetland	Activities that may affect condition of the wetland
(North of) Douglas North Wetland and (South of) Blind Creek	Weeds; Other (historic drain)
Boggy Creek	Weeds
Chimneys Creek Lagoon	4WD or motor bike use; effluent seepage from septic tanks; rubbish dumping, stormwater; Urban development, sewerage leakage
Dianas Basin	Vegetation clearance, litter from cars on road, 4WD and motor bikes; barway management
Four Mile Creek	Vegetation clearance
Grants Lagoon	Effluent from septic tanks; recreational boating, rubbish dumping, Dogs (droppings) ; recreational boating
Hendersons Lagoon	Urban development, recreational fishing, Other (farming , spraying); Barway management, Other (acid sulphate soils could if they occurred and were disturbed); weeds
Parkside Lagoon	Rubbish dumping; grazing
Scamander River Backwater	Urban development; Barway management, Weeds, Rubbish dumping; Cats & dogs; Nearby roads; Effluent seepage; Garden rubbish; Lawn clippings; Vegetation clearance; recreational fishing (netting for prawns), sewage leakage from pumping station
Templestowe	effluent seepage from septic tanks; grazing; weeds; 4WD or motor bike use; recreational walking
Upper Medeas Cove Marshes	Weeds, Effluent seepage from septic tanks; 4WD or motor bike use
Wrinklers Lagoon	Water extraction (when barway opened), barway management, rubbish dumping; Urban development; cats and dogs

Landholders were asked what their intentions for the wetland on their property were. Nearly all respondents to this question said that they wanted to use the wetland for wildlife only or a combination of wildlife and recreation. The most common response to this question was to “leave the wetland as it is”. There was an overwhelming indication from most landholders that they liked their wetland the way it is and wished to continue to enjoy the visual and aural aspects that the wetland provided.

Interestingly, none of the properties that listed ‘animal grazing’ as an activity on the property (see Q6) stated that they wanted to utilise the wetlands for ‘mixed use’ (which included grazing). Several of these properties indicated that they were actively fencing stock from the wetland and attempting to rehabilitate from the affect of grazing.



Landholders were asked further what activities they would like to carry out on the wetland in the future. The activities that respondents identified that they would like to carry out on their wetland (noting that often the wetland is not actually within the boundary of the landholder) were:

Wetland	Activities
(North of) Douglas North Wetland and (South of) Blind Creek	Fencing; Weed control
Chimneys Lagoon	Replanting; Fencing; Weed control; Covenant; Fire Management; Drainage management; Flood management; Keep people out
Dianas Basin	Fencing, feral animal control, fire management (reveg on own property); weed control
Douglas River	Fencing, replanting
Grants Lagoon	Landing/boardwalk (from binalong Bay to footbridge. Other ( lagoon constantly open with breakwalls); Keep it natural; Leave it as is; Clear scrub a bit
Hendersons Lagoon	Fencing (farm needs to be fenced); Weed control, feral animal control, replanting; boardwalk; fire management
Oceana	leave it as it is
Parkside Lagoon	Boardwalk or pathway; drainage manangement
Scamander River Backwater	Feral animal control, access through sand dunes; fencing, weed control; drainage (barway); replanting, boardwalk; fire management
Templestowe	Feral animal control; Drainage management; Fire management; replanting; Boardwalk; fencing
Upper Medeas Cove Marshes	Fencing, weed control, feral animal control, drainage management, flood management, fire management, replanting; stop sand coming down after heavy rain
Wrinklers Lagoon	Weed control, fire management; Drainage management (barway); boardwalk
Yarmouth Creek	Fire management

A full list of landholders who said that they were interested in undertaking on-ground work is presented in Attachment 3.

The most common obstacles to carrying out these activities in the future were money and time followed by a lack of knowledge. Other obstacles given were not being permitted to undertake activities by council or the P&WS, a lack of labour or that an issue was just ‘too big’ (eg. siltation in Upper Medeas Cove Marshes and a permanent opening at Grants Lagoon).

Just over half of the landholders surveyed said that they would like more information and support to help better manage the wetland. Labour (14 responses) was most commonly identified, followed by technical information (13), advice on appropriate management activities (12), money (11) and support with planning (9). One respondent indicated they were already receiving assistance and that they wouldn’t be able to manage more assistance at the moment.

### **Chimneys Lagoon**

Around 8 landowners face on to Chimneys Lagoon and they seem to be fairly interested in their Lagoon – six responded to the survey and four participated in the phone survey.

Overall, these people would like Chimneys Lagoon to stay much the same as it is now. They value it for its natural values, visual amenity and recreation. They think that the vegetation is in good to excellent condition but are concerned about weeds. The landholders report that they actively manage weeds and for fire. The Lagoon and its surrounding vegetation support a variety of birds and bird watching is enjoyed by some of the residents.

The main concern of the landowners around Chimneys Lagoon is about the quality of the water. They attribute the poor water quality to storm water inflows, septic leaks, run-off, seepage from nearby dump sites, rubbish and motor bikes.

They would all like to do more to better manage the wetland. The main activities they would like to undertake are fencing, replanting and weed control.

## **3.3 Conclusion**

There was a good response to the mail out survey and phone survey and conforms to expectations of this type of method (see Fowler.F.J. 2002). Given that there was no follow up or reminders after the initial mail out this indicates a fairly good level of interest in the subject matter of the survey. However, the results of the surveys should not be generalised to a broader population because it is a self-selected group of interested people not a random sample. In terms of identifying a group of landholders likely to successfully implement ‘on-ground’ works a method based on drawing out interested people is appropriate.

In both the mail out survey and phone survey respondents came from about half of the possible wetlands in the Break-O’Day area. About one third of respondents to the mail survey had some concerns about the quality of their wetland and the impacts of a range of activities on them. In context this means that the sample was not just comprised of people who had negative impressions of the wetlands but was made up of a majority who had positive perceptions about them. One of the key findings in fact was the extent to which this group valued their wetlands and regarding their condition in a positive light.

Respondents to the phone survey came from a range of property sizes. This was a diverse group although the dominant land use was residential. Most of the wetlands identified through the phone survey were shared by more than one landholders and over half had between 5 and 10 landholders. This indicates that the management of impacts on wetlands will need to engage with a range of different landholders. Most of the use of wetlands could be described as passive recreation. Only one landholder reported active use of the wetland i.e. grazing. About 80% of respondents did not extract water from the wetland and water quantity issues did not seem to be of significant concern.

Water quality issues however seemed to be of more concern to the landholders who responded to the phone survey. The majority said that water quality was either good or average however, 35% said had some concern. The range of activities that landholders identified as impacting on water quality were diverse and included storm water inflows, septic leaks, motor bike use, run off from roads and agricultural activity. Clearly, the priority as identified by the respondents to the mail and phone survey was water quality. Activities and on-ground works to address these issues would likely be welcomed by the community.

Generally, landholders were very positive about the condition of vegetation in or near the wetland. However, the results indicate some concern about weeds with about one third of respondent of the view that the number of weeds were increasing.

The majority of respondents to the phone survey said that swans and water birds used the wetlands. In contrast only half of respondents thought that there were fish in the wetlands. The presence of birds on the wetlands was valued by the landholders.

Nearly of all of the landholders thought that the condition of the wetlands were affected by activities. The impact of leaking septic tanks was identified in the general questions on condition of the wetlands as well as those specific to water quality. Off road vehicles, rubbish dumping and weeds were the most commonly identified impacting activities after septics.

It is notable that the most common preferred future uses of the wetlands were conservation and recreation. Basically landholders wanted the wetlands to stay the same. They were willing to undertake works to improve the condition of the wetlands and the priority concerns were identified earlier. While landholders were willing to undertake a range of activities to better manage the wetlands money, time and lack of knowledge were identified as obstacles. Well targeted activities to support this interested and concerned group of landholders better manage their local wetlands would is most likely be a wise investment and result in positive outcomes for both the community and the environment.

## Attachment I – Mail Out Survey

**Please complete the questions below and return to Rural Development Services in the enclosed pre-paid envelope.**

Name: \_\_\_\_\_

Address: \_\_\_\_\_

Phone number: \_\_\_\_\_

Name of coastal lagoon or wetland: \_\_\_\_\_

Do you give permission for a consultant from North Barker Ecosystem Services to enter your property to undertake a visual inspection of a coastal lagoon or wetland? Please circle.

Yes

No

Would you like to participate in a short phone survey (10 mins) about the condition and management needs of wetlands and coastal lagoons in the Break O'Day municipality?

Yes

No

Would you like more information on the management of coastal lagoons or wetlands? Please circle.

Yes

No

Do you have any concerns about the condition of the coastal lagoon or wetland on your property. Please circle.

Yes

No

If yes, please briefly describe your concerns.

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- ☐ Please send me an electronic copy of the final health check report (requires email contact)

**Thankyou**

## Attachment 2 – Phone Survey

### Landholder Phone Survey

#### Section 1 – Interviewee Details (to be filled in from written response where possible)

1. Name \_\_\_\_\_
2. Address \_\_\_\_\_
3. Phone \_\_\_\_\_
4. Email \_\_\_\_\_
5. Property size \_\_\_\_\_
6. Current activities on property:
  - Residence
  - Animal Grazing
  - Cropping
  - Native forest
  - Plantation forest
  - Storage of chemical, fertiliser, fuel etc
  - Other

#### Section 2 – Wetland Details

7. Name of wetland on your property \_\_\_\_\_
8. Size of wetland \_\_\_\_\_
9. Is the wetland entirely within your property boundary? Y/N
10. How many neighbours face the wetland \_\_\_\_\_
11. Current use of wetland
  - Grazing
  - Recreation/boating
  - Fishing
  - Other
12. Has the wetland been drained or dammed in the past? Y/N
13. Is water extracted from the wetland for any purpose? Y/N
  - Irrigation
  - Stock and domestic

- Other

14. How is water taken ?

- Dam
- Pumps
- Other

15. Do you undertake any of the following on or adjacent to the wetland:

Weed control                      Y/N

Fire management                Y/N

Vegetation clearing            Y/N

### **Section 3 - Condition of wetland**

#### Vegetation

16. Is there vegetation around the edge of the wetland? Y/N

17. How would you rate the condition of the vegetation

Poor    fair        excellent

18. Is there vegetation in the wetland e.g. seagrass Y/N

Describe \_\_\_\_\_

19. How would you rate the condition of the vegetation

Poor    fair        excellent

20. Do you think that the number of species of plants in the wetland has changed over the last 5 years? Y/N

21. Do you know of any rare or unusual animals or plants in the wetland or the vegetation surrounding it?

22. Are there weeds in the wetland area? Y/N

23. Do you think the number of weeds in the wetland has changed over the last 5 years? Y/N

#### Water quality

24. Is the water in the wetland

- Salty
- Fresh
- Changes over the season

25. How would you rank the quality of the water?

Poor    average                excellent

26. Has the quality of water changed in the last 5? Years? Y/N

27. Have you ever observed any of the following

- A green colour in the water



- A smell (rotten eggs, rotting sea weed etc)
- Bubbles coming up from the sediment

28. Are there any activities that you think are affecting the quality of the water in the wetland?  
Please describe (either within your property or the catchment)

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Water quantity

29. Is the wetland currently full/empty?

30. Do the levels of water in the wetland change in response to rain? Y/N

30 a. Following the recent high rainfall, were the water levels in the wetland

Not significantly changed

Higher than normal

The highest you have ever observed

31. Do the levels of water in the wetland change in response to the tide? Y/N

32. Are there any activities that you think are affecting the quantity of water in the wetland? Please  
describe either within your property or the catchment)

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Fish and birds

33. Do swans or other water birds use the wetland? Y/N

34. Does the wetland contain fish? Y/N

35. If so, what fish species do you know of?

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**Threats:**

36. Do you think that the condition of the wetland is affected by (please tick):

- Urban development
  - Water extraction
  - Bar way management
  - Vegetation clearance
  - Grazing
  - Weeds
  - Cats and dogs
  - Recreational fishing
-

- Recreational walking
- Nearby roads
- Recreational boating
- 4WD or motor bike use
- Hunting
- Rubbish dumping
- Effluent seepage from septic tanks

**Future intentions:**

37. What are your intentions for the wetlands on your property?

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38. How would you like to utilise your wetlands?

- Grazing
- Wildlife only (for birds, fish, natural vegetation)
- Recreation only (fishing, bird watching, boating etc)
- Mixed use ( Grazing and wildlife and recreation)

Other

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39. What activities would you like to carry out on your wetland in the future?

- Fencing
- Weed control
- Feral animal control
- Drainage management
- Flood management
- Fire management
- Tree/shrub/reed planting
- Landing/boardwalk etc

Other \_\_\_\_\_

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40. Do you see any obstacles to carrying out these activities? Y/N

- Lack of money
- Lack of knowledge
- Lack of time
- Other

41. What information or support would you like to help you better manage your wetland?

- Advice on appropriate management activities
- Technical information
- Support with planning
- Money
- Labour

Other \_\_\_\_\_

## Attachment 3 – Landholders interested in ‘on-ground’ works

Wetland	Surname	First Name	Activities
(North of) Douglas North Wetland and (South of) Blind Creek	Woolley	Lorraine & Rob	Fencing; Weed control
Chimneys Lagoon	Lloyd	Ken & Maureen	Replanting
Chimneys Lagoon	Znidersic	Liz	Fencing, replanting
Chimneys Lagoon	Pearse	Rod (Tasmanian Land Conservancy)	Weed control; Other - covenant
Chimneys Lagoon	Murphy	Howard	Weed, Drainage, flood management; Fire; replanting; Other (keep people out)
Dianas Basin	Graham	Cameron	Fencing, feral animal control, fire management (reveg on own property)
Dianas Basin (inlet)	Davis	Marylin	Weed control
Douglas River	Madsen (Douglas River Pty Ltd)	Ian	Fencing, replanting
Grants Lagoon	Weyer	Rainer	Landing/boardwalk (from binalong Bay to footbridge. Other ( lagoon constantly open
Grants Lagoon	Eymael	John	Other (keep it natural where we are)
Grants Lagoon	Wilson	Les	Other - clear the scrub a bit
Grants Lagoon	Duncan	Sally	Other - leave it as is
Hendersons Lagoon	Ransley	Narelle & Ian	Fencing (farm needs to be fenced); Weed control, feral animal control, replanting
Hendersons Lagoon	Frater	Paul	Weed control; Boardwalk (at ford from reserve to allow loop walk)
Hendersons Lagoon	Hayes	Frederick	Weed control, fire , boardwalk
Oceana	Hoult	John	Other (leave it as it is)
Parkside Lagoon	Bradford	Wayne Roy	Other - pathway
Parkside Lagoon	Gee	M.Joan & Tony	Boardwalk (on Boggy Creek)
Parkside Lagoon	Cowie	Roxy	Boardwalk
Parkside Lagoon	Thurley	Peter	Drainage management
Scamander River Backwater	Corby	Phillip	Weed, feral animal control, other (access through sand dunes)
Scamander River Backwater	Stone	Patrick	fencing, weed control; drainage (barway); replanting, boardwalk
Scamander River Backwater	Mighall	Malcolm	Weed control, fire management
Templestowe	van der Woude (F.A.M. P/L)	Pieter M	Fencing. Replanting
Templestowe	Quon	Dave & Sheryl	Feral animal control; Drainage management; Fire management; replanting; Boardwalk
Upper Medeas Cove Marshes	Flack	Stephen	Fencing, weed control, feral animal control, drainage man, flood manage, fire manage,
Upper Medeas Cove Marshes	Cox	David & Michele	Fencing, replanting
Upper Medeas Cove Marshes	Wiggins	Laura and Kevin	Other (some way of stopping sand comind down with heavy rain)
Upper Medeas Cove Marshes	Weekes	Gillian	Weed control
Upper Medeas Cove Marshes	Bowen	Jim	Weed control; Drainage management; Flood management
Wrinklers Lagoon	Chugg	Sheila	Weed control, fire management
Wrinklers Lagoon	Shaw	Pat	Drainage management (barway); boardwalk would be nice
Yarmouth Creek	Bowsor & Leanne McMurtrie	Don	Fire management

Species Common Name	EPBC Act	TSP Act	Other significance	Preferred Habitat	TASVEG Communities	Habitat is present within wetland
<i>Antipodia chaostola</i> Chaostola Skipper		endangered		Dry open forest preferably woodland with <i>Gahnia radula</i> at low altitude	DAS NBA DAC DTO DPU DOB DGL DSO DSG DAM	2, 3, 4, 5, 7, 8, 9, 10, 14, 16, 19, 23, 25
<i>Aquila audax fleayi</i> Wedge-tailed Eagle	Endangered	endangered		Large mature trees with a protected aspect within large tracts (more than 10 ha) of eucalypt or mixed forest are preferred as nesting habitat. Will use many other types of vegetation (including others not listed here) as foraging habitat.	DGL DOB DTD DTO WGL WVI WOL WOB WNL DSC DSG DSO	2, 3, 4, 5, 7, 9, 10, 14, 16, 23, 25
<i>Arenaria interpres</i> Ruddy Turnstone			JAMBA CAMBA	Mud, sand and saltmarsh	OSM ASS AUS AHS	3, 4, 5, 7, 10, 11, 12, 14, 16, 19, 22, 23, 25, 28, 29
<i>Calidris acuminata</i> Sharp-tailed Sandpiper			JAMBA CAMBA	Sand, dunes, mud, river gravel shore and saltmarsh	OSM ASS AUS AHS	3, 4, 5, 7, 10, 11, 12, 14, 16, 19, 22, 23, 25, 28, 29
<i>Calidris canutus</i> Red Knot			JAMBA CAMBA	Mud and saltmarsh	OSM ASS AUS AHS	3, 4, 5, 7, 10, 11, 12, 14, 16, 19, 22, 23, 25, 28, 29
<i>Calidris ferruginea</i> Curlew Sandpiper			JAMBA CAMBA	Sand, mud and saltmarsh	OSM ASS AUS AHS	3, 4, 5, 7, 10, 11, 12, 14, 16, 19, 22, 23, 25, 28, 29
<i>Calidris ruficollis</i> Red-necked Stint			JAMBA CAMBA	Sand, dunes, sand bar, mud, river gravel shore and saltmarsh	OSM ASS AUS AHS	3, 4, 5, 7, 10, 11, 12, 14, 16, 19, 22, 23, 25, 28, 29
<i>Chlidonias leucoptera</i> White-winged Black Tern			JAMBA CAMBA	Saltmarsh	ASS AUS AHS	11

Species Common Name	EPBC Act	TSP Act	Other significance	Preferred Habitat	TASVEG Communities	Habitat is present within wetland
<i>Dasyurus maculatus maculatus</i> Spotted-tail Quoll	Vulnerable	rare		Structurally complex vegetation (ie in good condition) especially in riparian zones. Any intact dry or wet forest, dry and wet heath and scrub heath	WOB WOL WGL WNL WVI	
<i>Eudyptula minor</i> Little Penguin			Colonies under threat sensitive breeding habitat	Fore and back dunes surrounded by low tussock and other vegetation	SRC	
<i>Fraus latistria</i> Broad-striped Ghost Moth		rare		Heathland and sedgeland	SCH SHL SHW SMM ASF ARS	2, 3, 5, 7, 9, 10, 11, 14, 16, 17, 19, 22, 23, 24, 28, 29
<i>Gallinago harwickii</i> Latham's Snipe			JAMBA CAMBA	Fresh water sedgeland and mud	ASF OSM AHS	2, 3, 4, 5, 7, 9, 10, 11, 14, 16, 17, 19, 23, 25, 28, 29
<i>Haliaeetus leucogaster</i> White-bellied Sea-Eagle		vulnerable		Forest with significant old-growth eucalypt component within 5 km of the coast (nearest coast including shores, bays, inlets and peninsulas), rivers, lakes or complex of farm dams. May use other vegetation types as foraging habitat.	DAC DNI DGL DOB DPU DVG DTD DTO DVC WGL WVI WOL WOB WNL DSC DSG DSO	2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 14, 16, 19, 22, 23, 24, 25, 29
<i>Heteroscelus brevipes</i> Grey-tailed Tattler			JAMBA CAMBA	Sand, dunes, mud, saltmarsh, river, gravel, shore	OSM ASS AUS AHS ORO	3, 4, 5, 7, 10, 11, 12, 14, 16, 19, 23, 25, 28, 29
<i>Lathamus discolor</i> Swift Parrot	Endangered	endangered		Foraging habitat: within 5 km of the coast (nearest coast including shores, bays inlets or peninsulas), grassy forest dominated by <i>Eucalyptus globulus</i> or grassy or shrubby forest dominated by <i>E. ovata</i> . Edge of foraging habitat: between 5 & 10 km from the coast.	DGL DOV WGL DPU	3, 4, 5, 9, 14, 16, 23, 24, 25, 28, 29



Species Common Name	EPBC Act	TSP Act	Other significance	Preferred Habitat	TASVEG Communities	Habitat is present within wetland
<i>Lathamus discolor</i> Swift Parrot	Endangered	endangered		Nesting habitat: within 5 km of the coast (nearest coast including shores, bays inlets or peninsulas) and near foraging habitat. Nesting trees are usually one of <i>Eucalyptus globulus</i> , <i>E. obliqua</i> , <i>E. pulchella</i> , <i>E. viminalis</i> and <i>E. delegatensis</i> , but can include other trees containing suitable hollows.	DOB DTO DTD DNI DAC DAM DAS DAD DVC DVS WOB WOL WNL WVI DSC DSG	3, 4, 5, 6, 7, 8, 9, 12, 16, 19, 22, 23, 24, 29
<i>Limnodynastes peronii</i> Striped Marsh Frog		rare		Large swamps, weedy lagoons, dams with abundant marginal vegetation	AHF ASF	2, 3, 4, 9, 17, 22, 28
<i>Limosa lapponica</i> Bar-tailed Godwit			JAMBA CAMBA	Mud, sand, dunes, coastal grassland and saltmarsh	OSM ASS AUS AHS GHC	3, 4, 5, 7, 10, 11, 12, 14, 16, 17, 19, 22, 23, 25, 28, 29
<i>Litoria raniformis</i> Green and Gold Frog	Vulnerable	vulnerable		Permanent and temporary water bodies (streams, ponds, dams) with vegetation in or around them	ASF AHF OAQ	2, 3, 4, 8, 9, 16, 17, 19, 22, 28, 29
<i>Numenius madagascariensis</i> Eastern Curlew		endangered	JAMBA CAMBA	Mud, sand and saltmarsh	OSM ASS AUS AHS	3, 4, 5, 7, 10, 11, 12, 14, 16, 19, 23, 25, 28, 29
<i>Numenius phaeopus</i> Whimbrel			JAMBA CAMBA	Sand and saltmarsh	OSM ASS AUS AHS	3, 4, 5, 7, 10, 11, 12, 14, 16, 19, 23, 25, 28, 29
<i>Pardalotus quadragintus</i> Forty-spotted Pardalote	Endangered	endangered		Grassy dry forest and woodland containing <i>Eucalyptus viminalis</i> (white gum) within 5 km of the coast.	DVG DVC DVS	3, 4, 6, 7, 11, 12, 16, 22, 24, 29
<i>Perameles gunnii gunnii</i> Eastern-barred Bandicoot	Vulnerable			Grassy woodlands, native grasslands mosaics of pasture and ground cover including shrubby weeds	DGL DVG DPU NBA GCL GPL GSL GTL SHL	3, 4, 5, 14, 16, 23, 24, 25
<i>Pluvialis fulva</i> Pacific Golden Plover			JAMBA CAMBA	Sand, mud and saltmarsh	OSM ASS AUS AHS	3, 4, 5, 7, 10, 11, 12, 14, 16, 19, 23, 25, 28, 29
<i>Podiceps cristatus</i> Great Crested Grebe		rare		Lakes, rivers and estuaries	ASF AHF	2, 4, 9, 17, 22, 28

Species Common Name	EPBC Act	TSP Act	Other significance	Preferred Habitat	TASVEG Communities	Habitat is present within wetland
<i>Prototroctes maraena</i> Australian Grayling	Vulnerable	vulnerable		Rivers	Rivers	
<i>Pseudemoia rawlinsoni</i> Glossy Grass Skink		rare		Wetlands and swampy habitats including grassy wetlands and tea tree swamps	AHL SHW SMM SLW SRI NME	2, 3, 4, 5, 6, 7, 8, 14, 16, 17, 19, 22, 23, 27
<i>Pseudomys novaehollandiae</i> New Holland Mouse		endangered		Nesting habitat: Dry coastal heathland and open heathy forest	SCH	2, 3, 5, 10, 17, 19
<i>Pseudomys novaehollandiae</i> New Holland Mouse		endangered		Foraging habitat: Dry coastal heathland and open heathy forest	DAC SAC SSC	2, 3, 4, 5, 8, 9, 10, 11, 12, 14, 16, 17, 19, 23, 24, 25, 28, 29
<i>Puffinus tenuirostris</i> Short-tailed shearwater			JAMBA Colonies under threat sensitive breeding habitat	Coastal grassland, sand, dunes, headlands and islands	GHC SRC OSM	3, 4, 5, 7, 10, 11, 12, 14, 16, 17, 19, 23, 25, 28, 29
<i>Sarcophilus harrisii</i> Tasmanian Devil		vulnerable		Dry forest, open grassy woodland, and coastal heath and scrub (dry only)	NBA DAC DAD DAM DAS DGL DNI DOB DOV DPU DTO DTD DVC DVG DVS SAC SSC SCH DSG DSO	2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 14, 16, 17, 19, 22, 23, 24, 25, 28, 29
<i>Schayera baiulus</i> Schayers Grasshopper		endangered		Remnant coastal heathland and open forest	SCH DAC DSO DSG DAM	2, 3, 5, 6, 7, 8, 9, 10, 14, 17, 19, 23, 25
<i>Sterna albifrons sinensis</i> Little Tern		endangered	JAMBA CAMBA sensitive breeding habitat	Sand or shingle beaches, unvegetated sites near estuaries and nearby lakes, and estuarine and offshore islands	OSM ASS AUS AHS SRC	3, 4, 5, 7, 10, 11, 12, 14, 16, 19, 23, 25, 28, 29

Species Common Name	EPBC Act	TSP Act	Other significance	Preferred Habitat	TASVEG Communities	Habitat is present within wetland
<i>Sterna nereis nereis</i> Fairy Tern		rare	sensitive breeding habitat	Sand or shingle beaches, unvegetated sites near estuaries and nearby lakes, and estuarine and offshore islands	OSM ASS AUS AHS SRC	3, 4, 5, 7, 10, 11, 12, 14, 16, 19, 23, 25, 28, 29
<i>Sterna striata</i> White-fronted Tern		vulnerable	sensitive breeding habitat	Islands or stacks, sandy beaches to sheltered coasts including estuaries, bays, spits and shingle	SRC OSM GHC	3, 4, 5, 7, 10, 11, 12, 14, 16, 17, 19, 23, 25, 28, 29
<i>Tasmanipatus anophthalmus</i> Blind Velvet Worm		endangered		From near sea level in Eucalypt forest with rotting logs > 40cm diameter	WOB WVI DSC	6
<i>Tasmanipatus barretti</i> Giant Velvet Worm		rare		Wet eucalypt forest, mixed forest to rainforest with rotting logs	WOB WVI	6
<i>Tringa nebularia</i> Common Greenshank			JAMBA CAMBA	Mud, sand, dunes, river gravel shore and saltmarsh	OSM ASS AUS AHS	3, 4, 5, 7, 10, 11, 12, 14, 16, 23, 25, 28, 29
<i>Tyto novaehollandiae castanops</i> Masked Owl		endangered		Lowland dry sclerophyll forest with old growth components	DAC DNI DAS DGL DOB DPU DOV DVG DTD DTO DVC DVS WOB WOL WGL WNL WVI DAM DSC DSO DSG	3, 4, 5, 6, 7, 8, 9, 10, 14, 16, 19, 22, 23, 24, 25, 28, 29

## Environmental and Declared Weeds

Code	Scientific_Name	Common_Name	Declared_Environmental
KT	<i>Acacia paradoxa</i>	kangaroo thorn	Environmental weed
M	<i>Ammophila arenaria</i>	marram grass	Environmental weed
BC	<i>Asparagus asparagoides</i>	bridal creeper	Declared weed
AF	<i>Asparagus scandens</i>	asparagus fern	Declared weed
TL	<i>Chamaecytisus palmensis</i>	tree lucerne	Environmental weed
BS	<i>Chrysanthemoides monilifera</i>	boneseed	Declared weed
H	<i>Conium maculatum</i>	hemlock	Environmental weed
MI	<i>Coprosma repens</i>	mirror bush	Environmental weed
CR	<i>Coprosma robusta</i>	karamu	Environmental weed
PG	<i>Cortaderia selloana</i>	pampas grass	Environmental weed
C	<i>Cotoneaster</i> sp.	cotoneaster	Environmental weed
EB	<i>Cytisus scoparius</i>	english broom	Declared weed
CI	<i>Delairea odorata</i>	cape ivy	Environmental weed
DP	<i>Dipogon lignosus</i>	Dolichos Pea	Environmental weed
S	<i>Erica lusitanica</i>	spanish heath	Declared weed
SS	<i>Euphorbia paralias</i>	sea spurge	Environmental weed
F	<i>Foeniculum vulgare</i>	fennel	Declared weed
G	<i>Gazania linearis</i>	tufted gazania	Environmental weed
MB	<i>Genista monspessulana</i>	montpellier broom	Declared weed
IVY	<i>Hedera helix</i>	ivy	Environmental weed
LJ	<i>Lonicera japonica</i>	Japanese honeysuckle	Environmental weed
LA	<i>Lupinus arboreus</i>	tree lupin	Environmental weed
AB	<i>Lycium ferocissimum</i>	african boxthorn	Declared weed
HH	<i>Marrubium vulgare</i>	horehound	Declared weed
ST	<i>Nassella trichotoma</i>	serrated tussock	Declared weed
O	<i>Osteospermum fruticosum</i>	trailing african daisy	Environmental weed
CA	<i>Paraserianthes lophantha</i>	Cape Leeuwin wattle	Environmental weed
PA	<i>Paspalum dilatatum</i>	paspalum	Environmental weed
PF	<i>Passiflora</i> sp.	passion fruit	Environmental weed
PI	<i>Pinus radiata</i>	radiata pine	Environmental weed
SP	<i>Pittosporum undulatum</i>	sweet pittosporum	Environmental weed
PM	<i>Polygala myrtifolia</i>	myrtle-leaf milkwort	Environmental weed
PS	<i>Psoralea pinnata</i>	blue butterfly bush	Environmental weed
BR	<i>Rosa rubiginosa</i>	briar rose	Environmental weed
BB	<i>Rubus fruticosus aggregate</i>	blackberry	Declared weed
CW	<i>Salix fragilis</i>	crack willow	Declared weed
R	<i>Senecio jacobaea</i>	ragwort	Declared weed
RG	<i>Spartina anglica</i>	rice grass	Environmental weed
WJ	<i>Tradescantia fluminensis</i>	wandering jew	Environmental weed
G	<i>Ulex europaeus</i>	gorse	Declared weed
PW	<i>Vinca major</i>	blue periwinkle	Environmental weed
WA	<i>Watsonia meriana</i>	watsonia	Environmental weed
ZA	<i>Zantedeschia aethiopica</i>	arum lily	Environmental weed

## Aquatic Weeds

Scientific_Name	Common_Name	Aquatic	Naturalised in Tas
<i>Cabomba caroliniana</i>	fanwort	Aquatic weed - Declared	No
<i>Egeria densa</i>	dense waterweed	Aquatic weed - Declared	Yes
<i>Eichhornia crassipes</i>	water hyacinth	Aquatic weed - Declared	No

<i>Elodea canadensis</i>	Canadian pondweed	Aquatic weed - Declared	Yes
<i>Eleocharis parodii</i>	parodi spike rush	Aquatic weed - Declared	No
<i>Equisetum</i> sp.	horsetail	Aquatic weed - Declared	Yes
<i>Glyceria maxima</i>	reed sweetgrass	Aquatic weed -	Yes
<i>Gymnocoronis spilanthoides</i>	Senegal tea plant	Aquatic weed - Declared	No
<i>Hydrilla verticillata</i>	hydrilla	Aquatic weed - Declared	No
<i>Lagarosiphon major</i>	lagarosiphon	Aquatic weed - Declared	No
<i>Salvinia molesta</i>	salvinia	Aquatic weed - Declared	No
<i>Trapa</i> sp.	floating water chestnut	Aquatic weed - Declared	No
<i>Zizania</i> sp.	wild rice	Aquatic weed - Declared	No

## Species list - Moriarty/ Windmill Lagoon (2)

### Status codes:

#### ORIGIN

i - introduced  
d - declared weed WM Act  
en - endemic to Tasmania  
t - within Australia, occurs only in Tas.

#### NATIONAL SCHEDULE

EPBC Act 1999  
CR - critically endangered  
EN - endangered  
VU - vulnerable

#### STATE SCHEDULE

TSP Act 1995  
e - endangered  
v - vulnerable  
r - rare

### Sites:

201	02 - Wet Heathland (SHW) - E609937, N5424403	19/08/2009	Philip Barker
202	02 - Coastal Heathland (SCH) - E609937, N5424403	19/08/2009	Philip Barker
203	02 - Acacia longifolia coastal scrub (SAC) - E609937, N5424403	19/08/2009	Philip Barker
204	02 - Lowland Grassy Sedgeland (GSL) - E609937, N5424403	19/08/2009	Philip Barker
205	02 - Coastal Scrub (SSC) - E609937, N5424403	19/08/2009	Philip Barker
206	02 - Eucalyptus amygdalina coastal forest and woodland (DAC) - E609937, N5424403	19/08/2009	Philip Barker
207	02 - Melaleuca ericifolia swamp forest (NME) - E609937, N5424403	19/08/2009	Philip Barker
208	02 - Allocasuarina verticillata forest (NAV) - E609937, N5424403	19/08/2009	Philip Barker
209	02 - Fresh water aquatic sedgeland & rushland (ASF) - E609937, N5424403	19/08/2009	Philip Barker
210	02 - Melaleuca squarrosa scrub (SMR) - E609937, N5424403	19/08/2009	Philip Barker
211	02 - Leptospermum scrub (SLW) - E609937, N5424403	19/08/2009	Philip Barker
212	02 - Fresh water aquatic herbland (AHF) - E610130, N5425372	19/08/2009	Chris Obst

Site	Name	Common name	Status
<b>DICOTYLEDONAE</b>			
<b>APIACEAE</b>			
204 207 209 211 212	<i>Centella cordifolia</i>	swampwort	
204 206 209	<i>Hydrocotyle hirta</i>	hairy pennywort	
204 209	<i>Hydrocotyle muscosa</i>	mossy pennywort	
209	<i>Hydrocotyle sp.</i>	pennywort	
206	<i>Xanthosia pilosa</i>	woolly crossherb	
206	<i>Xanthosia tasmanica</i>	small crossherb	
<b>ASTERACEAE</b>			
209	<i>Cirsium vulgare</i>	spear thistle	i
201 202 203 205 206	<i>Coronidium scorpioides</i>	curling everlasting	
204 208	<i>Euchiton collinus</i>	common cottonleaf	
204 208	<i>Hypochoeris glabra</i>	smooth catsear	i
206	<i>Lagenophora sp.</i>	daisy	
202 205	<i>Leptorhynchos squamatus</i>	scaly buttons	
206 208 209	<i>Olearia lirata</i>	forest daisybush	
206 208	<i>Senecio sp.</i>	groundsel	
<b>CAMPANULACEAE</b>			
208	<i>Wahlenbergia sp.</i>	bluebell	
<b>CARYOPHYLLACEAE</b>			
206	<i>Cerastium glomeratum</i>	sticky mouse-ear	i
<b>CASUARINACEAE</b>			
201 202 203 205 206 208	<i>Allocasuarina monilifera</i>	necklace sheoak	en
203 208	<i>Allocasuarina verticillata</i>	drooping sheoak	



<b>CONVOLVULACEAE</b>		
203 206 208	<i>Dichondra repens</i>	kidneyweed
<b>CRASSULACEAE</b>		
204	<i>Crassula sieberiana</i>	stone-crop
<b>DILLENIACEAE</b>		
202	<i>Hibbertia acicularis</i>	prickly guineaflower
201 203	<i>Hibbertia riparia</i>	erect guineaflower
206	<i>Hibbertia virgata</i>	twiggy guineaflower r
<b>DROSERACEAE</b>		
202	<i>Drosera peltata</i>	pale sundew
<b>EPACRIDACEAE</b>		
202 203	<i>Acrotriche serrulata</i>	ants delight
201	<i>Astroloma humifusum</i>	native cranberry
202 205 206	<i>Epacris impressa</i>	common heath
201 202	<i>Epacris lanuginosa</i>	swamp heath
201 210	<i>Epacris obtusifolia</i>	bluntleaf heath
201 202 203 206	<i>Leucopogon ericoides</i>	pink beardheath
202 203 205 206	<i>Leucopogon parviflorus</i>	coast beardheath
201 202 205 206	<i>Leucopogon virgatus</i>	common beard-heath
202	<i>Monotoca elliptica</i>	tree broomheath
210	<i>Sprengelia incarnata</i>	pink swampheath
201	<i>Styphelia adscendens</i>	golden heath
<b>ERICACEAE</b>		
201	<i>Erica lusitana</i>	spanish heath d
<b>EUPHORBIACEAE</b>		
206	<i>Amperea xiphoclada</i> var. <i>xiphoclada</i>	broom spurge
208 209	<i>Poranthera microphylla</i>	small poranthera
<b>FABACEAE</b>		
201 202 205 206 210	<i>Aotus ericoides</i>	golden pea
202 203 206	<i>Bossiaea cinerea</i>	showy bossia
206 208	<i>Desmodium gunnii</i>	southern ticktrefoil v
201 202 205 206	<i>Dillwynia glaberrima</i>	smooth parrotpea
205 206 208	<i>Glycine clandestina</i>	twining glycine
202 206 208	<i>Kennedia prostrata</i>	running postman
202 205 206	<i>Phyllota diffusa</i>	heath bushpea en
206	<i>Platylobium formosum</i>	handsome flatpea
201 210	<i>Pultenaea stricta</i>	rigid bushpea
<b>GERANIACEAE</b>		
201 207	<i>Geranium potentilloides</i>	mountain cranesbill
<b>GOODENIACEAE</b>		
209	<i>Goodenia lanata</i>	trailing native-primrose
<b>HALORAGACEAE</b>		
203 206 208	<i>Gonocarpus teucrioides</i>	forest raspwort
206	<i>Haloragis brownii</i>	swamp raspwort
212	<i>Myriophyllum</i> sp.	water milfoil

MENYANTHACEAE			
201 212	<i>Nymphoides exigua</i>	dwarf marshwort	en
209 210	<i>Villarsia exaltata</i>	erect marshflower	r
212	<i>Villarsia reniformis</i>	running marshflower	
MIMOSACEAE			
206	<i>Acacia dealbata</i> subsp. <i>dealbata</i>	silver wattle	
202 205	<i>Acacia genistifolia</i>	spreading wattle	
206			
201 202	<i>Acacia longifolia</i>	coast wattle	
203 205			
206			
208	<i>Acacia mearnsii</i>	black wattle	
202 205	<i>Acacia suaveolens</i>	sweet wattle	
206			
206	<i>Acacia terminalis</i>	sunshine wattle	
206	<i>Acacia ulicifolia</i>	juniper wattle	r
201 207	<i>Acacia verticillata</i>	prickly mimosa	
211			
MYRTACEAE			
202 205	<i>Eucalyptus amygdalina</i>	black peppermint	en
206			
205	<i>Eucalyptus ovata</i> var. <i>ovata</i>	black gum	
203 205	<i>Eucalyptus viminalis</i> subsp. <i>viminalis</i>	white gum	
202 205	<i>Euryomyrtus ramosissima</i>	heath-myrtle	
206			
206 208	<i>Kunzea ambigua</i>	white kunzea	
201 207	<i>Leptospermum lanigerum</i>	woolly teatree	
209 211			
201 202	<i>Leptospermum scoparium</i>	common tea-tree	
204 205			
210			
201 202	<i>Melaleuca ericifolia</i>	coast paperbark	
204 205			
207 210			
211			
210	<i>Melaleuca squarrosa</i>	scented paperbark	
ONAGRACEAE			
207	<i>Epilobium</i> sp.	willowherb	
OXALIDACEAE			
203 204	<i>Oxalis perennans</i>	grassland woodsorrel	
206 208			
PITTOSPORACEAE			
206	<i>Bursaria spinosa</i> subsp. <i>spinosa</i>	prickly box	
POLYGALACEAE			
202 205	<i>Comesperma volubile</i>	blue lovecreeper	
206			
POLYGONACEAE			
205	<i>Muehlenbeckia australis</i>	climbing lignum	
PORTULACACEAE			
204	<i>Calandrinia</i> sp.	purslane	
PROTEACEAE			
202 203	<i>Banksia marginata</i>	silver banksia	
205 206			
210	<i>Conospermum hookeri</i>	tasmanian smokebush	en VU v
202 206	<i>Persoonia juniperina</i>	prickly geebung	

<b>ROSACEAE</b>		
208	<i>Acaena</i> sp.	sheep's burr
<b>RUBIACEAE</b>		
204 206	<i>Asperula subsimplex</i>	water woodruff r
<b>RUTACEAE</b>		
209	<i>Boronia parviflora</i>	swamp boronia
206	<i>Boronia pilosa</i>	hairy boronia
202 203	<i>Correa reflexa</i>	correa
205 206		
206	<i>Correa reflexa</i> var. <i>nummulariifolia</i>	roundleaf correa
<b>SANTALACEAE</b>		
206 208	<i>Exocarpos cupressiformis</i>	common native-cherry
202 204	<i>Leptomeria drupacea</i>	erect currantbush
205 206		
207 210		
<b>STACKHOUSIACEAE</b>		
206	<i>Stackhousia monogyna</i>	forest candles
<b>THYMELAEACEAE</b>		
206	<i>Pimelea glauca</i>	smooth riceflower
203	<i>Pimelea linifolia</i> subsp. <i>linifolia</i>	slender riceflower
<b>TREMANDRACEAE</b>		
206	<i>Tetratheca pilosa</i>	hairy pinkbells
<b>VIOLACEAE</b>		
208	<i>Viola hederacea</i>	ivy leaf violet
<b>MONOCOTYLEDONAE</b>		
<b>CYPERACEAE</b>		
209	<i>Baumea juncea</i>	bare twigsedge
206	<i>Baumea tetragona</i>	square twigsedge
209	<i>Eleocharis sphacelata</i>	tall spikesedge
202 205	<i>Ficinia nodosa</i>	knobby clubsedge
209	<i>Gahnia filum</i>	chaffy sawsedge
201 202	<i>Lepidosperma concavum</i>	sand swordsedge
203 205		
206 208		
201 206	<i>Lepidosperma filiforme</i>	common rapiersedge
207 211		
206	<i>Lepidosperma gladiatum</i>	coast swordsedge
201 202	<i>Lepidosperma longitudinale</i>	spreading swordsedge
204 207		
209 210		
211		
204 209	<i>Schoenus apogon</i>	common bogsedge
209	<i>Schoenus brevifolius</i>	zigzag bogsedge r
<b>IRIDACEAE</b>		
201 202	<i>Patersonia fragilis</i>	short purpleflag
206 210		
<b>JUNCAGINACEAE</b>		
209 212	<i>Triglochin procerum</i>	greater waterribbons
209 212	<i>Triglochin striatum</i>	streaked arrowgrass

<b>LILIACEAE</b>		
202 205 206	<i>Burchardia umbellata</i>	milkmaids
202 203 208	<i>Dianella revoluta</i>	spreading flaxlily
206	<i>Dianella tasmanica</i>	forest flaxlily
204	<i>Laxmannia orientalis</i>	dwarf wire-lily
<b>ORCHIDACEAE</b>		
206 208	<i>Acianthus pusillus</i>	small mosquito-orchid
203 206	<i>Caladenia sp.</i>	spider-orchid
206	<i>Glossodia major</i>	waxlip orchid
206 208	<i>Pterostylis pedunculata</i>	maroonhood
205 206	<i>Pterostylis sp.</i>	greenhood
206	<i>Pyrorchis nigricans</i>	fire orchid
208	<i>Thelymitra sp.</i>	sun-orchid
<b>POACEAE</b>		
204 206 208	<i>Austrodanthonia sp.</i>	wallabygrass
203	<i>Austrostipa flavescens</i>	yellow speargrass
204 206 208	<i>Austrostipa sp.</i>	speargrass
209	<i>Deyeuxia densa</i>	heath bentgrass
204 209	<i>Deyeuxia sp.</i>	bent grass
209	<i>Ehrharta distichophylla</i>	hairy ricegrass
201 206 210	<i>Ehrharta stipoides</i>	weeping grass
204	<i>Eragrostis curvula</i>	african lovegrass
209	<i>Graminaea sp.</i>	grass species
202 209	<i>Poa labillardierei</i>	silver tussockgrass
202 203	<i>Themeda triandra</i>	kangaroo grass
204	<i>Zoysia macrantha</i>	prickly couch
<b>POTAMOGETONACEAE</b>		
209	<i>Potamogeton sp.</i>	pondweed
<b>RESTIONACEAE</b>		
204 209	<i>Apodasmia brownii</i>	coarse twinerush
209	<i>Empodisma minus</i>	spreading roperush
201 210	<i>Eurychorda complanata</i>	flat cordrush
202 204	<i>Hypolaena fastigiata</i>	tassel roperush
205 206		
201 207	<i>Leptocarpus tenax</i>	slender twinerush
209 210 211		
<b>XANTHORRHOEACEAE</b>		
201 202 203 204 205 206 208 209	<i>Lomandra longifolia</i>	sagg
202 206	<i>Xanthorrhoea australis</i>	southern grasstree
<b>XYRIDACEAE</b>		
201 209 210 211	<i>Xyris operculata</i>	tall yelloweye
201	<i>Xyris sp.</i>	yelloweye

## PTERIDOPHYTA

### ADIANTACEAE

206	<i>Adiantum aethiopicum</i>	common maidenhair
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### ASPLENIACEAE

206 208	<i>Asplenium flabellifolium</i>	necklace fern
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### DENNSTAEDTIACEAE

202 203	<i>Pteridium esculentum</i>	bracken
205 206		

### GLEICHENIACEAE

204 207	<i>Gleichenia microphylla</i>	scrambling corallfern
209 210		
211		

### LYCOPODIACEAE

204 209	<i>Lycopodium fastigiatum</i>	mountain clubmoss
210		

## Site Report: Moriarty/ Windmill Lagoon (2)

### Site: 201 02 - Wet Heathland (SHW)

Grid Reference: 609937E, 5424403N  
Accuracy: within 1 kilometre  
Recorder: Philip Barker  
Date of Survey: 19 Aug 2009

Trees: *Allocasuarina monilifera*  
Tall Shrubs: *Acacia verticillata*, *Leptospermum lanigerum*, *Leptospermum scoparium*, *Melaleuca ericifolia*  
Shrubs: *Acacia longifolia*, *Dillwynia glaberrima*, *Epacris lanuginosa*, *Epacris obtusifolia*, *Leucopogon ericoides*, *Pultenaea stricta*  
Low Shrubs: *Aotus ericoides*, *Astroloma humifusum*, *Hibbertia riparia*, *Leucopogon virgatus*, *Styphelia adscendens*  
Herbs: *Coronidium scorpioides*, *Geranium potentilloides*, *Nymphoides exigua*  
Graminoids: *Eurychorda complanata*, *Lepidosperma concavum*, *Lepidosperma filiforme*, *Lepidosperma longitudinale*, *Leptocarpus tenax*, *Lomandra longifolia*, *Patersonia fragilis*, *Xyris operculata*, *Xyris* sp.  
Grasses: *Ehrharta stipoides*  
Weeds: *Erica lusitanica*

### Site: 202 02 - Coastal Heathland (SCH)

Grid Reference: 609937E, 5424403N  
Accuracy: within 1 kilometre  
Recorder: Philip Barker  
Date of Survey: 19 Aug 2009

Trees: *Allocasuarina monilifera*, *Eucalyptus amygdalina*  
Tall Shrubs: *Banksia marginata*, *Leptospermum scoparium*, *Melaleuca ericifolia*  
Shrubs: *Acacia genistifolia*, *Acacia longifolia*, *Acacia suaveolens*, *Bossiaea cinerea*, *Dillwynia glaberrima*, *Epacris impressa*, *Epacris lanuginosa*, *Euryomyrtus ramosissima*, *Leptomeria drupacea*, *Leucopogon ericoides*, *Leucopogon parviflorus*, *Monotoca elliptica*, *Persoonia juniperina*, *Phyllota diffusa*  
Low Shrubs: *Acrotriche serrulata*, *Aotus ericoides*, *Hibbertia acicularis*, *Leucopogon virgatus*  
Herbs: *Burchardia umbellata*, *Coronidium scorpioides*, *Correa reflexa*, *Dianella revoluta*, *Drosera peltata*, *Kennedia prostrata*, *Leptorhynchos squamatus*  
Graminoids: *Ficinia nodosa*, *Hypolaena fastigiata*, *Lepidosperma concavum*, *Lepidosperma longitudinale*, *Lomandra longifolia*, *Patersonia fragilis*, *Xanthorrhoea australis*  
Grasses: *Poa labillardierei*, *Themeda triandra*  
Ferns: *Pteridium esculentum*  
Climbers: *Comesperma volubile*

### Site: 203 02 - Acacia longifolia coastal scrub (SAC)

Grid Reference: 609937E, 5424403N  
Accuracy: within 1 kilometre  
Recorder: Philip Barker  
Date of Survey: 19 Aug 2009

Trees: *Allocasuarina monilifera*, *Allocasuarina verticillata*, *Eucalyptus viminalis* subsp. *viminalis*  
Tall Shrubs: *Banksia marginata*  
Shrubs: *Acacia longifolia*, *Bossiaea cinerea*, *Leucopogon ericoides*, *Leucopogon parviflorus*, *Pimelea linifolia* subsp. *linifolia*  
Low Shrubs: *Acrotriche serrulata*, *Hibbertia riparia*  
Herbs: *Caladenia* sp., *Coronidium scorpioides*, *Correa reflexa*, *Dianella revoluta*, *Dichondra repens*, *Gonocarpus teucrioides*, *Oxalis perennans*  
Graminoids: *Lepidosperma concavum*, *Lomandra longifolia*  
Grasses: *Austrostipa flavescens*, *Themeda triandra*  
Ferns: *Pteridium esculentum*

### Site: 204 02 - Lowland Grassy Sedgeland (GSL)

Grid Reference: 609937E, 5424403N  
Accuracy: within 1 kilometre  
Recorder: Philip Barker



Date of Survey: 19 Aug 2009

Tall Shrubs: *Leptospermum scoparium*, *Melaleuca ericifolia*

Shrubs: *Leptomeria drupacea*

Herbs: *Asperula subsimplex*, *Calandrinia* sp., *Centella cordifolia*, *Crassula sieberiana*, *Euchiton collinus*, *Hydrocotyle hirta*, *Hydrocotyle muscosa*, *Laxmannia orientalis*, *Oxalis perennans*

Graminoids: *Apodasmia brownii*, *Hypolaena fastigiata*, *Lepidosperma longitudinale*, *Lomandra longifolia*, *Schoenus apogon*

Grasses: *Austrodanthonia* sp., *Austrostipa* sp., *Deyeuxia* sp., *Zoysia macrantha*

Ferns: *Gleichenia microphylla*, *Lycopodium fastigiatum*

Weeds: *Eragrostis curvula*, *Hypochoeris glabra*

### Site: 205 02 - Coastal Scrub (SSC)

Grid Reference: 609937E, 5424403N

Accuracy: within 1 kilometre

Recorder: Philip Barker

Date of Survey: 19 Aug 2009

Trees: *Allocasuarina monilifera*, *Eucalyptus amygdalina*, *Eucalyptus ovata* var. *ovata*, *Eucalyptus viminalis* subsp. *viminalis*

Tall Shrubs: *Banksia marginata*, *Leptospermum scoparium*, *Melaleuca ericifolia*

Shrubs: *Acacia genistifolia*, *Acacia longifolia*, *Acacia suaveolens*, *Dillwynia glaberrima*, *Epacris impressa*, *Euryomyrtus ramosissima*, *Leptomeria drupacea*, *Leucopogon parviflorus*, *Phyllota diffusa*

Low Shrubs: *Aotus ericoides*, *Leucopogon virgatus*

Herbs: *Burchardia umbellata*, *Coronidium scorpioides*, *Correa reflexa*, *Glycine clandestina*, *Leptorhynchos squamatus*, *Pterostylis* sp.

Graminoids: *Ficinia nodosa*, *Hypolaena fastigiata*, *Lepidosperma concavum*, *Lomandra*

Ferns: *Pteridium esculentum*

Climbers: *Comesperma volubile*, *Muehlenbeckia australis*

### Site: 206 02 - Eucalyptus amygdalina coastal forest and woodland (DAC)

Grid Reference: 609937E, 5424403N

Accuracy: within 1 kilometre

Recorder: Philip Barker

Date of Survey: 19 Aug 2009

Trees: *Allocasuarina monilifera*, *Bursaria spinosa* subsp. *spinosa*, *Eucalyptus amygdalina*

Tall Shrubs: *Acacia dealbata* subsp. *dealbata*, *Banksia marginata*, *Exocarpos cupressiformis*, *Kunzea ambigua*

Shrubs: *Acacia genistifolia*, *Acacia longifolia*, *Acacia suaveolens*, *Acacia terminalis*, *Acacia ulicifolia*, *Amperea xiphoclada* var. *xiphoclada*, *Boronia pilosa*, *Bossiaea cinerea*, *Dillwynia glaberrima*, *Epacris impressa*, *Euryomyrtus ramosissima*, *Leptomeria drupacea*, *Leucopogon ericoides*, *Leucopogon parviflorus*, *Olearia lirata*, *Persoonia juniperina*, *Phyllota diffusa*

Low Shrubs: *Aotus ericoides*, *Hibbertia virgata*, *Leucopogon virgatus*, *Pimelea glauca*, *Platylobium formosum*, *Tetradlea pilosa*

Herbs: *Acianthus pusillus*, *Asperula subsimplex*, *Burchardia umbellata*, *Caladenia* sp., *Coronidium scorpioides*, *Correa reflexa*, *Correa reflexa* var. *nummulariifolia*, *Desmodium gunnii*, *Dianella tasmanica*, *Dichondra repens*, *Glossodia major*, *Glycine clandestina*, *Gonocarpus teucrioides*, *Haloragis brownii*, *Hydrocotyle hirta*, *Kennedia prostrata*, *Lagenophora* sp., *Oxalis perennans*, *Pterostylis pedunculata*, *Pterostylis* sp., *Pyrorchis nigricans*, *Senecio* sp., *Stackhousia monogyna*, *Xanthosia pilosa*, *Xanthosia tasmanica*

Graminoids: *Baumea tetragona*, *Hypolaena fastigiata*, *Lepidosperma concavum*, *Lepidosperma filiforme*, *Lepidosperma gladiatum*, *Lomandra longifolia*, *Patersonia fragilis*, *Xanthorrhoea australis*

Grasses: *Austrodanthonia* sp., *Austrostipa* sp., *Ehrharta stipoides*

Ferns: *Adiantum aethiopicum*, *Asplenium flabellifolium*, *Pteridium esculentum*

Climbers: *Comesperma volubile*

Weeds: *Cerastium glomeratum*

### Site: 207 02 - Melaleuca ericifolia swamp forest (NME)

Grid Reference: 609937E, 5424403N

Accuracy: within 1 kilometre

Recorder: Philip Barker

Date of Survey: 19 Aug 2009  
Tall Shrubs: *Acacia verticillata*, *Leptospermum lanigerum*, *Melaleuca ericifolia*  
Shrubs: *Leptomeria drupacea*  
Herbs: *Centella cordifolia*, *Epilobium* sp., *Geranium potentilloides*  
Graminoids: *Lepidosperma filiforme*, *Lepidosperma longitudinale*, *Leptocarpus tenax*  
Ferns: *Gleichenia microphylla*

**Site: 208 02 - Allocasuarina verticillata forest (NAV)**

Grid Reference: 609937E, 5424403N  
Accuracy: within 1 kilometre  
Recorder: Philip Barker  
Date of Survey: 19 Aug 2009  
Trees: *Allocasuarina monilifera*, *Allocasuarina verticillata*  
Tall Shrubs: *Acacia mearnsii*, *Exocarpos cupressiformis*, *Kunzea ambigua*  
Shrubs: *Olearia lirata*  
Herbs: *Acaena* sp., *Acianthus pusillus*, *Desmodium gunnii*, *Dianella revoluta*, *Dichondra repens*, *Euchiton collinus*, *Glycine clandestina*, *Gonocarpus teucroides*, *Kennedia prostrata*, *Oxalis perennans*, *Poranthera microphylla*, *Pterostylis pedunculata*, *Senecio* sp., *Thelymitra* sp., *Viola hederacea*, *Wahlenbergia* sp.  
Graminoids: *Lepidosperma concavum*, *Lomandra longifolia*  
Grasses: *Austrodanthonia* sp., *Austrostipa* sp.  
Ferns: *Asplenium flabellifolium*  
Weeds: *Hypochoeris glabra*

**Site: 209 02 - Fresh water aquatic sedgeland & rushland (ASF)**

Grid Reference: 609937E, 5424403N  
Accuracy: within 1 kilometre  
Recorder: Philip Barker  
Date of Survey: 19 Aug 2009  
Tall Shrubs: *Leptospermum lanigerum*  
Shrubs: *Boronia parviflora*, *Olearia lirata*  
Herbs: *Centella cordifolia*, *Goodenia lanata*, *Hydrocotyle hirta*, *Hydrocotyle muscosa*, *Hydrocotyle* sp., *Poranthera microphylla*, *Potamogeton* sp., *Villarsia exaltata*  
Graminoids: *Apodasmia brownii*, *Baumea juncea*, *Eleocharis sphacelata*, *Empodisma minus*, *Gahnia filum*, *Lepidosperma longitudinale*, *Leptocarpus tenax*, *Lomandra longifolia*, *Schoenus apogon*, *Schoenus brevifolius*, *Triglochin procerum*, *Triglochin striatum*, *Xyris operculata*  
Grasses: *Deyeuxia densa*, *Deyeuxia* sp., *Ehrharta distichophylla*, *Graminaea* sp., *Poa labillardierei*  
Ferns: *Gleichenia microphylla*, *Lycopodium fastigiatum*  
Weeds: *Cirsium vulgare*

**Site: 210 02 - Melaleuca squarrosa scrub (SMR)**

Grid Reference: 609937E, 5424403N  
Accuracy: within 1 kilometre  
Recorder: Philip Barker  
Date of Survey: 19 Aug 2009  
Tall Shrubs: *Leptospermum scoparium*, *Melaleuca ericifolia*, *Melaleuca squarrosa*  
Shrubs: *Conospermum hookeri*, *Epacris obtusifolia*, *Leptomeria drupacea*, *Pultenaea stricta*, *Sprengelia incarnata*  
Low Shrubs: *Aotus ericoides*  
Herbs: *Villarsia exaltata*  
Graminoids: *Eurychorda complanata*, *Lepidosperma longitudinale*, *Leptocarpus tenax*, *Patersonia fragilis*, *Xyris operculata*  
Grasses: *Ehrharta stipoides*  
Ferns: *Gleichenia microphylla*, *Lycopodium fastigiatum*

**Site: 211 02 - Leptospermum scrub (SLW)**

Grid Reference: 609937E, 5424403N  
Accuracy: within 1 kilometre  
Recorder: Philip Barker  
Date of Survey: 19 Aug 2009

Tall Shrubs: *Acacia verticillata*, *Leptospermum lanigerum*, *Melaleuca ericifolia*  
Herbs: *Centella cordifolia*  
Graminoids: *Lepidosperma filiforme*, *Lepidosperma longitudinale*, *Leptocarpus tenax*, *Xyris operculata*  
Ferns: *Gleichenia microphylla*

**Site: 212 02 - Fresh water aquatic herbland (AHF)**

Grid Reference: 610130E, 5425372N  
Accuracy: GPS (within 10 metres)  
Recorder: Chris Obst  
Date of Survey: 19 Aug 2009  
Herbs: *Centella cordifolia*, *Myriophyllum* sp., *Nymphoides exigua*, *Villarsia reniformis*  
Graminoids: *Triglochin procerum*, *Triglochin striatum*

## Species list - Diana's Basin (3)

### Status codes:

#### ORIGIN

i - introduced  
d - declared weed WM Act  
en - endemic to Tasmania  
t - within Australia, occurs only in Tas.

#### NATIONAL SCHEDULE

EPBC Act 1999  
CR - critically endangered  
EN - endangered  
VU - vulnerable

#### STATE SCHEDULE

TSP Act 1995  
e - endangered  
v - vulnerable  
r - rare

### Sites:

301	03 - Eucalyptus amygdalina coastal forest and woodland (DAC) - E607680, N5418680	23/09/2009	Chris	Obst
302	03 - Wet Heathland (SHW) - E607680, N5418680	23/09/2009	Chris	Obst
303	03 - Saline sedgeland/rushland (ARS) - E607680, N5418680	23/09/2009	Chris	Obst
304	03 - Eucalyptus ovata forest and woodland (DOV) - E607680, N5418680	23/09/2009	Chris	Obst
305	03 - Coastal Scrub (SSC) - E607680, N5418680	23/09/2009	Chris	Obst
306	03 - Marram Grassland (FMG) - E607680, N5418680	23/09/2009	Chris	Obst
307	03 - Acacia longifolia coastal scrub (SAC) - E607680, N5418680	23/09/2009	Chris	Obst
308	03 - Eucalyptus sieberi forest and woodland not on granite (DSO) - E607680, N5418680	23/09/2009	Chris	Obst
309	03 - Coastal Heathland (SCH) - E607680, N5418680	23/09/2009	Chris	Obst
310	03 - Melaleuca squarrosa scrub (SMR) - E607680, N5418680	23/09/2009	Chris	Obst
311	03 - Eucalyptus globulus dry forest and woodland (DGL) - E607680, N5418680	23/09/2009	Chris	Obst
312	03 - Euc viminalis - Euc globulus coastal forest and woodland (DVC) - E607680, N5418680	23/09/2009	Chris	Obst
313	03 - Allocasuarina verticillata forest (NAV) - E607680, N5418680	23/09/2009	Chris	Obst

Site	Name	Common name	Status
<b>DICOTYLEDONAE</b>			
<b>AIZOACEAE</b>			
303 307	<i>Carpobrotus rossii</i>	native pigface	
<b>APIACEAE</b>			
303	<i>Centella cordifolia</i>	swampwort	
311	<i>Hydrocotyle hirta</i>	hairy pennywort	
308	<i>Xanthosia pilosa</i>	woolly crossherb	
<b>ASTERACEAE</b>			
311	<i>Asteraceae sp.</i>	native daisy	
303	<i>Cirsium vulgare</i>	spear thistle	i
308	<i>Coronidium scorpioides</i>	curling everlasting	
308	<i>Craspedia glauca</i>	common billybuttons	en
304 311	<i>Hypochoeris radicata</i>	rough catsear	i
303 305	<i>Senecio sp.</i>	groundsel	
306 307			
311			
<b>CAMPANULACEAE</b>			
305	<i>Lobelia alata</i>	angled lobelia	
305 308	<i>Wahlenbergia sp.</i>	bluebell	
<b>CARYOPHYLLACEAE</b>			
305 307	<i>Scleranthus biflorus</i>	twinflower knawel	
<b>CASUARINACEAE</b>			
304 305	<i>Allocasuarina littoralis</i>	black sheoak	
308 309			
311			
309	<i>Allocasuarina monilifera</i>	necklace sheoak	en
305 309	<i>Allocasuarina verticillata</i>	drooping sheoak	
311 313			
<b>CHENOPODIACEAE</b>			
307	<i>Rhagodia candolleana subsp.</i>	coastal saltbush	
<b>CONVOLVULACEAE</b>			

305 311 312 313	<i>Dichondra repens</i>	kidneyweed	
<b>CRASSULACEAE</b>			
305 307	<i>Crassula sieberiana</i>	stone-crop	
<b>DILLENIACEAE</b>			
308 311	<i>Hibbertia appressa</i>	southern guineaflower	
309 312	<i>Hibbertia riparia</i>	erect guineaflower	
309	<i>Hibbertia virgata</i>	twiggy guineaflower	r
<b>DROSERACEAE</b>			
308	<i>Drosera macrantha</i>	climbing sundew	
308 311	<i>Drosera peltata</i> subsp. <i>auriculata</i>	tall sundew	
<b>EPACRIDACEAE</b>			
308 311	<i>Acrotriche serrulata</i>	ants delight	
311	<i>Astroloma humifusum</i>	native cranberry	
305 309 310	<i>Epacris impressa</i>	common heath	
305	<i>Epacris lanuginosa</i>	swamp heath	
305 309 312	<i>Leucopogon ericoides</i>	pink beardheath	
305 307	<i>Leucopogon parviflorus</i>	coast beardheath	
309	<i>Leucopogon virgatus</i>	common beard-heath	
305 309 311 312 313	<i>Monotoca elliptica</i>	tree broomheath	
310	<i>Sprengelia incarnata</i>	pink swampheath	
308	<i>Styphelia adscendens</i>	golden heath	
<b>ERICACEAE</b>			
309 312	<i>Erica lusitanica</i>	spanish heath	d
<b>EUPHORBIACEAE</b>			
311	<i>Amperea xiphoclada</i> var. <i>xiphoclada</i>	broom spurge	
311	<i>Beyeria viscosa</i>	pinkwood	
304 309 310	<i>Poranthera microphylla</i>	small poranthera	
<b>FABACEAE</b>			
309 313	<i>Aotus ericoides</i>	golden pea	
308 312	<i>Bossiaea cinerea</i>	showy bossia	
310	<i>Dillwynia glaberrima</i>	smooth parrotpea	
311	<i>Glycine clandestina</i>	twining glycine	
311	<i>Indigofera australis</i>	native indigo	
305 311	<i>Kennedia prostrata</i>	running postman	
308	<i>Platylobium formosum</i>	handsome flatpea	
311 312	<i>Platylobium triangulare</i>	arrow flatpea	
311	<i>Pultenaea daphnoides</i> var. <i>obcordata</i>	heartleaf bushpea	
310	<i>Pultenaea stricta</i>	rigid bushpea	
<b>GENTIANACEAE</b>			
305 307 308	<i>Centaurium erythraea</i>	common centaury	i
<b>GERANIACEAE</b>			
305 311	<i>Geranium</i> sp.	native geranium	
<b>GOODENIACEAE</b>			
305	<i>Goodenia humilis</i>	swamp native-primrose	
308 311 312	<i>Goodenia lanata</i>	trailing native-primrose	
307	<i>Goodenia ovata</i>	hop native-primrose	
<b>HALORAGACEAE</b>			
305	<i>Gonocarpus micranthus</i> subsp.	creeping raspswort	
304 308 311	<i>Gonocarpus teucrioides</i>	forest raspswort	

<b>LAURACEAE</b>		
311	<i>Cassytha pubescens</i>	downy dodderlaurel
<b>MIMOSACEAE</b>		
312	<i>Acacia genistifolia</i>	spreading wattle
303 305	<i>Acacia longifolia</i>	coast wattle
306 307		
309 312		
313		
305 311	<i>Acacia melanoxylon</i>	blackwood
308 309	<i>Acacia suaveolens</i>	sweet wattle
312	<i>Acacia terminalis</i>	sunshine wattle
310 311	<i>Acacia verticillata</i>	prickly mimosa
<b>MYRTACEAE</b>		
310 311	<i>Eucalyptus amygdalina</i>	black peppermint
312		en
305 307	<i>Eucalyptus globulus subsp. globulus</i>	tasmanian blue gum
308 311		
312		
304 310	<i>Eucalyptus ovata var. ovata</i>	black gum
311 312		
308 311	<i>Eucalyptus sieberi</i>	ironbark
311 312	<i>Eucalyptus viminalis subsp. viminalis</i>	white gum
304 310	<i>Leptospermum lanigerum</i>	woolly teatree
304 305	<i>Leptospermum scoparium</i>	common tea-tree
309 311		
311	<i>Melaleuca ericifolia</i>	coast paperbark
303 304	<i>Melaleuca gibbosa</i>	slender honeymyrtle
309		
303 310	<i>Melaleuca squarrosa</i>	scented paperbark
<b>OXALIDACEAE</b>		
305 306	<i>Oxalis perennans</i>	grassland woodsorrel
307 311		
312		
<b>PITTOSPORACEAE</b>		
311	<i>Bursaria spinosa subsp. spinosa</i>	prickly box
<b>PLANTAGINACEAE</b>		
303	<i>Plantago coronopus</i>	buckshorn plantain
<b>POLYGALACEAE</b>		
308 311	<i>Comesperma volubile</i>	blue lovecreeper
312		
<b>POLYGONACEAE</b>		
305 307	<i>Muehlenbeckia australis</i>	climbing lignum
<b>PRIMULACEAE</b>		
303	<i>Samolus repens</i>	creeping brookweed
<b>PROTEACEAE</b>		
304 305	<i>Banksia marginata</i>	silver banksia
307 309		
313		
<b>RHAMNACEAE</b>		
311	<i>Pomaderris apetala</i>	common dogwood
308 311	<i>Pomaderris elliptica</i>	yellow dogwood



<b>ROSACEAE</b>		
303 305 311	<i>Acaena</i> sp.	sheep's burr
<b>RUTACEAE</b>		
312	<i>Correa reflexa</i> var. <i>nummulariifolia</i>	roundleaf correa
<b>SANTALACEAE</b>		
305 311 312	<i>Exocarpos cupressiformis</i>	common native-cherry
308 311 312	<i>Leptomeria drupacea</i>	erect currantbush
<b>STACKHOUSIACEAE</b>		
308	<i>Stackhousia monogyna</i>	forest candles
<b>STYLIDIACEAE</b>		
309	<i>Stylidium graminifolium</i>	narrowleaf triggerplant
<b>THYMELAEACEAE</b>		
311	<i>Pimelea humilis</i>	dwarf riceflower
311 312	<i>Pimelea linifolia</i> subsp. <i>linifolia</i>	slender riceflower
<b>VIOLACEAE</b>		
311	<i>Viola hederacea</i>	ivy-leaf violet
<b>GYMNOSPERMAE</b>		
<b>PINACEAE</b>		
305	<i>Pinus</i> sp.	pine
<b>MONOCOTYLEDONAE</b>		
<b>CYPERACEAE</b>		
303	<i>Baumea juncea</i>	bare twigsedge
311	<i>Carex appressa</i>	tall sedge
303 305 306	<i>Ficinia nodosa</i>	knobby clubsedge
303	<i>Gahnia filum</i>	chaffy sawsedge
304 310 311	<i>Gahnia grandis</i>	cutting grass
304 308 312	<i>Gahnia radula</i>	thatch sawsedge
303 305 308 309 311 312 313	<i>Lepidosperma concavum</i>	sand sword-sedge
305	<i>Lepidosperma filiforme</i>	common rapier-sedge
305 307	<i>Lepidosperma gladiatum</i>	coast sword-sedge
304	<i>Lepidosperma longitudinale</i>	spreading sword-sedge
304	<i>Schoenus apogon</i>	common bog-sedge
<b>IRIDACEAE</b>		
308	<i>Diplarrena moraea</i>	white flag-iris
309	<i>Patersonia fragilis</i>	short purple-flag
<b>JUNCACEAE</b>		
303	<i>Juncus kraussii</i> subsp. <i>australiensis</i>	sea rush
303 305	<i>Juncus pallidus</i>	pale rush
<b>LILIACEAE</b>		
308	<i>Dianella revoluta</i>	spreading flax-lily
<b>ORCHIDACEAE</b>		
308 311	<i>Acianthus caudatus</i>	mayfly orchid
309	<i>Caladenia fuscata</i>	dusky fingers
308	<i>Chiloglottis</i> sp.	bird orchid
305 307 308	<i>Cyrtostylis</i> sp.	gnat-orchid
311	<i>Diuris pardina</i>	leopard orchid

308 309 311	<i>Glossodia major</i>	waxlip orchid
311	<i>Pterostylis pedunculata</i>	maroonhood
308	<i>Pterostylis</i> sp.	greenhood
305 307	<i>Pyrorchis nigricans</i>	fire orchid
<b>POACEAE</b>		
306 307	<i>Ammophila arenaria</i>	marram grass
311	<i>Austrostipa</i> sp.	speargrass
303	<i>Distichlis distichophylla</i>	australian saltgrass
305 307	<i>Ehrharta stipoides</i>	weeping grass
311 313		
303	<i>Phragmites australis</i>	southern reed
305 307	<i>Poa labillardierei</i>	silver tussockgrass
303 307	<i>Poa poiformis</i>	coastal tussockgrass
311	<i>Themeda triandra</i>	kangaroo grass
<b>RESTIONACEAE</b>		
303 309 310	<i>Apodasmia brownii</i>	coarse twinerush
304 305 309	<i>Eurychorda complanata</i>	flat cordrush
304 308 309 313	<i>Hypolaena fastigiata</i>	tassel roperush
<b>XANTHORRHOEACEAE</b>		
303 304 305 308 309 311 312 313	<i>Lomandra longifolia</i>	sagg
305 308 309	<i>Xanthorrhoea australis</i>	southern grasstree
<b>PTERIDOPHYTA</b>		
<b>ASPIDIACEAE</b>		
311	<i>Polystichum proliferum</i>	mother shieldfern
<b>DENNSTAEDTIACEAE</b>		
303 304 305 307 308 310 311 312 313	<i>Pteridium esculentum</i>	bracken
<b>DICKSONIACEAE</b>		
311	<i>Dicksonia antarctica</i>	soft treefern
<b>LINDSAEACEAE</b>		
304	<i>Lindsaea linearis</i>	screw fern
<b>SELAGINELLACEAE</b>		
304 305 309	<i>Selaginella uliginosa</i>	swamp spikemoss

## Site Report - Diana's Basin (3)

### Site: 301 03 - Eucalyptus amygdalina coastal forest and woodland (DAC)

Grid Reference:	607680E, 5418680N
Accuracy:	GPS (within 10 metres)
Recorder:	Chris Obst
Date of Survey:	23 Sep 2009
Trees:	<i>Acacia melanoxylon</i> , <i>Allocasuarina littoralis</i> , <i>Allocasuarina monilifera</i> , <i>Eucalyptus amygdalina</i> , <i>Eucalyptus globulus</i> subsp. <i>globulus</i> , <i>Eucalyptus ovata</i> var. <i>ovata</i> , <i>Eucalyptus sieberi</i> , <i>Eucalyptus viminalis</i> subsp. <i>viminalis</i>
Tall Shrubs:	<i>Acacia verniciflua</i> , <i>Banksia marginata</i> , <i>Kunzea ambigua</i> , <i>Leptospermum lanigerum</i> , <i>Leptospermum scoparium</i> , <i>Melaleuca squarrosa</i>
Shrubs:	<i>Acacia genistifolia</i> , <i>Acacia stricta</i> , <i>Acacia suaveolens</i> , <i>Acacia terminalis</i> , <i>Boronia pilosa</i> , <i>Bossiaea cinerea</i> , <i>Bossiaea prostrata</i> , <i>Calytrix tetragona</i> , <i>Cassinia aculeata</i> , <i>Epacris impressa</i> , <i>Epacris lanuginosa</i> , <i>Euryomyrtus ramosissima</i> , <i>Leptomeria drupacea</i> , <i>Leucopogon collinus</i> , <i>Leucopogon ericoides</i> , <i>Leucopogon parviflorus</i> , <i>Melaleuca gibbosa</i> , <i>Monotoca elliptica</i> , <i>Monotoca scoparia</i> , <i>Persoonia juniperina</i> , <i>Phyllota diffusa</i> , <i>Pimelea linifolia</i> subsp. <i>linifolia</i> , <i>Pomaderris elliptica</i>
Low Shrubs:	<i>Acrotriche serrulata</i> , <i>Aotus ericoides</i> , <i>Brachyloma ciliatum</i> , <i>Hibbertia acicularis</i> , <i>Hibbertia empetrifolia</i> subsp. <i>empetrifolia</i> , <i>Hibbertia procumbens</i> , <i>Hibbertia riparia</i> , <i>Leucopogon virgatus</i> , <i>Pimelea humilis</i> , <i>Platylobium formosum</i> , <i>Styphelia</i>
Herbs:	<i>Acianthus</i> sp., <i>Caladenia fuscata</i> , <i>Caladenia</i> sp., <i>Coronidium scorpioides</i> , <i>Correa reflexa</i> , <i>Correa reflexa</i> var. <i>nummulariifolia</i> , <i>Cyrtostylis</i> sp., <i>Dianella revoluta</i> , <i>Dichondra repens</i> , <i>Diuris pardina</i> , <i>Drosera peltata</i> subsp. <i>auriculata</i> , <i>Drosera pygmaea</i> , <i>Eriochilus cucullatus</i> , <i>Glossodia major</i> , <i>Gonocarpus micranthus</i> subsp. <i>micranthus</i> , <i>Gonocarpus tetragynus</i> , <i>Goodenia lanata</i> , <i>Hypericum gramineum</i> , <i>Lagenophora stipitata</i> , <i>Oxalis perennans</i> , <i>Poranthera microphylla</i> , <i>Pterostylis nana</i> , <i>Pterostylis</i> sp., <i>Pyrorchis nigricans</i> , <i>Selliera radicans</i> , <i>Senecio</i> sp., <i>Stylidium graminifolium</i> , <i>Viola hederacea</i> , <i>Wahlenbergia</i> sp., <i>Xanthosia pilosa</i>
Graminoids:	<i>Apodasmia brownii</i> , <i>Diplarrena moraea</i> , <i>Eurychorda complanata</i> , <i>Gahnia radula</i> , <i>Hypolaena fastigiata</i> , <i>Lepidosperma concavum</i> , <i>Lepidosperma ensiforme</i> , <i>Lepidosperma filiforme</i> , <i>Leptocarpus tenax</i> , <i>Lomandra longifolia</i> , <i>Patersonia fragilis</i> , <i>Xanthorrhoea australis</i>
Grasses:	<i>Austrodanthonia setacea</i> , <i>Austrostipa flavescens</i> , <i>Deyeuxia</i> sp., <i>Ehrharta distichophylla</i> , <i>Ehrharta stipoides</i> , <i>Poa labillardierei</i>
Ferns:	<i>Adiantum aethiopicum</i> , <i>Gleichenia dicarpa</i> , <i>Lindsaea linearis</i> , <i>Pteridium esculentum</i> , <i>Selaginella uliginosa</i>
Climbers:	<i>Cassytha melantha</i> , <i>Cassytha pubescens</i>
Weeds:	<i>Centaurium erythraea</i> , <i>Hypochoeris radicata</i>

### Site: 302 03 - Wet Heathland (SHW)

Grid Reference:	607680E, 5418680N
Accuracy:	GPS (within 10 metres)
Recorder:	Chris Obst
Date of Survey:	23 Sep 2009
Trees:	<i>Allocasuarina littoralis</i> , <i>Eucalyptus amygdalina</i> , <i>Eucalyptus ovata</i> var. <i>ovata</i>
Tall Shrubs:	<i>Acacia verticillata</i> , <i>Banksia marginata</i> , <i>Leptospermum lanigerum</i> , <i>Leptospermum scoparium</i> , <i>Melaleuca ericifolia</i> , <i>Melaleuca squarrosa</i>
Shrubs:	<i>Bauera rubioides</i> , <i>Boronia pilosa</i> , <i>Calytrix tetragona</i> , <i>Epacris impressa</i> , <i>Epacris lanuginosa</i> , <i>Leucopogon ericoides</i> , <i>Leucopogon parviflorus</i> , <i>Sprengelia incarnata</i>
Low Shrubs:	<i>Hibbertia riparia</i>
Graminoids:	<i>Apodasmia brownii</i> , <i>Empodisma minus</i> , <i>Eurychorda complanata</i> , <i>Gahnia sieberiana</i> , <i>Gymnoschoenus sphaerocephalus</i> , <i>Lepidosperma filiforme</i> , <i>Leptocarpus tenax</i> , <i>Lomandra longifolia</i> , <i>Schoenus lepidosperma</i> subsp. <i>lepidosperma</i> , <i>Xanthorrhoea australis</i>
Ferns:	<i>Gleichenia dicarpa</i> , <i>Lindsaea linearis</i> , <i>Pteridium esculentum</i> , <i>Selaginella uliginosa</i>
Climbers:	<i>Cassytha pubescens</i>

### Site: 303 03 - Saline sedgeland/rushland (ARS)

Grid Reference: 607680E, 5418680N  
Accuracy: GPS (within 10 metres)  
Recorder: Chris Obst  
Date of Survey: 23 Sep 2009

Tall Shrubs: *Melaleuca squarrosa*  
Shrubs: *Acacia longifolia*, *Melaleuca gibbosa*  
Herbs: *Acaena* sp., *Carpobrotus rossii*, *Centella cordifolia*, *Plantago coronopus*, *Samolus repens*, *Senecio* sp.  
Graminoids: *Apodasmia brownii*, *Baumea juncea*, *Ficinia nodosa*, *Gahnia filum*, *Juncus kraussii* subsp. *australiensis*, *Juncus pallidus*, *Lepidosperma concavum*, *Lomandra*  
Grasses: *Distichlis distichophylla*, *Phragmites australis*, *Poa poiformis*  
Ferns: *Pteridium esculentum*  
Weeds: *Cirsium vulgare*

### Site: 304 03 - Eucalyptus ovata forest and woodland (DOV)

Grid Reference: 607680E, 5418680N  
Accuracy: GPS (within 10 metres)  
Recorder: Chris Obst  
Date of Survey: 23 Sep 2009

Trees: *Allocasuarina littoralis*, *Eucalyptus ovata* var. *ovata*  
Tall Shrubs: *Banksia marginata*, *Leptospermum lanigerum*, *Leptospermum scoparium*  
Shrubs: *Melaleuca gibbosa*  
Herbs: *Gonocarpus teucrioides*, *Poranthera microphylla*  
Graminoids: *Eurychorda complanata*, *Gahnia grandis*, *Gahnia radula*, *Hypolaena fastigiata*, *Lepidosperma longitudinale*, *Lomandra longifolia*, *Schoenus apogon*  
Ferns: *Lindsaea linearis*, *Pteridium esculentum*, *Selaginella uliginosa*  
Weeds: *Hypochoeris radicata*

### Site: 305 03 - Coastal Scrub (SSC)

Grid Reference: 607680E, 5418680N  
Accuracy: GPS (within 10 metres)  
Recorder: Chris Obst  
Date of Survey: 23 Sep 2009

Trees: *Acacia melanoxylon*, *Allocasuarina littoralis*, *Allocasuarina verticillata*, *Eucalyptus globulus* subsp. *globulus*  
Tall Shrubs: *Banksia marginata*, *Exocarpos cupressiformis*, *Leptospermum scoparium*  
Shrubs: *Acacia longifolia*, *Epacris impressa*, *Epacris lanuginosa*, *Leucopogon ericoides*, *Leucopogon parviflorus*, *Monotoca elliptica*  
Herbs: *Acaena* sp., *Crassula sieberiana*, *Cyrtostylis* sp., *Dichondra repens*, *Geranium* sp., *Gonocarpus micranthus* subsp. *micranthus*, *Goodenia humilis*, *Kennedia prostrata*, *Lobelia alata*, *Oxalis perennans*, *Pyrorchis nigricans*, *Scleranthus biflorus*, *Senecio* sp., *Wahlenbergia* sp.  
Graminoids: *Eurychorda complanata*, *Ficinia nodosa*, *Juncus pallidus*, *Lepidosperma concavum*, *Lepidosperma filiforme*, *Lepidosperma gladiatum*, *Lomandra longifolia*, *Xanthorrhoea australis*  
Grasses: *Ehrharta stipoides*, *Poa labillardierei*  
Ferns: *Pteridium esculentum*, *Selaginella uliginosa*  
Climbers: *Muehlenbeckia australis*  
Weeds: *Centaurium erythraea*, *Pinus* sp.

### Site: 306 03 - Marram Grassland (FMG)

Grid Reference: 607680E, 5418680N  
Accuracy: GPS (within 10 metres)  
Recorder: Chris Obst  
Date of Survey: 23 Sep 2009

Shrubs: *Acacia longifolia*  
Herbs: *Oxalis perennans*, *Senecio* sp.  
Graminoids: *Ficinia nodosa*  
Weeds: *Ammophila arenaria*

**Site: 307 03 - Acacia longifolia coastal scrub (SAC)**

Grid Reference: 607680E, 5418680N  
Accuracy: GPS (within 10 metres)  
Recorder: Chris Obst  
Date of Survey: 23 Sep 2009

Trees: *Eucalyptus globulus* subsp. *globulus*  
Tall Shrubs: *Banksia marginata*  
Shrubs: *Acacia longifolia*, *Goodenia ovata*, *Leucopogon parviflorus*, *Rhagodia candolleana* subsp. *candolleana*  
Herbs: *Carpobrotus rossii*, *Crassula sieberiana*, *Cyrtostylis* sp., *Oxalis perennans*, *Pyrrochloa nigricans*, *Scleranthus biflorus*, *Senecio* sp.  
Graminoids: *Lepidosperma gladiatum*  
Grasses: *Ehrharta stipoides*, *Poa labillardierei*, *Poa poiformis*  
Ferns: *Pteridium esculentum*  
Climbers: *Muehlenbeckia australis*  
Weeds: *Ammophila arenaria*, *Centaureum erythraea*

**Site: 308 03 - Eucalyptus sieberi forest and woodland not on granite (DSO)**

Grid Reference: 607680E, 5418680N  
Accuracy: GPS (within 10 metres)  
Recorder: Chris Obst  
Date of Survey: 23 Sep 2009

Trees: *Allocasuarina littoralis*, *Eucalyptus globulus* subsp. *globulus*, *Eucalyptus sieberi*  
Shrubs: *Acacia suaveolens*, *Bossiaea cinerea*, *Leptomeria drupacea*, *Pomaderris elliptica*  
Low Shrubs: *Acrotriche serrulata*, *Hibbertia appressa*, *Platylobium formosum*, *Styphelia adscendens*  
Herbs: *Acianthus caudatus*, *Chiloglottis* sp., *Coronidium scorpioides*, *Craspedia glauca*, *Cyrtostylis* sp., *Dianella revoluta*, *Drosera macrantha*, *Drosera peltata* subsp. *auriculata*, *Glossodia major*, *Gonocarpus teucroides*, *Goodenia lanata*, *Pterostylis* sp., *Stackhousia monogyna*, *Wahlenbergia* sp., *Xanthosia pilosa*  
Graminoids: *Diplarrena moraea*, *Gahnia radula*, *Hypolaena fastigiata*, *Lepidosperma concavum*, *Lomandra longifolia*, *Xanthorrhoea australis*  
Ferns: *Pteridium esculentum*  
Climbers: *Comesperma volubile*  
Weeds: *Centaureum erythraea*

**Site: 309 03 - Coastal Heathland (SCH)**

Grid Reference: 607680E, 5418680N  
Accuracy: GPS (within 10 metres)  
Recorder: Chris Obst  
Date of Survey: 23 Sep 2009

Trees: *Allocasuarina littoralis*, *Allocasuarina monilifera*, *Allocasuarina verticillata*  
Tall Shrubs: *Banksia marginata*, *Leptospermum scoparium*  
Shrubs: *Acacia longifolia*, *Acacia suaveolens*, *Epacris impressa*, *Leucopogon ericoides*, *Melaleuca gibbosa*, *Monotoca elliptica*  
Low Shrubs: *Aotus ericoides*, *Hibbertia riparia*, *Hibbertia virgata*, *Leucopogon virgatus*  
Herbs: *Caladenia fuscata*, *Glossodia major*, *Poranthera microphylla*, *Stylidium graminifolium*  
Graminoids: *Apodasmia brownii*, *Eurychorda complanata*, *Hypolaena fastigiata*, *Lepidosperma concavum*, *Lomandra longifolia*, *Patersonia fragilis*, *Xanthorrhoea australis*  
Ferns: *Selaginella uliginosa*  
Weeds: *Erica lusitanica*

**Site: 310 03 - Melaleuca squarrosa scrub (SMR)**

Grid Reference: 607680E, 5418680N  
Accuracy: GPS (within 10 metres)  
Recorder: Chris Obst  
Date of Survey: 23 Sep 2009

Trees: *Eucalyptus amygdalina*, *Eucalyptus ovata* var. *ovata*  
Tall Shrubs: *Acacia verticillata*, *Leptospermum lanigerum*, *Melaleuca squarrosa*  
Shrubs: *Dillwynia glaberrima*, *Epacris impressa*, *Pultenaea stricta*, *Sprengelia incarnata*  
Herbs: *Poranthera microphylla*  
Graminoids: *Apodasmia brownii*, *Gahnia grandis*

Ferns: *Pteridium esculentum*

**Site: 311 03 - Eucalyptus globulus dry forest and woodland (DGL)**

Grid Reference: 607680E, 5418680N  
Accuracy: GPS (within 10 metres)  
Recorder: Chris Obst  
Date of Survey: 23 Sep 2009

Trees: *Acacia melanoxylon*, *Allocasuarina littoralis*, *Allocasuarina verticillata*, *Bursaria spinosa* subsp. *spinosa*, *Eucalyptus amygdalina*, *Eucalyptus globulus* subsp. *globulus*, *Eucalyptus ovata* var. *ovata*, *Eucalyptus sieberi*, *Eucalyptus viminalis* subsp. *viminalis*  
Tall Shrubs: *Acacia verticillata*, *Beyeria viscosa*, *Exocarpos cupressiformis*, *Leptospermum scoparium*, *Melaleuca ericifolia*, *Pomaderris apetala*, *Pultenaea daphnoides* var. *obcordata*  
Shrubs: *Amperea xiphoclada* var. *xiphoclada*, *Leptomeria drupacea*, *Monotoca elliptica*, *Pimelea linifolia* subsp. *linifolia*, *Pomaderris elliptica*  
Low Shrubs: *Acrotriche serrulata*, *Astroloma humifusum*, *Hibbertia appressa*, *Indigofera australis*, *Pimelea humilis*, *Platylobium triangulare*  
Herbs: *Acaena* sp., *Acianthus caudatus*, *Asteraceae* sp., *Dichondra repens*, *Diuris pardina*, *Drosera peltata* subsp. *auriculata*, *Geranium* sp., *Glossodia major*, *Glycine clandestina*, *Gonocarpus teucroides*, *Goodenia lanata*, *Hydrocotyle hirta*, *Kennedia prostrata*, *Oxalis perennans*, *Pterostylis pedunculata*, *Senecio* sp., *Viola hederacea*  
Graminoids: *Carex appressa*, *Gahnia grandis*, *Lepidosperma concavum*, *Lomandra longifolia*  
Grasses: *Austrostipa* sp., *Ehrharta stipoides*, *Themeda triandra*  
Ferns: *Dicksonia antarctica*, *Polystichum proliferum*, *Pteridium esculentum*  
Climbers: *Cassytha pubescens*, *Comesperma volubile*  
Weeds: *Hypochoeris radicata*

**Site: 312 03 - Euc viminalis - Euc globulus coastal forest and woodland (DVC)**

Grid Reference: 607680E, 5418680N  
Accuracy: GPS (within 10 metres)  
Recorder: Chris Obst  
Date of Survey: 23 Sep 2009  
Trees: *Eucalyptus amygdalina*, *Eucalyptus globulus* subsp. *globulus*, *Eucalyptus ovata* var. *ovata*, *Eucalyptus viminalis* subsp. *viminalis*  
Tall Shrubs: *Exocarpos cupressiformis*  
Shrubs: *Acacia genistifolia*, *Acacia longifolia*, *Acacia terminalis*, *Bossiaea cinerea*, *Leptomeria drupacea*, *Leucopogon ericoides*, *Monotoca elliptica*, *Pimelea linifolia*  
Low Shrubs: *Hibbertia riparia*, *Platylobium triangulare*  
Herbs: *Correa reflexa* var. *nummulariifolia*, *Dichondra repens*, *Goodenia lanata*, *Oxalis perennans*  
Graminoids: *Gahnia radula*, *Lepidosperma concavum*, *Lomandra longifolia*  
Ferns: *Pteridium esculentum*  
Climbers: *Comesperma volubile*  
Weeds: *Erica lusitanica*

**Site: 313 03 - Allocasuarina verticillata forest (NAV)**

Grid Reference: 607680E, 5418680N  
Accuracy: GPS (within 10 metres)  
Recorder: Chris Obst  
Date of Survey: 23 Sep 2009  
Trees: *Allocasuarina verticillata*  
Tall Shrubs: *Banksia marginata*  
Shrubs: *Acacia longifolia*, *Monotoca elliptica*  
Low Shrubs: *Aotus ericoides*  
Herbs: *Dichondra repens*  
Graminoids: *Hypolaena fastigiata*, *Lepidosperma concavum*, *Lomandra longifolia*  
Grasses: *Ehrharta stipoides*  
Ferns: *Pteridium esculentum*



## Species list - Piccaninny Swamp (4)

### Status codes:

#### ORIGIN

i - introduced

d - declared weed WM Act

en - endemic to Tasmania

t - within Australia, occurs only in Tas.

#### NATIONAL SCHEDULE

EPBC Act 1999

CR - critically endangered

EN - endangered

VU - vulnerable

#### STATE SCHEDULE

TSP Act 1995

e - endangered

v - vulnerable

r - rare

### Sites:

401	04 - Melaleuca ericifolia swamp forest (NME) - E607000, N5384200	21/09/2009	Chris	Obst
402	04 - Acacia longifolia coastal scrub (SAC) - E607000, N5384200	21/09/2009	Chris	Obst
403	04 - Fresh water aquatic herbland (AHF) - E607000, N5384200	21/09/2009	Chris	Obst
404	04 - Pteridium esculentum fernland (FPF) - E607000, N5384200	21/09/2009	Chris	Obst
405	04 - Euc viminalis - Euc globulus coastal forest and woodland (DVC) - E607000, N5384200	21/09/2009	Chris	Obst
406	04 - Eucalyptus globulus dry forest and woodland (DGL) - E607000, N5384200	21/09/2009	Chris	Obst
407	04 - Regenerating cleared land (FRG) - E607000, N5384200	21/09/2009	Chris	Obst

Site	Name	Common name	Status
	<b>DICOTYLEDONAE</b>		
	<b>AIZOACEAE</b>		
402	<i>Carpobrotus rossii</i>	native pigface	
	<b>APIACEAE</b>		
403	<i>Centella cordifolia</i>	swampwort	
	<b>APOCYNACEAE</b>		
406	<i>Vinca major</i>	blue periwinkle	i
	<b>ASTERACEAE</b>		
402	<i>Actites megalocarpus</i>	dune thistle	
406	<i>Cassinia aculeata</i>	dollybush	
404 405	<i>Hypochoeris radicata</i>	rough catsear	i
406			
402	<i>Senecio sp.</i>	groundsel	
	<b>CARYOPHYLLACEAE</b>		
405	<i>Scleranthus biflorus</i>	twinflor knawel	
	<b>CASUARINACEAE</b>		
405	<i>Allocasuarina littoralis</i>	black sheoak	
	<b>CONVOLVULACEAE</b>		
401 402	<i>Dichondra repens</i>	kidneyweed	
405 406			
	<b>CRASSULACEAE</b>		
405	<i>Crassula sieberiana</i>	stone-crop	
	<b>EPACRIDACEAE</b>		
405	<i>Astroloma humifusum</i>	native cranberry	
402	<i>Leucopogon parviflorus</i>	coast beardheath	
406 407	<i>Lissanthe strigosa</i>	peach berry	
405	<i>Monotoca elliptica</i>	tree broomheath	
	<b>ERICACEAE</b>		
401 406	<i>Erica lusitanica</i>	spanish heath	d
	<b>FABACEAE</b>		
406	<i>Bossiaea prostrata</i>	creeping bossia	
405	<i>Daviesia ulicifolia</i>	spiky bitterpea	
405	<i>Glycine clandestina</i>	twining glycine	
406	<i>Trifolium sp.</i>	clover	
	<b>GOODENIACEAE</b>		
401	<i>Selliera radicans</i>	shiny swampmat	
	<b>HALORAGACEAE</b>		

403	<i>Myriophyllum sp.</i>	water milfoil	
	<b>MENYANTHACEAE</b>		
403	<i>Villarsia reniformis</i>	running marshflower	
	<b>MIMOSACEAE</b>		
406	<i>Acacia dealbata</i> subsp. <i>dealbata</i>	silver wattle	
402	<i>Acacia longifolia</i>	coast wattle	
406	<i>Acacia melanoxylon</i>	blackwood	
401	<i>Acacia verticillata</i>	prickly mimosa	
	<b>MYRTACEAE</b>		
405	<i>Eucalyptus amygdalina</i>	black peppermint	en
402 405	<i>Eucalyptus globulus</i> subsp. <i>globulus</i>	tasmanian blue gum	
406 407			
406 407	<i>Eucalyptus sieberi</i>	ironbark	
405 406	<i>Eucalyptus viminalis</i> subsp. <i>viminalis</i>	white gum	
405	<i>Leptospermum scoparium</i>	common tea-tree	
401	<i>Melaleuca ericifolia</i>	coast paperbark	
	<b>OXALIDACEAE</b>		
402 404	<i>Oxalis perennans</i>	grassland woodsorrel	
405 406			
	<b>PITTOSPORACEAE</b>		
401 405	<i>Bursaria spinosa</i> subsp. <i>spinosa</i>	prickly box	
406 407			
	<b>POLYGALACEAE</b>		
401	<i>Comesperma volubile</i>	blue lovecreeper	
	<b>POLYGONACEAE</b>		
404 405	<i>Acetosella vulgaris</i>	sheep sorrel	i
406			
	<b>PROTEACEAE</b>		
401 402	<i>Banksia marginata</i>	silver banksia	
405			
	<b>RANUNCULACEAE</b>		
402 403	<i>Ranunculus sp.</i>	buttercup	
	<b>RHAMNACEAE</b>		
401 406	<i>Pomaderris apetala</i>	common dogwood	
	<b>ROSACEAE</b>		
401 402	<i>Acaena sp.</i>	sheep's burr	
405			
401 406	<i>Rubus fruticosus</i>	blackberry	d
	<b>SALICACEAE</b>		
406	<i>Salix sp.</i>	willow	d
	<b>SANTALACEAE</b>		
402 405	<i>Exocarpos cupressiformis</i>	common native-cherry	
406			
	<b>THYMELAEACEAE</b>		
402	<i>Pimelea glauca</i>	smooth riceflower	
405	<i>Pimelea humilis</i>	dwarf riceflower	
	<b>URTICACEAE</b>		
406	<i>Urtica urens</i>	stinging nettle	i
	<b>VIOLACEAE</b>		
401 405	<i>Viola hederacea</i>	ivy-leaf violet	

## MONOCOTYLEDONAE

### CYPERACEAE

401	<i>Carex appressa</i>	tall sedge
402	<i>Ficinia nodosa</i>	knobby clubsedge
401	<i>Gahnia grandis</i>	cutting grass
406	<i>Gahnia radula</i>	thatch sawsedge
402	<i>Lepidosperma gladiatum</i>	coast sword sedge
401 405	<i>Lepidosperma longitudinale</i>	spreading sword sedge
406		
401	<i>Schoenus sp.</i>	bog sedge

### IRIDACEAE

405 406	<i>Diplarrena moraea</i>	white flag-iris
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### JUNCACEAE

401 402	<i>Juncus kraussii subsp. australiensis</i>	sea rush
401	<i>Juncus pallidus</i>	pale rush
404 406	<i>Juncus sp.</i>	Rush

### JUNCAGINACEAE

401 403	<i>Triglochin procerum</i>	greater water ribbons
403	<i>Triglochin striatum</i>	streaked arrowgrass

### ORCHIDACEAE

405	<i>Pterostylis sp.</i>	greenhood
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### POACEAE

402	<i>Ammophila arenaria</i>	marram grass	i
406	<i>Austrodanthonia sp.</i>	wallaby grass	
402	<i>Austrostipa sp.</i>	spear grass	
402	<i>Austrostipa stipoides</i>	coast spear grass	
402 404	<i>Dactylis glomerata</i>	cocksfoot	i
401	<i>Distichlis distichophylla</i>	australian salt grass	
405 406	<i>Ehrharta stipoides</i>	weeping grass	
406	<i>Poa labillardierei</i>	silver tussock grass	
401 402	<i>Poa poliformis</i>	coastal tussock grass	
405 406	<i>Poa rodwayi</i>	velvet tussock grass	
402	<i>Spinifex sericeus</i>	beach spinifex	
404	<i>Sporobolus africanus</i>	rat tail grass	i
405 406	<i>Themeda triandra</i>	kangaroo grass	

### RESTIONACEAE

401	<i>Apodasmia brownii</i>	coarse twinerush
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### TYPHACEAE

403	<i>Typha orientalis</i>	broadleaf cumbungi
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### XANTHORRHOEACEAE

401 402	<i>Lomandra longifolia</i>	sagg
405 406		
407		

## PTERIDOPHYTA

### DENNSTAEDTIACEAE

402 404	<i>Pteridium esculentum</i>	bracken
405 406		
407		

## Site Report - Piccaninny Swamp (4)

### Site: 401 04 - Melaleuca ericifolia swamp forest (NME)

Grid Reference: 607000E, 5384200N  
Accuracy: GPS (within 10 metres)  
Recorder: Chris Obst  
Date of Survey: 21 Sep 2009

Trees: *Bursaria spinosa* subsp. *spinosa*  
Tall Shrubs: *Acacia verticillata*, *Banksia marginata*, *Melaleuca ericifolia*, *Pomaderris apetala*  
Herbs: *Acaena* sp., *Dichondra repens*, *Selliera radicans*, *Viola hederacea*  
Graminoids: *Apodasmia brownii*, *Carex appressa*, *Gahnia grandis*, *Juncus kraussii* subsp. *australiensis*, *Juncus pallidus*, *Lepidosperma longitudinale*, *Lomandra longifolia*, *Schoenus* sp., *Triglochin procerum*  
Grasses: *Distichlis distichophylla*, *Poa poiformis*  
Climbers: *Comesperma volubile*  
Weeds: *Erica lusitanica*, *Rubus fruticosus*

### Site: 402 04 - Acacia longifolia coastal scrub (SAC)

Grid Reference: 607000E, 5384200N  
Accuracy: GPS (within 10 metres)  
Recorder: Chris Obst  
Date of Survey: 21 Sep 2009

Trees: *Eucalyptus globulus* subsp. *globulus*  
Tall Shrubs: *Banksia marginata*, *Exocarpos cupressiformis*  
Shrubs: *Acacia longifolia*, *Leucopogon parviflorus*  
Low Shrubs: *Pimelea glauca*  
Herbs: *Acaena* sp., *Actites megalocarpus*, *Carpobrotus rossii*, *Dichondra repens*, *Oxalis perennans*, *Ranunculus* sp., *Senecio* sp.  
Graminoids: *Ficinia nodosa*, *Juncus kraussii* subsp. *australiensis*, *Lepidosperma gladiatum*, *Lomandra longifolia*  
Grasses: *Austrostipa* sp., *Austrostipa stipoides*, *Poa poiformis*, *Spinifex sericeus*  
Ferns: *Pteridium esculentum*  
Weeds: *Ammophila arenaria*, *Dactylis glomerata*

### Site: 403 04 - Fresh water aquatic herbland (AHF)

Grid Reference: 607000E, 5384200N  
Accuracy: GPS (within 10 metres)  
Recorder: Chris Obst  
Date of Survey: 21 Sep 2009

Herbs: *Centella cordifolia*, *Myriophyllum* sp., *Ranunculus* sp., *Villarsia reniformis*  
Graminoids: *Triglochin procerum*, *Triglochin striatum*, *Typha orientalis*

### Site: 404 04 - Pteridium esculentum fernland (FPF)

Grid Reference: 607000E, 5384200N  
Accuracy: GPS (within 10 metres)  
Recorder: Chris Obst  
Date of Survey: 21 Sep 2009

Herbs: *Oxalis perennans*  
Graminoids: *Juncus* sp.  
Ferns: *Pteridium esculentum*  
Weeds: *Acetosella vulgaris*, *Dactylis glomerata*, *Hypochoeris radicata*, *Sporobolus africanus*

**Site: 405 04 - Euc viminalis - Euc globulus coastal forest and woodland (DVC)**

Grid Reference: 607000E, 5384200N  
Accuracy: GPS (within 10 metres)  
Recorder: Chris Obst  
Date of Survey: 21 Sep 2009

Trees: *Allocasuarina littoralis*, *Bursaria spinosa* subsp. *spinosa*, *Eucalyptus amygdalina*, *Eucalyptus globulus* subsp. *globulus*, *Eucalyptus viminalis* subsp. *viminalis*

Tall Shrubs: *Banksia marginata*, *Exocarpos cupressiformis*, *Leptospermum scoparium*

Shrubs: *Daviesia ulicifolia*, *Monotoca elliptica*

Low Shrubs: *Astroloma humifusum*, *Pimelea humilis*

Herbs: *Acaena* sp., *Crassula sieberiana*, *Dichondra repens*, *Glycine clandestina*, *Oxalis perennans*, *Pterostylis* sp., *Scleranthus biflorus*, *Viola hederacea*

Graminoids: *Diplarrena moraea*, *Lepidosperma longitudinale*, *Lomandra longifolia*

Grasses: *Ehrharta stipoides*, *Poa rodwayi*, *Themeda triandra*

Ferns: *Pteridium esculentum*

Weeds: *Acetosella vulgaris*, *Hypochoeris radicata*

**Site: 406 04 - Eucalyptus globulus dry forest and woodland (DGL)**

Grid Reference: 607000E, 5384200N  
Accuracy: GPS (within 10 metres)  
Recorder: Chris Obst  
Date of Survey: 21 Sep 2009

Trees: *Acacia melanoxydon*, *Bursaria spinosa* subsp. *spinosa*, *Eucalyptus globulus* subsp. *globulus*, *Eucalyptus sieberi*, *Eucalyptus viminalis* subsp. *viminalis*

Tall Shrubs: *Acacia dealbata* subsp. *dealbata*, *Exocarpos cupressiformis*, *Pomaderris apetala*

Shrubs: *Bossiaea prostrata*, *Cassinia aculeata*

Low Shrubs: *Lissanthe strigosa*

Herbs: *Dichondra repens*, *Oxalis perennans*, *Trifolium* sp.

Graminoids: *Diplarrena moraea*, *Gahnia radula*, *Juncus* sp., *Lepidosperma longitudinale*, *Lomandra longifolia*

Grasses: *Austrodanthonia* sp., *Ehrharta stipoides*, *Poa labillardierei*, *Poa rodwayi*, *Themeda triandra*

Ferns: *Pteridium esculentum*

Weeds: *Acetosella vulgaris*, *Erica lusitanica*, *Hypochoeris radicata*, *Rubus fruticosus*, *Salix* sp., *Urtica urens*, *Vinca major*

**Site: 407 04 - Regenerating cleared land (FRG)**

Grid Reference: 607000E, 5384200N  
Accuracy: GPS (within 10 metres)  
Recorder: Chris Obst  
Date of Survey: 21 Sep 2009

Trees: *Bursaria spinosa* subsp. *spinosa*, *Eucalyptus globulus* subsp. *globulus*, *Eucalyptus sieberi*

Low Shrubs: *Lissanthe strigosa*

Graminoids: *Lomandra longifolia*

Ferns: *Pteridium esculentum*

## Species list - Grants Lagoon (5)

### Status codes:

#### ORIGIN

i - introduced

d - declared weed WM Act

en - endemic to Tasmania

t - within Australia, occurs only in Tas.

#### NATIONAL SCHEDULE

EPBC Act 1999

CR - critically endangered

EN - endangered

VU - vulnerable

#### STATE SCHEDULE

TSP Act 1995

e - endangered

v - vulnerable

r - rare

### Sites:

501	05 - Acacia longifolia coastal scrub (SAC) - E608880, N5432680	3/09/2009	Chris	Obst
502	05 - Coastal Scrub (SSC) - E608970, N5432500	3/09/2009	Chris	Obst
503	05 - Saline sedgeland/rushland (ARS) - E608900, N5432490	3/09/2009	Chris	Obst
504	05 - Eucalyptus amygdalina coastal forest and woodland (DAC) - E608820, N5432320	3/09/2009	Chris	Obst
505	05 - Melaleuca ericifolia swamp forest (NME) - E608950, N5432260	3/09/2009	Chris	Obst
506	05 - Eucalyptus ovata forest and woodland (DOV) - E608550, N5431940	3/09/2009	Chris	Obst
507	05 - Eucalyptus globulus dry forest and woodland (DGL) - E607720, N5432600	3/09/2009	Chris	Obst
508	05 - Melaleuca squarrosa scrub (SMR) - E608508, N5432897	3/09/2009	Chris	Obst
509	05 - Coastal heathland (SCH) - E608576, N5432880	3/09/2009	Chris	Obst
510	05 - Eucalyptus sieberi forest and woodland not on granite (DSO) - E607887, N5431872	3/09/2009	Chris	Obst

Site	Name	Common name	Status
<b>DICOTYLEDONAE</b>			
<b>AIZOACEAE</b>			
501	<i>Carpobrotus rossii</i>	native pigface	
501 502	<i>Tetragonia implexicoma</i>	bower spinach	
<b>APIACEAE</b>			
504 510	<i>Xanthosia pilosa</i>	woolly crossherb	
<b>ASTERACEAE</b>			
501	<i>Actites megalocarpus</i>	dune thistle	
502	<i>Asteraceae sp.</i>	native daisy	
502 504	<i>Coronidium scorpioides</i>	curling everlasting	
510			
502 510	<i>Hypochoeris radicata</i>	rough catsear	i
505	<i>Olearia lirata</i>	forest daisybush	
502 504	<i>Osteospermum fruticosum</i>	trailing daisy	i
505			
501	<i>Senecio pinnatifolius</i>	common coast groundsel	
502 507	<i>Senecio sp.</i>	groundsel	
502	<i>Vellereophyton dealbatum</i>	white cudweed	i
<b>CAMPANULACEAE</b>			
510	<i>Wahlenbergia sp.</i>	bluebell	
<b>CARYOPHYLLACEAE</b>			
502	<i>Cerastium glomeratum</i>	sticky mouse-ear	i
<b>CASUARINACEAE</b>			
506 507	<i>Allocasuarina littoralis</i>	black sheoak	
510			
504 509	<i>Allocasuarina monilifera</i>	necklace sheoak	en
502	<i>Allocasuarina verticillata</i>	drooping sheoak	
<b>CHENOPODIACEAE</b>			
502	<i>Rhagodia candolleana subsp.</i>	coastal saltbush	
<b>CONVOLVULACEAE</b>			
504	<i>Dichondra repens</i>	kidneyweed	
<b>CRASSULACEAE</b>			
502	<i>Crassula sieberiana</i>	stone-crop	



<b>DILLENACEAE</b>		
510	<i>Hibbertia acicularis</i>	prickly guineaflower
507	<i>Hibbertia appressa</i>	southern guineaflower
510	<i>Hibbertia empetrifolia</i> subsp. <i>empetrifolia</i>	scrambling guineaflower
510	<i>Hibbertia procumbens</i>	spreading guineaflower
502 504	<i>Hibbertia riparia</i>	erect guineaflower
506 509		
<b>DROSERACEAE</b>		
504 507	<i>Drosera macrantha</i>	climbing sundew
<b>EPACRIDACEAE</b>		
507 510	<i>Acrotriche serrulata</i>	ants delight
502 510	<i>Astroloma humifusum</i>	native cranberry
502 504	<i>Epacris impressa</i>	common heath
506 510		
502 504	<i>Leucopogon ericoides</i>	pink beardheath
506 509		
501	<i>Leucopogon parviflorus</i>	coast beardheath
502 504	<i>Monotoca elliptica</i>	tree broomheath
506 507		
509		
504 508	<i>Sprengelia incarnata</i>	pink swampheath
510	<i>Styphelia adscendens</i>	golden heath
<b>EUPHORBIACEAE</b>		
502 506	<i>Amperea xiphioclada</i> var. <i>xiphioclada</i>	broom spurge
507 510		
<b>FABACEAE</b>		
502 504	<i>Aotus ericoides</i>	golden pea
507 509		
510		
502 504	<i>Bossiaea cinerea</i>	showy bossia
506 507		
509 510		
507	<i>Bossiaea prostrata</i>	creeping bossia
504 510	<i>Dillwynia glaberrima</i>	smooth parrotpea
507 510	<i>Kennedia prostrata</i>	running postman
505 506	<i>Platylobium formosum</i>	handsome flatpea
507		
507	<i>Platylobium obtusangulum</i>	common flatpea
505	<i>Psoralea pinnata</i>	blue butterflybush
510	<i>Pultenaea daphnoides</i> var. <i>obcordata</i>	heartleaf bushpea
<b>GENTIANACEAE</b>		
510	<i>Centaurium erythraea</i>	common centaury
<b>GOODENIACEAE</b>		
510	<i>Goodenia lanata</i>	trailing native-primrose
<b>HALORAGACEAE</b>		
507 510	<i>Gonocarpus tetragynus</i>	common raspwort
502 504	<i>Gonocarpus teucrioides</i>	forest raspwort
507 510		
<b>LAURACEAE</b>		
504	<i>Cassytha glabella</i>	slender dodderlaurel
504	<i>Cassytha pubescens</i>	downy dodderlaurel

<b>MIMOSACEAE</b>		
502 504 506	<i>Acacia genistifolia</i>	spreading wattle
501 502 504 509	<i>Acacia longifolia</i>	coast wattle
506	<i>Acacia melanoxylon</i>	blackwood
510	<i>Acacia myrtifolia</i>	redstem wattle
504 507 510	<i>Acacia suaveolens</i>	sweet wattle
502 504 507 510	<i>Acacia terminalis</i>	sunshine wattle
505 506 507 508	<i>Acacia verticillata</i>	prickly mimosa
<b>MYRTACEAE</b>		
502 504 506 509 510	<i>Calytrix tetragona</i>	common fringemyrtle
504 507 510	<i>Eucalyptus amygdalina</i>	black peppermint en
507	<i>Eucalyptus globulus subsp. globulus</i>	tasmanian blue gum
505 506 510	<i>Eucalyptus ovata var. ovata</i>	black gum
507 510	<i>Eucalyptus sieberi</i>	ironbark
505 507 510	<i>Eucalyptus viminalis subsp. viminalis</i>	white gum
510	<i>Euryomyrtus ramosissima</i>	heath-myrtle
502	<i>Kunzea ambigua</i>	white kunzea
504 507 508 509	<i>Leptospermum scoparium</i>	common tea-tree
505 506	<i>Melaleuca ericifolia</i>	coast paperbark
504	<i>Melaleuca gibbosa</i>	slender honeymyrtle
505 508	<i>Melaleuca squarrosa</i>	scented paperbark
<b>OXALIDACEAE</b>		
506 507	<i>Oxalis perennans</i>	grassland woodsorrel
<b>PITTOSPORACEAE</b>		
502 507	<i>Bursaria spinosa subsp. spinosa</i>	prickly box
505	<i>Pittosporum undulatum</i>	sweet pittosporum i
<b>POLYGALACEAE</b>		
502 504	<i>Comesperma ericinum</i>	heath milkwort
510	<i>Comesperma retusum</i>	mountain milkwort
504 506 507	<i>Comesperma volubile</i>	blue lovecreeper
<b>POLYGONACEAE</b>		
502	<i>Muehlenbeckia australis</i>	climbing lignum
<b>PROTEACEAE</b>		
502 504 507 510	<i>Banksia marginata</i>	silver banksia
510	<i>Lomatia tinctoria</i>	guitarplant en
<b>RHAMNACEAE</b>		
506 507 510	<i>Pomaderris elliptica</i>	yellow dogwood
505	<i>Pomaderris pilifera</i>	hairy dogwood
507	<i>Pomaderris sp.</i>	dogwood

<b>ROSACEAE</b>		
505	<i>Rubus fruticosus</i>	blackberry d
<b>RUTACEAE</b>		
501	<i>Correa alba</i> var. <i>alba</i>	white correa
501 502	<i>Correa reflexa</i>	correa
504 509		
506	<i>Correa reflexa</i> var. <i>nummulariifolia</i>	roundleaf correa
<b>SANTALACEAE</b>		
502 506	<i>Exocarpos cupressiformis</i>	common native-cherry
507 510		
<b>STYLIDIACEAE</b>		
502 506	<i>Stylidium graminifolium</i>	narrowleaf triggerplant
510		
<b>THYMELAEACEAE</b>		
502	<i>Pimelea humilis</i>	dwarf riceflower
502 504	<i>Pimelea linifolia</i> subsp. <i>linifolia</i>	slender riceflower
510		
<b>TREMANDRACEAE</b>		
504 510	<i>Tetratheca labillardierei</i>	glandular pinkbells
502	<i>Tetratheca pilosa</i>	hairy pinkbells
<b>VIOLACEAE</b>		
507	<i>Viola hederacea</i>	ivyleaf violet
<b>MONOCOTYLEDONAE</b>		
<b>CYPERACEAE</b>		
502 503	<i>Baumea juncea</i>	bare twigsedge
505 506		
501	<i>Ficinia nodosa</i>	knobby clubsedge
505 507	<i>Gahnia grandis</i>	cutting grass
510	<i>Gahnia radula</i>	thatch sawsedge
510	<i>Gahnia rodwayi</i>	dwarf sawsedge
508	<i>Gymnoschoenus sphaerocephalus</i>	buttongrass en
502 504	<i>Lepidosperma concavum</i>	sand swordsedg
505 506		
507 509		
510		
509	<i>Lepidosperma filiforme</i>	common rapiersedge
502	<i>Lepidosperma gladiatum</i>	coast swordsedg
501 506	<i>Lepidosperma longitudinale</i>	spreading swordsedg
510		
<b>IRIDACEAE</b>		
504	<i>Patersonia fragilis</i>	short purpleflag
507	<i>Patersonia occidentalis</i>	long purpleflag
<b>JUNCACEAE</b>		
502 503	<i>Juncus kraussii</i> subsp. <i>australiensis</i>	sea rush
505		
<b>LILIACEAE</b>		
502 506	<i>Dianella revoluta</i>	spreading flaxlily
507		

<b>ORCHIDACEAE</b>		
507	<i>Chiloglottis</i> sp.	bird orchid
502 507	<i>Cyrtostylis</i> sp.	gnat-orchid
507	<i>Dockrillia striolata</i>	rock orchid
504	<i>Glossodia major</i>	waxlip orchid
507	<i>Pterostylis</i> sp.	greenhood
504	<i>Pyrorchis nigricans</i>	fire orchid
<b>POACEAE</b>		
501	<i>Ammophila arenaria</i>	marram grass
510	<i>Austrodanthonia</i> sp.	wallabygrass
507	<i>Austrostipa</i> sp.	speargrass
501	<i>Austrostipa stipoides</i>	coast speargrass
510	<i>Dactylis glomerata</i>	cocksfoot
504	<i>Ehrharta stipoides</i>	weeping grass
506	<i>Phragmites australis</i>	southern reed
502	<i>Poa poiformis</i>	coastal tussockgrass
502	<i>Poaceae</i> sp.	grass
502	<i>Themeda triandra</i>	kangaroo grass
<b>RESTIONACEAE</b>		
502 503	<i>Apodasmia brownii</i>	coarse twinerush
508		
504 509	<i>Hypolaena fastigiata</i>	tassel roperush
510		
<b>XANTHORRHOEACEAE</b>		
501 504	<i>Lomandra longifolia</i>	sagg
507 509		
504 510	<i>Xanthorrhoea australis</i>	southern grasstree
<b>PTERIDOPHYTA</b>		
<b>DENNSTAEDTIACEAE</b>		
502 504	<i>Pteridium esculentum</i>	bracken
505 506		
507 510		
<b>GLEICHENIACEAE</b>		
508	<i>Gleichenia dicarpa</i>	pouched coralfern
<b>HYMENOPHYLLACEAE</b>		
507	<i>Hymenophyllum cupressiforme</i>	common filmyfern
<b>SELAGINELLACEAE</b>		
510	<i>Selaginella uliginosa</i>	swamp spikemoss

## Site Report - Grants Lagoon (5)

### Site: 501 05 - Acacia longifolia coastal scrub (SAC)

Grid Reference: 608880E, 5432680N  
Accuracy: GPS (within 10 metres)  
Recorder: Chris Obst  
Date of Survey: 3 Sep 2009

Shrubs: *Acacia longifolia*, *Correa alba* var. *alba*, *Leucopogon parviflorus*  
Herbs: *Actites megalocarpus*, *Carpobrotus rossii*, *Correa reflexa*, *Senecio pinnatifolius*, *Tetragonia implexicoma*  
Graminoids: *Ficinia nodosa*, *Lepidosperma longitundinale*, *Lomandra longifolia*  
Grasses: *Austrostipa stipoides*  
Weeds: *Ammophila arenaria*

### Site: 502 05 - Coastal Scrub (SSC)

Grid Reference: 608970E, 5432500N  
Accuracy: GPS (within 10 metres)  
Recorder: Chris Obst  
Date of Survey: 3 Sep 2009

Trees: *Allocasuarina verticillata*, *Bursaria spinosa* subsp. *spinosa*  
Tall Shrubs: *Banksia marginata*, *Exocarpos cupressiformis*, *Kunzea ambigua*  
Shrubs: *Acacia genistifolia*, *Acacia longifolia*, *Acacia terminalis*, *Amperea xiphoclada* var. *xiphoclada*, *Bossiaea cinerea*, *Calytrix tetragona*, *Epacris impressa*, *Leucopogon ericoides*, *Monotoca elliptica*, *Pimelea linifolia* subsp. *linifolia*, *Rhagodia candolleana* subsp. *candolleana*  
Low Shrubs: *Aotus ericoides*, *Astroloma humifusum*, *Hibbertia riparia*, *Pimelea humilis*, *Tetradlea pilosa*  
Herbs: *Asteraceae* sp., *Comesperma ericinum*, *Coronidium scorpioides*, *Correa reflexa*, *Crassula sieberiana*, *Cyrtostylis* sp., *Dianella revoluta*, *Gonocarpus teucroides*, *Senecio* sp., *Stylidium graminifolium*, *Tetragonia implexicoma*  
Graminoids: *Apodasmia brownii*, *Baumea juncea*, *Juncus kraussii* subsp. *australiensis*, *Lepidosperma concavum*, *Lepidosperma gladiatum*  
Grasses: *Poa poiformis*, *Poaceae* sp., *Themeda triandra*  
Ferns: *Pteridium esculentum*  
Climbers: *Muehlenbeckia australis*  
Weeds: *Cerastium glomeratum*, *Hypochoeris radicata*, *Osteospermum fruticosum*, *Vellereophyton dealbatum*

### Site: 503 05 - Saline sedgeland/rushland (ARS)

Grid Reference: 608900E, 5432490N  
Accuracy: GPS (within 10 metres)  
Recorder: Chris Obst  
Date of Survey: 3 Sep 2009

Graminoids: *Apodasmia brownii*, *Baumea juncea*, *Juncus kraussii* subsp. *australiensis*

### Site: 504 05 - Eucalyptus amygdalina coastal forest and woodland (DAC)

Grid Reference: 608820E, 5432320N  
Accuracy: GPS (within 10 metres)  
Recorder: Chris Obst  
Date of Survey: 3 Sep 2009

Trees: *Allocasuarina monilifera*, *Eucalyptus amygdalina*  
Tall Shrubs: *Banksia marginata*, *Leptospermum scoparium*  
Shrubs: *Acacia genistifolia*, *Acacia longifolia*, *Acacia suaveolens*, *Acacia terminalis*, *Bossiaea cinerea*, *Calytrix tetragona*, *Dillwynia glaberrima*, *Epacris impressa*, *Leucopogon ericoides*, *Melaleuca gibbosa*, *Monotoca elliptica*, *Pimelea linifolia* subsp. *linifolia*, *Sprengelia incarnata*  
Low Shrubs: *Aotus ericoides*, *Hibbertia riparia*, *Tetradlea pilosa*  
Herbs: *Comesperma ericinum*, *Coronidium scorpioides*, *Correa reflexa*, *Dichondra repens*, *Drosera macrantha*, *Glossodia major*, *Gonocarpus teucroides*, *Pyrorchis nigricans*, *Xanthosia pilosa*  
Graminoids: *Hypolaena fastigiata*, *Lepidosperma concavum*, *Lomandra longifolia*, *Patersonia fragilis*, *Xanthorrhoea australis*

Grasses: *Ehrharta stipoides*  
Ferns: *Pteridium esculentum*  
Climbers: *Cassytha glabella*, *Cassytha pubescens*, *Comesperma volubile*  
Weeds: *Osteospermum fruticosum*

**Site: 505 05 - Melaleuca ericifolia swamp forest (NME)**

Grid Reference: 608950E, 5432260N  
Accuracy: GPS (within 10 metres)  
Recorder: Chris Obst  
Date of Survey: 3 Sep 2009  
  
Trees: *Eucalyptus ovata* var. *ovata*, *Eucalyptus viminalis* subsp. *viminalis*  
Tall Shrubs: *Acacia verticillata*, *Melaleuca ericifolia*, *Melaleuca squarrosa*  
Shrubs: *Olearia lirata*, *Pomaderris pilifera*  
Low Shrubs: *Platylobium formosum*  
Graminoids: *Baumea juncea*, *Gahnia grandis*, *Juncus kraussii* subsp. *australiensis*,  
*Lepidosperma concavum*  
Ferns: *Pteridium esculentum*  
Weeds: *Osteospermum fruticosum*, *Pittosporum undulatum*, *Psoralea pinnata*, *Rubus fruticosus*

**Site: 506 05 - Eucalyptus ovata forest and woodland (DOV)**

Grid Reference: 608550E, 5431940N  
Accuracy: GPS (within 10 metres)  
Recorder: Chris Obst  
Date of Survey: 3 Sep 2009  
  
Trees: *Acacia melanoxylon*, *Allocasuarina littoralis*, *Eucalyptus ovata* var. *ovata*  
Tall Shrubs: *Acacia verticillata*, *Exocarpos cupressiformis*, *Melaleuca ericifolia*  
Shrubs: *Acacia genistifolia*, *Amperea xiphoclada* var. *xiphoclada*, *Bossiaea cinerea*, *Calytrix tetragona*, *Epacris impressa*, *Leucopogon ericoides*, *Monotoca elliptica*, *Pomaderris elliptica*  
Low Shrubs: *Hibbertia riparia*, *Platylobium formosum*  
Herbs: *Correa reflexa* var. *nummulariifolia*, *Dianella revoluta*, *Oxalis perennans*, *Stylidium graminifolium*  
Graminoids: *Baumea juncea*, *Lepidosperma concavum*, *Lepidosperma longitudinale*  
Grasses: *Phragmites australis*  
Ferns: *Pteridium esculentum*  
Climbers: *Comesperma volubile*

**Site: 507 05 - Eucalyptus globulus dry forest and woodland (DGL)**

Grid Reference: 607720E, 5432600N  
Accuracy: GPS (within 10 metres)  
Recorder: Chris Obst  
Date of Survey: 3 Sep 2009  
  
Trees: *Allocasuarina littoralis*, *Bursaria spinosa* subsp. *spinosa*, *Eucalyptus amygdalina*,  
*Eucalyptus globulus* subsp. *globulus*, *Eucalyptus sieberi*, *Eucalyptus viminalis*  
subsp. *viminalis*  
Tall Shrubs: *Acacia verticillata*, *Banksia marginata*, *Exocarpos cupressiformis*, *Leptospermum scoparium*, *Pomaderris* sp.  
Shrubs: *Acacia suaveolens*, *Acacia terminalis*, *Amperea xiphoclada* var. *xiphoclada*,  
*Bossiaea cinerea*, *Bossiaea prostrata*, *Monotoca elliptica*, *Pomaderris elliptica*  
Low Shrubs: *Acrotriche serrulata*, *Aotus ericoides*, *Hibbertia appressa*, *Platylobium formosum*,  
*Platylobium obtusangulum*  
Herbs: *Chiloglottis* sp., *Cyrtostylis* sp., *Dianella revoluta*, *Dockrillia striolata*, *Drosera macrantha*,  
*Gonocarpus tetragynus*, *Gonocarpus teucrioides*, *Kennedia prostrata*, *Oxalis perennans*,  
*Pterostylis* sp., *Senecio* sp., *Viola hederacea*  
Graminoids: *Gahnia grandis*, *Lepidosperma concavum*, *Lomandra longifolia*, *Patersonia occidentalis*  
Grasses: *Austrostipa* sp.  
Ferns: *Hymenophyllum cupressiforme*, *Pteridium esculentum*  
Climbers: *Comesperma volubile*

**Site: 508 05 - Melaleuca squarrosa scrub (SMR)**

Grid Reference: 608508E, 5432897N  
Accuracy: GPS (within 10 metres)



Recorder: Chris Obst  
Date of Survey: 3 Sep 2009  
Tall Shrubs: *Acacia verticillata*, *Leptospermum scoparium*, *Melaleuca squarrosa*  
Shrubs: *Sprengelia incarnata*  
Graminoids: *Apodasmia brownii*, *Gymnoschoenus sphaerocephalus*  
Ferns: *Gleichenia dicarpa*

### Site: 509 05 - Coastal heathland (SCH)

Grid Reference: 608576E, 5432880N  
Accuracy: GPS (within 10 metres)  
Recorder: Chris Obst  
Date of Survey: 3 Sep 2009  
Trees: *Allocasuarina monilifera*  
Tall Shrubs: *Leptospermum scoparium*  
Shrubs: *Acacia longifolia*, *Bossiaea cinerea*, *Calytrix tetragona*, *Leucopogon ericoides*, *Monotoca elliptica*  
Low Shrubs: *Aotus ericoides*, *Hibbertia riparia*  
Herbs: *Correa reflexa*  
Graminoids: *Hypolaena fastigiata*, *Lepidosperma concavum*, *Lepidosperma filiforme*, *Lomandra longifolia*

### Site: 510 05 - Eucalyptus sieberi forest and woodland not on granite (DSO)

Grid Reference: 607887E, 5431872N  
Accuracy: GPS (within 10 metres)  
Recorder: Chris Obst  
Date of Survey: 3 Sep 2009  
Trees: *Allocasuarina littoralis*, *Eucalyptus amygdalina*, *Eucalyptus ovata* var. *ovata*, *Eucalyptus sieberi*  
Tall Shrubs: *Banksia marginata*, *Exocarpos cupressiformis*, *Pultenaea daphnoides* var. *obcordata*  
Shrubs: *Acacia suaveolens*, *Acacia terminalis*, *Amperea xiphoclada* var. *xiphoclada*, *Bossiaea cinerea*, *Calytrix tetragona*, *Dillwynia glaberrima*, *Epacris impressa*, *Euryomyrtus ramosissima*, *Lomatia tinctoria*, *Pimelea linifolia* subsp. *linifolia*,  
Low Shrubs: *Acacia myrtifolia*, *Acrotriche serrulata*, *Aotus ericoides*, *Astroloma humifusum*, *Hibbertia acicularis*, *Hibbertia empetrifolia* subsp. *empetrifolia*, *Hibbertia procumbens*, *Styphelia adscendens*, *Tetratheca labillardierei*  
Herbs: *Comesperma retusum*, *Coronidium scorpioides*, *Gonocarpus tetragynus*, *Gonocarpus teucroides*, *Goodenia lanata*, *Kennedia prostrata*, *Stylidium graminifolium*, *Wahlenbergia* sp., *Xanthosia pilosa*  
Graminoids: *Gahnia radula*, *Gahnia rodwayi*, *Hypolaena fastigiata*, *Lepidosperma concavum*, *Lepidosperma longitudinale*, *Xanthorrhoea australis*  
Grasses: *Austrodanthonia* sp.  
Ferns: *Pteridium esculentum*, *Selaginella uliginosa*  
Weeds: *Centaurium erythraea*, *Dactylis glomerata*, *Hypochoeris radicata*

## Species list - Parkside Lagoon (7)

### Status codes:

#### ORIGIN

i - introduced  
d - declared weed WM Act  
en - endemic to Tasmania  
t - within Australia, occurs only in Tas.

#### NATIONAL SCHEDULE

EPBC Act 1999  
CR - critically endangered  
EN - endangered  
VU - vulnerable

#### STATE SCHEDULE

TSP Act 1995  
e - endangered  
v - vulnerable  
r - rare

### Sites:

701	07 - Euc. viminalis - Euc. globulus coastal forest and woodland (DVC) - E606800, N5422800	24/09/2009	Chris	Obst
702	07 - Pteridium esculentum fernland (FPF) - E606800, N5422800	24/09/2009	Chris	Obst
703	07 - Melaleuca ericifolia swamp forest (NME) - E606800, N5422800	24/09/2009	Chris	Obst
704	07 - Saline sedgeland/rushland (ARS) - E606800, N5422800	24/09/2009	Chris	Obst
705	07 - Eucalyptus sieberi forest and woodland not on granite (DSO) - E606800, N5422800	24/09/2009	Chris	Obst
706	07 - Melaleuca squarrosa scrub (SMR) - E606800, N5422800	24/09/2009	Chris	Obst

Site	Name	Common name	Status
<b>DICOTYLEDONAE</b>			
<b>APIACEAE</b>			
703 704	<i>Apium prostratum</i>	sea celery	
705	<i>Hydrocotyle hirta</i>	hairy pennywort	
705	<i>Xanthosia pilosa</i>	woolly crossherb	
<b>ASTERACEAE</b>			
705	<i>Coronidium scorpioides</i>	curling everlasting	
702	<i>Hypochoeris radicata</i>	rough catsear	i
701	<i>Olearia lirata</i>	forest daisybush	
<b>CASUARINACEAE</b>			
705	<i>Allocasuarina littoralis</i>	black sheoak	
<b>CONVOLVULACEAE</b>			
705	<i>Dichondra repens</i>	kidneyweed	
<b>CUNONIACEAE</b>			
706	<i>Bauera rubioides</i>	wiry bauera	
<b>DILLENIACEAE</b>			
705	<i>Hibbertia appressa</i>	southern guineaflower	
<b>EPACRIDACEAE</b>			
705	<i>Acrotriche serrulata</i>	ants delight	
705	<i>Epacris impressa</i>	common heath	
705	<i>Monotoca elliptica</i>	tree broomheath	
706	<i>Sprengelia incarnata</i>	pink swampheath	
<b>EUPHORBIACEAE</b>			
705	<i>Amperea xiphoclada</i> var. <i>xiphoclada</i>	broom spurge	
<b>FABACEAE</b>			
705	<i>Aotus ericoides</i>	golden pea	
705	<i>Bossiaea cinerea</i>	showy bossia	
705	<i>Platylobium formosum</i>	handsome flatpea	
705	<i>Pultenaea daphnoides</i> var. <i>obcordata</i>	heartleaf bushpea	
705	<i>Pultenaea stricta</i>	rigid bushpea	
<b>GOODENIACEAE</b>			
705	<i>Goodenia lanata</i>	trailing native-primrose	
<b>HALORAGACEAE</b>			
705	<i>Gonocarpus teucroides</i>	forest raspwort	
<b>LAURACEAE</b>			

703 705	<i>Cassytha pubescens</i>	downy dodderlaurel	
<b>MIMOSACEAE</b>			
705	<i>Acacia dealbata</i> subsp. <i>dealbata</i>	silver wattle	
701	<i>Acacia mearnsii</i>	black wattle	
701 702	<i>Acacia paradoxa</i>	thorn wattle	i
705	<i>Acacia suaveolens</i>	sweet wattle	
705	<i>Acacia terminalis</i>	sunshine wattle	
703 705	<i>Acacia verticillata</i>	prickly mimosa	
706			
<b>MYRTACEAE</b>			
705	<i>Eucalyptus amygdalina</i>	black peppermint	en
702	<i>Eucalyptus globulus</i> subsp. <i>globulus</i>	tasmanian blue gum	
705	<i>Eucalyptus sieberi</i>	ironbark	
701 705	<i>Eucalyptus viminalis</i> subsp. <i>viminalis</i>	white gum	
706	<i>Leptospermum scoparium</i>	common tea-tree	
701 703	<i>Melaleuca ericifolia</i>	coast paperbark	
706			
706	<i>Melaleuca squarrosa</i>	scented paperbark	
<b>OXALIDACEAE</b>			
701 705	<i>Oxalis perennans</i>	grassland woodsorrel	
<b>PITTOSPORACEAE</b>			
703	<i>Billardiera longiflora</i>	purple appleberry	en
701 705	<i>Bursaria spinosa</i> subsp. <i>spinosa</i>	prickly box	
<b>POLYGALACEAE</b>			
705	<i>Comesperma volubile</i>	blue lovecreeper	
<b>PROTEACEAE</b>			
705	<i>Lomatia tinctoria</i>	guitarplant	en
705	<i>Persoonia juniperina</i>	prickly geebung	
<b>RHAMNACEAE</b>			
705	<i>Pomaderris pilifera</i>	hairy dogwood	
<b>ROSACEAE</b>			
701	<i>Acaena</i> sp.	sheep's burr	
705	<i>Rubus fruticosus</i>	blackberry	d
<b>RUBIACEAE</b>			
705	<i>Coprosma quadrifida</i>	native currant	
<b>RUTACEAE</b>			
705	<i>Correa reflexa</i>	correa	
<b>SANTALACEAE</b>			
701 705	<i>Exocarpos cupressiformis</i>	common native-cherry	
705	<i>Leptomeria drupacea</i>	erect currantbush	
<b>STACKHOUSIACEAE</b>			
705	<i>Stackhousia monogyna</i>	forest candles	
<b>THYMELAEACEAE</b>			
705	<i>Pimelea linifolia</i> subsp. <i>linifolia</i>	slender riceflower	
<b>VIOLACEAE</b>			
705	<i>Viola hederacea</i>	ivy-leaf violet	

## MONOCOTYLEDONAE

### CYPERACEAE

703 704	<i>Gahnia filum</i>	chaffy sawsedge
703 705	<i>Gahnia grandis</i>	cutting grass
706		
705	<i>Gahnia radula</i>	thatch sawsedge
705	<i>Lepidosperma concavum</i>	sand swordedge
705	<i>Lepidosperma longitudinale</i>	spreading swordedge
703	<i>Schoenus lepidosperma</i> subsp. <i>lepidosperma</i>	slender bogsedge

### JUNCACEAE

703 704	<i>Juncus kraussii</i> subsp. <i>australiensis</i>	sea rush
702 704	<i>Juncus pallidus</i>	pale rush

### LILIACEAE

705	<i>Dianella revoluta</i>	spreading flaxlily
703 705	<i>Dianella tasmanica</i>	forest flaxlily

### ORCHIDACEAE

705	<i>Acianthus caudatus</i>	mayfly orchid
705	<i>Chiloglottis</i> sp.	bird orchid
705	<i>Pterostylis</i> sp.	greenhood

### POACEAE

703 704	<i>Distichlis distichophylla</i>	australian saltgrass
701 702	<i>Ehrharta stipoides</i>	weeping grass
705		
702	<i>Sporobolus africanus</i>	ratstail grass

### RESTIONACEAE

706	<i>Apodasmia brownii</i>	coarse twinerush
706	<i>Eurychorda complanata</i>	flat cordrush

### XANTHORRHOEACEAE

701 705	<i>Lomandra longifolia</i>	sagg
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### PTERIDOPHYTA

#### DENNSTAEDTIACEAE

701 702	<i>Pteridium esculentum</i>	bracken
703 705		

### GLEICHENIACEAE

706	<i>Gleichenia dicarpa</i>	pouched coralfern
703 706	<i>Gleichenia microphylla</i>	scrambling coralfern

## Site Report for Project: NRM006

### Site: 701 07 - Euc. viminalis - Euc. globulus coastal forest and woodland

Grid Reference: 606800E, 5422800N  
Accuracy: GPS (within 10 metres)  
Recorder: Chris Obst  
Date of Survey: 24 Sep 2009

Trees: *Bursaria spinosa* subsp. *spinosa*, *Eucalyptus viminalis* subsp. *viminalis*  
Tall Shrubs: *Acacia mearnsii*, *Exocarpos cupressiformis*, *Melaleuca ericifolia*  
Shrubs: *Acacia paradoxa*, *Olearia lirata*  
Herbs: *Acaena* sp., *Oxalis perennans*  
Graminoids: *Lomandra longifolia*  
Grasses: *Ehrharta stipoides*  
Ferns: *Pteridium esculentum*

### Site: 702 07 - Pterideum esculentum fernland (FPF)

Grid Reference: 606800E, 5422800N  
Accuracy: GPS (within 10 metres)  
Recorder: Chris Obst  
Date of Survey: 24 Sep 2009

Trees: *Eucalyptus globulus* subsp. *globulus*  
Shrubs: *Acacia paradoxa*  
Graminoids: *Juncus pallidus*  
Grasses: *Ehrharta stipoides*  
Ferns: *Pteridium esculentum*  
Weeds: *Hypochoeris radicata*, *Sporobolus africanus*

### Site: 703 07 - Melaleuca ericifolia swamp forest (NME)

Grid Reference: 606800E, 5422800N  
Accuracy: GPS (within 10 metres)  
Recorder: Chris Obst  
Date of Survey: 24 Sep 2009

Tall Shrubs: *Acacia verticillata*, *Melaleuca ericifolia*  
Herbs: *Apium prostratum*, *Dianella tasmanica*  
Graminoids: *Gahnia filum*, *Gahnia grandis*, *Juncus kraussii* subsp. *australiensis*, *Schoenus lepidosperma* subsp. *lepidosperma*  
Grasses: *Distichlis distichophylla*  
Ferns: *Gleichenia microphylla*, *Pteridium esculentum*  
Climbers: *Billardiera longiflora*, *Cassytha pubescens*

### Site: 704 07 - Saline sedgeland/rushland (ARS)

Grid Reference: 606800E, 5422800N  
Accuracy: GPS (within 10 metres)  
Recorder: Chris Obst  
Date of Survey: 24 Sep 2009

Herbs: *Apium prostratum*  
Graminoids: *Gahnia filum*, *Juncus kraussii* subsp. *australiensis*, *Juncus pallidus*  
Grasses: *Distichlis distichophylla*

**Site: 705 07 - Eucalyptus sieberi forest and woodland not on granite (DSO)**

Grid Reference: 606800E, 5422800N  
Accuracy: GPS (within 10 metres)  
Recorder: Chris Obst  
Date of Survey: 24 Sep 2009

Trees: *Allocasuarina littoralis*, *Bursaria spinosa* subsp. *spinosa*, *Eucalyptus amygdalina*, *Eucalyptus sieberi*, *Eucalyptus viminalis* subsp. *viminalis*  
Tall Shrubs: *Acacia dealbata* subsp. *dealbata*, *Acacia verticillata*, *Exocarpos cupressiformis*, *Pultenaea daphnoides* var. *obcordata*  
Shrubs: *Acacia suaveolens*, *Acacia terminalis*, *Amperea xiphoclada* var. *xiphoclada*, *Bossiaea cinerea*, *Coprosma quadrifida*, *Epacris impressa*, *Leptomeria drupacea*, *Lomatia tinctoria*, *Monotoca elliptica*, *Persoonia juniperina*, *Pimelea linifolia* subsp. *linifolia*, *Pomaderris pilifera*, *Pultenaea stricta*  
Low Shrubs: *Acrotriche serrulata*, *Aotus ericoides*, *Hibbertia appressa*, *Platylobium formosum*  
Herbs: *Acianthus caudatus*, *Chiloglottis* sp., *Coronidium scorpioides*, *Correa reflexa*, *Dianella revoluta*, *Dianella tasmanica*, *Dichondra repens*, *Gonocarpus teucroides*, *Goodenia lanata*, *Hydrocotyle hirta*, *Oxalis perennans*, *Pterostylis* sp., *Stackhousia monogyna*, *Viola hederacea*, *Xanthosia pilosa*  
Graminoids: *Gahnia grandis*, *Gahnia radula*, *Lepidosperma concavum*, *Lepidosperma longitudinale*, *Lomandra longifolia*  
Grasses: *Ehrharta stipoides*  
Ferns: *Pteridium esculentum*  
Climbers: *Cassytha pubescens*, *Comesperma volubile*  
Weeds: *Rubus fruticosus*

**Site: 706 07 - Melaleuca squarrosa scrub (SMR)**

Grid Reference: 606800E, 5422800N  
Accuracy: GPS (within 10 metres)  
Recorder: Chris Obst  
Date of Survey: 24 Sep 2009

Tall Shrubs: *Acacia verticillata*, *Leptospermum scoparium*, *Melaleuca ericifolia*, *Melaleuca squarrosa*  
Shrubs: *Bauera rubioides*, *Sprengelia incarnata*  
Graminoids: *Apodasmia brownii*, *Eurychorda complanata*, *Gahnia grandis*  
Ferns: *Gleichenia dicarpa*, *Gleichenia microphylla*



## Species list - Chimneys Lagoon (8)

### Status codes:

#### ORIGIN

i - introduced  
d - declared weed WM Act  
en - endemic to Tasmania  
t - within Australia, occurs only in Tas.

#### NATIONAL SCHEDULE

EPBC Act 1999  
CR - critically endangered  
EN - endangered  
VU - vulnerable

#### STATE SCHEDULE

TSP Act 1995  
e - endangered  
v - vulnerable  
r - rare

### Sites:

801	08 - Melaleuca ericifolia swamp forest (NME) - E608820, N5423860	3/09/2009	Chris	Obst
802	08 - Eucalyptus amygdalina coastal forest and woodland (DAC) - E608840, N5423870	3/09/2009	Chris	Obst
803	08 - Allocasuarina littoralis forest (NAL) - E608570, N5423680	3/03/2009	Chris	Obst

Site	Name	Common name	Status
<b>DICOTYLEDONAE</b>			
<b>APIACEAE</b>			
803	<i>Conium maculatum</i>	hemlock	i
802	<i>Xanthosia pilosa</i>	woolly crossherb	
<b>ASTERACEAE</b>			
803	<i>Osteospermum fruticosum</i>	trailing daisy	i
803	<i>Senecio</i> sp.	groundsel	
<b>CASUARINACEAE</b>			
802 803	<i>Allocasuarina littoralis</i>	black sheoak	
<b>DROSERACEAE</b>			
802	<i>Drosera macrantha</i>	climbing sundew	
802	<i>Drosera peltata</i> subsp. <i>auriculata</i>	tall sundew	
<b>EPACRIDACEAE</b>			
802	<i>Leucopogon ericoides</i>	pink beardheath	
<b>EUPHORBIACEAE</b>			
802	<i>Poranthera microphylla</i>	small poranthera	
<b>FABACEAE</b>			
803	<i>Psoralea pinnata</i>	blue butterflybush	i
<b>MIMOSACEAE</b>			
801	<i>Acacia verticillata</i>	prickly mimosa	
<b>MYRTACEAE</b>			
802	<i>Eucalyptus amygdalina</i>	black peppermint	en
802	<i>Eucalyptus globulus</i> subsp. <i>globulus</i>	tasmanian blue gum	
802 803	<i>Eucalyptus ovata</i> var. <i>ovata</i>	black gum	
802	<i>Eucalyptus viminalis</i> subsp. <i>viminalis</i>	white gum	
802	<i>Kunzea ambigua</i>	white kunzea	
802	<i>Leptospermum laevigatum</i>	coast teatree	
802 803	<i>Leptospermum scoparium</i>	common tea-tree	
801	<i>Melaleuca ericifolia</i>	coast paperbark	
801	<i>Melaleuca squarrosa</i>	scented paperbark	
<b>PROTEACEAE</b>			
802	<i>Banksia marginata</i>	silver banksia	
<b>RANUNCULACEAE</b>			
802	<i>Ranunculus</i> sp.	buttercup	
<b>ROSACEAE</b>			
801	<i>Acaena</i> sp.	sheep's burr	
<b>SANTALACEAE</b>			
802	<i>Leptomeria drupacea</i>	erect currantbush	

<b>STACKHOUSIACEAE</b>		
802	<i>Stackhousia monogyna</i>	forest candles
<b>MONOCOTYLEDONAE</b>		
<b>ARACEAE</b>		
801	<i>Zantedeschia aethiopica</i>	arum lily
<b>CYPERACEAE</b>		
801 802	<i>Gahnia grandis</i>	cutting grass
802 803	<i>Lepidosperma concavum</i>	sand sword
801 803	<i>Lepidosperma longitudinale</i>	spreading sword
802	<i>Schoenus apogon</i>	common bog
<b>JUNCACEAE</b>		
801	<i>Juncus kraussii subsp. australiensis</i>	sea rush
<b>LEMNACEAE</b>		
801	<i>Lemna disperma</i>	common duckweed
<b>ORCHIDACEAE</b>		
803	<i>Acianthus caudatus</i>	mayfly orchid
803	<i>Acianthus sp.</i>	mosquito orchid
802	<i>Caladenia fuscata</i>	dusky fingers
802	<i>Chiloglottis sp.</i>	bird orchid
802	<i>Diuris pardina</i>	leopard orchid
802 803	<i>Glossodia major</i>	waxlip orchid
802	<i>Pterostylis nutans</i>	nodding greenhood
<b>POACEAE</b>		
802	<i>Graminaea sp.</i>	grass species
<b>RESTIONACEAE</b>		
802	<i>Hypolaena fastigiata</i>	tassel roperush
<b>XANTHORRHOEACEAE</b>		
802 803	<i>Lomandra longifolia</i>	sagg
802	<i>Xanthorrhoea australis</i>	southern grasstree
<b>PTERIDOPHYTA</b>		
<b>DENNSTAEDTIACEAE</b>		
802 803	<i>Pteridium esculentum</i>	bracken

## Site Report - Chimneys Lagoon (8)

### Site: 801 08 - Melaleuca ericifolia swamp forest (NME)

Grid Reference: 608820E, 5423860N  
Accuracy: GPS (within 10 metres)  
Recorder: Chris Obst  
Date of Survey: 3 Sep 2009  
Tall Shrubs: *Acacia verticillata*, *Melaleuca ericifolia*, *Melaleuca squarrosa*  
Herbs: *Acaena* sp., *Lemna disperma*  
Graminoids: *Gahnia grandis*, *Juncus kraussii* subsp. *australiensis*, *Lepidosperma longitudinale*  
Weeds: *Zantedeschia aethiopica*

### Site: 802 08 - Eucalyptus amygdalina coastal forest and woodland (DAC)

Grid Reference: 608840E, 5423870N  
Accuracy: GPS (within 10 metres)  
Recorder: Chris Obst  
Date of Survey: 3 Sep 2009  
Trees: *Allocasuarina littoralis*, *Eucalyptus amygdalina*, *Eucalyptus globulus* subsp. *globulus*, *Eucalyptus ovata* var. *ovata*, *Eucalyptus viminalis* subsp. *viminalis*  
Tall Shrubs: *Banksia marginata*, *Kunzea ambigua*, *Leptospermum laevigatum*, *Leptospermum scoparium*  
Shrubs: *Leptomeria drupacea*, *Leucopogon ericoides*  
Herbs: *Caladenia fuscata*, *Chiloglottis* sp., *Diuris pardina*, *Drosera macrantha*, *Drosera peltata* subsp. *auriculata*, *Glossodia major*, *Poranthera microphylla*, *Pterostylis nutans*, *Ranunculus* sp., *Stackhousia monogyna*, *Xanthosia pilosa*  
Graminoids: *Gahnia grandis*, *Hypolaena fastigiata*, *Lepidosperma concavum*, *Lomandra longifolia*, *Schoenus apogon*, *Xanthorrhoea australis*  
Grasses: *Graminaea* sp.  
Ferns: *Pteridium esculentum*

### Site: 803 08 - Allocasuarina littoralis forest (NAL)

Grid Reference: 608570E, 5423680N  
Accuracy: GPS (within 10 metres)  
Recorder: Chris Obst  
Date of Survey: 3 Mar 2009  
Trees: *Allocasuarina littoralis*, *Eucalyptus ovata* var. *ovata*  
Tall Shrubs: *Leptospermum scoparium*  
Herbs: *Acianthus caudatus*, *Acianthus* sp., *Glossodia major*, *Senecio* sp.  
Graminoids: *Lepidosperma concavum*, *Lepidosperma longitudinale*, *Lomandra longifolia*  
Ferns: *Pteridium esculentum*  
Weeds: *Conium maculatum*, *Osteospermum fruticosum*, *Psoralea pinnata*

## Species list - Oceana Wetland (9)

### Status codes:

#### ORIGIN

i - introduced

d - declared weed WM Act

en - endemic to Tasmania

t - within Australia, occurs only in Tas.

#### NATIONAL SCHEDULE

EPBC Act 1999

CR - critically endangered

EN - endangered

VU - vulnerable

#### STATE SCHEDULE

TSP Act 1995

e - endangered

v - vulnerable

r - rare

### Sites:

901	09 - Melaleuca squarrosa scrub (SMR) - E607000, N5416600	25/09/2009	Chris	Obst
902	09 - Fresh water aquatic sedgeland and rushland (ASF) - E607000, N5416600	25/09/2009	Chris	Obst
903	09 - Eucalyptus sieberi forest and woodland not on granite (DSO) - E607000, N5416600	25/09/2009	Chris	Obst
904	09 - Eucalyptus amygdalina coastal forest and woodland (DAC) - E607000, N5416600	25/09/2009	Chris	Obst
905	09 - Fresh water aquatic herbland (AHF) - E607000, N5416600	25/09/2009	Chris	Obst
906	09 - Eucalyptus ovata forest and woodland (DOV) - E607000, N5416600	25/09/2009	Chris	Obst
907	09 - Regenerating cleared land (FRG) - E607000, N5416600	25/09/2009	Chris	Obst

Site	Name	Common name	Status
<b>DICOTYLEDONAE</b>			
<b>APIACEAE</b>			
905	<i>Centella cordifolia</i>	swampwort	
903 904	<i>Xanthosia pilosa</i>	woolly crossherb	
903	<i>Xanthosia tasmanica</i>	small crossherb	
<b>ASTERACEAE</b>			
903 907	<i>Asteraceae sp.</i>	native daisy	
906	<i>Coronidium scorpioides</i>	curling everlasting	
907	<i>Olearia lirata</i>	forest daisybush	
<b>CASUARINACEAE</b>			
901 903	<i>Allocasuarina littoralis</i>	black sheoak	
904 906			
907			
904 906	<i>Allocasuarina monilifera</i>	necklace sheoak	en
<b>DILLENIACEAE</b>			
903	<i>Hibbertia appressa</i>	southern guineaflower	
903 904	<i>Hibbertia riparia</i>	erect guineaflower	
<b>DROSERACEAE</b>			
901	<i>Drosera peltata subsp. auriculata</i>	tall sundew	
<b>EPACRIDACEAE</b>			
901 903	<i>Acrotriche serrulata</i>	ants delight	
904	<i>Astroloma humifusum</i>	native cranberry	
903 904	<i>Epacris impressa</i>	common heath	
904	<i>Leucopogon collinus</i>	white beardheath	
903 904	<i>Leucopogon ericoides</i>	pink beardheath	
903	<i>Monotoca elliptica</i>	tree broomheath	
903	<i>Monotoca scoparia</i>	prickly broomheath	
903 904	<i>Styphelia adscendens</i>	golden heath	
<b>FABACEAE</b>			
901 903	<i>Aotus ericoides</i>	golden pea	
904 906			
907			
903 904	<i>Bossiaea cinerea</i>	showy bossia	
907			
903	<i>Bossiaea prostrata</i>	creeping bossia	
903	<i>Daviesia ulicifolia</i>	spiky bitterpea	
901 904	<i>Dillwynia glaberrima</i>	smooth parrotpea	
906			

904	<i>Phyllota diffusa</i>	heath bushpea	en
	<b>GOODENIACEAE</b>		
903	<i>Goodenia lanata</i>	trailing native-primrose	
	<b>HALORAGACEAE</b>		
903 904	<i>Gonocarpus tetragynus</i>	common raspwort	
903	<i>Gonocarpus teucrioides</i>	forest raspwort	
	<b>LAURACEAE</b>		
902 906	<i>Cassytha glabella</i>	slender dodderlaurel	
	<b>MENYANTHACEAE</b>		
902 905	<i>Villarsia exaltata</i>	erect marshflower	r
902	<i>Villarsia reniformis</i>	running marshflower	
	<b>MIMOSACEAE</b>		
907	<i>Acacia dealbata</i> subsp. <i>dealbata</i>	silver wattle	
904 906	<i>Acacia genistifolia</i>	spreading wattle	
907			
901 903	<i>Acacia melanoxylon</i>	blackwood	
903 904	<i>Acacia suaveolens</i>	sweet wattle	
903 904	<i>Acacia terminalis</i>	sunshine wattle	
907			
901 903	<i>Acacia verticillata</i>	prickly mimosa	
	<b>MYRTACEAE</b>		
903 904	<i>Eucalyptus amygdalina</i>	black peppermint	en
901 902	<i>Eucalyptus ovata</i> var. <i>ovata</i>	black gum	
903 906			
907			
903	<i>Eucalyptus sieberi</i>	ironbark	
901 903	<i>Leptospermum scoparium</i>	common tea-tree	
904 906			
907			
901 902	<i>Melaleuca squarrosa</i>	scented paperbark	
906 907			
	<b>OXALIDACEAE</b>		
903	<i>Oxalis perennans</i>	grassland woodsorrel	
	<b>POLYGALACEAE</b>		
903	<i>Comesperma volubile</i>	blue lovecreeper	
	<b>PROTEACEAE</b>		
901 904	<i>Banksia marginata</i>	silver banksia	
906 907			
	<b>RHAMNACEAE</b>		
903	<i>Pomaderris elliptica</i>	yellow dogwood	
	<b>RUTACEAE</b>		
904	<i>Correa reflexa</i>	correa	
	<b>SANTALACEAE</b>		
903	<i>Exocarpos cupressiformis</i>	common native-cherry	
904	<i>Leptomeria drupacea</i>	erect currantbush	
	<b>VIOLACEAE</b>		
903	<i>Viola hederacea</i>	ivyleaf violet	

## MONOCOTYLEDONAE

### CYPERACEAE

901	<i>Gahnia grandis</i>	cutting grass
903 904 906	<i>Gahnia radula</i>	thatch sawsedge
903 904 907	<i>Lepidosperma concavum</i>	sand sword-sedge
901 902 905 906	<i>Lepidosperma longitudinale</i>	spreading sword-sedge

### IRIDACEAE

904	<i>Patersonia fragilis</i>	short purpleflag
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### JUNCACEAE

901	<i>Juncus pallidus</i>	pale rush
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### JUNCAGINACEAE

902 905	<i>Triglochin procerum</i>	greater water-ribbons
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### LILIACEAE

903	<i>Dianella revoluta</i>	spreading flaxlily
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### ORCHIDACEAE

903	<i>Acianthus pusillus</i>	small mosquito-orchid
904	<i>Caladenia fuscata</i>	dusky fingers
904	<i>Caladenia</i> sp.	spider-orchid
903 907	<i>Chiloglottis</i> sp.	bird orchid
903	<i>Diuris pardina</i>	leopard orchid
904 907	<i>Glossodia major</i>	waxlip orchid
903	<i>Pterostylis</i> sp.	greenhood

### POACEAE

903	<i>Ehrharta stipoides</i>	weeping grass
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### RESTIONACEAE

901 904 906	<i>Apodasmia brownii</i>	coarse twinerush
901	<i>Eurychorda complanata</i>	flat cordrush
903 904 906 907	<i>Hypolaena fastigiata</i>	tassel roperush

### XANTHORRHOEACEAE

901 903 904 906	<i>Lomandra longifolia</i>	sagg
903 904 906	<i>Xanthorrhoea australis</i>	southern grasstree

## PTERIDOPHYTA

### DENNSTAEDTIACEAE

901 903 904 906	<i>Pteridium esculentum</i>	bracken
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### GLEICHENIACEAE

901	<i>Gleichenia dicarpa</i>	pouched coralfern
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### SELAGINELLACEAE

907	<i>Selaginella uliginosa</i>	swamp spikemoss
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## Site Report - Oceana Wetland (9)

### Site: 901 09 - Melaleuca squarrosa scrub (SMR)

Grid Reference: 607000E, 5416600N  
Accuracy: GPS (within 10 metres)  
Recorder: Chris Obst  
Date of Survey: 25 Sep 2009

Trees: *Acacia melanoxylon*, *Allocasuarina littoralis*, *Eucalyptus ovata* var. *ovata*  
Tall Shrubs: *Acacia verticillata*, *Banksia marginata*, *Leptospermum scoparium*, *Melaleuca squarrosa*  
Shrubs: *Dillwynia glaberrima*  
Low Shrubs: *Acrotriche serrulata*, *Aotus ericoides*  
Herbs: *Drosera peltata* subsp. *auriculata*  
Graminoids: *Apodasmia brownii*, *Eurychorda complanata*, *Gahnia grandis*, *Juncus pallidus*, *Lepidosperma longitudinale*, *Lomandra longifolia*  
Ferns: *Gleichenia dicarpa*, *Pteridium esculentum*

### Site: 902 09 - Fresh water aquatic sedgeland and rushland (ASF)

Grid Reference: 607000E, 5416600N  
Accuracy: GPS (within 10 metres)  
Recorder: Chris Obst  
Date of Survey: 25 Sep 2009

Trees: *Eucalyptus ovata* var. *ovata*  
Tall Shrubs: *Melaleuca squarrosa*  
Herbs: *Villarsia exaltata*, *Villarsia reniformis*  
Graminoids: *Lepidosperma longitudinale*, *Triglochin procerum*  
Climbers: *Cassytha glabella*

### Site: 903 09 - Eucalyptus sieberi forest and woodland not on granite (DSO)

Grid Reference: 607000E, 5416600N  
Accuracy: GPS (within 10 metres)  
Recorder: Chris Obst  
Date of Survey: 25 Sep 2009

Trees: *Acacia melanoxylon*, *Allocasuarina littoralis*, *Eucalyptus amygdalina*, *Eucalyptus ovata* var. *ovata*, *Eucalyptus sieberi*  
Tall Shrubs: *Acacia verticillata*, *Exocarpos cupressiformis*, *Leptospermum scoparium*  
Shrubs: *Acacia suaveolens*, *Acacia terminalis*, *Bossiaea cinerea*, *Bossiaea prostrata*, *Daviesia ulicifolia*, *Epacris impressa*, *Leucopogon ericoides*, *Monotoca elliptica*, *Monotoca scoparia*, *Pomaderris elliptica*  
Low Shrubs: *Acrotriche serrulata*, *Aotus ericoides*, *Hibbertia appressa*, *Hibbertia riparia*, *Styphelia adscendens*  
Herbs: *Acianthus pusillus*, *Asteraceae* sp., *Chiloglottis* sp., *Dianella revoluta*, *Diuris pardina*, *Gonocarpus tetragynus*, *Gonocarpus teucroides*, *Goodenia lanata*, *Oxalis perennans*, *Pterostylis* sp., *Viola hederacea*, *Xanthosia pilosa*, *Xanthosia tasmanica*  
Graminoids: *Gahnia radula*, *Hypolaena fastigiata*, *Lepidosperma concavum*, *Lomandra longifolia*, *Xanthorrhoea australis*  
Grasses: *Ehrharta stipoides*  
Ferns: *Pteridium esculentum*  
Climbers: *Comesperma volubile*

**Site: 904 09 - Eucalyptus amygdalina coastal forest and woodland (DAC)**

Grid Reference: 607000E, 5416600N  
Accuracy: GPS (within 10 metres)  
Recorder: Chris Obst  
Date of Survey: 25 Sep 2009

Trees: *Allocasuarina littoralis*, *Allocasuarina monilifera*, *Eucalyptus amygdalina*  
Tall Shrubs: *Banksia marginata*, *Leptospermum scoparium*  
Shrubs: *Acacia genistifolia*, *Acacia suaveolens*, *Acacia terminalis*, *Bossiaea cinerea*, *Dillwynia glaberrima*, *Epacris impressa*, *Leptomeria drupacea*, *Leucopogon collinus*, *Leucopogon ericoides*, *Phyllota diffusa*  
Low Shrubs: *Aotus ericoides*, *Astroloma humifusum*, *Hibbertia riparia*, *Styphelia adscendens*  
Herbs: *Caladenia fuscata*, *Caladenia* sp., *Correa reflexa*, *Glossodia major*, *Gonocarpus tetragynus*, *Xanthosia pilosa*  
Graminoids: *Apodasmia brownii*, *Gahnia radula*, *Hypolaena fastigiata*, *Lepidosperma concavum*, *Lomandra longifolia*, *Patersonia fragilis*, *Xanthorrhoea australis*  
Ferns: *Pteridium esculentum*

**Site: 905 09 - Fresh water aquatic herbland (AHF)**

Grid Reference: 607000E, 5416600N  
Accuracy: GPS (within 10 metres)  
Recorder: Chris Obst  
Date of Survey: 25 Sep 2009

Herbs: *Centella cordifolia*, *Villarsia exaltata*  
Graminoids: *Lepidosperma longitudinale*, *Triglochin procerum*

**Site: 906 09 - Eucalyptus ovata forest and woodland (DOV)**

Grid Reference: 607000E, 5416600N  
Accuracy: GPS (within 10 metres)  
Recorder: Chris Obst  
Date of Survey: 25 Sep 2009

Trees: *Allocasuarina littoralis*, *Allocasuarina monilifera*, *Eucalyptus ovata* var. *ovata*  
Tall Shrubs: *Banksia marginata*, *Leptospermum scoparium*, *Melaleuca squarrosa*  
Shrubs: *Acacia genistifolia*, *Dillwynia glaberrima*  
Low Shrubs: *Aotus ericoides*  
Herbs: *Coronidium scorpioides*  
Graminoids: *Apodasmia brownii*, *Gahnia radula*, *Hypolaena fastigiata*, *Lepidosperma longitudinale*, *Lomandra longifolia*, *Xanthorrhoea australis*  
Ferns: *Pteridium esculentum*  
Climbers: *Cassytha glabella*

**Site: 907 09 - Regenerating cleared land (FRG)**

Grid Reference: 607000E, 5416600N  
Accuracy: GPS (within 10 metres)  
Recorder: Chris Obst  
Date of Survey: 25 Sep 2009

Trees: *Allocasuarina littoralis*, *Eucalyptus ovata* var. *ovata*  
Tall Shrubs: *Acacia dealbata* subsp. *dealbata*, *Banksia marginata*, *Leptospermum scoparium*, *Melaleuca squarrosa*  
Shrubs: *Acacia genistifolia*, *Acacia terminalis*, *Bossiaea cinerea*, *Olearia lirata*  
Low Shrubs: *Aotus ericoides*  
Herbs: *Asteraceae* sp., *Chiloglottis* sp., *Glossodia major*  
Graminoids: *Hypolaena fastigiata*, *Lepidosperma concavum*  
Ferns: *Selaginella uliginosa*

## Species list - Wrinklers Lagoon (10)

### Status codes:

#### ORIGIN

i - introduced  
d - declared weed WM Act  
en - endemic to Tasmania  
t - within Australia, occurs only in Tas.

#### NATIONAL SCHEDULE

EPBC Act 1999  
CR - critically endangered  
EN - endangered  
VU - vulnerable

#### STATE SCHEDULE

TSP Act 1995  
e - endangered  
v - vulnerable  
r - rare

### Sites:

1001 10 - Eucalyptus sieberi forest and woodland not on granite (DSO) - E605850, N5412030	2/09/2009	Chris	Obst
1002 10 - Melaleuca squarrosa scrub (SMR) - E605931, N5411945	2/09/2009	Chris	Obst
1003 10 - Coastal heathland (SCH) - E606090, N5411830	3/09/2009	Chris	Obst
1004 10 - Saline sedgeland/rushland (ARS) - E605950, N5411090	3/09/2009	Chris	Obst
1005 10 - Acacia longifolia coastal scrub (SAC) - E606080, N5411240	3/09/2009	Chris	Obst

Site	Name	Common name	Status
<b>DICOTYLEDONAE</b>			
<b>AIZOACEAE</b>			
1005	<i>Carpobrotus edulis</i>	yellow pigface	i
1003	<i>Carpobrotus rossii</i>	native pigface	
1005			
<b>APIACEAE</b>			
1001	<i>Xanthosia pilosa</i>	woolly crossherb	
1003			
1001	<i>Xanthosia tasmanica</i>	small crossherb	
<b>ASTERACEAE</b>			
1005	<i>Asteraceae sp.</i>	native daisy	
1001	<i>Coronidium scorpioides</i>	curling everlasting	
1003			
1001	<i>Euchiton collinus</i>	common cottonleaf	
1005	<i>Gazania linearis</i>	tufted gazania	i
1001	<i>Hypochoeris radicata</i>	rough catsear	i
1005			
1003	<i>Olearia ramulosa</i>	twiggy daisybush	
1005	<i>Senecio sp.</i>	groundsel	
1005	<i>Sonchus oleraceus</i>	common sowthistle	i
<b>BORAGINACEAE</b>			
1005	<i>Cynoglossum australe</i>	coast houndstongue	r
<b>CAMPANULACEAE</b>			
1001	<i>Wahlenbergia sp.</i>	bluebell	
1005			
<b>CASUARINACEAE</b>			
1001	<i>Allocasuarina littoralis</i>	black sheoak	
1001	<i>Allocasuarina monilifera</i>	necklace sheoak	en
1003			
1005	<i>Allocasuarina verticillata</i>	drooping sheoak	
<b>CHENOPODIACEAE</b>			
1005	<i>Rhagodia candolleana subsp.</i>	coastal saltbush	
<b>DILLENIACEAE</b>			
1001	<i>Hibbertia acicularis</i>	prickly guineaflower	
1003			
1001	<i>Hibbertia empetrifolia subsp. empetrifolia</i>	scrambling guineaflower	
1001	<i>Hibbertia riparia</i>	erect guineaflower	
1003			
<b>DROSERACEAE</b>			
1001	<i>Drosera macrantha</i>	climbing sundew	

1001	<i>Drosera peltata</i>	pale sundew	
1003			
	<b>EPACRIDACEAE</b>		
1001	<i>Acrotriche serrulata</i>	ants delight	
1003			
1005	<i>Astroloma humifusum</i>	native cranberry	
1001	<i>Epacris impressa</i>	common heath	
1003			
1001	<i>Leucopogon collinus</i>	white beardheath	
1003			
1001	<i>Leucopogon ericoides</i>	pink beardheath	
1003			
1005	<i>Leucopogon parviflorus</i>	coast beardheath	
1001	<i>Monotoca elliptica</i>	tree broomheath	
1005			
1001	<i>Monotoca glauca</i>	goldey wood	
	<b>EUPHORBIACEAE</b>		
1001	<i>Amperea xiphioclada</i> var. <i>xiphioclada</i>	broom spurge	
1003			
	<b>FABACEAE</b>		
1001	<i>Aotus ericoides</i>	golden pea	
1003			
1001	<i>Bossiaea cinerea</i>	showy bossia	
1003			
1005			
1001	<i>Bossiaea prostrata</i>	creeping bossia	
1001	<i>Dillwynia cinerascens</i>	grey parrotpea	
1001	<i>Dillwynia glaberrima</i>	smooth parrotpea	
1003			
1001	<i>Dillwynia sericea</i>	showy parrotpea	
1003			
1001	<i>Gompholobium huegelii</i>	common wedgepea	
1003			
1001	<i>Phyllota diffusa</i>	heath bushpea	en
1003			
1001	<i>Platylobium triangulare</i>	arrow flatpea	
1005	<i>Psoralea pinnata</i>	blue butterflybush	i
1001	<i>Pultenaea daphnoides</i> var. <i>obcordata</i>	heartleaf bushpea	
1001	<i>Pultenaea stricta</i>	rigid bushpea	
	<b>GERANIACEAE</b>		
1005	<i>Geranium</i> sp.	native geranium	
	<b>GOODENIACEAE</b>		
1001	<i>Goodenia lanata</i>	trailing native-primrose	
1001	<i>Goodenia ovata</i>	hop native-primrose	
	<b>HALORAGACEAE</b>		
1001	<i>Gonocarpus tetragynus</i>	common raspwort	
	<b>LAURACEAE</b>		
1001	<i>Cassytha glabella</i>	slender dodderlaurel	
1003			
1001	<i>Cassytha pubescens</i>	downy dodderlaurel	
	<b>MIMOSACEAE</b>		
1001	<i>Acacia genistifolia</i>	spreading wattle	
1003			
1004			
1005			
1003	<i>Acacia longifolia</i>	coast wattle	
1005			
1001	<i>Acacia melanoxylon</i>	blackwood	
1003	<i>Acacia myrtifolia</i>	redstem wattle	
1001	<i>Acacia suaveolens</i>	sweet wattle	
1003			
1001	<i>Acacia terminalis</i>	sunshine wattle	

1003			
1002	<i>Acacia verticillata</i>	prickly mimosa	
	<b>MYRTACEAE</b>		
1001	<i>Calytrix tetragona</i>	common fringemyrtle	
1003			
1001	<i>Eucalyptus amygdalina</i>	black peppermint	en
1003			
1001	<i>Eucalyptus globulus subsp. globulus</i>	tasmanian blue gum	
1001	<i>Eucalyptus sieberi</i>	ironbark	
1003			
1001	<i>Eucalyptus viminalis subsp. viminalis</i>	white gum	
1005	<i>Leptospermum laevigatum</i>	coast teatree	
1001	<i>Leptospermum scoparium</i>	common tea-tree	
1003			
1001	<i>Melaleuca gibbosa</i>	slender honeymyrtle	
1004			
1001	<i>Melaleuca squarrosa</i>	scented paperbark	
1002			
	<b>OXALIDACEAE</b>		
1005	<i>Oxalis perennans</i>	grassland woodsorrel	
	<b>PITTOSPORACEAE</b>		
1005	<i>Bursaria spinosa subsp. spinosa</i>	prickly box	
1001	<i>Rhytidosporum procumbens</i>	starry appleberry	
1003			
	<b>PLANTAGINACEAE</b>		
1005	<i>Plantago coronopus</i>	buckshorn plantain	i
1004	<i>Plantago lanceolata</i>	ribwort plantain	i
1005			
1001	<i>Plantago sp.</i>	plantain	
	<b>POLYGALACEAE</b>		
1001	<i>Comesperma ericinum</i>	heath milkwort	
	<b>POLYGONACEAE</b>		
1005	<i>Acetosella vulgaris</i>	sheep sorrel	i
1004	<i>Muehlenbeckia australis</i>	climbing lignum	
1005			
	<b>PROTEACEAE</b>		
1001	<i>Banksia marginata</i>	silver banksia	
1003			
1005			
1001	<i>Lomatia tinctoria</i>	guitarplant	en
1001	<i>Persoonia juniperina</i>	prickly geebung	
	<b>RHAMNACEAE</b>		
1001	<i>Pomaderris apetala</i>	common dogwood	
1001	<i>Pomaderris elliptica</i>	yellow dogwood	
1001	<i>Pomaderris pilifera</i>	hairy dogwood	
1003			
	<b>ROSACEAE</b>		
1004	<i>Acaena sp.</i>	sheep's burr	
1005			
1004	<i>Cotoneaster sp.</i>	cotoneaster	i
1005	<i>Rosa rubiginosa</i>	sweet briar	i
1005	<i>Rubus fruticosus</i>	blackberry	d
	<b>RUTACEAE</b>		
1001	<i>Boronia pilosa</i>	hairy boronia	
1005	<i>Correa reflexa</i>	correa	
1001	<i>Correa reflexa var. nummulariifolia</i>	roundleaf correa	
1001	<i>Philotheca virgata</i>	twiggy waxflower	
1003			

1003	<i>Zieria veronicea</i> subsp. <i>veronicea</i>	pink zieria	e
<b>SANTALACEAE</b>			
1001 1005	<i>Exocarpos cupressiformis</i>	common native-cherry	
<b>STACKHOUSIACEAE</b>			
1003	<i>Stackhousia monogyna</i>	forest candles	
<b>THYMELAEACEAE</b>			
1005	<i>Pimelea glauca</i>	smooth riceflower	
1005	<i>Pimelea humilis</i>	dwarf riceflower	
1001	<i>Pimelea linifolia</i> subsp. <i>linifolia</i>	slender riceflower	
1003 1005			
<b>TREMANDRACEAE</b>			
1001	<i>Tetralochea labillardierei</i>	glandular pinkbells	
<b>VIOLACEAE</b>			
1001 1005	<i>Viola hederacea</i>	ivy-leaf violet	
<b>GYMNOSPERMAE</b>			
<b>PINACEAE</b>			
1001	<i>Pinus radiata</i>	radiata pine	i
<b>MONOCOTYLEDONAE</b>			
<b>CYPERACEAE</b>			
1004 1005	<i>Baumea juncea</i>	bare twigsedge	
1005	<i>Ficinia nodosa</i>	knobby clubsedge	
1002	<i>Gahnia grandis</i>	cutting grass	
1001	<i>Gahnia radula</i>	thatch sawsedge	
1001	<i>Lepidosperma concavum</i>	sand sword-sedge	
1003 1005			
1005	<i>Lepidosperma gladiatum</i>	coast sword-sedge	
1004	<i>Lepidosperma longitudinale</i>	spreading sword-sedge	
1001	<i>Schoenus lepidosperma</i> subsp. <i>lepidosperma</i>	slender bogsedge	
<b>IRIDACEAE</b>			
1005	<i>Freesia hybrid</i>	freesia	i
1001	<i>Patersonia fragilis</i>	short purpleflag	
1005	<i>Romulea rosea</i> var. <i>australis</i>	lilac oniongrass	i
<b>JUNCACEAE</b>			
1004	<i>Juncus kraussii</i> subsp. <i>australiensis</i>	sea rush	
<b>LILIACEAE</b>			
1001	<i>Burchardia umbellata</i>	milkmaids	
1005	<i>Dianella revoluta</i>	spreading flaxlily	
<b>ORCHIDACEAE</b>			
1001	<i>Acianthus pusillus</i>	small mosquito-orchid	
1001	<i>Chiloglottis</i> sp.	bird orchid	
1001	<i>Pterostylis</i> sp.	greenhood	
<b>POACEAE</b>			
1005	<i>Ammophila arenaria</i>	marram grass	i
1005	<i>Austrodanthonia setacea</i>	bristly wallabygrass	
1005	<i>Austrostipa blackii</i>	crested speargrass	r
1005	<i>Austrostipa</i> sp.	speargrass	
1004	<i>Dactylis glomerata</i>	cocksfoot	i
1005			
1004	<i>Distichlis distichophylla</i>	australian saltgrass	



1005			
1001	<i>Ehrharta stipoides</i>	weeping grass	
1005	<i>Lagurus ovatus</i>	haretail grass	i
1005	<i>Poa labillardierei</i>	silver tussockgrass	
1004	<i>Poa poiformis</i>	coastal tussockgrass	
1005			
1005	<i>Sporobolus africanus</i>	ratstail grass	i
1004	<i>Stenotaphrum secundatum</i>	buffalo grass	i
1005			
	<b>RESTIONACEAE</b>		
1001	<i>Apodasmia brownii</i>	coarse twinerush	
1004			
1005			
1001	<i>Eurychorda complanata</i>	flat cordrush	
1001	<i>Hypolaena fastigiata</i>	tassel roperush	
1003			
	<b>XANTHORRHOEACEAE</b>		
1001	<i>Lomandra longifolia</i>	sagg	
1003			
1004			
1005			
1001	<i>Xanthorrhoea australis</i>	southern grasstree	
1003			
	<b>PTERIDOPHYTA</b>		
	<b>DENNSTAEDTIACEAE</b>		
1001	<i>Pteridium esculentum</i>	bracken	
1002			
1003			
	<b>GLEICHENIACEAE</b>		
1002	<i>Gleichenia dicarpa</i>	pouched coralfern	

## Site Report - Wrinklers Lagoon (10)

### Site: 1001 10 - Eucalyptus sieberi forest and woodland not on granite (DSO)

Grid Reference: 605850E, 5412030N  
Accuracy: GPS (within 10 metres)  
Recorder: Chris Obst  
Date of Survey: 2 Sep 2009

Trees: *Acacia melanoxylon*, *Allocasuarina littoralis*, *Allocasuarina monilifera*, *Eucalyptus amygdalina*, *Eucalyptus globulus* subsp. *globulus*, *Eucalyptus sieberi*, *Eucalyptus viminalis* subsp. *viminalis*

Tall Shrubs: *Banksia marginata*, *Exocarpos cupressiformis*, *Leptospermum scoparium*, *Melaleuca squarrosa*, *Monotoca glauca*, *Pomaderris apetala*, *Pultenaea daphnoides* var. *obcordata*

Shrubs: *Acacia genistifolia*, *Acacia suaveolens*, *Acacia terminalis*, *Amperea xiphoclada* var. *xiphoclada*, *Boronia pilosa*, *Bossiaea cinerea*, *Bossiaea prostrata*, *Calytrix tetragona*, *Dillwynia cinerascens*, *Dillwynia glaberrima*, *Dillwynia sericea*, *Epacris impressa*, *Goodenia ovata*, *Leucopogon collinus*, *Leucopogon ericoides*, *Lomatia tinctoria*, *Melaleuca gibbosa*, *Monotoca elliptica*, *Persoonia juniperina*, *Philothea virgata*, *Phyllota diffusa*, *Pimelea linifolia* subsp. *linifolia*, *Pomaderris elliptica*, *Pomaderris pilifera*, *Pultenaea stricta*

Low Shrubs: *Acrotriche serrulata*, *Aotus ericoides*, *Hibbertia acicularis*, *Hibbertia empetrifolia* subsp. *empetrifolia*, *Hibbertia riparia*, *Platylobium triangulare*, *Tetradlea*

Herbs: *Acianthus pusillus*, *Burchardia umbellata*, *Chiloglottis* sp., *Comesperma ericinum*, *Coronidium scorpioides*, *Correa reflexa* var. *nummulariifolia*, *Drosera macrantha*, *Drosera peltata*, *Euchiton collinus*, *Gompholobium huegelii*, *Gonocarpus tetragynus*, *Goodenia lanata*, *Plantago* sp., *Pterostylis* sp., *Rhytidisporum procumbens*, *Viola hederacea*, *Wahlenbergia* sp., *Xanthosia pilosa*, *Xanthosia tasmanica*

Graminoids: *Apodasmia brownii*, *Eurychorda complanata*, *Gahnia radula*, *Hypolaena fastigiata*, *Lepidosperma concavum*, *Lomandra longifolia*, *Patersonia fragilis*, *Schoenus lepidosperma* subsp. *lepidosperma*, *Xanthorrhoea australis*

Grasses: *Ehrharta stipoides*

Ferns: *Pteridium esculentum*

Climbers: *Cassytha glabella*, *Cassytha pubescens*

Weeds: *Hypochoeris radicata*, *Pinus radiata*

### Site: 1002 10 - Melaleuca squarrosa scrub (SMR)

Grid Reference: 605931E, 5411945N  
Accuracy: GPS (within 10 metres)  
Recorder: Chris Obst  
Date of Survey: 2 Sep 2009

Tall Shrubs: *Acacia verticillata*, *Melaleuca squarrosa*

Graminoids: *Gahnia grandis*

Ferns: *Gleichenia dicarpa*, *Pteridium esculentum*

### Site: 1003 10 - Coastal heathland (SCH)

Grid Reference: 606090E, 5411830N  
Accuracy: GPS (within 10 metres)  
Recorder: Chris Obst  
Date of Survey: 3 Sep 2009

Trees: *Allocasuarina monilifera*, *Eucalyptus amygdalina*, *Eucalyptus sieberi*

Tall Shrubs: *Banksia marginata*, *Leptospermum scoparium*

Shrubs: *Acacia genistifolia*, *Acacia longifolia*, *Acacia suaveolens*, *Acacia terminalis*, *Amperea xiphoclada* var. *xiphoclada*, *Bossiaea cinerea*, *Calytrix tetragona*, *Dillwynia glaberrima*, *Dillwynia sericea*, *Epacris impressa*, *Leucopogon collinus*, *Leucopogon ericoides*, *Olearia ramulosa*, *Philothea virgata*, *Phyllota diffusa*, *Pimelea linifolia* subsp. *linifolia*, *Pomaderris pilifera*

Low Shrubs: *Acacia myrtifolia*, *Acrotriche serrulata*, *Aotus ericoides*, *Hibbertia acicularis*, *Hibbertia riparia*

Herbs: *Carpobrotus rossii*, *Coronidium scorpioides*, *Drosera peltata*, *Gompholobium huegelii*, *Rhytidisporum procumbens*, *Stackhousia monogyna*, *Xanthosia pilosa*, *Zieria veronicea* subsp. *veronicea*

Graminoids: *Hypolaena fastigiata*, *Lepidosperma concavum*, *Lomandra longifolia*, *Xanthorrhoea australis*

Ferns: *Pteridium esculentum*  
Climbers: *Cassytha glabella*

### Site: 1004 10 - Saline sedgeland/rushland (ARS)

Grid Reference: 605950E, 5411090N  
Accuracy: GPS (within 10 metres)  
Recorder: Chris Obst  
Date of Survey: 3 Sep 2009

Shrubs: *Acacia genistifolia*, *Melaleuca gibbosa*  
Herbs: *Acaena* sp.  
Graminoids: *Apodasmia brownii*, *Baumea juncea*, *Juncus kraussii* subsp. *australiensis*,  
*Lepidosperma longitudinale*, *Lomandra longifolia*  
Grasses: *Distichlis distichophylla*, *Poa poiformis*  
Climbers: *Muehlenbeckia australis*  
Weeds: *Cotoneaster* sp., *Dactylis glomerata*, *Plantago lanceolata*, *Stenotaphrum*

### Site: 1005 10 - Acacia longifolia coastal scrub (SAC)

Grid Reference: 606080E, 5411240N  
Accuracy: GPS (within 10 metres)  
Recorder: Chris Obst  
Date of Survey: 3 Sep 2009

Trees: *Allocasuarina verticillata*, *Bursaria spinosa* subsp. *spinosa*  
Tall Shrubs: *Banksia marginata*, *Exocarpos cupressiformis*, *Leptospermum laevigatum*  
Shrubs: *Acacia genistifolia*, *Acacia longifolia*, *Bossiaea cinerea*, *Leucopogon parviflorus*,  
*Monotoca elliptica*, *Pimelea linifolia* subsp. *linifolia*, *Rhagodia candolleana* subsp.  
*candolleana*  
Low Shrubs: *Astroloma humifusum*, *Pimelea glauca*, *Pimelea humilis*  
Herbs: *Acaena* sp., *Asteraceae* sp., *Carpobrotus rossii*, *Correa reflexa*, *Cynoglossum*  
*australe*, *Dianella revoluta*, *Geranium* sp., *Oxalis perennans*, *Plantago coronopus*,  
*Senecio* sp., *Viola hederacea*, *Wahlenbergia* sp.  
Graminoids: *Apodasmia brownii*, *Baumea juncea*, *Ficinia nodosa*, *Lepidosperma concavum*,  
*Lepidosperma gladiatum*, *Lomandra longifolia*  
Grasses: *Austrodanthonia setacea*, *Austrostipa blackii*, *Austrostipa* sp., *Distichlis*  
*distichophylla*, *Poa labillardierei*, *Poa poiformis*  
Climbers: *Muehlenbeckia australis*  
Weeds: *Acetosella vulgaris*, *Ammophila arenaria*, *Carpobrotus edulis*, *Dactylis glomerata*,  
*Freesia hybrid*, *Gazania linearis*, *Hypochoeris radicata*, *Lagurus ovatus*, *Plantago*  
*lanceolata*, *Psoralea pinnata*, *Romulea rosea* var. *australis*, *Rosa rubiginosa*, *Rubus*  
*fruticosus*, *Sonchus oleraceus*, *Sporobolus africanus*, *Stenotaphrum secundatum*

## Species list - Scamander River Mouth Backwater (11)

### Status codes:

#### ORIGIN

i - introduced  
d - declared weed WM Act  
en - endemic to Tasmania  
t - within Australia, occurs only in Tas.

#### NATIONAL SCHEDULE

EPBC Act 1999  
CR - critically endangered  
EN - endangered  
VU - vulnerable

#### STATE SCHEDULE

TSP Act 1995  
e - endangered  
v - vulnerable  
r - rare

### Sites:

1101 11 - Succulent saline herbland (ASS) - E605600, N5409670	18/08/2009	Chris	Obst
1102 11 - Saline sedgeland/rushland (ARS) - E605730, N5409780	18/08/2009	Chris	Obst
1103 11 - Acacia longifolia coastal scrub (SAC) - E605860, N5410140	18/08/2009	Chris	Obst
1104 11 - Coastal scrub (SSC) - E605700, N5410200	18/08/2009	Chris	Obst
1105 11 - Euc viminalis - Euc globulus coastal forest and woodland (DVC) - E605610, N5409940	18/08/2009	Chris	Obst

Site	Name	Common name	Status
<b>DICOTYLEDONAE</b>			
<b>AIZOACEAE</b>			
1103	<i>Carpobrotus edulis</i>	yellow pigface	i
1102	<i>Disphyma crassifolium</i> subsp. <i>clavellatum</i>	roundleaf pigface	
<b>APIACEAE</b>			
1102	<i>Apium prostratum</i>	sea celery	
<b>ASTERACEAE</b>			
1105	<i>Coronidium scorpioides</i>	curling everlasting	
1105	<i>Lagenophora stipitata</i>	blue bottledaisy	
1105	<i>Olearia ramulosa</i>	twiggy daisybush	
1104	<i>Osteospermum fruticosum</i>	trailing daisy	i
1103	<i>Sonchus</i> sp.	sowthistle	i
<b>CASUARINACEAE</b>			
1105	<i>Allocasuarina monilifera</i>	necklace sheoak	en
1104	<i>Allocasuarina verticillata</i>	drooping sheoak	
<b>CHENOPODIACEAE</b>			
1103	<i>Rhagodia candolleana</i> subsp.	coastal saltbush	
1104			
1101	<i>Sarcocornia quinqueflora</i>	beaded glasswort	
1101	<i>Suaeda australis</i>	southern seablite	
1102			
<b>CONVOLVULACEAE</b>			
1102	<i>Dichondra repens</i>	kidneyweed	
<b>CRASSULACEAE</b>			
1103	<i>Crassula sieberiana</i>	stone-crop	
<b>EPACRIDACEAE</b>			
1105	<i>Epacris impressa</i>	common heath	
1105	<i>Leucopogon ericoides</i>	pink beardheath	
1103	<i>Leucopogon parviflorus</i>	coast beardheath	
1104			
1105			
<b>EUPHORBIACEAE</b>			
1105	<i>Amperea xiphoclada</i> var. <i>xiphoclada</i>	broom spurge	
<b>FABACEAE</b>			
1104	<i>Bossiaea cinerea</i>	showy bossia	
1105			
1105	<i>Dillwynia sericea</i>	showy parrotpea	
1104	<i>Dipogon lignosus</i>	dolichos pea	i
<b>LAURACEAE</b>			

1104	<i>Cassytha glabella</i>	slender dodderlaurel	
1104	<i>Cassytha pubescens</i>	downy dodderlaurel	
	<b>MIMOSACEAE</b>		
1103	<i>Acacia longifolia</i>	coast wattle	
1105	<i>Acacia suaveolens</i>	sweet wattle	
1105	<i>Acacia terminalis</i>	sunshine wattle	
	<b>MYOPORACEAE</b>		
1104	<i>Myoporum insulare</i>	common boobialla	
	<b>MYRTACEAE</b>		
1105	<i>Eucalyptus amygdalina</i>	black peppermint	en
1105	<i>Eucalyptus viminalis</i> subsp. <i>viminalis</i>	white gum	
1104	<i>Leptospermum scoparium</i>	common tea-tree	
	<b>OXALIDACEAE</b>		
1103	<i>Oxalis perennans</i>	grassland woodsorrel	
	<b>PITTOSPORACEAE</b>		
1104	<i>Pittosporum undulatum</i>	sweet pittosporum	i
	<b>PLANTAGINACEAE</b>		
1102	<i>Plantago coronopus</i>	buckshorn plantain	i
	<b>POLYGALACEAE</b>		
1104	<i>Polygala myrtifolia</i>	myrtleleaf milkwort	i
	<b>POLYGONACEAE</b>		
1104	<i>Muehlenbeckia australis</i>	climbing lignum	
	<b>PRIMULACEAE</b>		
1101	<i>Samolus repens</i>	creeping brookweed	
1102			
	<b>PROTEACEAE</b>		
1104	<i>Banksia marginata</i>	silver banksia	
	<b>RANUNCULACEAE</b>		
1102	<i>Ranunculus</i> sp.	buttercup	
	<b>RHAMNACEAE</b>		
1104	<i>Pomaderris apetala</i>	common dogwood	
	<b>ROSACEAE</b>		
1104	<i>Acaena</i> sp.	sheep's burr	
1104	<i>Rubus fruticosus</i>	blackberry	d
	<b>RUBIACEAE</b>		
1103	<i>Asperula subsimplex</i>	water woodruff	r
1102	<i>Coprosma repens</i>	mirrorbush	i
1104			
	<b>RUTACEAE</b>		
1104	<i>Correa alba</i> var. <i>alba</i>	white correa	
1105	<i>Correa reflexa</i>	correa	
	<b>SANTALACEAE</b>		
1103	<i>Exocarpos cupressiformis</i>	common native-cherry	
1105			
	<b>THYMELAEACEAE</b>		
1103	<i>Pimelea humilis</i>	dwarf riceflower	
1105	<i>Pimelea linifolia</i> subsp. <i>linifolia</i>	slender riceflower	
	<b>TREMANDRACEAE</b>		
1105	<i>Tetradlea labillardierei</i>	glandular pinkbells	
	<b>MONOCOTYLEDONAE</b>		

<b>CYPERACEAE</b>			
1102	<i>Cyperus sp.</i>	umbrella sedge	
1102	<i>Ficinia nodosa</i>	knobby clubsedge	
1103			
1105	<i>Lepidosperma concavum</i>	sand sword sedge	
1102	<i>Schoenus lepidosperma subsp. lepidosperma</i>	slender bogsedge	
<b>JUNCACEAE</b>			
1101	<i>Juncus kraussii subsp. australiensis</i>	sea rush	
1102			
1103			
<b>LILIACEAE</b>			
1103	<i>Dianella revoluta</i>	spreading flaxlily	
<b>POACEAE</b>			
1103	<i>Ammophila arenaria</i>	marram grass	i
1103	<i>Austrostipa flavescens</i>	yellow speargrass	
1105			
1104	<i>Cortaderia selloana</i>	silver pampasgrass	d
1102	<i>Distichlis distichophylla</i>	australian saltgrass	
1103			
1105	<i>Hierochloe rariflora</i>	cane holygrass	r
1102	<i>Phragmites australis</i>	southern reed	
1104	<i>Poa labillardierei</i>	silver tussockgrass	
1102	<i>Poa poiiformis</i>	coastal tussockgrass	
1104	<i>Poaceae sp.</i>	grass	
<b>RESTIONACEAE</b>			
1105	<i>Hypolaena fastigiata</i>	tassel roperush	
<b>XANTHORRHOEACEAE</b>			
1104	<i>Lomandra longifolia</i>	sagg	
1105			
<b>PTERIDOPHYTA</b>			
<b>GLEICHENIACEAE</b>			
1104	<i>Gleichenia microphylla</i>	scrambling coralfern	



## Site Report - Scamander River Mouth Backwater (11)

### Site: 1101 11 - Succulent saline herbland (ASS)

Grid Reference: 605600E, 5409670N  
Accuracy: GPS (within 10 metres)  
Recorder: Chris Obst  
Date of Survey: 18 Aug 2009

Shrubs: *Sarcocornia quinqueflora*  
Low Shrubs: *Sarcocornia quinqueflora*  
Herbs: *Samolus repens*, *Suaeda australis*  
Graminoids: *Juncus kraussii* subsp. *australiensis*

### Site: 1102 11 - Saline sedgeland/rushland (ARS)

Grid Reference: 605730E, 5409780N  
Accuracy: GPS (within 10 metres)  
Recorder: Chris Obst  
Date of Survey: 18 Aug 2009

Herbs: *Apium prostratum*, *Dichondra repens*, *Disphyma crassifolium* subsp. *clavellatum*, *Plantago coronopus*, *Ranunculus* sp., *Samolus repens*, *Suaeda australis*  
Graminoids: *Cyperus* sp., *Ficinia nodosa*, *Juncus kraussii* subsp. *australiensis*, *Schoenus lepidosperma* subsp. *lepidosperma*  
Grasses: *Distichlis distichophylla*, *Phragmites australis*, *Poa poiformis*  
Weeds: *Coprosma repens*

### Site: 1103 11 - Acacia longifolia coastal scrub (SAC)

Grid Reference: 605860E, 5410140N  
Accuracy: GPS (within 10 metres)  
Recorder: Chris Obst  
Date of Survey: 18 Aug 2009

Tall Shrubs: *Exocarpos cupressiformis*  
Shrubs: *Acacia longifolia*, *Leucopogon parviflorus*, *Rhagodia candolleana* subsp.  
Low Shrubs: *Pimelea humilis*  
Herbs: *Asperula subsimplex*, *Crassula sieberiana*, *Dianella revoluta*, *Oxalis perennans*  
Graminoids: *Ficinia nodosa*, *Juncus kraussii* subsp. *australiensis*  
Grasses: *Austrostipa flavescens*, *Distichlis distichophylla*  
Weeds: *Ammophila arenaria*, *Carpobrotus edulis*, *Sonchus* sp.

### Site: 1104 11 - Coastal scrub (SSC)

Grid Reference: 605700E, 5410200N  
Accuracy: GPS (within 10 metres)  
Recorder: Chris Obst  
Date of Survey: 18 Aug 2009

Trees: *Allocasuarina verticillata*  
Tall Shrubs: *Banksia marginata*, *Leptospermum scoparium*, *Pomaderris apetala*  
Shrubs: *Bossiaea cinerea*, *Correa alba* var. *alba*, *Leucopogon parviflorus*, *Myoporum insulare*, *Rhagodia candolleana* subsp. *candolleana*  
Herbs: *Acaena* sp.  
Graminoids: *Lomandra longifolia*  
Grasses: *Poa labillardierei*, *Poaceae* sp.  
Ferns: *Gleichenia microphylla*  
Climbers: *Cassytha glabella*, *Cassytha pubescens*, *Muehlenbeckia australis*  
Weeds: *Coprosma repens*, *Cortaderia selloana*, *Dipogon lignosus*, *Osteospermum fruticosum*, *Pittosporum undulatum*, *Polygala myrtifolia*, *Rubus fruticosus*

### Site: 1105 11 - Euc viminalis - Euc globulus coastal forest and woodland (DVC)

Grid Reference: 605610E, 5409940N  
Accuracy: GPS (within 10 metres)  
Recorder: Chris Obst  
Date of Survey: 18 Aug 2009

Trees: *Allocasuarina monilifera*, *Eucalyptus amygdalina*, *Eucalyptus viminalis* subsp.

	<i>viminalis</i>
Tall Shrubs:	<i>Exocarpos cupressiformis</i>
Shrubs:	<i>Acacia suaveolens</i> , <i>Acacia terminalis</i> , <i>Amperea xiphoclada</i> var. <i>xiphoclada</i> , <i>Bossiaea cinerea</i> , <i>Dillwynia sericea</i> , <i>Epacris impressa</i> , <i>Leucopogon ericoides</i> , <i>Leucopogon parviflorus</i> , <i>Olearia ramulosa</i> , <i>Pimelea linifolia</i> subsp. <i>linifolia</i>
Low Shrubs:	<i>Tetratheca labillardierei</i>
Herbs:	<i>Coronidium scorpioides</i> , <i>Correa reflexa</i> , <i>Lagenophora stipitata</i>
Graminoids:	<i>Hypolaena fastigiata</i> , <i>Lepidosperma concavum</i> , <i>Lomandra longifolia</i>
Grasses:	<i>Austrostipa flavescens</i> , <i>Hierochloe rariflora</i>

## Species list - Templestowe Lagoon (12)

### Status codes:

#### ORIGIN

i - introduced  
d - declared weed WM Act  
en - endemic to Tasmania  
t - within Australia, occurs only in Tas.

#### NATIONAL SCHEDULE

EPBC Act 1999  
CR - critically endangered  
EN - endangered  
VU - vulnerable

#### STATE SCHEDULE

TSP Act 1995  
e - endangered  
v - vulnerable  
r - rare

### Sites:

1201 12 - Saline sedgeland/rushland (ARS) - E606280, N5380350	1/09/2009	Chris	Obst
1202 12 - Melaleuca ericifolia swamp forest (NME) - E606400,	1/09/2009	Chris	Obst
1203 12 - Acacia longifolia coastal scrub (SAC) - E606960, N2379100	1/09/2009	Chris	Obst
1204 12 - Euc viminalis - Euc globulus coastal forest and woodland (DVC) - E606820, N5379300	1/09/2009	Chris	Obst
1205 12 - Allocasuarina verticillata forest (NAV) - E606830, N5379540	1/09/2009	Chris	Obst

Site	Name	Common name	Status
<b>DICOTYLEDONAE</b>			
<b>AIZOACEAE</b>			
1203	<i>Carpobrotus rossii</i>	native pigface	
<b>ASTERACEAE</b>			
1203	<i>Actites megalocarpus</i>	dune thistle	
1202	<i>Cirsium vulgare</i>	spear thistle	i
1203	<i>Hypochoeris glabra</i>	smooth catsear	i
1205			
1202	<i>Hypochoeris radicata</i>	rough catsear	i
1203	<i>Olearia axillaris</i>	coast daisybush	
1203	<i>Senecio pinnatifolius</i>	common coast groundsel	
1203	<i>Senecio sp.</i>	groundsel	
<b>BRASSICACEAE</b>			
1202	<i>Nasturtium officinale</i>	two-row watercress	i
<b>CAMPANULACEAE</b>			
1205	<i>Wahlenbergia sp.</i>	bluebell	
<b>CARYOPHYLLACEAE</b>			
1204	<i>Cerastium glomeratum</i>	sticky mouse-ear	i
<b>CASUARINACEAE</b>			
1204	<i>Allocasuarina verticillata</i>	drooping sheoak	
1205			
<b>CHENOPODIACEAE</b>			
1203	<i>Rhagodia candolleana subsp.</i>	coastal saltbush	
1204			
1205			
1201	<i>Sarcocornia quinqueflora</i>	beaded glasswort	
<b>CONVOLVULACEAE</b>			
1202	<i>Dichondra repens</i>	kidneyweed	
1204			
1205			
<b>CRASSULACEAE</b>			
1205	<i>Crassula sieberiana</i>	stone-crop	
<b>EPACRIDACEAE</b>			
1203	<i>Acrotriche serrulata</i>	ants delight	
1203	<i>Leucopogon parviflorus</i>	coast beardheath	
1204			
1205			
1204	<i>Monotoca elliptica</i>	tree broomheath	

<b>FABACEAE</b>			
1204	<i>Glycine clandestina</i>	twining glycine	
1204	<i>Vicia sp.</i>	vetch, tare	i
<b>GERANIACEAE</b>			
1201	<i>Geranium sp.</i>	native geranium	
<b>GOODENIACEAE</b>			
1201	<i>Selliera radicans</i>	shiny swampmat	
<b>MIMOSACEAE</b>			
1203	<i>Acacia longifolia</i>	coast wattle	
1204			
1205			
1204	<i>Acacia melanoxylon</i>	blackwood	
1205			
1201	<i>Acacia verticillata</i>	prickly mimosa	
1202			
<b>MYRTACEAE</b>			
1204	<i>Eucalyptus globulus subsp. globulus</i>	tasmanian blue gum	
1202	<i>Leptospermum lanigerum</i>	woolly teatree	
1202	<i>Melaleuca ericifolia</i>	coast paperbark	
<b>ONAGRACEAE</b>			
1202	<i>Epilobium sp.</i>	willowherb	
<b>OXALIDACEAE</b>			
1203	<i>Oxalis perennans</i>	grassland woodsorrel	
1204			
<b>PLANTAGINACEAE</b>			
1201	<i>Plantago coronopus</i>	buckshorn plantain	i
1202	<i>Plantago lanceolata</i>	ribwort plantain	i
<b>POLYGONACEAE</b>			
1203	<i>Acetosella vulgaris</i>	sheep sorrel	i
1202	<i>Rumex sp.</i>	dock	
<b>PRIMULACEAE</b>			
1201	<i>Samolus repens</i>	creeping brookweed	
<b>PROTEACEAE</b>			
1203	<i>Banksia marginata</i>	silver banksia	
1204			
1205			
<b>ROSACEAE</b>			
1201	<i>Acaena sp.</i>	sheep's burr	
1202			
1203			
1201	<i>Rosa rubiginosa</i>	sweet briar	i
1202			
1202	<i>Rubus fruticosus</i>	blackberry	d
<b>THYMELAEACEAE</b>			
1201	<i>Pimelea glauca</i>	smooth riceflower	
1203			

## MONOCOTYLEDONAE

### CYPERACEAE

1201	<i>Ficinia nodosa</i>	knobby clubsedge
1203		
1205		
1201	<i>Gahnia filum</i>	chaffy sawsedge
1202	<i>Gahnia grandis</i>	cutting grass
1201	<i>Gahnia trifida</i>	coast sawsedge
1203	<i>Lepidosperma concavum</i>	sand swordedge
1203	<i>Lepidosperma gladiatum</i>	coast swordedge
1204		
1205		
1201	<i>Schoenus apogon</i>	common bogsedge

### JUNCACEAE

1201	<i>Juncus kraussii</i> subsp. <i>australiensis</i>	sea rush
1203		
1202	<i>Juncus</i> sp.	Rush
1202	<i>Luzula</i> sp.	luzula

### POACEAE

1203	<i>Ammophila arenaria</i>	marram grass	i
1205	<i>Austrostipa</i> sp.	speargrass	
1203	<i>Austrostipa stipoides</i>	coast speargrass	
1201	<i>Dactylis glomerata</i>	cocksfoot	i
1202			
1201	<i>Distichlis distichophylla</i>	australian saltgrass	
1203			
1201	<i>Phragmites australis</i>	southern reed	
1205	<i>Poa labillardierei</i>	silver tussockgrass	
1201	<i>Poa poiformis</i>	coastal tussockgrass	
1203			
1203	<i>Spinifex sericeus</i>	beach spinifex	
1201	<i>Themeda triandra</i>	kangaroo grass	

### RESTIONACEAE

1201	<i>Apodasmia brownii</i>	coarse twinerush
1203		

### TYPHACEAE

1202	<i>Typha domingensis</i>	slender cumbungi
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### XANTHORRHOEACEAE

1201	<i>Lomandra longifolia</i>	sagg
1202		
1203		
1204		
1205		

## PTERIDOPHYTA

### DENNSTAEDTIACEAE

1204	<i>Pteridium esculentum</i>	bracken
1205		

## Site Report - Templestowe Lagoon (12)

### Site: 120 12 - Saline sedgeland/rushland (ARS)

Grid Reference: 606280E, 5380350N  
Accuracy: GPS (within 10 metres)  
Recorder: Chris Obst  
Date of Survey: 1 Sep 2009

Tall Shrubs: *Acacia verticillata*  
Shrubs: *Sarcocornia quinqueflora*  
Low Shrubs: *Pimelea glauca*, *Sarcocornia quinqueflora*  
Herbs: *Acaena* sp., *Geranium* sp., *Plantago coronopus*, *Samolus repens*, *Selliera*  
Graminoids: *Apodasmia brownii*, *Ficinia nodosa*, *Gahnia filum*, *Gahnia trifida*, *Juncus kraussii* subsp. *australiensis*, *Lomandra longifolia*, *Schoenus apogon*  
Grasses: *Distichlis distichophylla*, *Phragmites australis*, *Poa poiformis*, *Themeda triandra*  
Weeds: *Dactylis glomerata*, *Rosa rubiginosa*

### Site: 120 12 - Melaleuca ericifolia swamp forest (NME)

Grid Reference: 606400E, 5380360N  
Accuracy: GPS (within 10 metres)  
Recorder: Chris Obst  
Date of Survey: 1 Sep 2009

Tall Shrubs: *Acacia verticillata*, *Leptospermum lanigerum*, *Melaleuca ericifolia*  
Herbs: *Acaena* sp., *Dichondra repens*, *Epilobium* sp., *Rumex* sp.  
Graminoids: *Gahnia grandis*, *Juncus* sp., *Lomandra longifolia*, *Luzula* sp., *Typha*  
Weeds: *Cirsium vulgare*, *Dactylis glomerata*, *Hypochoeris radicata*, *Nasturtium officinale*, *Plantago lanceolata*, *Rosa rubiginosa*, *Rubus fruticosus*

### Site: 120 12 - Acacia longifolia coastal scrub (SAC)

Grid Reference: 606960E, 2379100N  
Accuracy: GPS (within 10 metres)  
Recorder: Chris Obst  
Date of Survey: 1 Sep 2009

Tall Shrubs: *Banksia marginata*  
Shrubs: *Acacia longifolia*, *Leucopogon parviflorus*, *Olearia axillaris*, *Rhagodia candolleana* subsp. *candolleana*  
Low Shrubs: *Acrotriche serrulata*, *Pimelea glauca*  
Herbs: *Acaena* sp., *Actites megalocarpus*, *Carpobrotus rossii*, *Oxalis perennans*, *Senecio pinnatifolius*, *Senecio* sp.  
Graminoids: *Apodasmia brownii*, *Ficinia nodosa*, *Juncus kraussii* subsp. *australiensis*, *Lepidosperma concavum*, *Lepidosperma gladiatum*, *Lomandra longifolia*  
Grasses: *Austrostipa stipoides*, *Distichlis distichophylla*, *Poa poiformis*, *Spinifex sericeus*  
Weeds: *Acetosella vulgaris*, *Ammophila arenaria*, *Hypochoeris glabra*

### Site: 120 12 - Euc viminalis - Euc globulus coastal forest and woodland

Grid Reference: 606820E, 5379300N  
Accuracy: GPS (within 10 metres)  
Recorder: Chris Obst  
Date of Survey: 1 Sep 2009

Trees: *Acacia melanoxylon*, *Allocasuarina verticillata*, *Eucalyptus globulus* subsp.  
Tall Shrubs: *Banksia marginata*  
Shrubs: *Acacia longifolia*, *Leucopogon parviflorus*, *Monotoca elliptica*, *Rhagodia candolleana* subsp. *candolleana*  
Herbs: *Dichondra repens*, *Glycine clandestina*, *Oxalis perennans*  
Graminoids: *Lepidosperma gladiatum*, *Lomandra longifolia*  
Ferns: *Pteridium esculentum*  
Weeds: *Cerastium glomeratum*, *Vicia* sp.

### Site: 120 12 - Allocasuarina verticillata forest (NAV)

Grid Reference: 606830E, 5379540N  
Accuracy: GPS (within 10 metres)  
Recorder: Chris Obst

Date of Survey: 1 Sep 2009

Trees: *Acacia melanoxylon*, *Allocasuarina verticillata*

Tall Shrubs: *Banksia marginata*

Shrubs: *Acacia longifolia*, *Leucopogon parviflorus*, *Rhagodia candolleana* subsp.

Herbs: *Crassula sieberiana*, *Dichondra repens*, *Wahlenbergia* sp.

Graminoids: *Ficinia nodosa*, *Lepidosperma gladiatum*, *Lomandra longifolia*

Grasses: *Austrostipa* sp., *Poa labillardierei*

Ferns: *Pteridium esculentum*

Weeds: *Hypochoeris glabra*



## Species list - Lower Marsh Creek/ Chain of Lagoons (16)

### Status codes:

#### ORIGIN

i - introduced  
d - declared weed WM Act  
en - endemic to Tasmania  
t - within Australia, occurs only in Tas.

#### NATIONAL SCHEDULE

EPBC Act 1999  
CR - critically endangered  
EN - endangered  
VU - vulnerable

#### STATE SCHEDULE

TSP Act 1995  
e - endangered  
v - vulnerable  
r - rare

### Sites:

1601 16 - *Acacia longifolia* coastal scrub (SAC) - E607990, N5388220 1/09/2009 Chris Obst  
1602 16 - *Eucalyptus ovata* heathy woodland (DOW) - E607990, N5388470 1/09/2009 Chris Obst  
1603 16 - *Eucalyptus globulus* dry forest and woodland (DGL) - E607990, N5388460 1/09/2009 Chris Obst  
  
1604 16 - *Melaleuca ericifolia* swamp forest (NME) - E607560, N5387750 1/09/2009 Chris Obst  
1605 16 - Fresh water aquatic sedgeland and rushland (ASF) - E607510, N5387880 1/09/2009 Chris Obst  
  
1606 16 - *Acacia dealbata* forest (NAD) - E607260, N5387350 2/09/2009 Chris Obst  
1607 16 - *Pteridium esculentum* fernland (FPF) - E607400, N6387280 2/09/2009 Chris Obst  
1608 16 - *Euc viminialis* - *Euc globulus* coastal forest and woodland (DVC) - E607240, N5386760 2/09/2009Chris

Obst

Site	Name	Common name	Status
<b>DICOTYLEDONAE</b>			
<b>AIZOACEAE</b>			
1601	<i>Carpobrotus rossii</i>	native pigface	
<b>ASTERACEAE</b>			
1601	<i>Actites megalocarpus</i>	dune thistle	
1605	<i>Cirsium sp.</i>	thistle	i
1603	<i>Coronidium scorpioides</i>	curling everlasting	
1608	<i>Lagenophora sp.</i>	daisy	
1601	<i>Olearia axillaris</i>	coast daisybush	
1608	<i>Olearia lirata</i>	forest daisybush	
1601 1603	<i>Senecio sp.</i>	groundsel	
1601	<i>Sonchus sp.</i>	sowthistle	i
<b>CARYOPHYLLACEAE</b>			
1601	<i>Cerastium glomeratum</i>	sticky mouse-ear	i
<b>CASUARINACEAE</b>			
1602 1603	<i>Allocasuarina littoralis</i>	black sheoak	
<b>CHENOPODIACEAE</b>			
1601 1603	<i>Rhagodia candolleana subsp. candolleana</i>	coastal saltbush	
<b>CONVOLVULACEAE</b>			
1601 1603	<i>Dichondra repens</i>	kidneyweed	
1604			
<b>CRASSULACEAE</b>			
1601	<i>Crassula sieberiana</i>	stone-crop	
<b>DILLENIACEAE</b>			
1603	<i>Hibbertia appressa</i>	southern guineaflower	
1602 1603	<i>Hibbertia riparia</i>	erect guineaflower	
<b>EPACRIDACEAE</b>			
1602 1603	<i>Epacris impressa</i>	common heath	
1604	<i>Epacris lanuginosa</i>	swamp heath	
1603	<i>Leucopogon collinus</i>	white beardheath	
1601 1603	<i>Leucopogon parviflorus</i>	coast beardheath	
1603	<i>Monotoca elliptica</i>	tree broomheath	

1602	<i>Sprengelia incarnata</i>	pink swampheath	
<b>EUPHORBIACEAE</b>			
1603 1608	<i>Amperea xiphioclada</i> var. <i>xiphioclada</i>	broom spurge	
<b>FABACEAE</b>			
1602	<i>Almaleea subumbellata</i>	wiry bushpea	
1603	<i>Aotus ericoides</i>	golden pea	
1608	<i>Bossiaea cinerea</i>	showy bossia	
1607	<i>Bossiaea prostrata</i>	creeping bossia	
1603	<i>Glycine clandestina</i>	twining glycine	
1603	<i>Indigofera australis</i>	native indigo	
1603	<i>Kennedia prostrata</i>	running postman	
1603	<i>Platylobium formosum</i>	handsome flatpea	
1608	<i>Psoralea pinnata</i>	blue butterflybush	i
1603	<i>Pultenaea</i> sp.	bushpea	
1602 1603 1608	<i>Pultenaea stricta</i>	rigid bushpea	
<b>GERANIACEAE</b>			
1601	<i>Geranium</i> sp.	native geranium	
<b>HALORAGACEAE</b>			
1602 1603 1608	<i>Gonocarpus tetragynus</i>	common raspwort	
1603 1607 1608	<i>Gonocarpus teucroides</i>	forest raspwort	
<b>LAURACEAE</b>			
1602 1608	<i>Cassytha pubescens</i>	downy dodderlaurel	
<b>MIMOSACEAE</b>			
1606	<i>Acacia dealbata</i> subsp. <i>dealbata</i>	silver wattle	
1602 1603 1607	<i>Acacia genistifolia</i>	spreading wattle	
1601 1602	<i>Acacia longifolia</i>	coast wattle	
1602 1604	<i>Acacia melanoxylon</i>	blackwood	
1603	<i>Acacia myrtifolia</i>	redstem wattle	
1603 1608	<i>Acacia suaveolens</i>	sweet wattle	
1602	<i>Acacia verniciflua</i>	varnish wattle	
1603 1604 1606 1608	<i>Acacia verticillata</i>	prickly mimosa	
<b>MYRTACEAE</b>			
1608	<i>Eucalyptus amygdalina</i>	black peppermint	en
1602 1603 1608	<i>Eucalyptus globulus</i> subsp. <i>globulus</i>	tasmanian blue gum	
1602 1608	<i>Eucalyptus ovata</i> var. <i>ovata</i>	black gum	
1602 1603 1608	<i>Eucalyptus sieberi</i>	ironbark	
1608	<i>Eucalyptus viminalis</i> subsp. <i>viminalis</i>	white gum	
1603	<i>Euryomyrtus ramosissima</i>	heath-myrtle	
1604	<i>Leptospermum lanigerum</i>	woolly teatree	
1602 1603 1607 1608	<i>Leptospermum scoparium</i>	common tea-tree	
1602 1603 1604 1608	<i>Melaleuca ericifolia</i>	coast paperbark	

1602	<i>Melaleuca gibbosa</i>	slender honeymyrtle	
<b>OXALIDACEAE</b>			
1601 1603	<i>Oxalis perennans</i>	grassland woodsorrel	
<b>PITTOSPORACEAE</b>			
1608	<i>Bursaria spinosa subsp. spinosa</i>	prickly box	
<b>POLYGONACEAE</b>			
1607 1608	<i>Acetosella vulgaris</i>	sheep sorrel	i
<b>PROTEACEAE</b>			
1601 1602 1603	<i>Banksia marginata</i>	silver banksia	
<b>RHAMNACEAE</b>			
1603	<i>Pomaderris sp.</i>	dogwood	
<b>ROSACEAE</b>			
1601	<i>Acaena sp.</i>	sheep's burr	
1604 1607 1608	<i>Rubus fruticosus</i>	blackberry	d
<b>SANTALACEAE</b>			
1601 1602 1603	<i>Exocarpos cupressiformis</i>	common native-cherry	
<b>SOLANACEAE</b>			
1604	<i>Lycium ferocissimum</i>	african boxthorn	d
<b>THYMELAEACEAE</b>			
1603 1608	<i>Pimelea linifolia subsp. linifolia</i>	slender riceflower	
<b>VIOLACEAE</b>			
1603	<i>Viola hederacea</i>	ivy-leaf violet	
<b>UNKNOWN</b>			
	<i>unknown</i>	deciduous exotic tree	i
<b>MONOCOTYLEDONAE</b>			
<b>ARACEAE</b>			
	<i>Zantedeschia aethiopica</i>	arum lily	i
<b>CYPERACEAE</b>			
1605 1608	<i>Carex appressa</i>	tall sedge	
1605	<i>Cyperus sp.</i>	umbrella sedge	
1601	<i>Ficinia nodosa</i>	knobby clus-sedge	
1608	<i>Gahnia grandis</i>	cutting grass	
1601 1602 1603 1604	<i>Lepidosperma concavum</i>	sand sword-sedge	
1601 1603	<i>Lepidosperma gladiatum</i>	coast sword-sedge	
1603	<i>Lepidosperma longitudinale</i>	spreading sword-sedge	
1608	<i>Schoenus apogon</i>	common bog-sedge	
<b>IRIDACEAE</b>			
1602 1607	<i>Patersonia fragilis</i>	short purple-flag	
<b>JUNCACEAE</b>			

1601 1604 1605	<i>Juncus kraussii subsp. australiensis</i>	sea rush	
1605	<i>Juncus sp.</i>	Rush	
	<b>LILIACEAE</b>		
1601	<i>Dianella revoluta</i>	spreading flaxlily	
	<b>ORCHIDACEAE</b>		
1607 1608	<i>Chiloglottis sp.</i>	bird orchid	
	<b>POACEAE</b>		
1601	<i>Ammophila arenaria</i>	marram grass	i
1601	<i>Austrostipa sp.</i>	speargrass	
1601	<i>Austrostipa stipoides</i>	coast speargrass	
1601	<i>Dactylis glomerata</i>	cocksfoot	i
1604 1606 1607	<i>Ehrharta stipoides</i>	weeping grass	
1603	<i>Elymus scaber</i>	rough wheatgrass	
1601	<i>Lagurus ovatus</i>	haretail grass	i
1605	<i>Phragmites australis</i>	southern reed	
1601 1603	<i>Poa labillardierei</i>	silver tussockgrass	
1601	<i>Spinifex sericeus</i>	beach spinifex	
1601	<i>Sporobolus africanus</i>	ratstail grass	i
1603	<i>Themeda triandra</i>	kangaroo grass	
	<b>RESTIONACEAE</b>		
1602 1604	<i>Apodasmia brownii</i>	coarse twinerush	
1602 1603 1604	<i>Hypolaena fastigiata</i>	tassel roperush	
	<b>XANTHORRHOEACEAE</b>		
1601 1602 1603 1604 1608	<i>Lomandra longifolia</i>	sagg	
1602	<i>Xanthorrhoea australis</i>	southern grasstree	
	<b>PTERIDOPHYTA</b>		
	<b>BLECHNACEAE</b>		
1604 1608	<i>Blechnum wattsii</i>	hard waterfern	
	<b>DENNSTAEDTIACEAE</b>		
1602 1603 1606 1607 1608	<i>Pteridium esculentum</i>	bracken	
	<b>GLEICHENIACEAE</b>		
1602 1608	<i>Gleichenia dicarpa</i>	pouched corallfern	
1604	<i>Gleichenia microphylla</i>	scrambling corallfern	
	<b>LYCOPODIACEAE</b>		
1603 1604 1607	<i>Lycopodium fastigiatum</i>	mountain clubmoss	

## Site Report - Lower Marsh Creek Chain of Lagoons (16)

### Site: 1601 16 - *Acacia longifolia* coastal scrub (SAC)

Grid Reference: 607990E, 5388220N  
Accuracy: GPS (within 10 metres)  
Recorder: Chris Obst  
Date of Survey: 1 Sep 2009

Tall Shrubs: *Banksia marginata*, *Exocarpos cupressiformis*  
Shrubs: *Acacia longifolia*, *Leucopogon parviflorus*, *Olearia axillaris*, *Rhagodia candolleana* subsp. *candolleana*

Herbs: *Acaena* sp., *Actites megalocarpus*, *Carpobrotus rossii*, *Crassula sieberiana*, *Dianella revoluta*, *Dichondra repens*,  
*Geranium* sp., *Oxalis perennans*, *Senecio* sp.

Graminoids: *Ficinia nodosa*, *Juncus kraussii* subsp. *australiensis*, *Lepidosperma concavum*,  
*Lepidosperma gladiatum*, *Lomandra longifolia*

Grasses: *Austrostipa* sp., *Austrostipa stipoides*, *Poa labillardierei*, *Spinifex sericeus*

Weeds: *Ammophila arenaria*, *Cerastium glomeratum*, *Dactylis glomerata*, *Lagurus ovatus*,  
*Sonchus* sp., *Sporobolus africanus*

### Site: 1602 16 - *Eucalyptus ovata* heathy woodland (DOW)

Grid Reference: 607990E, 5388470N  
Accuracy: GPS (within 10 metres)  
Recorder: Chris Obst  
Date of Survey: 1 Sep 2009

Trees: *Acacia melanoxylon*, *Allocasuarina littoralis*, *Eucalyptus globulus* subsp. *globulus*,  
*Eucalyptus ovata* var. *ovata*,  
*Eucalyptus sieberi*

Tall Shrubs: *Acacia verniciflua*, *Banksia marginata*, *Exocarpos cupressiformis*, *Leptospermum scoparium*, *Melaleuca ericifolia*

Shrubs: *Acacia genistifolia*, *Acacia longifolia*, *Epacris impressa*, *Melaleuca gibbosa*, *Pultenaea stricta*, *Sprengelia incarnata*

Low Shrubs: *Hibbertia riparia*

Herbs: *Almaleea subumbellata*, *Gonocarpus tetragynus*

Graminoids: *Apodasmia brownii*, *Hypolaena fastigiata*, *Lepidosperma concavum*, *Lomandra longifolia*,  
*Patersonia fragilis*,  
*Xanthorrhoea australis*

Ferns: *Gleichenia dicarpa*, *Pteridium esculentum*

Climbers: *Cassytha pubescens*

### Site: 1603 16 - *Eucalyptus globulus* dry forest and woodland (DGL)

Grid Reference: 607990E, 5388460N  
Accuracy: GPS (within 10 metres)  
Recorder: Chris Obst  
Date of Survey: 1 Sep 2009

Trees: *Allocasuarina littoralis*, *Eucalyptus globulus* subsp. *globulus*, *Eucalyptus sieberi*

Tall Shrubs: *Acacia verticillata*, *Banksia marginata*, *Exocarpos cupressiformis*, *Leptospermum scoparium*, *Melaleuca ericifolia*,  
*Pomaderris* sp.

Shrubs: *Acacia genistifolia*, *Acacia suaveolens*, *Amperea xiphoclada* var. *xiphoclada*, *Epacris impressa*, *Euryomyrtus ramosissima*, *Leucopogon collinus*, *Leucopogon parviflorus*, *Monotoca elliptica*, *Pimelea linifolia* subsp. *linifolia*,  
*Pultenaea* sp., *Pultenaea stricta*, *Rhagodia candolleana* subsp. *candolleana*

Low Shrubs: *Acacia myrtifolia*, *Aotus ericoides*, *Hibbertia appressa*, *Hibbertia riparia*, *Indigofera australis*, *Platylobium formosum*

Herbs: *Coronidium scorpioides*, *Dichondra repens*, *Glycine clandestina*, *Gonocarpus tetragynus*,  
*Gonocarpus teucrioides*,  
*Kennedia prostrata*, *Oxalis perennans*, *Senecio* sp., *Viola hederacea*

Graminoids: *Hypolaena fastigiata*, *Lepidosperma concavum*, *Lepidosperma gladiatum*, *Lepidosperma longitudinale*, *Lomandra longifolia*  
Grasses: *Elymus scaber*, *Poa labillardierei*, *Themeda triandra*  
Ferns: *Lycopodium fastigiatum*, *Pteridium esculentum*

**Site: 1604 16 - Melaleuca ericifolia swamp forest (NME)**

Grid Reference: 607560E, 5387750N  
Accuracy: GPS (within 10 metres)  
Recorder: Chris Obst  
Date of Survey: 1 Sep 2009

Trees: *Acacia melanoxylon*  
Tall Shrubs: *Acacia verticillata*, *Leptospermum lanigerum*, *Melaleuca ericifolia*  
Shrubs: *Epacris lanuginosa*  
Herbs: *Dichondra repens*  
Graminoids: *Apodasmia brownii*, *Hypolaena fastigiata*, *Juncus kraussii* subsp. *australiensis*, *Lepidosperma concavum*, *Lomandra longifolia*  
Grasses: *Ehrharta stipoides*  
Ferns: *Blechnum wattsii*, *Gleichenia microphylla*, *Lycopodium fastigiatum*  
Weeds: *Lycium ferocissimum*, *Rubus fruticosus*

**Site: 1605 16 - Fresh water aquatic sedgeland and rushland (ASF)**

Grid Reference: 607510E, 5387880N  
Accuracy: GPS (within 10 metres)  
Recorder: Chris Obst  
Date of Survey: 1 Sep 2009  
Graminoids: *Carex appressa*, *Cyperus* sp., *Juncus kraussii* subsp. *australiensis*, *Juncus* sp.  
Grasses: *Phragmites australis*  
Weeds: *Cirsium* sp.

**Site: 1606 16 - Acacia dealbata forest (NAD)**

Grid Reference: 607260E, 5387350N  
Accuracy: GPS (within 10 metres)  
Recorder: Chris Obst  
Date of Survey: 2 Sep 2009  
Tall Shrubs: *Acacia dealbata* subsp. *dealbata*, *Acacia verticillata*  
Grasses: *Ehrharta stipoides*  
Ferns: *Pteridium esculentum*

**Site: 1607 16 - Pteridium esculentum fernland (FPF)**

Grid Reference: 607400E, 6387280N  
Accuracy: GPS (within 10 metres)  
Recorder: Chris Obst  
Date of Survey: 2 Sep 2009  
Tall Shrubs: *Leptospermum scoparium*  
Shrubs: *Acacia genistifolia*, *Bossiaea prostrata*  
Herbs: *Chiloglottis* sp., *Gonocarpus teucroides*  
Graminoids: *Patersonia fragilis*  
Grasses: *Ehrharta stipoides*  
Ferns: *Lycopodium fastigiatum*, *Pteridium esculentum*  
Weeds: *Acetosella vulgaris*, *Rubus fruticosus*

**Site: 1608 16 - Euc viminalis - Euc globulus coastal forest and woodland (DVC)**

Grid Reference: 607240E, 5386760N  
Accuracy: GPS (within 10 metres)  
Recorder: Chris Obst  
Date of Survey: 2 Sep 2009  
Trees: *Bursaria spinosa* subsp. *spinosa*, *Eucalyptus amygdalina*, *Eucalyptus globulus* subsp. *globulus*, *Eucalyptus ovata* var. *ovata*, *Eucalyptus sieberi*, *Eucalyptus viminalis* subsp. *viminalis*

Tall Shrubs: *Acacia verticillata*, *Leptospermum scoparium*, *Melaleuca ericifolia*  
Shrubs: *Acacia suaveolens*, *Amperea xiphoclada* var. *xiphoclada*, *Bossiaea cinerea*, *Olearia lirata*,  
*Pimelea linifolia* subsp. *linifolia*, *Pultenaea stricta*  
Herbs: *Chiloglottis* sp., *Gonocarpus tetragynus*, *Gonocarpus teucroides*, *Lagenophora* sp.  
Graminoids: *Carex appressa*, *Gahnia grandis*, *Lomandra longifolia*, *Schoenus apogon*  
Ferns: *Blechnum watsii*, *Gleichenia dicarpa*, *Pteridium esculentum*  
Climbers: *Cassytha pubescens*  
Weeds: *Acetosella vulgaris*, *Psoralea pinnata*, *Rubus fruticosus*