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BIOBANKING ASSESSMENT METHODOLOGY AND TREE SURVEY ASSESSMENT

Cobaki Estate

A Report Prepared for
Leda Manorstead Pty Ltd

DECEMBER 2015

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1 INTRODUCTION

A detailed vegetation assessment was completed by JWA Pty Ltd at the subject site on 22 September 2015. This detailed assessment utilised the BioBanking Assessment Methodology (BAM) (OEH 2014) to determine the site value (vegetation condition) of a Swamp mahogany (*Eucalyptus robusta*) open woodland community covering an area of approximately 3.8 ha (**FIGURE 1**). The location and details (DBH, height and habitat features) of all Swamp mahogany trees within the mapped community were also recorded. A complete list of plant species recorded within the community is provided at **APPENDIX 1.**

The BAM is a tool used to determine the number of ecosystem credits that can be created at a biobank site or required at a development site, but is also recognised as a useful tool for determining the status of vegetation on development sites.

2 METHODOLOGY

2.1 Background

Section 5.3 of the BAM sets out how to assess and measure site value (vegetation condition). Vegetation types are used as surrogates for general vegetation condition. The information on each vegetation type is contained within the Vegetation Types Database. This database is held by the Office of Environment & Heritage (OEH) and is publicly available. The Vegetation Benchmarks Database identifies the range of quantitative measures that represent the benchmark condition for the vegetation type. This database is also held by OEH and is publicly available.

2.2 Plot and Transect Surveys

Plot and transect surveys are used to provide quantitative measures of 10 site attributes in each vegetation zone. The 10 site attributes, provided in **TABLE 1**, are assessed for a vegetation zone against benchmark data for the relevant Plant Community Type (PCT), except where the zone is derived vegetation, in which case it must be assessed against the benchmark data which in the opinion of the assessor is the most likely original PCT, or against the benchmark data for the vegetation class of the most likely original PCT.

Line transects (50m) must be used to assess the site attributes that are measured by percentage foliage cover. Other site attributes are assessed by plots (20m x 20m plot for native plant species richness and 50m x 20m plot for number of trees with hollows and total length of fallen logs). The attribute for proportion of over-storey species occurring as regeneration is measured across the entire vegetation zone being assessed. The plot and transect surveys are completed in random locations within in the vegetation zone to sample vegetation condition across the zone.

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LEGEND

Community 6 - Mid-high open woodland (*Eucalyptus robusta*)

Site Outline

0 500m

SCALE: 1 : 12 500 @ A3

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FIGURE 1

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DATE: 28 September 2015
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TITLE

SWAMP MAHOGANY COMMUNITY

TABLE 1
SCORING & WEIGHTING OF SITE ATTRIBUTES

Site attribute	Site attribute score				Weighting for attribute score
	0	1	2	3	
Native plant species richness	0	>0 - <50% of benchmark	50% - <100% benchmark	≥ benchmark	25
Native over-storey cover	0 – 10% or >200% of benchmark	>10 - <50% or >150 – 200% of benchmark	50 - <100% or >100 – 150% of benchmark	within benchmark	10
Native mid-storey cover	0 – 10% or >200% of benchmark	>10 - <50% or >150 – 200% of benchmark	50 - <100% or >100 – 150% of benchmark	within benchmark	10
Native ground cover (grasses)	0 – 10% or >200% of benchmark	>10 - <50% or >150 – 200% of benchmark	50 - <100% or >100 – 150% of benchmark	within benchmark	2.5
Native ground cover (shrubs)	0 – 10% or >200% of benchmark	>10 - <50% or >150 – 200% of benchmark	50 - <100% or >100 – 150% of benchmark	within benchmark	2.5
Native ground cover (other)	0 – 10% or >200% of benchmark	>10 - <50% or >150 – 200% of benchmark	50 - <100% or >100 – 150% of benchmark	within benchmark	2.5
Exotic plant cover	>66%	>33 – 66%	>5 – 33%	0 – 5%	5
Number of trees with hollows	0	>0 - <50% of benchmark	50% - <100% of benchmark	≥ benchmark	20
Proportion of over-storey trees occurring as regeneration	0	>0 - <50%	50 - <100%	100%	12.5
Total length of fallen logs	0 – 10% of benchmark	>10% - <50% of benchmark	50 – <100% of benchmark	≥ benchmark	10

2.3 Survey Sites

In accordance with the BAM, the minimum number of transects/plots required within a vegetation zone of 0 - 4 ha is one (1) transect/plot per 2 ha (or part thereof). Accordingly, two (2) plot and transect surveys were completed within the 3.8 ha Swamp mahogany community. The location of the survey sites was selected randomly and is shown in **FIGURE 2.**

N

LEGEND

Plot and Transect Survey Site

Community 6 - Mid-high open woodland (*Eucalyptus robusta*)

0 100m

SCALE: 1 : 2500 @ A3

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FIGURE 2

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TITLE

PLOT & TRANSECT SURVEY SITES

2.4 Calculating the Current Site Value Score

The current site value score is determined from the plot surveys. Ten site condition attributes are assessed against benchmark values to determine vegetation condition and the site value score. The benchmarks for PCT ID 1230 (NR254): Swamp Mahogany swamp forest on coastal lowlands of the NSW North Coast Bioregion (VIS Classification 2.1) have been used. This PCT is considered to most closely resemble the Swamp mahogany community occurring on the subject site.

The benchmark range is the range of numeric values identified in the Vegetation Benchmarks Database for each site attribute for vegetation types or classes, or collected from local reference sites or obtained from published sources.

The current site attribute score is either 0, 1, 2 or 3 as shown in **TABLE 1**. As shown in the following equation, the site attribute scores are weighted and summed, then converted to a current site value score out of 100. This equation is automatically applied when attributes are entered into the BioBanking Credit Calculator.

Equation 1: Ecosystem credits – determining the current Site Value score for a vegetation zone at the development and biobank site

$$S_C = \frac{\left(\sum_{v=a}^{j}(a_v w_v)\right) + 5\left((a_a a_g) + (a_b a_i) + (a_h a_j) + (a_c a_k)\right) \times 100}{c}$$

where
- S_C is the current Site Value score of the vegetation zone
- a_v is the attribute score for the vth *site attribute* (a–j) as defined in Table 1
- a_k is equal to $(a_d + a_e + a_f)/3$, the average score for attributes d, e and f
- w_v is the weighting for the vth *site attribute* (a–j) as defined in Table 1
- c is the maximum score that can be obtained given the attributes a–j that occur in the vegetation type (the maximum score varies depending on which attributes occur in the vegetation type under assessment).

If the lower benchmark value for any site attribute is zero, and the measure of that attribute on the site is zero, then the site attribute score of that attribute against the benchmark is 3. If the *only* benchmark value for any site attribute is zero, then the attribute is not included in Equation 1 and *c* is scaled accordingly.

The multipliers for 'native over-storey cover x proportion of over-storey species occurring as regeneration' and 'number of trees with hollows x total length of fallen logs' may be omitted from Equation 1 (and *c* recalculated accordingly) for determining Site Value at a development or biobank site if the vegetation type is from one of the following vegetation formations: Grasslands, Heathlands, Alpine Complex, Freshwater Wetlands, Saline Wetlands or Arid Shrublands.

3 RESULTS

3.1 Plot and Transect Surveys

During the BAM assessment data was collected from the locations shown in **FIGURE 2**. The results are provided in **TABLES 2 & 3** below.

TABLE 2
SURVEY RESULTS FOR PLOT & TRANSECT 1

Attribute	Benchmark^	Site results	Site attribute score	Weighting
a) Native plant species richness	24	18	2	25
b) Native over-storey cover	10 – 70%	26%	3	10
c) Native mid-storey cover	10 – 60%	0%	0	10
d) Native ground cover (grasses)	2 – 80%	8%	3	2.5
e) Native ground cover (shrubs)	0 – 70%	2%	3	2.5
f) Native ground cover (other)	0 – 90%	22%	3	2.5
g) Exotic plant cover	-	>66%	0	5
h) Number of trees with hollows	0.1	0	0	20
i) Proportion of over-storey species occurring as regeneration	-	0.5	2	12.5
j) Total length of fallen logs	5	6	3	10

TABLE 3
SURVEY RESULTS FOR PLOT & TRANSECT 2

Attribute	Benchmark^	Site results	Site attribute score	Weighting
a) Native plant species richness	24	22	2	25
b) Native over-storey cover	10 – 70%	21%	3	10
c) Native mid-storey cover	10 – 60%	0%	0	10
d) Native ground cover (grasses)	2 – 80%	5%	3	2.5
e) Native ground cover (shrubs)	0 – 70%	0%	3	2.5
f) Native ground cover (other)	0 – 90%	62%	3	2.5
g) Exotic plant cover	-	>33 - 66%	1	5
h) Number of trees with hollows	0.1	0	0	20
i) Proportion of over-storey species occurring as regeneration	-	0.5	2	12.5
j) Total length of fallen logs	5	0	0	10

3.2 Site Value Score

The site value score was determined based on the results of the ten condition attributes collected from the plot/transect surveys. The site attribute scores were entered into the BioBanking Credit Calculator which converts these to a current site value score out of 100.

The Swamp mahogany vegetation community achieved a current site value score of **51.33/100** (refer Biobanking Credit Calculator report at **APPENDIX 2**).

3.3 Tree Survey

The results of the tree survey are provided in **FIGURE 3** and **TABLE 4.** A total of fifty-two (52) Swamp mahogany trees were recorded within the community.

TABLE 4
SWAMP MAHOGANY TREE DETAILS

Tree Number	Approx. diameter at breast height (DBH) (mm)	Approx. height (m)	Notes
1.	550	14	Some crown dieback
2.	(150)(50)	4	MS
3.	250	7	
4.	300	6	
5.	600	14	
6.	620	15	
7.	600	14	Arboreal termitaria. Some crown dieback
8.	800	15	Small bird nest (species unknown)
9.	850	15	
10.	600	13	Some crown dieback
11.	400	11	Major crown dieback
12.	500	12	Major crown dieback
13.	450	11	Major crown dieback
14.	550	13	
15.	420	11	Crown dieback
16.	650	14	
17.	620	12	
18.	(550)(320)(280)	11	MS. Some crown dieback
19.	380	12	Some crown dieback
20.	540	12	Small bird nest (species unknown)
21.	720	12	

22.	380	11	Some crown dieback
23.	880	12	Some crown dieback
24.	600	11	
25.	500	12	Arboreal termitaria. Some crown dieback
26.	620	14	Some crown dieback
27.	640	13	
28.	750	15	
29.	1150	14	Arboreal termitaria
30.	(320)(150)	9	MS. Major crown dieback
31.	(650)(320)	13	MS. Crown dieback
32.	(500)(450)	12	MS
33.	380	11	
34.	(440)(100)	10	MS. Some crown dieback
35.	(650)(550)(350)	12	MS. Arboreal termitaria. Major crown dieback
36.	780	13	Some crown dieback
37.	720	12	Some crown dieback
38.	620	11	Some crown dieback
39.	700	10	Crown dieback
40.	600	12	Crown dieback
41.	630	12	
42.	(650)(380)	13	MS. Some crown dieback
43.	480	13	Some crown dieback
44.	330	12	
45.	350	13	
46.	680	12	Some crown dieback
47.	450	11	Some crown dieback
48.	650	13	Some crown dieback
49.	450	11	Some crown dieback
50.	500	11	
51.	(680)(300)	13	MS. Bird nest (Magpie)
52.	730	12	Crown dieback

MS – multi-stemmed

Two (2) standing dead trees with small – medium sized hollows and arboreal termitaria were observed and their location recorded (**FIGURE 3**). A pair of Rainbow lorikeets (*Trichoglossus moluccanus*) was observed to be utilising the hollows of the northern-most dead tree.

N

LEGEND

- Surveyed Swamp mahogany (*Eucalyptus robusta*)
- Hollow-bearing dead trees
- Community 6 - Mid-high open woodland (*Eucalyptus robusta*)

0 100m

SCALE: 1 : 2500 @ A3

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FIGURE 3

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DATE: 09 October 2015
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TITLE
TREE SURVEY

4 DISCUSSION

The purpose of this BAM assessment and tree survey was to determine the current site value (vegetation condition) of a remnant Swamp mahogany vegetation community occurring on the subject site. Data collected during the tree survey, BAM assessment, and the subsequent BAM calculation, indicates that the condition of this vegetation community is highly degraded, when compared to benchmark condition, achieving an average site value score of **51.33/ 100**. The tree survey revealed that twenty-nine (29) of the surveyed trees (>55%) are exhibiting some level of crown dieback. The cause of the dieback is unknown but may be attributable to altered hydrology/groundwater conditions as a result of site regrading and drainage works. Some individual trees, however, such as those observed with significant habitat features, are considered to have elevated conservation significance.

REFERENCES

OEH (2014) Biobanking Assessment Methodology 2014. September 2014. Office of Environment & Heritage for the NSW Government.

APPENDIX 1 – PLANT SPECIES LIST

Botanical name	Common name	Life Form
Acacia ulicifolia	Prickly moses	Small shrub
*Andropogon virginicus**	Whisky grass	Grass
Aotus lanigera	Golden candlesticks	Small shrub
Austromyrtus dulcis	Midgen berry	Small shrub
Baeckea frutescens	Weeping Baeckea	Small shrub
Baloskion pallens	Didgery sticks	Rush
Baloskion tetraphyllum	Tassel cord rush	Rush
Blechnum indicum	Swamp water fern	Fern
Breynia oblongifolia	Coffee bush	Shrub
Bromus sp.*		Grass
*Cinnamomum camphora**	Camphor laurel	Tree
*Cuphea carthagenensis**	Columbian wax weed	Herb
Cypress polystachyos	Bunchy sedge	Sedge
Dianella caerulea	Blue flax lily	Herb
Drosera spatulata	A sundew	Herb
Elaeocarpus reticulatus	Blueberry ash	Shrub or small tree
Eucalyptus resinifera	Red mahogany	Tree
Eucalyptus robusta	Swamp mahogany	Tree. Also recorded as seedling i.e. regenerating
Fimbristylis nutans		Sedge
Gahnia aspera	Rough saw-sedge	Sedge
Gahnia clarkei	Tall saw-sedge	Sedge
Gleichnia dicarpa	Pouched coral fern	Fern
Gonocarpus micranthus		Herb
Hardenbergia violacea	Purple coral pea	Climbing or prostrate subshrub
Hibbertia scandens	Climbing guinea flower	Climber
Homoranthus virgatus		Small shrub

Hovea sp.		Small shrub
Imperata cylindrica	Blady grass	Grass
Kennedia rubicunda	Dusky coral pea	Climber
Lomandra longifolia	Spiny-head mat-rush	Rush
Lophostemon suaveolens	Swamp box	Tree
Lygodium microphyllum	Climbing snake fern	Fern
Melaleuca quinquenervia	Broad-leaved paperbark	Tree. Also recorded as seedling i.e. regenerating
Parsonsia straminea	Common silkpod	Vine
*Paspalum mandiocanum**	Broadleaf paspalum	Grass
*Pennisetum clandestinum**	Kikuyu grass	Grass
Pimelea linifolia	Slender rice flower	Small shrub
Poa sp.*		Grass
Pomax umbellata		Herb
Pteridium esculentum	Common bracken	Fern
Selaginella uliginosa	Swamp Selaginella	Clubmoss
*Senecio madagascariensis**	Fireweed	Forb
*Sisyrinchium rosulatum**	Scourweed	Herb
*Sporobolus africanus**	Paramatta grass	Grass

* Introduced species

APPENDIX 2 – BIOBANKING CREDIT CALCULATOR REPORT

BioBanking Credit Calculator

Ecosystem credits

Proposal ID :	XXXX/2015/2203D
Proposal name :	Cobaki Swamp Mahoganies
Assessor name :	Matthew Jenkins
Assessor accreditation number :	XXXXX
Tool version :	v4.0
Report created :	08/12/2015 10:45

Assessment circle name	Landscape score	Vegetation zone name	Vegetation type name	Condition	Red flag status	Management zone name	Management zone area	Current site value	Future site value	Loss in site value	Credit required for bio diversity	Credit required for TS	TS with highest credit requirement	Average species loss	Species TG Value	Final credit requirement for management zone
1	1.80	NR254_Moderate/Good_Poor	Swamp Mahogany swamp forest on coastal lowlands of the NSW North Coast Bioregion and northern Sydney Basin Bioregion	Moderate/Good_Poor	Yes	1	3.80	51.33	0.00	51.33	148	0		0.00	0.00	148

BioBanking Credit Calculator

Species credits

Proposal ID :

Proposal name :

Assessor name :

Assessor accreditation number :

Tool version : v4.0

Report created : 08/12/2015 10:45

Scientific name	Common name	Species TG value	Identified population?	Can Id. popn. be offset?	Area / number of loss	Negligible loss	Red flag status	Number of credits
			No					