BioBanking
Biodiversity Banking and Offsets Scheme

Draft
BioBanking Assessment Methodology

under Part 7A of the Threatened Species Conservation Act 1995

Department of Environment & Climate Change NSW

Submissions

DECC welcomes written comments on the draft BioBanking Assessment Methodology. The closing date for submissions is **Friday 1 February 2008**.

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This draft BioBanking Assessment Methodology is available on the DECC website at www.environment.nsw.gov.au or from Environment Line, telephone 131 555.

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1 Introduction

The BioBanking Scheme is established under Part 7A of the *Threatened Species Conservation Act 1995* (the TSC Act).

A key element of the BioBanking Scheme is the establishment of the BioBanking Assessment Methodology (the methodology) under section 127B of the TSC Act. The methodology is made by order of the Minister for Climate Change, Environment and Water and published in the *NSW Government Gazette*.

The methodology assesses all **biodiversity values** which are defined by the TSC Act as the composition, structure and function of ecosystems, and including (but not limited to) **threatened species**, **threatened populations** and **threatened ecological communities**, and their **habitats**. This definition does not include fish or marine vegetation within the meaning of Part 7A of the *Fisheries Management Act 1994*, unless that fish or marine vegetation has been the subject of an order under section 5A of the TSC Act.

The methodology assesses the biodiversity values currently occurring at a site, either a **development site** or a **biobank site**, and describes the process for measuring the loss of biodiversity values that results from clearing **native vegetation** on a development site and the gain in biodiversity values from undertaking **management actions** on a biobank site.

Biodiversity values are assessed within native vegetation as the surrogate for ecological communities.

In section 2, the methodology defines the circumstances in which **development** is to be regarded as improving or maintaining biodiversity values, including where the impact of that development is offset against the impact of management actions for which **biodiversity credits** are created.

There are two types of biodiversity credits:

1 **Ecosystem credits** are created or required for all impacts on biodiversity values (including threatened species that can be reliably predicted by **habitat surrogates**), except the threatened species or populations that require species credits.

2 **Species credits** are created or required for impacts on threatened species that cannot be reliably predicted to use an area of land based on habitat surrogates. Threatened species that require species credits are identified in the **Threatened Species Profile Database**.

In section 3, the methodology sets out how biodiversity values for ecological communities are assessed and measured on a development site and a biobank site. It also describes how the loss of biodiversity values at a development site, and the gain in biodiversity values at a biobank site, are measured.

In section 4, the methodology sets out how biodiversity values for threatened species are assessed and measured on a development site and a biobank site. This section determines the species that require further assessment, and whether they will require ecosystem credits or species credits.

Section 5 of the methodology establishes the rules for calculating the number and type of ecosystem credits and species credits that are required in relation to loss of biodiversity values at a development site, or created in relation to improving biodiversity values at a biobank site.

Section 6 contains the rules for the use of credits to offset the impacts of development (the **offset rules**) on threatened species at the development site by management actions at the biobank site.

The methodology has been prepared by the Department of Environment and Climate Change NSW (DECC).

The methodology drew on Gibbons, P., Ayers, D., Seddon, J., Doyle, S. and Briggs, S. (2005). BioMetric Operational Manual. Version 1.8: A Terrestrial Biodiversity Assessment Tool for the NSW Property Vegetation Plan Developer. NSW Department of Environment and Conservation, CSIRO Sustainable Ecosystems, Canberra. http://www.nationalparks.nsw.gov.au/npws.nsf/Content/BioMetric_tool.

For further information on the methodology, please refer to the *Background Paper for the BioBanking Assessment Methodology*, available from biobanking@environment.nsw.gov.au or by download from the DECC website at www.environment.nsw.gov.au/threatspec/biobankscheme.htm.

2 Improve or Maintain Biodiversity Values

2.1 Circumstances that improve or maintain biodiversity values

The methodology establishes the circumstances where the development is to be regarded as improving or maintaining biodiversity values. This includes where the impacts of clearing on biodiversity values at the development site are offset against the beneficial impacts of management actions which create biodiversity credits at the biobank site.

A development is to be regarded as improving or maintaining biodiversity values if

1 a the development does not impact a **red flag area**, OR

1 b the development impacts a red flag area but the Director General of DECC determines there will be an improve or maintain outcome in accordance with the provisions for variation of red flag areas,

AND

2 the impacts on biodiversity values are offset by the **retirement of biodiversity credits** in accordance with the offset rules.

2.2 Red flag areas

2.2.1 Definition of red flag areas

Red flag areas are defined as land that contains one or more of the following:

- a **vegetation type** that has a **percent cleared** value greater than 70% as listed in the **Vegetation Types Database**, and the vegetation is not in low condition as defined below
- an **ecological community** listed as critically endangered, endangered or vulnerable under the TSC Act, and the vegetation is not in low condition as defined below
- a threatened species, as identified in the Threatened Species Profile Database that:
  - cannot withstand further loss within any CMA, or
  - is vulnerable to threats beyond management control, or
  - is naturally very rare, or
  - in the case of flora species, there are known impediments to recruitment.
- an **Identified Population**, as defined in section 4.6 of this methodology and in the **Identified Populations Database**.

Vegetation in **low condition** means:

Woody native vegetation with native over-storey percent **foliage cover** less than 25% of the lower value of the over-storey foliage cover **benchmark** for that vegetation type

AND

- less than 50% of vegetation in the ground layer is indigenous species, OR
- greater than 90% of vegetation in the ground layer is cleared.

Native **grassland**, **wetland** or **herbfield** where:

- less than 50% of vegetation in the ground layer is indigenous species, or
- more than 90% of vegetation in the ground layer is cleared.

If native vegetation is not in low condition, it is in **moderate to good condition**.

2.3 Variation of red flag areas

2.3.1 Provisions for variation

Where a proposed development, or any part of it, is on land that is, or forms part of, a red flag area, the Director General of DECC may still make an assessment that a proposed development will improve or maintain biodiversity values if the Director General is of the opinion that:

- the development will improve or maintain biodiversity values in accordance with the assessment protocols in section 2.3.2, and
- strict avoidance of red flag areas is, in this particular case, unreasonable and unnecessary.

In making the assessment that the proposed development will improve or maintain biodiversity values on the red flag area, the Director General must publish reasons for the assessment on the DECC website.

The number of credits (or equivalent **environmental contribution**) required to offset the impact of the development on biodiversity values must always be retired, including when varying red flag areas. Any additional requirements to vary red flags are in addition to requirements to offset the impact of the development through retiring credits (or the equivalent environmental contribution).

2.3.2 Assessment protocols

For the proposed development to improve or maintain biodiversity values under the provisions for variation, the viability of biodiversity values on the development site must be assessed as low or not viable according to one or more of the following factors:

- The current or known future land uses surrounding the proposed development area – relatively small areas of native vegetation (a few hectares) surrounded or mostly surrounded (generally more than 75%) by intense land uses such as industrial or residential development have low viability.

- The size and **connectivity** of the proposed development area – relatively small areas (patches of a few hectares or less) of isolated native vegetation (more than several hundred metres from the next patch of native vegetation) have low viability.

- The condition of native vegetation in the area proposed for development – native vegetation in a degraded condition can have low viability or not be viable. Degraded condition vegetation is substantially below benchmark in one or more variables for the vegetation type, but not necessarily in low condition as defined. Degraded condition vegetation may, for example, be missing one or more structural layers, be even-aged, have weedy or exotic mid-storey or ground layers, or lack mature trees.

- The management input required to improve or maintain the biodiversity values of the clearing area – some areas of native vegetation require very high management input to improve or maintain their biodiversity values. For example, small patches of weed infested, native vegetation in urban areas are difficult or impossible to restore. Such areas have low viability compared with larger, less isolated areas in better condition where greater improvement can be obtained with equivalent or less management input.

If the biodiversity values on the development site are assessed as having low viability or are not viable, the Director General may also consider the following matters in deciding if the proposed development will improve or maintain biodiversity values on red flag areas:

1 The areas (and percent remaining) of native vegetation, the vegetation type, threatened ecological community, habitat for threatened species or threatened species in the region.

  For the purposes of these assessment protocols, region is defined as a **CMA subregion** in which the development is located and the adjoining CMA subregions.

  The presence in the region of relatively large areas (or high percent remaining) of the native vegetation, and/or the vegetation type(s) and/or the threatened ecological community(ies), and/or habitat(s) or regional occurrences of the threatened species that are present or predicted to be present at the proposed development site provides support for the variation in determining if the proposed development will improve or maintain biodiversity values despite the red flag area.

  The following factors are to be considered:

  - Relative abundance: whether the vegetation type or threatened ecological community at the development site is relatively abundant (e.g. tens of thousands of hectares or greater) in the region.
  - Percent remaining is high: whether the percent remaining of the vegetation type or threatened ecological community at the development site is relatively high (at least greater than 30%, preferably greater than 50%) in the region.
  - Percent native vegetation (by area) remaining is high: whether the percent remaining of native vegetation cover in the region is relatively high (greater than 50%).
  - Relative abundance of individual threatened species or threatened species habitat: whether habitat and/or numbers of threatened species in the region, being species identified in the Threatened Species Profile Database as red flag species or Identified Populations are such as would bear temporary loss at the development site while gains are being achieved at the biobank site(s).

2 Whether the proposed development is in accordance with an approved regional plan.

For the purpose of assessing if a proposed development will improve or maintain biodiversity values under these protocols, an approved regional plan can be a regional strategy, regional conservation plan, environmental planning instrument or another regional plan that has been approved by the relevant Minister.

The Director General must clearly define how undertaking development consistent with the plan provides support for an assessment that the proposed development will improve or maintain biodiversity values on the red flag area.

3 Whether an environmental contribution has been made or extra credits are proposed to be retired, in addition to the retirement of the required number of biodiversity credits to offset the impacts of the development.

Providing additional environmental contributions within the meaning of section 127B of the TSC Act or retiring extra credits (in addition to the required number of biodiversity credits or in addition to an environmental contribution) over and above those required to offset the impact of the development on biodiversity values provides support for an assessment that the proposed development will improve or maintain biodiversity values despite the red flag area.

2.4 Management actions that improve biodiversity values

Improvement in biodiversity values is the basis for the creation of biodiversity credits. Improvements are made by carrying out all of the management actions listed below. The **biobanking agreement** for a site will set out the area of land to which a management action applies, the details of the management required and the timeframes for applying the management action.

In accordance with the methodology, biobanking agreements must contain all the relevant management actions as follows:

- management of grazing for conservation
- weed control
- management of fire for conservation
- management of human disturbance
- retention of regrowth
- replanting or supplementary planting where natural regeneration will not be sufficient
- retention of dead timber
- nutrient control
- erosion control
- retention of rocks.

2.4.1 Additional management actions for threatened species

Additional management actions must be undertaken to address threats for particular threatened species where they are required by the Threatened Species Profile Database.

For species credits, the additional actions that are required by the methodology are determined by identifying all threatened species that require species credits and are likely to use land at the biobank site. Any additional management action that is identified in the Threatened Species Profile Database as relevant for these species must be undertaken at the biobank site. A biobanking agreement will set out the area of land to which an additional management action applies, the details of the management required and the timeframes for applying the management action.

For species credits, the additional actions that are required by the methodology and identified for relevant species in the Threatened Species Profile Database are:

- vertebrate pest management – pigs, foxes, miscellaneous species
- control of feral or overabundant native herbivores
- control of exotic fish species
- maintenance or reintroduction of natural flow regimes (where possible).

3 Assessment and Measurement of Ecological Communities

There are two types of biodiversity credits:

1 Ecosystem credits are created or required for all impacts on biodiversity values (including threatened species that can be reliably predicted by habitat surrogates), except the threatened species or populations that require species credits.

2 Species credits are created or required for impacts on threatened species that cannot be reliably predicted to use an area of land based on habitat surrogates. Threatened species that require species credits are identified in the Threatened Species Profile Database.

This section assesses and measures the biodiversity values of ecological communities for the purpose of determining the number of ecosystem credits that can be created at a biobank site or required at a development site. The assessment of threatened species that require ecosystem credits is described in section 4.

3.1 Vegetation type and condition

Vegetation types are used as surrogates for ecological communities. A vegetation type is the finest level of classification of native vegetation adopted by the methodology. A vegetation type is classified within a vegetation class, which in turn is classified within a **vegetation formation**. There are approximately 1600 vegetation types, 99 vegetation classes, and 12 vegetation formations in NSW.

The information on each vegetation type that is used in the methodology is contained within the Vegetation Types Database. This database is held by DECC and will be publicly available. The Vegetation Types Database contains:

- a description of each vegetation type, its class and formation
- the Catchment Management Authority (CMA) area within which the vegetation type occurs
- the percent cleared value of the vegetation type within each **CMA area** in which it occurs.

Any threatened ecological communities associated with the vegetation type are identified in the Threatened Species Profile Database.

The Director General may certify other data that can be used instead of data in the Vegetation Types Database if it more accurately reflects local environmental conditions. In certifying that data is available that reflects local environmental conditions more accurately, the Director General must provide reasons for this opinion and publish these reasons on the DECC website.

The certified local data can then be used in applying the methodology.

The **Vegetation Benchmarks Database** identifies the range of quantitative measures that represent the benchmark condition for the vegetation type. This database is held by DECC and will be publicly available.

Benchmarks are defined for specified attributes by vegetation community. Vegetation with relatively little evidence of modification generally has minimal timber harvesting (few stumps, coppicing, cut logs), minimal firewood collection, minimal exotic weed cover, minimal grazing and trampling by introduced or overabundant native herbivores, minimal soil disturbance, minimal canopy dieback, no evidence of

recent fire or flood, is not subject to high frequency burning, and shows evidence of recruitment of native species.

Other benchmark data that more accurately reflects the local environmental conditions for a vegetation type may be collected from local **reference sites** using procedures approved by DECC. These procedures are set out in the **BioBanking Operational Manual**.

3.1.1 Delineating vegetation zones

Prior to assessment of impact, the development site or biobank site must be divided into **vegetation zones**, using an aerial image of the site (see Appendix 1). Vegetation zones are delineated by vegetation type and broad condition state (and, where required, by proposed changes in native vegetation with clearing or management) for the purpose of assessing the average site condition of the vegetation and to survey for threatened species. Vegetation that is in low condition must always form a separate zone to vegetation that is not in low condition, within the same vegetation type.

Several areas of non-contiguous vegetation in the same CMA subregion may be combined into a single vegetation zone, where they are the same vegetation type and broad condition state. Areas of the same vegetation type but with different condition above low condition, may be delineated as separate zones for field survey. A separate zone must be created where a site lies across the border of a CMA subregion.

Where the extent of native vegetation at a development or biobank site has changed since the aerial image was made, and the clearing was legally approved or permitted under NSW legislation, a vegetation zone may be amended or deleted to reflect the current situation, based on current field survey. DECC must approve the amendment or removal of a vegetation zone prior to issuing a **biobanking statement** or biobanking agreement.

3.1.2 Attributing vegetation zones for a credit profile

Vegetation zones have attributes that are used to create the **credit profile** for each vegetation zone at a development site or biobank site. Vegetation zones with the same vegetation type and in low condition are attributed individually with this information. Vegetation zones with the same vegetation type but in different condition states above low condition are combined for attributing the information for the credit profile. Vegetation zones are attributed as follows:

1 CMA subregion in which the vegetation zone is located

2 vegetation type

3 vegetation formation

4 surrounding vegetation cover, which is the percentage of native vegetation cover within the 1000 ha **assessment circle** in which the vegetation zone is located. The percentage of native vegetation cover within the assessment circle is visually estimated as either <10%, 10–30%, 31–70% or >70% cover, taking into account both cover and condition of vegetation (see Appendix 2) for credit profiles (also assessed this way for **Landscape Value**).

5 **patch size, including low condition vegetation**, which is the area of native vegetation that includes the development site or the biobank site, plus any adjoining native vegetation (being where any separation between the vegetation is not greater than 100 m in woody vegetation, or 30 m in non-woody vegetation). Patch size, including low condition vegetation may comprise both moderate to

good condition and low condition vegetation. It is not restricted in area to the development or biobank site and may extend onto adjoining land for determining credit profiles. Patch sizes are in classes of ≤5 ha, 5–25 ha (including 25 ha), 25–100 ha (including 100 ha) or >100 ha

3.2 Site Value assessment

Site Value is the quantitative measure of the condition of native vegetation assessed for each vegetation zone. The Site Value assessment is also used to determine the condition of certain habitat attributes used by threatened species on the site.

3.2.1 Plot and transect surveys

Plot and/or **transect** surveys of the development and biobank sites are used to provide quantitative measures of 10 **site attributes** in each vegetation zone. The site attributes are assessed to calculate the number of ecosystem credits required (at a development site) or able to be created (at a biobank site).

Surveys required for each vegetation zone must be conducted in accordance with the procedures provided in the BioBanking Operational Manual that accompanies the **BioBanking Credit Calculator**.

The plot and/or transect surveys are conducted in the vegetation zone to sample vegetation condition across the zone. Regeneration is assessed for the entire zone.

3.2.2 Calculating the current Site Value score

The current Site Value score is determined from plot and/or transect surveys in each vegetation zone. Ten site (condition) attributes are assessed against benchmark values to determine vegetation condition and the Site Value score.

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**.

The benchmark range is a quantitative measure of the range of variability in condition attributes for native vegetation where there is relatively little evidence of modification by humans since European settlement.

In accordance with Table 1, the current site attribute score is either 0, 1, 2 or 3. As shown in equation 1, the site attribute scores are weighted and summed, then converted to a current Site Value score out of 100. The same equation is used to determine the current Site Value score at both the development and biobank sites.

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 benchmark for 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 the equation and c is scaled accordingly.

Table 1: Scoring and weighting of the site attributes

Site attribute		Site attribute score (see note below)				Weighting for site attribute score
		0	1	2	3	
a)	Native plant species richness	0	>0– <50% of benchmark	50– <100% of benchmark	≥benchmark	25
b)	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
c)	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
d)	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
e)	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
f)	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
g)	Exotic plant cover (calculated as percentage of total ground and mid-storey cover)	>66%	>33–66%	>5–33%	0–5%	5
h)	Number of trees with hollows	0 (unless benchmark includes 0)	>0– <50% of benchmark	50– <100% of benchmark	≥benchmark	20
i)	Proportion of over-storey species occurring as regeneration	0	>0– <50%	50– <100%	100%	12.5
j)	Total length of fallen logs	0–10% of benchmark	>10– <50% of benchmark	50– <100% of benchmark	≥benchmark	10

Note:The term 'within benchmark' means a measurement that is within (and including) the range of measurement identified as the benchmark for that vegetation type. The term '<benchmark' means a measurement that is less than the minimum measurement in the benchmark range. The term '>benchmark' means a measurement that is greater than the maximum measurement in the benchmark range.

3.2.3 Assessing change in Site Value at the development site

The change in Site Value at the development site is determined as the difference between the current Site Value score and the Site Value score following clearing using equation 2.

Equation 2: Ecosystem credits – change in Site Value score at the development site

$$\Delta S_{Loss} = S_{current} - S_{future}$$

where ΔS_{Loss} is the change (loss) in the Site Value score of a vegetation zone at the development site

$S_{current}$ is the current Site Value score, as determined by equation 1

S_{future} is the future (after clearing) Site Value score, as determined by equation 1.

The future Site Value is determined by decreasing the current site attribute scores by the loss in site attributes after clearing, according to equation 1.

3.2.4 Assessing change in Site Value score at the biobank site

The change in Site Value score at the biobank site is calculated as the difference between the current Site Value score and the predicted future Site Value score following management actions, using equation 3.

Equation 3: Ecosystem credits – change in Site Value score at the biobank site

$$\Delta S_{Gain} = S_{future} - S_{current}$$

where ΔS_{Gain} is the change (gain) in the Site Value score of a vegetation zone at the biobank site

S_{future} is the future Site Value score (with management actions as described below), as determined by equation 1

$S_{current}$ is the current Site Value score, as determined by equation 1.

The future Site Value score is determined by increasing the current site attribute scores by the predicted gains from the management actions listed in section 2.4.

The management actions are undertaken by the landholder to improve site attributes at the biobank site. The landholder must undertake all management actions identified by the BioBanking Credit Calculator as part of the assessment process.

Table 2: Calculation of the predicted future site attribute score for each site attribute with management at the biobank site

Site attribute		Increase in current site attribute score			
		0	1	2	3
a)	Native plant species richness	+0.5	+0.5	+ 1	No change
b)	Native over storey cover	+1	+1	+1	No change
c)	Native mid-storey cover	+1	+1	+1	No change
d)	Native ground cover (grasses)	+1	+1	+1	No change
e)	Native ground cover (shrubs)	+1	+1	+1	No change
f)	Native ground cover (other)	+1	+1	+1	No change
g)	Exotic plant cover[1]	+0.5	+0.5	+1	No change
h)	Number of trees with hollows	0	+0.5	+0.5	No change
i)	Proportion of over-storey species occurring as regeneration	+0.5	+1	+1	No change
j)	Total length of fallen logs	0	+ 0.5	+1	No change

1 Calculated as a percentage of total ground-storey and mid-storey cover.

The current Site Value score recognises past good management of biobank sites above that required by the *Native Vegetation Act 2003.* This recognition is included in the final calculation of ecosystem credits for a biobank site in equation 12.

3.3 Assessing Landscape Value

Landscape Value assesses change in fragmentation and connectivity with clearing or with management actions, and the size of adjacent remnant areas, on the development and biobank sites, based on the following attributes:

- Percent native vegetation cover in the landscape assesses the change in the percentage of native vegetation in 1000 ha assessment circles in which the development and biobank sites are located. Current and future percent native vegetation covers are visually estimated in increments of 10% as shown in Table 3 (also see Appendix 1).
- Connectivity value assesses the impact of clearing on the development site and management actions on the biobank site on connectivity with surrounding vegetation using the criteria in Table 4.
- **Total adjacent remnant area** is the area of native vegetation that is not in low condition and is linked (<100 m) to the development and biobank sites. The score for total adjacent remnant area is determined according to the **Mitchell Landscape** in which most of the proposal occurs.

A development or biobank site may require one or more assessment circles. If all the native vegetation to be impacted by development or improved by management actions is within a single assessment circle, then the circle is centred on the areas to be impacted. If the vegetation to be impacted or improved is greater than 1000 ha, or involves sites or zones in more than one 1000 ha circle, then more than one

assessment circle is required. The assessment circles are arranged so to ensure the minimum number are used.

3.3.1 Calculating the Landscape Value score

The Landscape Value score is calculated using equation 4 below.

Equation 4: Ecosystem credits – determine Landscape Value score

The landscape attributes are combined to provide a Landscape Value score out of 33. Percent native vegetation cover, connectivity value and total adjacent remnant area are each scored out of 11.

$$LV = \underline{(a + b + c)}$$

where LV is the Landscape Value score of the development site or biobank sites
a is percent native vegetation cover in the landscape score (see Table 3)
b is the connectivity value score (see Table 4)
c is total adjacent remnant area value (see Table 5).

Table 3: Determining percent native vegetation cover in the landscape for development and biobank sites

Percent native vegetation cover within a 1000 ha assessment circle (%)	Score for percent native vegetation cover (a)
≤10	1.1
11–20	2.2
21–30	3.3
31–40	4.4
41–50	5.5
51–60	6.6
61–70	7.7
71–80	8.8
81–90	9.9
91–100	11.0

Table 4: Criteria for assessing connectivity value and connectivity value score *

Connectivity value (b)	Current	After development
High Score = 11	The proposal (development or biobank site) includes vegetation that: • is *not* in low condition • has an average width >100 m, and • links to surrounding native vegetation on more than one compass quarter of the proposal.	At least one high connectivity value vegetation link is maintained (following development) or created (created at the biobank site following management actions) between surrounding native vegetation on more than one compass quarter.
Moderate Score = 8.25	The proposal (development or biobank site) includes vegetation that: • is *not* in low condition, • has an average width of >30 m–100 m, and • links to surrounding native vegetation on more than one compass quarter of the proposal.	At least one moderate connectivity value vegetation link is maintained (following development) or created (created at the biobank site following management actions) between surrounding native vegetation on more than one compass quarter.
Low Score = 5.5	The proposal (development or biobank site) includes vegetation that is in low condition and: • has an average width >100 m, and • links to surrounding native vegetation on more than one compass quarter of the proposal OR The proposal includes vegetation that is *not* in low condition and: • has an average width of >5 m–30 m • links to surrounding native vegetation on more than one compass quarter of the proposal The proposal includes vegetation that: • links to surrounding native vegetation via exotic vegetation with similar structure to the proposal on more than one compass quarter.	At least one low connectivity value vegetation link is maintained (following development) or created (created at the biobank site following management actions) between surrounding native vegetation on more than one compass quarter.
Nil Score = 2.75	The proposal (development or biobank site) includes vegetation that meets none of the above definitions.	No links between vegetation surrounding proposal that meet any of the above criteria will be maintained (following development) or created at the biobank site following management actions.

* Where the proposal includes multiple types of vegetation, choose the highest connectivity value for vegetation within the proposal. Vegetation is linked to surrounding native vegetation if it is ≤100 m from native vegetation that is, in turn, linked to native vegetation not in low condition and ≥1 ha. A gap of >100 m within a proposal means that the vegetation is not linked. Appendix 3 is a guide to the four levels of connectivity value.

Table 5: Criteria for assessing the adjacent remnant area *

Total adjacent remnant area	Percent cleared in the Mitchell Landscape in which most of the proposal occurs			
Value (c)	**<30%**	**30–70%**	**70–90%**	**>90%**
Very large (value = 11pts)	>500 ha	>100 ha	>50 ha	>20 ha
Large (value = 8.25pts)	>200 ha & ≤ 500 ha	>50 ha & ≤ 100 ha	>20 ha & ≤ 50 ha	>10 ha & ≤ 20 ha
Medium (value = 5.5pts)	>100 ha & ≤ 200 ha	>20 ha & ≤ 50 ha	>10 ha & ≤ 20 ha	>1 ha & ≤ 10 ha
Small (value 2.75pts)	> 0 ha & ≤ 100 ha	> 0 ha & ≤ 20 ha	> 0 ha & ≤ 10 ha	> 0 ha & ≤ 1 ha

* Native vegetation not in low condition and linked to the development or biobank sites.

3.3.2 Calculating change in Landscape Value score

Change in Landscape Value score at a development site:

The change in Landscape Value score at the development site is calculated as the difference between the current Landscape Value score and the predicted Landscape Value score after clearing using equation 5.

Equation 5: Ecosystem credits – change (loss) in Landscape Value score at a development site

$$\Delta LV_{Loss} = LV_{current} - LV_{with\ development}$$

where ΔLV_{Loss} is the change in the Landscape Value score of the development site

$LV_{current}$ is the Landscape Value score of development site before clearing

$LV_{with\ development}$ is the Landscape Value score of the development site after clearing

Landscape Value score LV is as determined in equation 4.

Change in Landscape Value score at a biobank site:

The change in Landscape Value score at a biobank site is calculated as the difference between current Landscape Value score and predicted Landscape Value score with management actions using equation 6.

Equation 6: Ecosystem credits – change (gain) in Landscape Value score at a biobank site

$$\Delta LV_{gain} = LV_{with\ mgmt} - LV_{current}$$

where ΔLV_{gain} is the change in Landscape Value score of the biobank site

$LV_{current}$ is the current Landscape Value score of the biobank site

$LV_{with\ mgmt}$ is the Landscape Value score of the biobank site with management actions

Landscape Value score LV is as determined in equation 4.

4 Assessment and Measurement of Threatened Species

The assessment of threatened species is described in this section.

This includes the assessment process for impacts on threatened species for which ecosystem credits are created or required and the assessment process for impacts on threatened species for which species credits are created or required.

4.1 Threatened Species Profile Database

Threatened species are assessed in the methodology using data from the Threatened Species Profile Database. The database is held by DECC, will be publicly available and is routinely amended to take into account new listings of threatened species under the TSC Act and to revise the data as required.

The components of the Threatened Species Profile Database that are used for all threatened species are:

- description of each threatened species, its habitat, ecology and threats
- CMA subregions within which the distribution of each species is associated (the distribution of a species is not associated with a CMA subregion if the species is identified by the database as being vagrant in that subregion)
- vegetation types with which each species is associated
- minimum surrounding vegetation cover class with which the species is associated (used as an initial filter to identify species for assessment)
- minimum **patch size** (hectares) with which the species is associated (used as an initial filter to identify species for assessment)
- the minimum vegetation condition with which the species is associated (being low condition vegetation or moderate to good condition vegetation) (used as an initial filter to identify species for assessment)
- whether an Identified Population of the species occurs within each CMA subregion (used to determine red flag sites)
- the management actions relevant for each species
- the response of the species to a gain in Site Value score and the management of threats within a vegetation zone (the T_G value).
- the class of credit (ecosystem or species) required for the species.

The additional components of the Threatened Species Profile Database that are used in the methodology for threatened species to which ecosystem credits apply are:

- the site attributes with which the habitat for the species is associated.

The additional components of the Threatened Species Profile Database that are used in the methodology for threatened species to which species credits apply are:

- any geographic characteristics that are associated with the occurrence of the species
- any specific habitat features associated with the occurrence of the species
- any threatened species which cannot withstand further loss

- the unit of measurement of impact to be applied for the species (either the number of **individuals** or area of habitat)
- the response of the species to management actions (the M value)
- the months of the year that the species is identifiable through survey.

In exceptional cases, the database may identify a species by two different sets of habitat characteristics. In these instances, the methodology is capable of applying different assessment approaches to different components of the habitat for the same species. For example, the database may identify that the breeding habitat for a cave roosting bat is a red flag area. However, the foraging habitat for the same species is not a red flag area and can be offset with ecosystem credits.

The Director General may certify that **more appropriate local data** can be used instead of data in the Threatened Species Profile Database if the more appropriate local data more accurately reflects local environmental conditions. The Director General must provide reasons for this opinion and publish these reasons on the DECC website.

4.2 Identifying the threatened species that require assessment

The threatened species to be assessed at a site are identified through an initial filtering of all threatened species using five criteria. These filters are used only for determining the species that require assessment and they are not used for assessing biodiversity values.

A threatened species is identified as requiring further assessment in the methodology if all five of the following criteria are met:

1 The distribution of the species includes the CMA subregion in which the development or biobank site is located (as identified in the Threatened Species Profile Database).

2 The species is associated with any one of the vegetation types occurring within the development or biobank site (as identified in the Threatened Species Profile Database).

3 The surrounding vegetation cover class within the 1000 ha assessment circle is equal to or greater than the minimum class specified as being required for that species. The minimum surrounding vegetation cover class required for a species is identified in the Threatened Species Profile Database as <10%, 11–30%, 31–70% or >70% cover.

4 The condition of any vegetation within the development or biobank site that meets the above criteria is equal to or greater than the minimum condition required for that species. The minimum condition required for a species is identified in the Threatened Species Profile Database as being either low condition or moderate to good condition vegetation.

5 The area of patch size, including low condition vegetation, in the development or biobank site is equal to or greater than the minimum patch size specified as required for that species. The minimum patch size required for a species is identified in the Threatened Species Profile Database as <5 ha, >5–25 ha, >25–100 ha or >100 ha.

Threatened species that meet these five criteria require further assessment and are then sorted into species that require either ecosystem credits or species credits.

Species that are identified in the Threatened Species Profile Database as being predictable by habitat surrogates are assessed according to the methodology for ecosystem credits.

Species that are identified in the Threatened Species Profile Database as not being predictable by habitat surrogates are assessed according to the methodology for species credits.

4.3 Assessment of threatened species for ecosystem credits

Threatened species that require ecosystem credits are assessed in conjunction with ecological communities, based on the vegetation type present on the site. The likely impacts on these species from clearing undertaken at the development site and management actions undertaken at the biobank site are measured by the predicted change in site attributes that result from these actions and by the area of land that is impacted.

Because these species have a high likelihood of occurring within a vegetation zone (or combination of zones into a credit profile), a **threatened species survey** is not required.

4.4 Assessment of threatened species for species credits

Threatened species for which species credits are created or required are identified in the Threatened Species Profile Database. Species credits apply to threatened species that have a low likelihood of occurring in a particular patch of the associated vegetation type.

Species that require species credits are assessed within a **species polygon**. A species polygon is a contiguous area of land comprising habitat for a threatened species (being a species to which species credits apply). A species polygon may be for the whole vegetation zone, or for a subsection of the vegetation zone, depending on the specific habitat attributes for the species that are identified in the Threatened Species Profile Database.

The filtering process to identify the species that require species credits is according to the three steps outlined below.

Step 1 – Secondary filtering of threatened species

Threatened species require assessment within a vegetation zone at a development or biobank site if they meet the secondary filtering criteria:

1 whether the development or biobank site contains any specified geographic attributes that are associated with the species that requires species credits in the Threatened Species Profile Database (for some species the database identifies additional information that describes in more detail the geographical location of a species within the CMA subregion)

AND

2 whether the vegetation zone contains habitat features associated with the species, as identified in the Threatened Species Profile Database.

A species that does not meet the secondary filtering criteria (if one or both geographic or habitat characteristics associated with the species are not present on the site) is regarded as not present on the site and does not require further assessment.

A species that is determined as likely to occur at a development or biobank site because of the secondary filtering (the relevant geographic and habitat requirements are present) is further assessed in Step 3.

Step 2 – Assessing for an identified population

An Identified Population is a population present within an area of land that is identified in the Threatened Species Profile Database as being habitat for a particular species for the purposes of requiring or creating credits and for identifying red flag areas.

An assessment of an Identified Population is required where:

- the initial filtering of threatened species indicates that the species is likely to occur within the CMA subregion and vegetation type(s) present at the development or biobank site

AND

- the Threatened Species Profile Database identifies that an Identified Population for the species is located within the CMA subregion at the development or biobank site.

Where both these criteria are met, further assessment is required to determine if any part of the biobank or development site is within the location of an area identified as an Identified Population. The mapped location or criteria for the species is contained in the Identified Populations Database. The Identified Populations Database will be publicly available on the DECC website.

If the development or biobank site *is not within* an Identified Population for a species, then the species is assessed against the secondary filters in accordance with Step 1.

The unit of measurement for fauna is area of habitat, and all land within the Identified Population that comprises native vegetation is determined to be habitat for the purposes of requiring or creating credits. Credits are determined based on this area of habitat within the Identified Population that is impacted. A threatened species survey to determine if habitat of the species is present within this area is not required (although a survey may still be required for areas outside of the Identified Population).

The unit of measurement for flora is the number of individuals, and a threatened species survey to determine the number of individuals to be impacted by development or management actions within the Identified Population is required (a survey may also be required for areas outside the Identified Population). A threatened species survey must be undertaken in accordance with Step 3.

Step 3 – Undertaking a threatened species survey

A threatened species survey is a targeted survey for a species that is undertaken in accordance with any guidelines provided in the BioBanking Operational Manual. The purpose of the survey is to determine if the species is present at the development or biobank site, and if so, either:

- the area of habitat likely to be impacted by development or management actions (for fauna species)

OR

- the number of individuals likely to be impacted by development or management actions (for flora species).

The survey must be undertaken during the time of the year that is suitable for identifying the species, as identified in the Threatened Species Profile Database.

At a development site, a threatened species survey is to be undertaken for a threatened species if the secondary filtering of species undertaken in Step 1 indicates that the species is likely to occur, unless:

- the entire development site is within an Identified Population for the species, being a species for which the unit of measurement of impact is the area of habitat (no surveying is required in this instance), or
- an **Expert Report** has been obtained identifying that the species is unlikely to be present, or
- an Expert Report has been obtained identifying that the species is likely to be present and the number of credits required has been calculated based on the estimated number of individuals or area impacted (section 4.5), or
- the species, being a species for which the unit of measurement of impact is area of habitat, is assumed to be present and the area of habitat impacted is determined in accordance with section 4.7.

The calculation of the number of credits required is based on the area of habitat or number or individuals likely to be impacted by the development.

A survey for threatened species is optional at a biobank site, except where species credits for a particular species are to be created at a biobank site.

The number of credits created at the biobank site is calculated based on the area of habitat or number of individuals likely to be improved by management actions, as determined by:

- a threatened species survey that has been undertaken for a threatened species (being a species to which species credits apply) for which the initial and secondary filtering of species indicates that the species is likely to occur at the site,

OR

- the area of habitat within an Identified Population for a species for which the unit of measurement of impact is the area of habitat (no survey is required).

4.4.1 Mapping and attributing a species polygon

A species polygon is used to identify areas of land where clearing impacts on the species at the development site and where specified management actions are required at a biobank site, to calculate the number of credits at the development site and the biobank site.

The boundary of the species polygon is the area of land subject to the impact of development or management actions, which surrounds the location/s of the species and contains the geographic characteristics and/or specific habitat features associated with that species on the development and biobank sites.

At the development site, a species polygon must be mapped if a threatened species is determined to be present by either:

- a threatened species survey
- an Expert Report
- an assumption that the species is present (based on habitat filters being present on the site)
- an assessment of an Identified Population.

At a biobank site, a species polygon must be mapped if a threatened species is determined to be present by either:

- an assessment of an Identified Population
- a threatened species survey.

A species polygon is attributed with a unit of measurement for the impacts resulting from the development or the management actions. The unit of measurement is either the number of individuals of the species within the species polygon, or the area of habitat (being the area of the species polygon). The Threatened Species Profile Database identifies which unit of measurement of impact is applicable to a species. The unit of measurement for threatened flora species is the number of individuals. The unit of measurement for fauna species is the area of habitat impacted. The assessment process differs depending on which unit of measurement applies.

A species polygon is mapped using aerial imagery made available by DECC.

4.5 Expert Report

An Expert Report is an assessment document prepared by a person accredited by the Director General under 142B (1) (c) of the TSC Act. At the development site, an Expert Report may be obtained instead of undertaking a threatened species survey.

An Expert Report can only be used for species to which species credits apply (i.e. species that cannot be reliably predicted using habitat surrogates) and not for any species to which ecosystem credits apply.

The purpose of the Expert Report is to determine that:

1 the species is unlikely to be present at the development site – in this case no further assessment of the species is required. An Expert Report cannot determine that a species is unlikely to be present if the land is within an Identified Population for that species.

2 the species is likely to be present – in this case the Expert Report must provide an estimate of the number of individuals or area of habitat to be impacted (according to the unit of measurement identified for the species in the Threatened Species Profile Database). The area of the species polygon is to be determined in accordance with section 4.4.1. If an estimate of the number of individuals is required, then the estimate is based on the density of individuals in nearby populations. The number of species credits required for the species at the development site is calculated based on this estimate.

3 the likely presence or non-presence of the species cannot be assessed without a threatened species survey – in this case a threatened species survey must be undertaken in accordance with section 4.4.

An Expert Report must be prepared in accordance with any guidance provided in the BioBanking Operational Manual that accompanies the BioBanking Credit Calculator.

DECC may decide not to accept an Expert Report if it is not prepared in accordance with the guidance provided in the BioBanking Operational Manual.

4.6 Identified Populations

An Identified Population is a population present within an area of land which is identified in the Threatened Species Profile Database as habitat for a particular species. An Identified Population is relevant for the purposes of requiring or creating

credits and for identifying red flag areas. When including Identified Populations in the database, DECC will consider the following criteria:

1 Whether the area of land provides habitat for a threatened species (being a species to which species credits apply) and for which targeted surveying is required to determine the presence of that species. The identification of land under this criterion is only required for species for which the unit of measure is the number of individuals (typically flora) and for species that are particularly difficult to detect or are unlikely to be identified for surveying using the habitat and geographic filters contained in the Threatened Species Profile Database.

2 Whether the area of land provides habitat for a threatened species (being a species to which species credits apply) for the purpose of calculating credits. The identification of land under this criterion is only required for species where the unit of measurement is area of habitat (typically fauna).

3 Whether the area of land provides habitat for a threatened species for the purpose of identifying red flag areas. The identification of land under this criterion is only permitted if the population is considered significant for the long term persistence of the species within the CMA subregion (i.e. a species that cannot withstand further loss as listed in the Threatened Species Profile Database).

An assessment of Identified Populations is required as specified in section 4.4.

There are two types of Identified Populations, determined according to the type of credit and the unit of measurement of impact identified for the species in the Threatened Species Profile Database. Where the unit of measurement is the number of individuals, a threatened species survey is required to determine the number of credits that are required or created. The types of Identified Populations are defined in Table 6.

Table 6: Types of Identified Populations

Type of Identified Population	Class of credit applying to the species	Unit of measurement of impact applying to the species	Is the Identified Population a red flag area?	Is a threatened species survey required to determine the number of credits required or created?
1	Species	Area of habitat	Yes	No
2	Species	No. of individuals	Yes	Yes

4.7 Assumed presence of fauna species

Where the development site contains any of the specified geographic attributes and habitat features associated with a fauna species, the species may be assumed to be present instead of undertaking a threatened species survey or obtaining an Expert Report, as indicated in section 4.4.

Where a species is assumed to be present, the location and area of the species polygon is determined in accordance with section 4.4. The calculation of the number of species credits required at the development site is based on this area of habitat (being the area of the species polygon).

5 Calculating Ecosystem Credits and Species Credits

This section provides the rules for calculating the number and type of ecosystem credits and species credits that are required in relation to impacts at a development site or created in relation to improving a biobank site.

5.1 Calculating ecosystem credits

The number of ecosystem credits for ecological communities required at a development site or created at a biobank site is determined by summing the credits from each vegetation zone in the site. Credit profiles are created for individual zones, except where there is more than one zone of the same vegetation type in moderate to good condition. Where this occurs, the zones for a vegetation type in moderate to good condition are combined for the credit profile.

Ecosystem credits for calculating change in ecological communities are determined by using equation 7 at a development site and equation 8 at a biobank site.

Equation 7: Ecosystem credits required at a development site for ecological communities

Number of Ecosystem Credits (Part 1) required for a vegetation zone at a development site

$$= (\Delta S_{loss} \times A_{loss}) + (\%\Delta LV_{loss} \times A_{loss})$$

Equation 8: Ecosystem credits created at a biobank site for ecological communities

Number of Ecosystem Credits (Part 1) created for a vegetation zone at a biobank site

$$= [(S_{current}/10) + \Delta S_{gain} \times A_{gain})] + (\%\Delta LV_{gain} \times A_{gain})$$

where $S_{current}$ is the current Site Value score of the vegetation zone as defined by equation 1

ΔS_{loss} is the change (loss) in the Site Value score of a vegetation zone at the development site, as defined by equation 2

$\%\Delta LV_{loss}$ is the proportion of the total landscape change (loss) score for the development site as determined by equation 5, apportioned to the vegetation zone

A_{loss} is the area in hectares of the vegetation zone at the development site

ΔS_{gain} is the change (gain) in the Site Value score of the vegetation zone at the biobank site, as defined by equation 3

$\%\Delta LV_{gain}$ is the proportion of the total landscape gain score for the biobank site, as determined by equation 6, apportioned to the vegetation zone

A_{gain} is the area in hectares of the vegetation zone at the biobank site.

5.2 Calculating ecosystem credits for threatened species

A calculation of ecosystem credits for threatened species must be undertaken if a threatened species that requires ecosystem credits is likely to use land within a vegetation zone at the development site. A threatened species is determined to be likely to use land within a vegetation zone if it meets the five criteria used in filtering for the species in section 4.2.

Ecosystem credits for threatened species calculations are based on the site attributes associated with the habitat of the species, as identified in the Threatened Species Profile Database. Losses in site attributes are averaged across all attributes reduced by the clearing as shown in equation 9.

Equation 9: Ecosystem credits – determining the change (loss) in Site Value score for a threatened species

$$\Delta S_{L\ spp1} = \left(\frac{a_{vc} - a_{vf}}{3} \right) \times 100$$

where $\Delta S_{L\ spp1}$ is the change (loss) in the Site Value score for site attributes that are relevant to Species 1, which is the species that is predicted to use land within the vegetation zone and which requires the greatest number of credits.

a_{vc} is the average of all current attribute scores (maximum value for each attribute is 3) for the vth site attributes (a–j) as defined in Table 1, where the vth attributes are identified in the Threatened Species Profile Database as being attributes that are associated with the habitat of Species 1

a_{vf} is the average of the future attribute scores (maximum value for each attribute is 3) for the vth site attributes (a–j) as defined in Table 1, where the vth attributes are identified in the Threatened Species Profile Database as being attributes that are associated with the habitat of Species 1.

Note: The maximum site loss score is 100, which is proportionally reduced if the critical site attributes do not start in the highest condition, or are not reduced to zero following the impacts of the development.

The number of ecosystem credits for a threatened species is then calculated separately for each threatened species that is likely to use land within the vegetation zone using equation 10 below.

Once the credit requirements for each threatened species that is likely to use land within a vegetation zone has been calculated, the number of ecosystem credits for threatened species required at a development site is based on the species with the highest credit requirements.

The number of credits required for the threatened species is weighted by the predicted response of the species to gain in Site Value and to management actions (T_G) on the biobank site.

Equation 10: Ecosystem credits at the development site by zone

$$\text{Ecosystem credits required for a vegetation zone at the development site} = \left\{ \left(\frac{\Delta S_{\text{loss spp1}} \times A_{\text{loss}}}{T_{G\ \text{spp1}}} \right) + (\%\Delta LV_{\text{loss}} \times A_{\text{loss}}) \right\}$$

where $\Delta S_{\text{loss spp1}}$ is the change (loss) in the score of the particular site attributes that are relevant to the habitat requirements of Species 1, as determined by equation 9. Species 1 is the species that is predicted to use land within the vegetation zone and which requires the greatest number of credits.

$\%\Delta LV_{\text{loss}}$ is the proportion of the landscape change (loss) score for the development site as determined by equation 5, apportioned to the vegetation zone.

$T_{G\ \text{spp1}}$ is the response of Species 1 to gain in Site Value and to management actions, as identified in the Threatened Species Profile Database. $T_{G\ \text{spp1}}$ is a value identified for each species in the Threatened Species Profile Database and has values between 0.1 and 1.

A_{loss} is the area in hectares of the vegetation zone.

5.3 Final calculation of ecosystem credits at a development site

The final calculation of ecosystem credits for a vegetation zone required at a development site or created at a biobank site is undertaken by comparing the number of ecosystem credits required for ecological communities with the number required for threatened species. The final number of ecosystem credits is based on the highest number of credits required for that zone using equation 11.

The number of ecosystem credits at both the development and biobank sites are scaled by a factor of 0.25. The number of credits is then rounded to the nearest whole number using conventional rounding rules, except if the number is less than one, in which case the number of credits is one.

The total number of ecosystem credits required for the entire site is determined by the summing all vegetation zones on the site as shown in equation 11.

Equation 11: Ecosystem credits – final credit calculations at the development site

$$\text{Total ecosystem credits required at the development site} = \sum_{i=1}^{n} \left(\text{Ecosystem credits required for vegetation zone } i \text{ at the development site} \right)$$

a) If $(\Delta S_{\text{loss}} + \%\Delta LV_{\text{loss}}) \geq \left(\frac{(\Delta S_{\text{loss spp1}})}{T_{G\ \text{spp1}}} \right) + \%\Delta LV_{\text{loss}}$ for vegetation zone *i*, then

$$\left(\begin{array}{c}\text{Ecosystem credits required for vegetation zone } i \text{ at the development site}\end{array}\right) = \left\{\left[(\Delta S_{loss} \times A_{loss}) + (\%\Delta LV_{loss} \times A_{loss})\right] \times 0.25\right\}$$

b) If $(\Delta S_{loss} + \%\Delta LV_{loss}) < \left(\frac{(\Delta S_{loss\ spp1})}{T_{G\ spp1}}\right) + \%\Delta LV_{loss}$ for vegetation zone *i*, then

$$\left(\begin{array}{c}\text{Ecosystem credits required for vegetation zone } i \text{ at the development site}\end{array}\right) = \left\{\left(\frac{\Delta S_{loss\ spp1} \times A_{loss}}{T_{G\ spp1}}\right) + (\%\Delta LV_{loss} \times A_{loss}) \times 0.25\right\}$$

where *i* is the *i*th vegetation zone to be impacted at the development site

ΔS_{loss} is the change (loss) in the Site Value score of a vegetation zone at the development site as defined by equation 2

$\%\Delta LV_{loss}$ is the proportion of the change (loss) in the overall Landscape Value score for the development site as determined by equation 5 apportioned to the vegetation zone

$\Delta S_{loss\ spp1}$ is the change (loss) in Site Value score that is relevant for Species 1, as determined by equation 10. Species 1 is the species that is predicted to use land within the vegetation zone and which requires the greatest number of credits.

$T_{G\ spp1}$ is the response of Species 1 to gain in Site Value and to the management actions, as identified for the species in the Threatened Species Profile Database. $T_{G\ spp1}$ is a value identified for each species in the Threatened Species Profile Database and has values between 0.1 and 1.

A_{loss} is the area in hectares of the *i*th vegetation zone.

5.4 Final calculation of ecosystem credits at a biobank site

At the biobank site, the total number of ecosystem credits required is determined by summing the credits created for each vegetation zone as a result of the management actions carried out or proposed to be carried out using equation 12.

The number of ecosystem credits at the development and biobank sites is scaled by a factor of 0.25. The number of credits is rounded to the nearest whole number using conventional rounding rules, except if the number is less than one, in which case the number of credits is one.

Equation 12: Ecosystem credits – final credit calculations at a biobank site

$$\text{Number of ecosystem credits created at a biobank site} = \sum_{i=1}^{n} [(S_{current}/10) + \Delta S_{gain} \times A_{gain})] + (\%\Delta LV_{gain} \times A_{gain}) \times 0.25$$

where *i* is the *i*th vegetation zone to be managed at the biobank site

$S_{current}$ is the current Site Value score of a vegetation zone at the biobank site, as defined by equation 1

ΔS_{gain} is the change (gain) in the Site Value score of a vegetation zone at the biobank site, as defined by equation 3

$\%\Delta LV_{gain}$ is the proportion of the total landscape gain score for the biobank site, as determined by equation 6, apportioned to the vegetation zone

A_{gain} is the area in hectares of the *i*th vegetation zone.

5.5 Number of species credits required at a development site

The species to which the calculation of species credits applies are identified through the assessment process in section 4.4.

The number of species credits required at the development site is calculated for individual species based on the area of habitat or number or individuals likely to be impacted by development within a species polygon using equation 13.

The number of species credits at both the development and biobank sites are scaled by a factor of 10. The number of credits is rounded to the nearest whole number using conventional rounding rules, except if the number being rounded is less than one, in which case the number of credits is rounded to one.

Equation 13: Species credits – number of credits required at the development site

$$\text{Number of species credits required for a threatened species at the development site} = \frac{H_{loss}}{M} \times 10$$

Where the Threatened Species Profile Database indicates that the unit of measurement of impact for a species is the area of habitat (mostly fauna), then:

H_{loss} is the area of habitat in hectares to be impacted at the development site, as determined in accordance with section 4.4

M is the response of the threatened species to management actions, as identified for the species in the Threatened Species Profile Database.

The scaling factor of 10 applies on both development and biobank sites.

Where the Threatened Species Profile Database indicates that the unit of measurement of impact for a species is the number of individuals (mostly flora), then:

H_{loss} is the number of individuals to be impacted at the development site, as determined in accordance with section 4.4.

M is the response of the threatened species to management actions, as identified for the species in the Threatened Species Profile Database

The scaling factor of 10 applies on both development and biobank sites.

5.6 Number of species credits created at a biobank site

The number of species credits created at the biobank site is calculated for individual species based on the area of habitat or number of individuals of a threatened species likely to be impacted positively by management actions within a species polygon using equation 14.

Equation 14: Species credits – number of credits created at the biobank site

Number of species credits created for a species at the biobank site	=	H_{gain} x 10

Where the Threatened Species Profile Database indicates that the unit of measurement of impact for a species is the area of habitat (mostly fauna), then:

H_{gain} is the area of habitat in hectares for the species to be impacted by the management actions at the biobank site, as determined in accordance with section 4.4

Where the Threatened Species Profile Database indicates that the unit of measurement of impact for a species is the number of individuals (mostly flora), then:

H_{gain} is the number of individuals of the species to be impacted by the management actions at the biobank site, as determined in accordance with section 4.4.

The scaling factor of 10 applies on both development and biobank sites.

6 Credit Profiles and Offset Rules for using Credits

A credit profile is a set of attributes that characterise the credit based on the vegetation type and the threatened species related to the vegetation zone (or group of zones where the individual zones are of one vegetation type and not in low condition) in which the credits are created. The credit profile forms part of the offset rules for using credits. This is to ensure that vegetation is offset by vegetation that is equally or more cleared and within the same vegetation formation, and that threatened species impacted at the development site are offset at biobank sites that provide suitable habitat within the geographic distribution of affected species.

6.1 Credit profile for ecosystem credits

The credit profile of an ecosystem credit contains five attributes which predict the presence of the threatened species for which habitat is being improved. These attributes relate to the CMA subregion, the vegetation type, the vegetation formation, the percent native vegetation cover in the landscape and the patch size, including low condition vegetation, that is required at the biobank site.

6.1.1 Credit profile at a development site

The credit profile for an ecosystem credit required at the development site is determined for a **group of credits**. A group of credits is one or more credits that have an identical credit profile.

At the development site, ecosystem credits are grouped for all vegetation zones with the same vegetation type and not in low condition. For example, if the development involves two different vegetation types, then the methodology calculates two groups of ecosystem credits. Two zones with the same vegetation type but in different condition within the moderate to good range are combined to have the same credit profile.

The credit profile attributes of an ecosystem credit at the development site are identified in Table 7.

Table 7: Attributes of the credit profile of an ecosystem credit at the development site

Credit profile attribute	Description
1 CMA subregion	one or more CMA subregions within which the required credit must be obtained and retired
2 Vegetation type	one or more vegetation types in which the required credit must be obtained and retired
3 Vegetation formation	the vegetation formation in which the credit must be obtained and retired
4 Surrounding vegetation cover	the surrounding vegetation cover class in which the required credit must be obtained and retired. This is either 0–10%, 11–30%, 31–70% or >70%.
5 Patch size, including low condition vegetation	The minimum patch size, including low condition vegetation, class in which the required credit must be obtained and retired. This is either <5 ha, 5–25 ha, >25–100 ha or >100 ha.

The credit profile attributes are determined in accordance with the following subsections.

Credit Profile Attribute 1: CMA subregion

Attribute 1 consists of one or more CMA subregions which are common to the geographic distribution of all the threatened species (to which this type of credit applies) that are predicted to be impacted within the vegetation zone(s) where the development occurs. If, for example, all the threatened species that are predicted to be impacted only occur within a single CMA subregion (being the subregion in which the development occurs), then the group of credits must be obtained and retired within this single CMA subregion. Alternatively, if the threatened species (or threatened ecological communities) predicted to be impacted upon by the development occur in a number of CMA subregions (including in different CMAs), then the group of credits can be obtained and retired in any of these subregions.

If no threatened species that require ecosystem credits are predicted to be impacted in the vegetation zone(s) to which the group of credits applies, then ecosystem credits can be obtained in any vegetation type in the same formation that is equally or more cleared than the vegetation type(s) being cleared within the CMA where the development occurs.

Credit Profile Attribute 2: Vegetation type

Attribute 2 consists of one or more vegetation types which:

1 are identified in the Threatened Species Profile Database as providing habitat for all the threatened species (to which this type of credit applies) that are identified as likely to occur[1] in the vegetation type to which the group of credits apply

2 have a percent cleared value in the CMA equal to or greater than the percent cleared value of the vegetation type in the CMA to which the group of credits apply.

For example, if all the threatened species predicted to be impacted by the development occur in a single vegetation type, then the group of credits must be obtained and retired within this single vegetation type. Alternatively, if the threatened species occur in a number of vegetation types, then attribute 2 contains each of these vegetation types (if the percent cleared value of the vegetation type is equal to or greater than that of the vegetation to be cleared). The group of credits can then be obtained and retired in one or more of these vegetation types.

If no threatened species that require ecosystem credits are predicted to be impacted in the vegetation zone(s) to which the group of credits applies, then ecosystem credits can be obtained in any vegetation type in the CMA that is in the same formation and has a percent cleared value in the CMA equal to or greater than the percent cleared value of the vegetation type in the CMA to which the group of credits applies.

Credit Profile Attribute 3: Vegetation formation

Attribute 3 is the vegetation formation under which the vegetation type is classified.

[1] A threatened species is determined to be likely to occur in a vegetation type by applying the initial filtering of species described in Section 4.2 to all vegetation polygons containing that vegetation type.

Credit Profile Attribute 4: Surrounding vegetation cover

Attribute 4 is the minimum surrounding vegetation cover which all threatened species to be impacted to which the group of credits applies can occupy as determined by the Threatened Species Profile Database. The surrounding vegetation cover classes are 0–10%, 11–30%, 31–70%, and >70% cover.

Credit Profile Attribute 5: Patch size, including low condition vegetation

Attribute 5 is the minimum class of patch size, including low condition vegetation in which all threatened species to be impacted within the vegetation type (to which the group of credits applies) can occupy, as determined by the Threatened Species Profile Database. The minimum patch size, including low condition vegetation, classes are <5 ha, 5–25 ha, >25–100 ha, or >100 ha.

6.1.2 Credit profile at a biobank site

The credit profile for an ecosystem credit created at a biobank site is determined for each vegetation zone (or group of zones where these are of the same vegetation type and not in low condition) that is to be positively impacted by management actions. Credits with the same profile are grouped after the credit profile has been assigned.

The attributes in the credit profile of an ecosystem credit at the biobank site are identified in Table 8.

Table 8: Attributes of the credit profile of an ecosystem credit at the biobank site

Credit profile attribute	Description
1 CMA subregion	the CMA subregion in which the credit is created
2 Vegetation type	the vegetation type in which the credit is created
3 Vegetation formation	the vegetation formation in which the credit is created
4 Surrounding vegetation cover	the surrounding vegetation cover in which the credit is created, with classes 0–10%, 11–30%, 31–70% or >70%.
5 Patch size, including low condition vegetation	the minimum patch size, including low condition vegetation, class in which the credit is created, with classes <5 ha, 5–25 ha, >25–100 ha or >100 ha.

The number of credits created with their credit profile at a biobank site is listed in a public register held by DECC for use by anyone seeking to obtain and retire ecosystem credits.

6.2 Credit profile for species credits

The credit profile of a species credit relates only to the species for which the credit is required or created.

6.3 Offset rules for using credits

6.3.1 Offset rules for ecosystem credits

A biobanking statement can only be issued in respect of a proposed development at a development site if the Director General determines that the proposed development will improve or maintain biodiversity values. The biobanking statement will specify the number and class of credits that must be retired in order to meet the improve or maintain test. The number and class of credits obtained from a biobank site must be compatible with those required at a development site by the biobanking statement.

The ecosystem credits retired from a biobank site are determined to be compatible with those required at the development site if all of the following conditions are met:

1 The number of ecosystem credits obtained and retired from the biobank site is equal to or greater than the number required at the development site, calculated by equation 11.

2 The CMA subregion identified in attribute 1 of the credit profile at the biobank site is the same as a subregion identified in attribute 1 of the credit required at the development site.

3 The vegetation type identified in attribute 2 of the credit profile at the biobank site is the same as a vegetation type identified in attribute 2 of the credit required at the development site.

4 The vegetation formation identified in attribute 3 of the credit profile at the biobank site is the same as the vegetation formation identified in attribute 3 of the credit required at the development site.

5 The surrounding vegetation cover class identified in attribute 4 of the credit profile at the biobank site is equal to or greater than the surrounding vegetation cover class in the landscape identified in attribute 4 of the credit required at the development site.

6 The patch size, including low condition vegetation, class identified in attribute 5 of the credit profile at the biobank site is equal to or greater than the patch size, including low condition class identified in attribute 5 of the credit required at the development site.

6.3.2 Offset rules for species credits

The credit profile of a species credit retired at a biobank site is determined to be compatible with a credit at a development site if the credit profile at both sites refers to the same threatened species.

6.4 Environmental contributions

Section 127B(7) of the TSC Act allows the number of biodiversity credits required to be retired to offset a development to be reduced where consideration is made in account of an environmental contribution that is required in respect of that development.

Environmental contributions may also be taken into account in the provisions for variation of red flags in accordance with section 2.3. If this has occurred, the Director General of DECC may decide that it is not necessary to take the environmental contributions into account in the number of credits required to be retired to offset the development.

The number of credits required for a development (being a development to which an environmental contribution applies) is determined in accordance with the following four steps.

Step 1: Identifying parts of the environmental contribution that are relevant

Only the parts of an environmental contribution that are relevant to the reduction of the number of credits required at a development site may be considered. The Director General may reduce the number of credits if the environmental contribution has resulted, or will result, in land being managed for improved biodiversity values in perpetuity to a standard comparable to that applied at a biobank site (as determined by the Director General).

Step 2: Calculating the number of credits that are equivalent to the relevant actions

The credits attributable to the environmental contribution (through the relevant actions identified in Step 1) are to be assessed as follows:

- if the contribution involves specific lands – use the methodology to determine the number and type of credits created on the land as if the land were to be established as a biobank site
- if the contribution involves the provision of funding for the purposes of managing land for improved biodiversity values yet to be specifically identified – establish an estimate of the area of land that is consistent with the credit profile that could be improved with the environmental contribution. The methodology is then used to determine the number and type of credits created on the land as if the land were to be established as a biobank site.

The method of pricing the environment contribution based on the estimated number of credits created is to be endorsed by the Director General.

Step 3: Calculating the total number of credits that are required as a result of development impacts

The methodology is applied to the development site to determine the number and type of credits required as a result of the development impacts and as if the environmental contribution was not required.

Step 4: Calculating the revised number of credits required to offset development taking the environmental contribution into account

The revised number of credits required to offset the development (if any) is calculated by subtracting the number of credits that are equivalent to the relevant actions in Step 2 from the number of credits required as a result of the development impacts in Step 3. A credit described in Step 2 can only be subtracted from the credits required in Step 3 if it has a credit type and profile that is compatible with the credit required in Step 3.

6.5 Deferred retirement arrangements

Under section 127ZT of the TSC Act, the Director General may approve a **deferred retirement arrangement** for a development that will restore or improve the biodiversity values affected by the development. A deferred retirement arrangement enables the Minister for Climate Change, Environment and Water to hold biodiversity credits until restorative actions have been undertaken. The former holder of the credits may apply to the Director General of DECC for the return transfer of the credits on the completion of the restorative actions. The Director General of DECC must determine any such application in accordance with the requirement of this methodology.

The number and class of biodiversity credits that may be transferred back to a former holder of biodiversity credits (or to any person who acquires the rights of a former holder to apply for such a transfer) on completion of those restorative actions are, in the opinion of the Director General, the number and type of credits that could be created if the development site and the restorative actions were assessed as a biobank site in accordance with the methodology. The maximum number and class of credits that may be returned to the former holder is the number and class of credits that are held by the Minister under the deferred retirement arrangement.

Glossary

assessment circle A circle of 1000 ha in which percent native vegetation cover in the landscape is assessed, taking into account both cover and condition of vegetation, for credit profiles and for Landscape Value score.

benchmarks (vegetation benchmarks) Quantitative measures of the range of variability in vegetation where there is relatively little evidence of modification by humans since European settlement. Benchmarks are defined for specified variables by vegetation community. Vegetation with relatively little evidence of modification generally has minimal timber harvesting (few stumps, coppicing, cut logs), minimal firewood collection, minimal exotic weed cover, minimal grazing and trampling by introduced or overabundant native herbivores, minimal soil disturbance, minimal canopy dieback, no evidence of recent fire or flood, not subject to high frequency burning, and evidence of recruitment of native species. Benchmarks are currently available by vegetation class (*sensu* Keith 2004)* at http://www.nationalparks.nsw.gov.au/npws.nsf/Content/*BioMetric*_tool.

biobanking agreement An agreement between the landowner and the Minister for Climate Change, Environment and Water (under Part 7A of the TSC Act) for the purpose of establishing a biobank site. The agreement states the management actions to be carried out to improve biodiversity values on the site and thereby create biodiversity credits under the scheme (section 127D of the TSC Act).

biobank site Land subject to a biobanking agreement.

BioBanking Credit Calculator A computer program that applies the methodology and calculates the number and classes of credits required at a development site or created at a biobank site.

BioBanking Operational Manual The description of how to use the BioBanking Credit Calculator with guidelines for surveys.

biobanking statement A statement of the number and class of credits to be retired for a particular development in accordance with the methodology, which may include other conditions to minimise the impact of the development on biodiversity values.

biodiversity credits Ecosystem or species credits that are required for the loss of biodiversity values in relation to the impacts of development or are created for management actions that have been carried out or are proposed to be carried out on or in respect of biobank sites that improve biodiversity values.

biodiversity values These include the composition, structure and function of ecosystems, and include (but are not limited to) threatened species, populations and ecological communities and their habitats, as defined by the TSC Act and, in the methodology, excluding fish or marine vegetation, unless that fish or marine vegetation has been the subject of an order under section 5A of the TSC Act.

CMA area The area of operation of a Catchment Management Authority, as described in Schedule 2 of the *Catchment Management Authorities Act 2003*.

CMA subregion Subregions of CMA areas as set out in the Environmental Outcomes Assessment Methodology, Native Vegetation Regulation 2005.

connectivity A measure of the extent to which areas of native vegetation are linked with other areas of native vegetation.

credit profile A description of the credit created or required in a vegetation zone or group of zones, according to the attributes of CMA subregion, vegetation type, vegetation formation, surrounding vegetation cover, and patch size including low condition.

deferred retirement arrangement An arrangement under section 127ZT of the TSC Act which enables the Minister for Climate Change, Environment and Water to hold biodiversity credits until restorative actions have been undertaken at a development site.

development Defined within the meaning of the *Environmental Planning and Assessment Act 1979* and includes development under Part 4, and an activity under Part 5 (see section 127(1) of the TSC Act). It may also include projects under Part 3A where the Planning Minister imposes credit retirement conditions or adopts a biobanking statement.

development site An area of land that is subject to a proposed development for which a biobanking statement is sought or obtained.

ecological community An assemblage of species occupying a particular area. Native vegetation is used as a surrogate for ecological communities in the methodology.

ecological viability The ability of biodiversity values in an area to persist for many generations or long time periods.

ecosystem credits Biodiversity credits for ecological communities and some threatened species, i.e. for biodiversity values except threatened species or populations that require species credits.

environmental contribution A contribution for the conservation or enhancement of the natural environment, as defined in section 127B(10) of the TSC Act.

Expert Report A report prepared by a person accredited by the Director General of DECC under section 142B(1)(c) of the TSC Act.

foliage cover The percentage of ground that would be covered by a vertical projection of the foliage and branches.

grassland Native vegetation classified in the vegetation formation Grasslands in Keith (2004)*. Grasslands are generally dominated by large perennial tussock grasses, a lack of woody plants, the presence of broad-leaved herbs in inter-tussock spaces, and their ecological association with fertile, heavy clay soils on flat topography in regions with low to moderate rainfall.

group of credits Credits that have an identical credit profile.

habitat An area or areas occupied, or periodically or occasionally occupied, by a species, population or ecological community, including any biotic or abiotic component.

habitat surrogates Measures of the spatial extent of biodiversity; in the methodology they are CMA subregion, vegetation type, surrounding vegetation cover, vegetation condition and patch area, including low condition vegetation.

herbfield Native vegetation which predominantly does not contain an over-storey or mid-storey and where the ground cover is dominated by non-grass species.

Identified Population A population present within an area of land identified in the Threatened Species Profile Database as habitat for a particular species. The location of an Identified Population is contained in the Identified Populations Database.

Identified Populations Database A database which contains information such as a map or criteria that describe the location of an Identified Population. The Identified Populations Database will be publicly available on the DECC website.

individual A single, mature organism.

Landscape Value A measure of fragmentation, connectivity and adjacency of native vegetation at a site. Landscape Value comprises: 1) percent native vegetation cover in the 1000 ha assessment circle(s) in which the development or biobank sites are located; 2) connectivity with surrounding vegetation; and 3) total adjacent remnant area.

low condition vegetation Woody native vegetation with native over-storey percent foliage cover less than 25% of the lower value of the over-storey foliage cover benchmark for that vegetation type, and

- less than 50% of vegetation in the ground layer is indigenous species, or
- greater than 90% of vegetation in the ground layer is cleared.

Native grassland, wetland or herbfield where:

- less than 50% of vegetation in the ground layer is indigenous species, or
- more than 90% of vegetation in the ground layer is cleared.

If native vegetation is not in low condition, it is in moderate to good condition.

Mitchell Landscape Landscapes which are relatively homogeneous in terms of geomorphology, soils and broad vegetation types, mapped at a scale of 1:250,000.

moderate to good condition vegetation Native vegetation that is not in low condition, as defined in section 2.1.1.

more appropriate local data Data that more accurately reflects local environmental conditions as certified by the Director General of DECC in relation to the Vegetation Benchmarks Database, the Vegetation Types Database and the Threatened Species Profile Database.

native vegetation Vegetation described in section 6 of the *Native Vegetation Act 2003*. Native vegetation is used as a surrogate for ecological communities in the methodology.

offset rules Circumstances in which credits can be used (retired) for a development to improve or maintain biodiversity values.

patch size Native vegetation in moderate to good condition where the separation between different areas is not greater than 100 m.

patch size, including low condition vegetation Native vegetation including low condition and moderate to good condition where the separation between different areas is not greater than 100 m.

percent cleared The percentage of a vegetation type that has been cleared within a CMA area as a proportion of its pre-European extent, as identified in the Vegetation Types Database.

percent foliage cover *see* foliage cover

percent vegetation cover (percent native vegetation cover in the landscape, surrounding vegetation cover) The percentage of native vegetation cover in the 1000 ha assessment circle in which the vegetation zone is located. The percent native vegetation cover within the assessment circle is visually estimated, taking into account both cover and condition of vegetation

plot An area in which some of the 10 site attributes that make up the Site Value score are assessed in a vegetation zone.

red flag area An area of land at the development site where the impact of the development on biodiversity values cannot be offset by the retirement of biodiversity credits in order to improve or maintain biodiversity values, unless there is an approved variation to the red flag area.

reference sites Relatively unmodified sites used to obtain local benchmark information where appropriate benchmarks are not available in the Vegetation Benchmarks Database for the vegetation type.

retirement of biodiversity credits A change in the status of a credit such that the credit can no longer be bought or sold. Retirement of credits may be required to comply with a biobanking statement or a direction issued by the Minister for Climate Change, Environment and Water, or they may be retired voluntarily.

site attributes Used to assess Site Value and threatened species habitat. The ten site attributes are native plant species richness, native over-storey cover, native mid-storey cover, native ground cover (grasses), native ground cover (shrubs), native ground cover (other), exotic plant cover (as a percentage of total ground and mid-storey cover), number of trees with hollows, proportion of over-storey species occurring as regeneration, and total length of fallen logs.

Site Value A quantitative measure of structural, compositional and functional condition of native vegetation, dependent on site attributes, multiplied by the area of the zone.

species that cannot withstand any loss In general, a species was identified as not being able to withstand any loss within a CMA area if the species was known to occur in less than three populations within that CMA area.

species credits Biodiversity credits for threatened species that cannot be reliably predicted to use an area of land based on habitat surrogates; species that require species credits are listed in the Threatened Species Profile Database.

species polygon The area of habitat, or number of individuals of a threatened species, impacted by clearing at the development site or by management actions at the biobank site.

surrounding percent vegetation cover *see* percent vegetation cover.

surrounding vegetation cover *see* percent vegetation cover.

threatened ecological community Defined in section 4 of the TSC Act.

threatened population Defined in section 4(1) of the TSC Act.

threatened species Threatened species and populations, as these terms are defined in section 4(1) of the TSC Act.

Threatened Species Profile Database This database contains information on habitat characteristics, range, response to management actions, survey requirements, and any red flag areas. It is used for calculation of ecosystem or species credits, filtering to determine the likely presence of threatened species, information on threatened species ability to withstand loss, and determining threatened species response to management.

threatened species survey A targeted survey for a threatened species undertaken in accordance with DECC guidelines to determine if the species is present.

total adjacent remnant area An area of moderate to good condition native vegetation of which the biobank site or development site is a part, which is less than 100 m from the next area of moderate to good native vegetation. Total adjacent remnant area provides landscape context to the biobank or development site, and may extend onto adjoining land.

transect A line or narrow belt along which environmental data are collected.

Vegetation Benchmarks Database A database of benchmarks for vegetation classes and some vegetation types. Vegetation benchmarks can also be collected from reference sites.

vegetation class An intermediate level of vegetation classification as defined in Keith (2004)*. There are 99 vegetation classes in NSW.

vegetation formation A broad level of vegetation classification as defined in Keith (2004)*. There are 12 vegetation formations in NSW.

vegetation type The finest level of classification of native vegetation used in the methodology. Vegetation types are assigned to vegetation classes, which in turn are assigned to vegetation formations. There are approximately 1600 vegetation types within NSW.

Vegetation Types Database A database which contains the information on each vegetation type used in the methodology and which comprises a description of each vegetation type, its class and formation; the CMA area within which the vegetation type occurs; the percent cleared value of the vegetation type; and the source of the information.

vegetation zone (zone) A relatively homogenous area in proposal area that is the same vegetation type and broad condition state. A single zone must not contain a mix of vegetation in low condition and not in low condition. Zones with the same vegetation type and in moderate to good condition (i.e. not in low condition) may be combined within one ecosystem credit profile. A zone may comprise one or more discontinuous areas, which may be mapped separately.

wetland Native vegetation classified in the vegetation formation defined as Freshwater Wetland in Keith (2004)*.

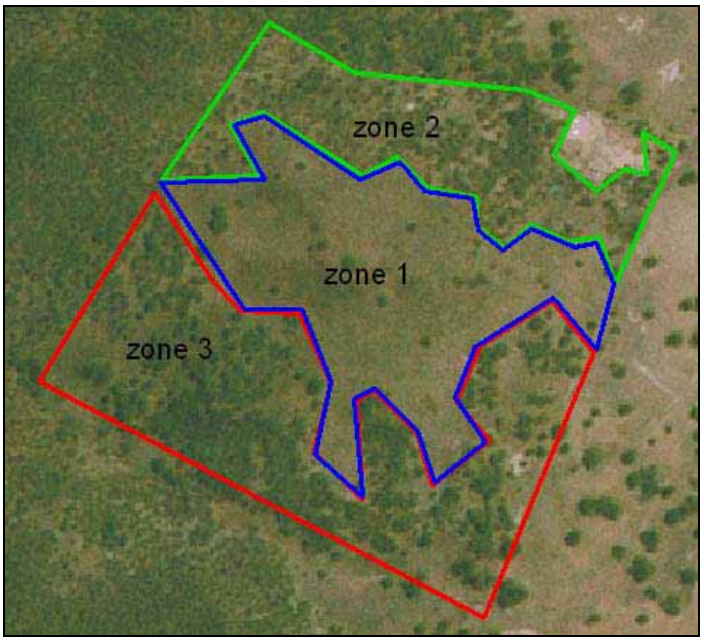
woody native vegetation Native vegetation that contains an over-storey and/or mid-storey that predominantly consists of trees and/or shrubs.

zone *see* vegetation zone.

* Keith, D. (2004) *Ocean shores to desert dunes: the native vegetation of New South Wales and the ACT*. Department of Environment and Conservation (NSW). Hurstville, NSW.

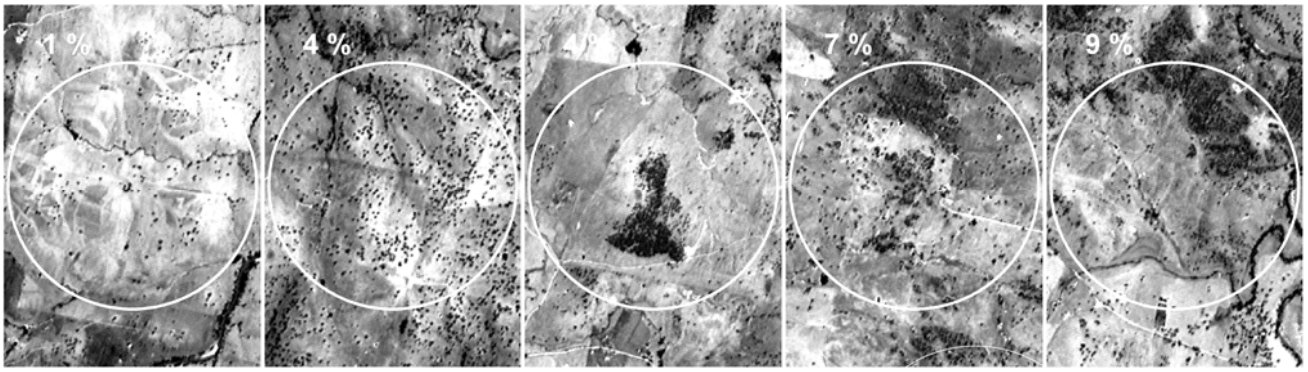
Appendix 1 Examples of vegetation zones

Below is an example of how a development site or biobank site should be stratified into relatively homogeneous vegetation zones before commencing the assessment. This proposal has been stratified into three zones: zone 1, bounded by blue, is largely cleared and in low condition and was determined to be a single vegetation type; zone 2, bounded by green, is a distinct vegetation type that is in a broadly uniform condition state; and zone 3, bounded by red, is the same vegetation type as in zone 1, but is in a different condition state, i.e. it is in moderate to good condition.

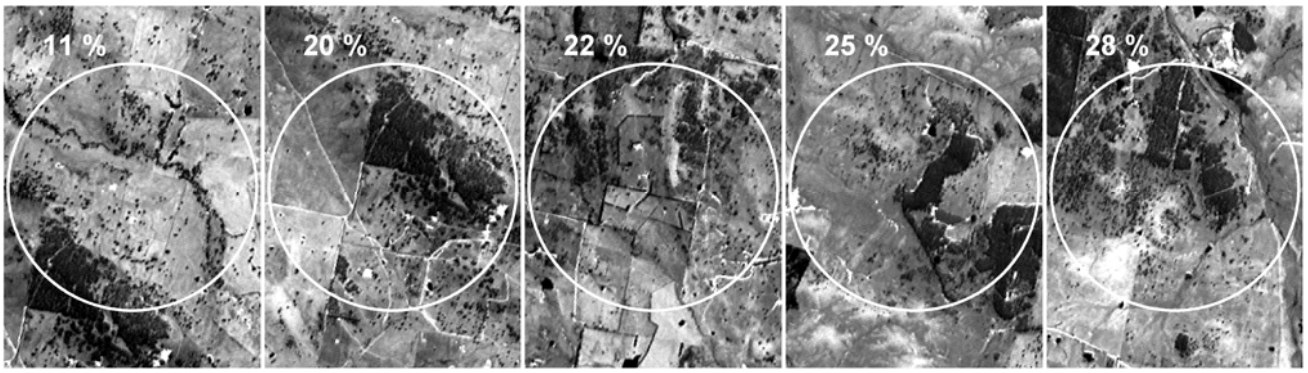


Appendix 2 Guide for estimating percent native vegetation cover (surrounding vegetation cover) in the landscape

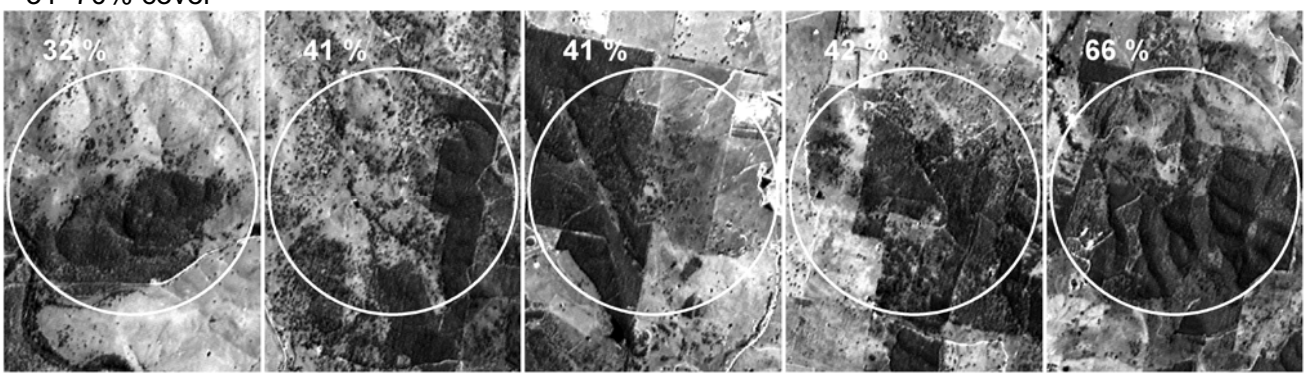
<10% cover



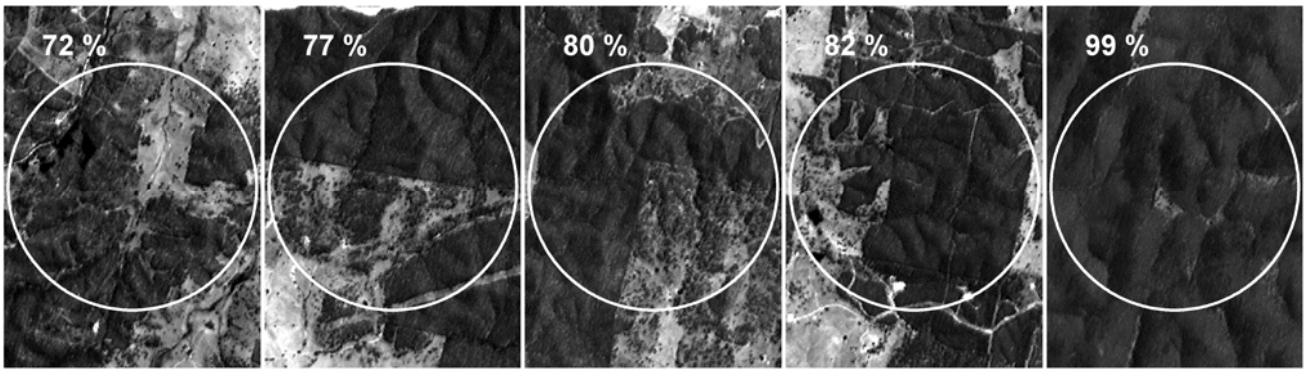
10–30% cover



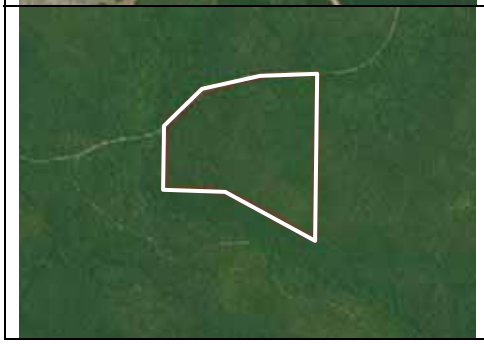
31–70% cover



>70% cover



Appendix 3 Examples of the four levels of connectivity using development proposals

Example clearing proposal	Current connectivity	Connectivity after development
	Moderate, because the vegetation in the proposal area: • is not in low condition • has an average width of 30–100 m • is linked to surrounding native vegetation on two compass quarters.	Nil, because no link (of any connectivity value) will be maintained between the surrounding areas of native vegetation following clearing.
	Low, because the vegetation in the proposal area: • is in low condition, • has an average width >100 m • is linked to surrounding native vegetation on four compass quarters.	Low, because a low connectivity value vegetation link will be maintained between surrounding remnants following clearing.
	Low, because the vegetation in the proposal area: • links to other native vegetation via exotic vegetation with similar structure to the proposed exotic pine plantation on three compass quarters.	Low, because a low connectivity value link will be maintained between surrounding native vegetation remnants (≥1 ha) via exotic vegetation with similar structure (exotic pine plantation) following clearing.
	High, because the vegetation in the proposal area: • is not in low condition • has an average width >100 m • is linked to surrounding native vegetation on three compass quarters.	Moderate, because one vegetation link of moderate connectivity value (not in low condition and 30–100 m wide) will be maintained between the areas of surrounding native vegetation following clearing.
	High, because the vegetation in the proposal area: • is not in low condition • has an average width >100 m • is surrounded (linked on four compass quarters) by native vegetation.	High, because high connectivity value vegetation links will be maintained between all areas of surrounding native vegetation following clearing of the proposal area.