Draft Framework for Biodiversity Assessment

For assessing and offsetting state significant development and state significant infrastructure

NSW Biodiversity Offsets Policy for Major Projects

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1 Introduction

1.1 NSW biodiversity offsets policy

The NSW Government is currently developing the NSW Biodiversity Offsets Policy for Major Projects (the policy) for two categories of development proposed under the planning system: state significant development and state significant infrastructure.

The policy:

- establishes a set of offsetting principles for major projects
- defines key thresholds for when offsetting is required
- adopts an assessment methodology to quantify and describe the offset required
- defines preferred mechanisms to establish offset sites
- provides a range of flexible options that can be used in lieu of providing offsets including rehabilitation actions and supplementary measures
- sets out how payments to the NSW Biodiversity Offsets Fund can be used to acquit offset requirements.

Further information on the biodiversity offset principles for major projects can be found at www.environment.nsw.gov.au/biodivoffsets/bioffsetspol.htm.

1.2 Purpose of this document

The Framework for Biodiversity Assessment (FBA) sets out the detailed operation of the policy. It contains the assessment methodology that is adopted by the policy to quantify and describe the impact assessment requirements and offset guidance that apply to major projects.

The FBA sets out the:

- requirements for a reliable and transparent assessment of biodiversity values on land for the purpose of:
  - identifying the biodiversity values on land subject to a proposed major development or proposed as a biodiversity offset
  - determining the impacts of major projects on biodiversity as part of an application for approval to undertake the major project under NSW planning legislation
  - quantifying and describing the biodiversity offsets required for the unavoidable impacts of major projects on biodiversity values
- types of conservation measures that are available to offset the unavoidable impacts of major projects, and how they may be used by a proponent to prepare a biodiversity offset strategy as part of an application for approval to undertake the major project.

1.3 Biodiversity offset principles for major projects

The Policy and the FBA are underpinned by seven key principles for determining biodiversity offset requirements for major projects. The FBA provides a framework for implementing these principles in practice. The offset principles for major projects are:

1. Before offsets are considered, impacts must first be avoided and unavoidable impacts minimised through mitigation measures. Only then should offsets be considered for the remaining impacts.
2. Offset requirements should be based on a reliable and transparent assessment of losses and gains.
3. Offsets must be targeted to the biodiversity values being lost or to higher conservation priorities.
4. Offsets must be additional to other legal requirements.
5. Offsets must be enduring, enforceable and auditable.
6. Supplementary measures can be used in lieu of offsets.
7. Offsets can be discounted where significant social and economic benefits accrue to NSW as a consequence of the proposal.

Further information on the biodiversity offset principles for major projects can be found in the Draft NSW Policy for Major Projects at www.environment.nsw.gov.au/biodivoffsets/1480biofpolmp.htm.

1.4 Overview of the Framework for Biodiversity Assessment

The FBA comprises three broad stages that set out the biodiversity assessment requirements and offset practices for major projects. The workflow for the stages is shown in Figure 1 and described below.

It should be noted that the detailed application of the FBA (such as to determine the number of biodiversity credits required at a development site or to be created at an offset site) must be made by a person accredited in accordance with section 142B(1)(c) of the *Threatened Species Conservation Act 1995* (see Section 13.1).

Stage 1 – Biodiversity assessment requirements

Stage 1 sets out the requirements and survey methods that must be undertaken by a proponent to identify, map and describe the native plant community types (PCTs), threatened species and threatened species habitat on the development site and an offset site.

At this stage, the FBA also sets out the requirements that must be undertaken by a proponent to assess the context of the proposed development site or offset site in the surrounding landscape. This includes assessing the extent of native vegetation cover and connectivity of native vegetation on the development or offset site with native vegetation surrounding the development or offset site.

The results and findings from the assessment of a proposed development site for a major project must be documented in a biodiversity assessment report. The biodiversity assessment report is to be submitted to the Department of Planning and Infrastructure as part of the application for development consent.

The results and findings from the assessment of land proposed as a biodiversity offset for a major project must be documented in a biodiversity offset strategy. The biodiversity offset strategy is to be submitted to the Department of Planning and Infrastructure as part of the application for development consent.

Stage 2 – Impact assessment of a major project

Stage 2 sets out the requirements for demonstrating how any impacts on biodiversity values have been avoided and minimised at the planning, construction and operational phases of the development.

This stage describes the methods to measure the loss to biodiversity caused by the remaining direct and indirect impacts of the development.

The FBA quantifies the loss and gain in biodiversity values through biodiversity credits. There are two categories of biodiversity credits:

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

The loss of biodiversity values caused by the project will be expressed as a biodiversity credit requirement and set out in the biodiversity assessment report. It will set out the number and type of biodiversity credits that would be required to offset the impact of development.

The FBA then provides guidance on Government expectations with respect to the offset requirement set out in the Impact Report.

Stage 3 – Biodiversity offset strategy requirements

Stage 3 sets out the requirements for preparing a biodiversity offset strategy for the development. The biodiversity offset strategy is submitted by a proponent and describes the measures proposed to meet the offset requirement determined in Stage 2.

The offset rules for matching the biodiversity credit requirement to an offset site are set out in this section. The offset rules ensure that offsets are targeted to the biodiversity values being lost or to higher conservation priorities. This includes defining the types of vegetation, threatened species habitat and the geographic location that can be used to offset a particular development.

The FBA provides guidance on the options that a proponent can use to fulfil an offset requirement, including:

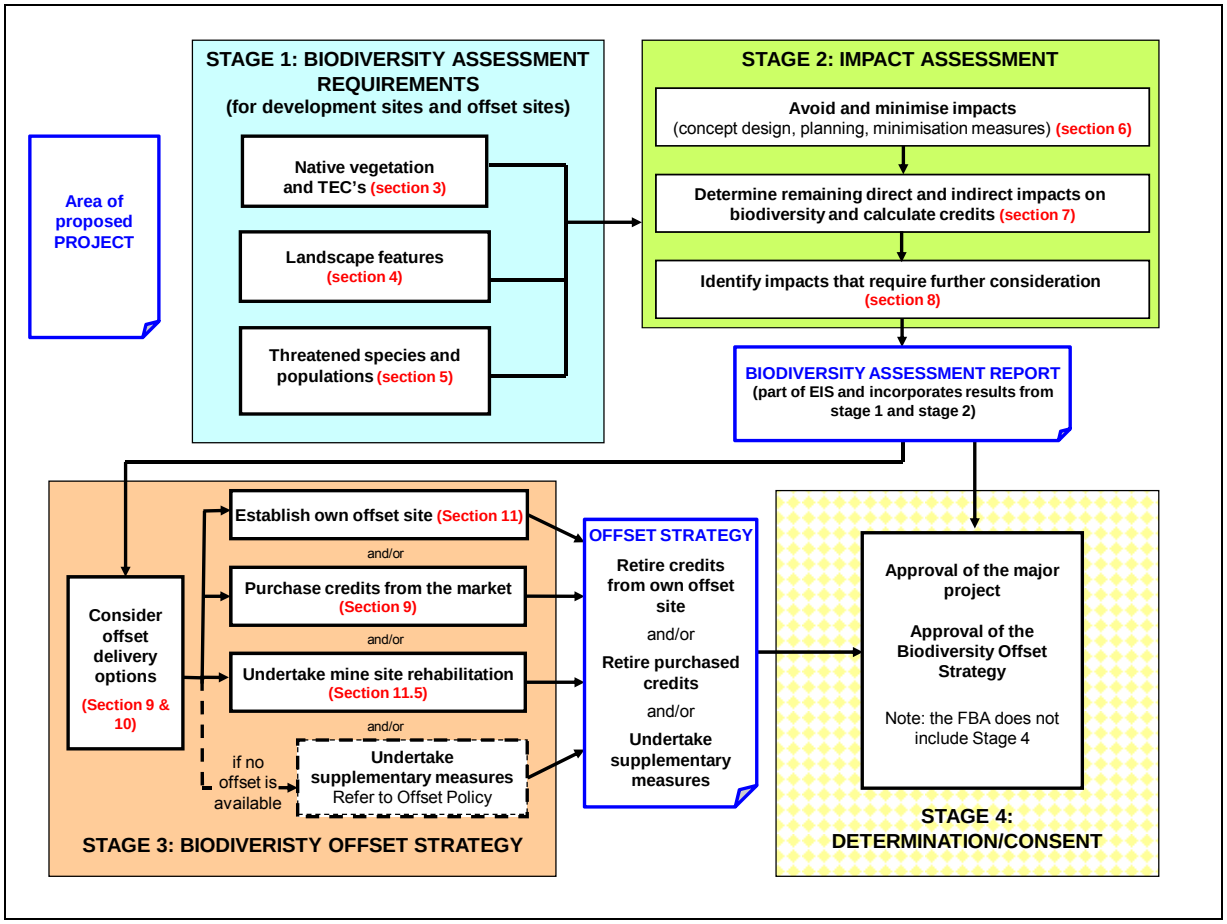
- establish their own offset site
- undertake rehabilitation of degraded land, or
- purchase biodiversity credits that have been generated by a landowner with an offset site.

The FBA sets out the requirements for calculating the gain in biodiversity values (in biodiversity credits) that can be achieved at an offset site through management actions.

In some circumstances, supplementary measures may also be used as part of a biodiversity offset strategy for a major project. For more information on supplementary measures, please refer to Appendix 1 of the Draft NSW Biodiversity Offsets Policy for Major Projects.

The biodiversity offset strategy is to be submitted to the Department of Planning and Infrastructure as part of the application for development consent.

Figure 1: Biodiversity impact assessment and offset strategy workflow



1.5 Biodiversity values assessed by the framework

The FBA must be used by a proponent to assess all biodiversity values on the development site for a major project. It must also be used to assess the biodiversity values on land proposed as an offset site.

1.6 Assessment of impacts on aquatic biodiversity

If there are likely to be impacts on aquatic biodiversity, proponents should refer to the *Fisheries NSW policy and guidelines for fish habitat conservation and management (Update 2013)* (Fisheries NSW policy and guidelines) for guidance on assessment of impacts on aquatic biodiversity and requirements for avoiding, minimising and offsetting these impacts. The Fisheries NSW policy and guidelines can be found at: www.dpi.nsw.gov.au/fisheries/habitat/publications/policies,-guidelines-and-manuals/fish-habitat-conservation

1.7 Biodiversity values not assessed by the framework

Biodiversity values that are not covered by the FBA include:

- marine mammals
- wandering sea birds
- biodiversity that is endemic to Lord Howe Island
- other environmental values, including impacts on water quality, air and soil.

1.8 Relationship to the NSW planning legislation

As part of an application for a major project, a proponent must prepare an environmental impact statement (EIS). Before preparing an EIS, proponents must apply to the Director-General of the Department of Planning & Infrastructure (DP&I) for the Director-General's requirements for environmental assessment (DGRs). The DGRs set out what is required for the preparation of the EIS.

Under the proposed NSW biodiversity offset policy for major projects, the DGRs will require a proponent to apply the FBA to assess the impacts that the major project will have on biodiversity values, and to determine the biodiversity offset requirement for the project. The biodiversity assessment report is the component of the EIS that describes the biodiversity values present on a development site and assesses the adverse impacts that the development has on biodiversity. It is prepared by an assessor according to the methods set out in the FBA.

1.9 Relationship to the *Environment Protection and Biodiversity Conservation Act 1999*

Major projects may also affect nationally listed threatened species and threatened ecological communities (TECs). These proposals are considered by the Commonwealth Department of the Environment (DE) under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The question of suitable offsetting often arises in the context of these decisions. The FBA addresses impacts on all nationally listed species and threatened ecological communities and may provide the basis for aligning NSW and Commonwealth offsetting requirements.

A copy of the Significant Impact Guidelines for Matters of National Environmental Significance (MNES) is available from www.environment.gov.au/resource/significant-impact-guidelines-11-matters-national-environmental-significance

A copy of the EPBC Act Environmental Offsets Policy is available from www.environment.gov.au/epbc/publications/environmental-offsets-policy.html

Stage 1 – Biodiversity assessment requirements

2 Matters relating to the biodiversity assessment requirement

2.1 Format and content of the biodiversity assessment report

A biodiversity assessment report must be prepared by an assessor and submitted to the Department of Planning and Infrastructure by the proponent with an application for development consent for a major project.

The biodiversity assessment report must include (but is not limited to) the following:

Stage 1: Biodiversity assessment requirement

(a) A set of maps of the proposed development site that:

  (i) identifies the development footprint, including areas of 'temporary' clearing, associated with construction as assessed and determined by the assessor in accordance with Section 6

  (ii) shows the extent and distribution of PCTs and vegetation zones that, in the opinion of the assessor are present on the proposed development site, including the locations of plot and transect surveys

  (iii) shows the extent and distribution of endangered ecological communities and critically endangered ecological communities that, in the opinion of the assessor, are present on the development site

  (iv) identifies the IBRA subregion/s and Mitchell landscape/s in which the development is located

  (v) shows the location of any threatened species that, in the opinion of the assessor, cannot withstand further loss

  (vi) shows the location of other threatened species and their habitat that, in the opinion of the assessor, are present on the site (Section 5.3), including location of surveys used to assess the development site

  (vii) identifies areas on the development site where an offset is not required as assessed and determined in accordance with Section 7.2.

  Note: All maps must include: map title, the site's name, location and lot/DP numbers, scale and grid reference, the date the map was prepared and a legend

(b) a description of the vegetation classification used by the assessor, the assessor's justification on the choice of PCTs, identification of the native plant species determined by the assessor to be present and a description of the mapping and survey techniques used to survey the development site (Section 3.3 and Section 3.4)

(c) a description of the Site value (condition) of the PCTs determined by the assessor to be present

(d) a description of the landscape value of the development site as assessed by the assessor in accordance with Section 4, and the method used by the assessor to assess landscape value

(e) a description of threatened species that, in the opinion of the assessor, are present at the development site. This description must include:

  (i) identification of threatened species habitat for species assessed by the assessor for ecosystem credits, including reasons that justify when a predicted species is assessed in accordance with Section 5.2 by the assessor as not being present on the development site

  (ii) identification by the assessor of any breeding habitat features for species that require ecosystem credits

  (iii) identification by the assessor of the species assessed in accordance with Section 5.3 for species credits and justification for why a species is removed from the candidate list

  (iv) a description of the survey techniques, timing and effort used by the assessor to assess threatened species in accordance with Section 5.4

  (v) results of the targeted threatened species survey including the area and location of the species identified by the assessor and undertaken in accordance with Section 5.3

  (vi) identification of any threatened species that cannot withstand further loss

  (vii) expert reports used in the assessment of threatened species and prepared in accordance with Section 5.5

(f) any expert reports used for the assessment of biodiversity values on the development site and prepared in accordance with Section 5.5

(g) justification of the assessor's use of certified local data in accordance with Section 13.2 for any part of the assessment of biodiversity values on the development site.

Stage 2: Impact assessment on biodiversity values

(a) Define the circumstances where a full assessment of the impact on biodiversity values is not required (Section 2.2)

(b) circumstances where, after undertaking an assessment of biodiversity values, the assessor determines that an offset is not required under Section 2.2

(c) a demonstration of the steps taken at the planning, construction and design phases to avoid and minimise the impacts of development (Section 6) including:

  (i) a description of the methods used to select a project site to ensure impacts of the development are avoided to the extent practicable or a reason for not using a method

  (ii) the measures that were taken, or are proposed to be taken by the proponent, to avoid and minimise the direct impacts of the development (Section 6.3)

  (iii) the measures that were taken, or are proposed to be taken by the proponent, to avoid and minimise the indirect impacts of the development (Section 6.4)

  (iv) justification for where further avoidance and minimisation of the impacts of development on biodiversity is not practicable

(d) assessment of the remaining adverse impacts on site value on:

  (i) ecological communities; and

(ii) threatened species habitat as identified by the assessor (Section 7.2)

(e) assessment of the remaining adverse impacts on landscape value (Section 7.3)

(f) calculation of the number of ecosystem credits for the remaining direct impacts on ecological communities and threatened species habitat (Section 7.4)

(g) calculation of the number of species credits for the remaining direct impacts on individual threatened species (Section 7.5)

(h) calculation of biodiversity credits for any indirect impacts where possible to measure (Section 7.6)

(i) biodiversity credit assessment report (biodiversity credits) produced from the Credit Calculator, that sets out the number and type of biodiversity credits required to offset the remaining impacts of development (Sections 7.4, 7.5 and 7.6)

(j) identification of any impacts on biodiversity values that require further consideration (Section 8)

(k) any expert reports the assessor uses to assess the impact on biodiversity values at the development site

(l) justification of the use of local data in accordance with Section 13.2 where the assessor has used more appropriate local data in any part of the impact assessment on biodiversity values at the development site.

2.2 Circumstances where a full assessment of impacts on biodiversity values is not required

If, during the assessment of biodiversity values at a development site, the assessor determines that:

1. an area of land does not contain native vegetation, then no further assessment of the impact of the development on biodiversity values is required for that area of land; and
2. a vegetation zone has a Site value score of 17 or less, and in the opinion of the assessor, the PCT is not listed as a critically endangered or endangered ecological community under the TSC Act or EPBC Act , then:
    a. assessment of native vegetation in that zone is not required beyond Section 3.4.2, and
    b. assessment of threatened species habitat in that zone is not required beyond Section 5.3, and
3. no threatened species or habitat components that require species credits have been identified after completing Step 3 in Section 5.3 of the FBA.

3 Assessing and measuring native vegetation

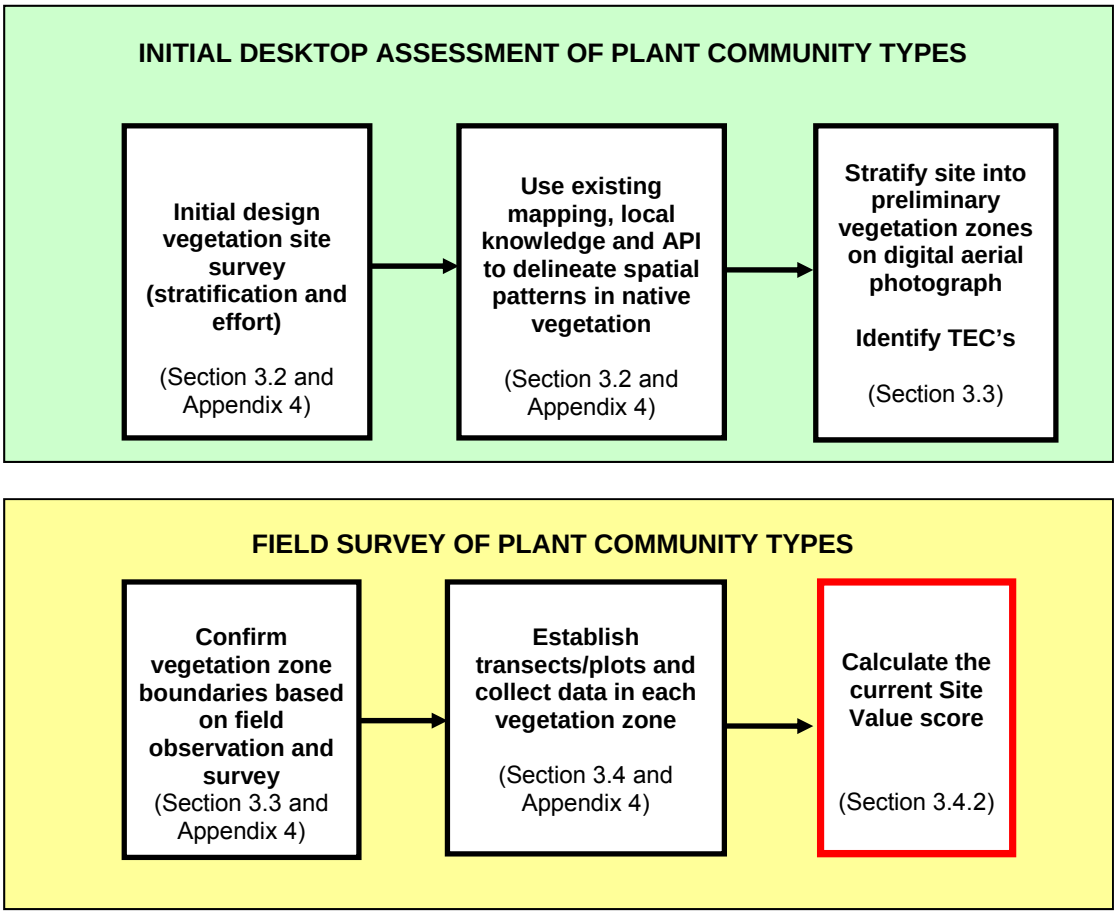
This section describes how the biodiversity values of native vegetation must be assessed and measured on a development site for the purposes of the Biodiversity assessment report.

The assessor must assess the biodiversity values of native vegetation by:

- identifying the PCTs on a development site
- identifying the conservation significance of the PCTs present on the development site
- identifying the condition of the native vegetation present and the spatial configuration of native vegetation, including connectivity and extent of native vegetation cover in the landscape surrounding the development site according to Section 4 of the FBA
- measuring the condition and habitat value of vegetation for threatened species, as set out in this part of the FBA.

The assessment and measurement of biodiversity values of threatened species is described in Section 5.

Figure 2: Indicative workflow to assess plant community type and condition



3.1 Native vegetation extent

The assessor must map all areas of native vegetation within the development site, using digital aerial photography (ADS–40 imagery) or the best available aerial imagery of the development site as a basis.

The assessor must map the following information on the aerial image:

- extent of native vegetation showing the distribution of PCTs
- distribution of endangered or critically endangered ecological communities
- vegetation zones which identify areas of different PCT and condition
- IBRA subregion in which the development site is located, or, if it is within more than one subregion, where most of the development site is located, and
- Mitchell landscapes in which the development site is located, or, if it is within more than one Mitchell landscape, where most of the development site is located.

3.2 Assessing native plant community types and ecological communities

An assessor must use the NSW plant community type (PCT) classification for identifying native plant communities at a development site.

The preliminary identification of PCTs and their distribution on a site may be based on visual interpretation of the aerial image and must be consistent with the conditions for visual interpretation set out in Appendix 4.

A detailed description and full geographic distribution of each PCT is contained within the NSW Vegetation Information System (VIS) Classification Database (the VIS Classification Database) and is publicly available from www.environment.nsw.gov.au/research/vegetationinformationsystem.htm. The VIS Classification Database will also identify the association of the PCT with an endangered or critically endangered ecological community.

The biodiversity assessment report must include a description of the PCT, justification on the choice of PCT identified on the development site, the native plant species present in the upper, mid and ground cover strata and a description of the mapping and survey techniques used to survey the development site.

Any threatened ecological communities that are associated with a PCT are identified in the VIS Classification Database. Where the assessor identifies an endangered ecological community or critically endangered ecological community on the development site, but according to data in the VIS Classification Database it is not associated with the PCT on the development site, the assessor must still identify the PCT as an endangered ecological community or critically endangered ecological community.

Some of the PCTs contained in the VIS Classification Database are derived or secondary vegetation communities (that is, the PCTs have been modified substantially since 1750). Derived PCTs must only be selected where an assessor cannot determine the original PCT.

Plant community types that are classified under the VIS Classification Database as being in the saline wetlands vegetation formation are to be assessed according to the Fisheries NSW policy and guidelines. This includes PCTs such as saltmarsh and mangroves. Where the development impacts on an EEC or CEEC which is classified under the saline wetland vegetation formation, the assessor must also assess the impacts of development according to the FBA.

3.3 Identifying vegetation zones

Prior to assessment of impact, the assessor must divide the development site into vegetation zones, using digital aerial photography (ADS–40 imagery) or the best available image of the development site. Interpretation of remote-sensed imagery or an aerial photograph can provide a primary spatial layer of vegetation zones.

Vegetation zones are initially delineated by PCT and broad condition for the purpose of assessing the average Site value (condition) of the vegetation zone and to survey for threatened species. Stratification of the development site into vegetation zones must be consistent with the procedures set out in Appendix 4.

The stratification of vegetation zones from any visual interpretation must be reviewed following the completion of an on-ground survey to confirm PCT and the site value assessment.

Vegetation that is in low condition must always form a separate zone to vegetation that is not in low condition, including within the same PCT.

Areas of non-contiguous vegetation may be combined into a single vegetation zone, where the vegetation is of the same PCT and broad condition at a development site. Areas of the same PCT but with different condition above low condition may be delineated as separate zones in order to stratify the development site for field survey.

Where the extent of native vegetation on a development site has changed since the digital aerial photography (ADS–40 imagery) or best available image was made, and the clearing was approved or permitted, vegetation zones must be amended or deleted to reflect the current situation, based on current field survey.

Vegetation in low condition means:

(a) woody native vegetation with native over-storey percent foliage cover less than 25% of the lower value of the over-storey percent foliage cover benchmark for that vegetation type, and:

- less than 50% of ground cover vegetation is indigenous species, or
- greater than 90% of ground cover vegetation is cleared

or

(b) native grassland, wetland or herbfield where either:

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

3.4 Assessing site value (vegetation condition)

Site value is the quantitative measure of the condition of native vegetation assessed for each vegetation zone against the benchmark for the PCT. The assessor must survey each vegetation zone in accordance with Section 3.4.1 to obtain a quantitative measure of the 10 site attributes listed in Table 1. The assessor must then calculate a Site value for each vegetation zone in accordance with Section 3.4.2.

The assessor must assess derived vegetation against the benchmark for the most likely original PCT(s), or against the benchmark for the vegetation class of the most likely original PCT.

Benchmarks are quantitative measures of the range of variability in vegetation condition in vegetation with relatively little evidence of modification by humans since European (post-1750) settlement. Benchmarks are defined for specified variables for each PCT. 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 has evidence of recruitment of native species.

An assessor may use benchmark data that more accurately reflects the local environmental conditions for a PCT. Data for a local benchmark may be collected from local reference sites, or obtained from relevant published sources using the procedures set out in Appendix 3.

The Vegetation Benchmarks Database is held by OEH and is publicly available at www.environment.nsw.gov.au/resources/biobanking/BioMBenchOct08.xls.

Table 1: Scoring and weighting of the site attributes

Site attribute		Site attribute score (see notes 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

In this table: The term 'within benchmark' means a measurement that is within (and including) the range of measurement identified as the benchmark for that PCT. 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.

3.4.1 Undertake plot and transect surveys

Line transects must be used to assess the condition attributes that are measured by percent foliage cover. Other condition attributes must be assessed by plots. Regeneration must be assessed across the entire vegetation zone.

The level of survey effort across the vegetation zone must be consistent with the practice of random stratified sampling as described in Appendix 4.

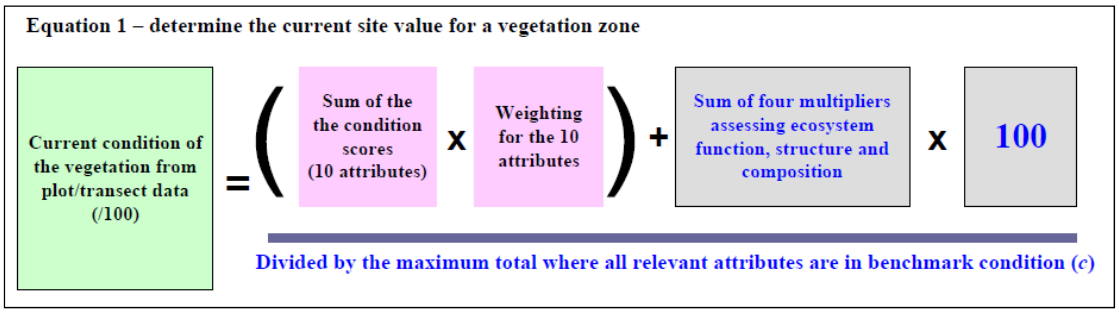
Plots and transects must be established randomly, or stratified randomly within a vegetation zone, accounting for the level of variation of that vegetation zone. This may be done by marking points randomly on the imagery within the vegetation zone and establishing plots and transects at all or some of these points. Alternatively, plots and transects can be established by pacing a random distance into the vegetation zone. The survey data must be collected from that point, with the process repeated elsewhere within the vegetation zone.

The minimum number of transects and plots that are required for each vegetation zone must be according to Table 11 in Appendix 4. If the broad condition of the vegetation is more variable across the zone, additional transects and plots to the number specified in Table 11 may be required to ensure a representative sample is taken for the vegetation zone.

3.4.2 Assessing the current site value score

The assessor must determine the current site value score for each vegetation zone from the plot and transect survey data collected for the vegetation zone. The current site attribute score must be assigned as 0, 1, 2 or 3 as shown in Table 1. As shown in Equation 1, the condition attribute scores are weighted and summed, then converted to a current site value score out of 100.

Equation 1: Determine the current site value score for a vegetation zone



Note: Simplified, diagrammatic representations of the equations used in the FBA, such as the one above, are used in the main body of this document. Full mathematical representation of each equation used in the methodology is provided in Appendix 1.

If the lower benchmark value for any site attribute is zero, and the measure of that attribute on the site is zero, then the site attribute score of that attribute against the benchmark is 3. If the *only* benchmark value for any site attribute is zero, then the attribute is not included in Equation 1 and *c* (that is, the maximum total where the relevant attributes are in benchmark condition) is scaled accordingly.

The multipliers for '*native over-storey cover × proportion of over-storey species occurring as regeneration'* and '*number of trees with hollows × total length of fallen logs*' may be omitted from Equation 1 (and *c is* recalculated accordingly) for determining Site value at a site if the PCT is from one of the following vegetation formations: grasslands, heathlands, alpine complex, freshwater wetlands, saline wetlands or arid shrublands.

4 Assessing landscape value

Landscape value components are assessed beyond the boundary of the development site or offset site and require the use of Geographical Information Systems (GIS) for optimal accuracy and consistency.

The attributes that must be used to assess landscape value include:

a) percent native vegetation cover in the landscape as described in Section 4.1 below

b) connectivity value as described in Section 4.2 below

c) adjacent remnant area as described in Section 4.3 below

d) strategic location of offset sites (for offsets sites only) as described in Section 4.4 below.

A combination of the three approaches may be used to assess the impacts of development on landscape value. For example, an assessor may use the linear approach to assess the impacts of road or rail infrastructure associated with a mine development, and the site-based approach to assess impact on the landscape of the actual mine.

Where a combination of the landscape value assessments are used to assess the impacts of development, the assessor must indicate the vegetation zones that are related to each of the landscape value assessments for the purpose of calculating ecosystem credits in Section 7.4 of the FBA.

For small and large site based major projects, landscape value must be assessed according to Appendix 5.

For linear shaped major projects, landscape value must be assessed according to Appendix 6.

For major projects that have multiple fragmentation impacts, landscape value must be assessed according to Appendix 6.

For an offset site, landscape value must be assessed according to Appendix 7.

Figure 3: Workflow to assess landscape value for a development or offset site

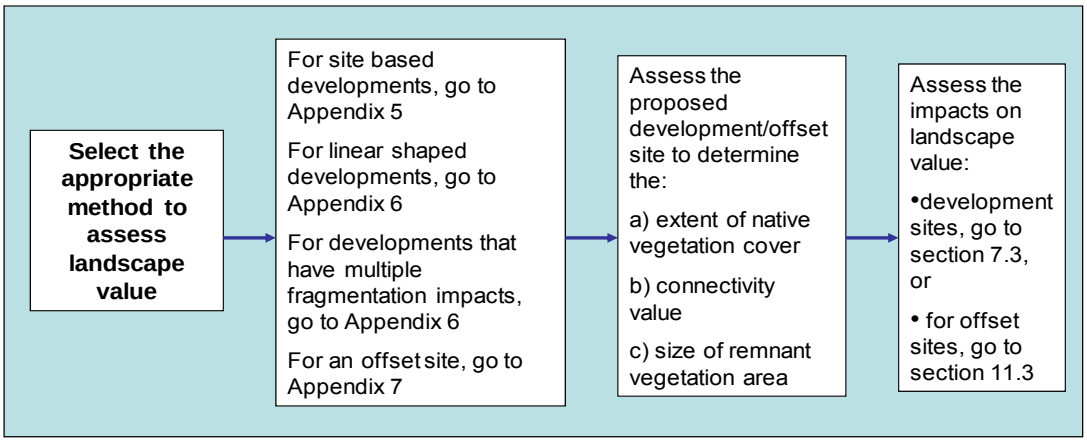


Table 2: Assessment of landscape value components for different types of development

Type of development footprint	Landscape value assessment components						
	Percent NV cover (inner circle)	**Percent NV cover** (outer circle)	**Percent NV cover** (buffer area)	**Connectivity value** (class or site)	**Adjacent remnant area**	**Strategic location of offset sites**	**LV score**
Large site based development (>500 ha) (e.g. mine site)	yes (/10)	yes (/16)	no (no score)	yes (/12)	yes (/12)	no	50
Small site based development (e.g. school, hospital)	yes (/10)	yes (/16)	no (no score)	yes (/12)	yes (/12)	no	50
Linear shaped developments (e.g. pipelines, highway) Multiple fragmentation impacts (e.g. coal seam gas field)	no (no score)	no (no score)	yes (/15)	yes (/15)	yes (/20)	no	50
Offset sites	yes (/10)	yes (/10)	no (no score)	yes (/9)	yes (/12)	yes (/9)	50

4.1 Assessing percent native vegetation cover

The current and future native woody vegetation cover (extent and condition) in the circle/s can be estimated with the assistance of GIS.

For site based developments and offsets, the assessment circle/s must be:

- centred over the site. The current and future native vegetation cover (extent and condition) in the circle is visually estimated in increments of 5%.
- centred on the area of native vegetation that is most impacted by the proposed development, or the area that has the most gain in native vegetation cover at an offset site.

For a linear shaped development, a development footprint buffer area must be established by creating a 550 m buffer along each side of the centre point of the development.

4.2 Assessing the connectivity value

An assessor can choose between two approaches to assess connectivity value of a development site. These are:

a) connectivity value classes. This approach is based on mapped state or regional biodiversity link, or riparian areas of rivers and streams, or

b) a site based connectivity value assessment that assesses vegetation condition and linkage width. This approach is used when the development site or offset site does not contain any connectivity value classes that are defined in a)

For the site based connectivity value assessment, a connecting link is defined as vegetation that is on the site and any adjoining vegetation that:

- is in moderate to good condition, and
- has a patch size >1 ha, and
- is separated by a distance of <100 m (or <30 m for grassy ecosystems), or
- is not separated by a large water body, dual carriageway, wider highway or similar hostile link.

4.3 Assessing the adjacent remnant area

Adjacent remnant area is the area of moderate to good condition native vegetation of which the site is a part, which is less than 100 m from the next area of moderate to good native vegetation. An adjacent remnant area may extend onto land that is adjoining the site.

The score for adjacent remnant area must be determined according to the Mitchell landscape in which the major project or offset site is located by measuring the area in hectares of the remnant area at the development site or offset site.

4.4 Assessing the strategic location of the offset site

Land that is proposed as an offset must be assessed to determine whether the offset site is within a strategic location.

Strategic locations for offset sites are defined as comprising either:

i. core areas, as identified within the Priority Investment Areas (PIA) Map[1], which include areas that are rare, threatened and contain unique biodiversity features, or

ii. state biodiversity corridors, as identified within the PIA Map, or

iii. regional biodiversity corridors, as identified within the PIA Map, or

iv. a site identified as a priority for conservation in the *Saving our Species* program (e.g. area identified for site-managed species[2]), or

v. riparian areas of 4th order streams or higher; important or regionally significant wetlands; or estuarine areas (as defined in Appendix 2).

[1] The *Priority Investment Areas (PIA) Map*, when released, will be an online map that displays strategic locations for investment in biodiversity protection and management. The PIA Map identifies core areas, which include areas that are rare, threatened and unique biodiversity assets, and biodiversity corridors of state and regional significance. The PIA Map is displayed on the Priority Investment Areas spatial viewer.

[2] Site-managed species are identified through the *Saving our Species* program. Through carrying out targeted management actions that are specific for that species at identified sites, site-managed species can be successfully secured in the wild in NSW.

5 Assessing and measuring threatened species

This section sets out how biodiversity values of threatened species must be assessed and measured at a development and offset site. The section sets out the habitat assessment and threatened species survey requirements, and identifies which threatened species require ecosystem credits or species credits. This includes threatened species that are listed under the EPBC Act.

5.1 Threatened Species Profile Database

Threatened species are assessed in the FBA using data in the Threatened Species Profile Database. This database is held by OEH, is publicly available and is routinely amended to include new listings of threatened species, populations and communities under the TSC Act and the EPBC Act, and to update information on existing listings.

The components of the Threatened Species Profile Database that an assessor must use for assessing all threatened species and populations are:

- the description of each threatened species, its habitat, ecology and threats, including the threatened species profile
- the class of credit (ecosystem or species) for the species
- the description of the habitat requirements/constraints for each species and population
- breeding, foraging or habitat information contained in the profile for the threatened species
- IBRA subregions with which the distribution of each species is either known or predicted to occur (the distribution of a species is not associated with an IBRA subregion if the species is identified by the database as being vagrant in that subregion)
- PCTs with which each species is associated
- the percent native vegetation cover class (surrounding vegetation cover) with which the species is associated (used as an initial filter to identify species for assessment)
- minimum adjacent remnant area or patch size, including low condition (hectares), with which the species is associated (used as an initial filter to identify species for assessment)
- whether the species is able to occupy low condition vegetation (used as an initial filter to identify species for assessment)
- any specific habitat features associated with the occurrence of the species
- the management actions for each species that are to be undertaken at an offset site
- the ability of a species to respond to improvement in site value or other habitat improvement at an offset site due to the management actions (the T_G value)
- any geographic characteristics associated with the occurrence of the species
- threatened species which cannot withstand further loss
- the months of the year that the species is identifiable through survey.

An assessor may use more appropriate local data, used instead of data in the Threatened Species Profile Database if the local data more accurately reflects the local environmental conditions of the site. The assessor must provide the reasons for the use of more appropriate local data in the biodiversity assessment report.

5.2 Species that can be predicted by habitat surrogates (ecosystem credits)

Threatened species that require ecosystem credits must be assessed in conjunction with general biodiversity values using data from the Threatened Species Profile Database.

Species that require ecosystem credits have a high likelihood of being present on the site, as predicted by Step 1 below. Therefore, a threatened species survey is not required to assess threatened species that require ecosystem credits as they are predicted to occur based on the presence of habitat surrogates.

The likely impacts on these species from clearing and development are measured by the loss of condition and habitat value that results from these actions and by the area of land that is impacted by clearing or development or managed on the offset site.

Species that require ecosystem credits for the impacts of development are assessed according to the two steps below. Species that create ecosystem credits at an offset site are assessed using Step 1.

Step 1: Identify the threatened species that are to be assessed at the site

The assessor must apply the criteria a) – f) as filters to each vegetation zone at the development site (or offset site) to predict the threatened species which are assessed for ecosystem credits for that vegetation zone. A threatened species is required to be assessed at the development site where:

a) the distribution of the species includes the IBRA subregion in which the development/offset site is located, or mostly located within, and

b) the species is associated with any of the PCTs occurring within the development/offset site (as determined at Section 3.2 of the FBA), and

c) the percent native vegetation cover class within the outer assessment circle is equal to or greater than the minimum class that is required for the species. The percent native vegetation cover class required for a species is either ≤10%, 11–30%, 31–70% or >70% native vegetation cover. This criterion does not apply to a development, or part of a development that is assessed using Appendix 6, and

d) the condition of any vegetation within the development site is equal to or greater than the minimum condition required for that species. The minimum condition required for a species is either low condition or moderate to good condition, and

e) the adjacent remnant area at the development site is equal to or greater than the minimum specified for that species. The minimum adjacent remnant area required for a species is ≤5 ha, >5–25 ha, >25–100 ha or >100 ha (as determined in Section 4.3 of the FBA), and

f) the species is identified as an ecosystem credit species in the Threatened Species Profile Database.

Where a vegetation zone is across one or more IBRA subregions, the IBRA subregion in which most of the proposal occurs must be used. This provision is not applicable to linear shaped developments.

The criterion c) (percent native vegetation cover class within the outer circle) is not applicable for linear shaped developments, or development that has multiple fragmentation issues. For these developments, the criteria a), b) and d) – f) are

applied as filters to each vegetation zone to predict the threatened species which are assessed for ecosystem credits for that vegetation zone.

If any one of these criteria is not met for a particular species, then no further assessment is required for that species at a development site or an offset site.

Step 2: Assess the habitat components of the vegetation zone at a development site (optional)

The assessor may undertake an optional assessment of the habitat components (for breeding, foraging or roosting habitat) to refine the list of species predicted for the vegetation zone in accordance with Step 2. This option can be used where the criteria in Step 1 have predicted threatened species to be present on the development site, but the assessor considers that the species is/are unlikely to occur at a development site because of the lack of habitat components.

The assessor determines whether the habitat components of threatened species that is/are predicted for a vegetation zone using the criteria in Step 1, are present on the clearing or development site.

Where one or more of the habitat components (breeding, foraging or roosting habitat) for the predicted species is/are found to be present on the development site, the development site is considered to contain suitable habitat for the species to use.

Where none of the habitat components (breeding, foraging or roosting habitat) of the predicted species is/are found to be present on development site, no further assessment is required for the species. The reasons for the species not being present on the development site (i.e. lack of habitat components) are to be recorded as part of the Biodiversity assessment report.

An assessment of whether the habitat components (breeding, foraging or roosting habitat) is/are present on the development site is undertaken using the habitat information in the profile for the species and any other habitat information in the Threatened Species Profile Database.

5.3 Assessing species that cannot be predicted by habitat surrogates (species credits)

Threatened species that cannot reliably be predicted to occur on a development site (or an offset site) through vegetation, distribution and habitat criteria are identified by the Threatened Species Profile Database as species credit species. In some circumstances, the particular habitat components of species assessed for ecosystem credit species, such as the breeding habitat of a cave roosting bat, are also assessed for species credits.

An assessment of species for species credits is optional at an offset site. However, species credits can only be created at an offset site where the offset site has been assessed in accordance with this section.

Species that require species credits to offset the impacts of a major project on a development site, or that create species credits at an offset site, must be identified and assessed in accordance with the five steps below.

Step 1: Identify candidate species for initial assessment

A list of candidate threatened species that require species credits known or likely to occur on a development site or an offset site must be developed, using data from the Threatened Species Profile Database.

Candidate threatened species that are initially assessed at the site are species that require species credits according to the Threatened Species Profile Database and where:

a) the geographic distribution of the species is known or predicted to include the IBRA subregion in which the site is located, and

b) the site contains habitat features or components associated with the species, as identified in the Threatened Species Profile Database.

Species that are indicated as being present at the development or offset site based on past surveys undertaken at the development or offset site can be added to the list of candidate species where the species has not been listed based on criteria a) – b).

Wind farm major projects

In the case of major projects where the proposed development is for a wind farm, the assessor must consider whether habitat features or habitat components in the landscape surrounding the development site warrant the inclusion of additional threatened species in the list of candidate species for assessment. This includes consideration of species that require ecosystem credits and migratory threatened species.

Habitat features such as caves and hollow bearing trees that are assessed for species credits are required to be on the list of candidate species.

These species are assessed under Step 2.

Step 2: Identify candidate species for further assessment

Species that do not require further assessment at a development site or an offset site must then be removed from the list of candidate species developed in accordance with Step 1. Species that do not require further assessment at a development site or an offset site are those to which one or more of the following apply:

- assessment of the habitat feature or component determines that the habitat is substantially degraded such that the particular species is unlikely to utilise the development site
- an expert report prepared in accordance with Section 5.5 of the FBA states the species is unlikely to be present at the development site
- the species is a vagrant species and unlikely to use habitat on the development site, or
- the records of the species presence in relation to the location of the development site are old (such as two decades or more) or have doubtful authenticity.

The assessor must provide the reasons why a species that does not require further assessment at the development site is removed from the list of candidate species in Step 3, as part of the biodiversity assessment report.

Step 3: Determine whether the species is present or not

A species can be determined to be present or not at a development site or offset site through a threatened species survey or by an expert report. An assessor may also assume that a species is present on a development site.

A threatened species survey is a targeted survey for a species that is undertaken in accordance with Section 5.4 of the FBA and any threatened species survey guidelines provided in the Operational Manual or otherwise by OEH.

An expert report is a report prepared by a suitably qualified expert in accordance with Section 5.5 of the FBA, to determine whether the species is likely or unlikely to use the potential habitat on the development site.

Where the survey or expert report confirms that the threatened species is not on the site or unlikely to use the habitat on a development site or an offset site, no further

assessment is required, and the species or its habitat is assessed as not being present.

Where the survey or expert report confirms that the threatened species is likely to use the habitat on a development site or an offset site, further assessment is required to determine the area of habitat for fauna species or the number of flora species on the site.

Hollow bearing trees that provide breeding habitat for threatened species that are assessed for ecosystem credit species must also be identified. The presence of hollow bearing trees was assessed in Section 3.4. The location of all hollow bearing trees on the site is required to be mapped.

Step 4: Identify if the development site contains any threatened species that cannot withstand further loss

Where the survey or expert report confirms that a threatened species is on a site or is likely to use the potential habitat on the site, the species must then be assessed to identify whether it is a species that cannot withstand further loss as identified in the Threatened Species Profiles Database.

The biodiversity assessment report must identify all species on a site or those likely to use the potential habitat on the site that cannot withstand further loss in the major catchment area.

Step 5: Finalise boundary of the species polygon

Where the survey or expert report confirms that the threatened species is likely to use the habitat on a development site or an offset site, a species polygon is used to determine the area of habitat for fauna species or the number of flora species on the site.

The boundary of the species polygon must be finalised on completion of the targeted survey or expert report. A species polygon is mapped using a satellite (ADS–40) or best available ortho-rectified aerial image.

The species polygon must include the locations of the species or areas occupied by the species, and contain the specific habitat feature or habitat component associated with that species on the site. A GPS must be used to confirm the location of the species polygon on the best available aerial image of the site. A description of the species, the habitat feature or component associated with the species on the site and its abundance must be included in the biodiversity assessment report.

The number of hollow bearing trees that provide breeding habitat for threatened species that are assessed for ecosystem credit species must also be identified. The species that use the habitat feature or are likely to use the breeding habitat feature must also be identified in the biodiversity assessment report.

The species polygon is attributed with a unit of measurement that is used to determine the number of species credits that are created or required for the species. The Threatened Species Profile Database identifies which unit of measurement of impact is applicable to a species. For fauna species, the unit of measurement is the area (hectares) of habitat impacted. For flora species, the unit of measurement is usually determined by the number of individuals. However, for species such as grasses, the area (hectares) of distribution of the species on the site may be used as the unit of measurement.

5.4 Undertaking a threatened species survey

A threatened species survey is a targeted survey for a species that is undertaken by an assessor at a development site or an offset site.

An assessor must undertake a threatened species survey during the time of year that is suitable for identifying the species, as identified in the Threatened Species Profile Database or by OEH. Surveys should be undertaken and recorded using a method that allows them to be replicated for repeat surveys.

Where a major project may have adverse indirect impacts on threatened species, a threatened species survey must also be used to assess whether the development site, or parts of the development site is over flown by migratory species, or other threatened species that are utilising habitat features or components in the surrounding landscape.

A threatened species survey must be undertaken for all species, including for the breeding habitat component of ecosystem credit species identified in Step 3 in Section 5.3 of the FBA.

However, a threatened species survey is not required if:

- the development site (or an offset site) is within any identified population for the species, or
- an expert report prepared in accordance with Section 5.5 has been obtained for the species, or
- the species is assumed to be present and the area of impact is determined in accordance with Section 5.7 of the FBA.

The timing, method and effort used for the targeted survey of threatened species must be included in the biodiversity assessment report.

Further information on threatened species survey guidelines can be obtained from the OEH website at www.environment.nsw.gov.au/threatenedspecies/surveyassessmentgdlns.htm.

Threatened species survey guidelines for amphibians are publicly available from the OEH website at www.environment.nsw.gov.au/resources/threatenedspecies/09213amphibians.pdf.

5.5 Using expert reports instead of undertaking a survey

An expert report may be obtained instead of undertaking a threatened species survey at a development site or an offset site.

An expert report must only be prepared by a person who is accredited by the Chief Executive of OEH under section 142B(1)(b) of the TSC Act, or a person who, in the opinion of the Chief Executive of OEH possesses specialised knowledge based on training, study or experience to provide expert opinion in relation to the biodiversity values to which an expert report relates.

The expert report must document the information that was considered, and/or rejected according to validity of the information in relation to the determination made in the expert report.

An expert report can only be used instead of survey for species to which species credits apply.

The purpose of an expert report instead of survey is to determine whether:

- the species is unlikely to be present on the development site – in this case no further assessment of the species is required, or
- the species is likely to be present on the site – in this case the expert report must provide an estimate of the number of individuals or area of habitat to be impacted by the development or the management actions (according to the unit of measurement identified for the species in the Threatened Species Profile

Database). The area of the species polygon is determined in accordance with Section 5.3 of the FBA. If an estimate of the number of individuals is required, then the estimate is based on the density of individuals in other, nearby populations. The number of species credits that are created or required for the species is calculated based on this estimate.

5.6 Assumed presence of threatened species on a development site

Where the development site contains any of the specified geographic attributes and the habitat features or habitat components associated with a species that is on the list of candidate species for assessment at Step 3 in Section 5.3, an assessor may opt to assume the species or breeding habitat component is present on the development site, instead of undertaking a threatened species survey or obtaining an expert report.

Where a species is assumed to be present, the assessor is required to determine the location and area of the species polygon in accordance with Step 5 in Section 5.3. The calculation of the number of species credits for a species assumed to be present on a clearing or development site is based on the area of the species polygon, or the number of individuals or area for flora species.

The assessor must provide reasons for the area and location of the species polygon on the development site in the biodiversity assessment report.

Species that require species credits, or the breeding habitat component of species that require ecosystem credits, cannot be assumed to be present on an offset site.

Stage 2 – Impact assessment (biodiversity values)

6 Avoid and minimise impacts on biodiversity values

Biodiversity offsets sit within the hierarchy of 'avoid, minimise and offset'. The first principle of the Policy is:

> 'Before offsets are considered, impacts must first be avoided and unavoidable impacts minimised through mitigation measures. Only then should offsets be considered for the remaining impacts.'

This section sets out the actions that a proponent of the major project must undertake to demonstrate that reasonable measures are taken to avoid and minimise the direct and indirect impacts of a development proposal on biodiversity values.

6.1 What are direct impacts?

Direct impacts on biodiversity values are those that are a direct result of the development. They are predictable, usually occur at or near to the development site and can be readily identified during the planning, design, construction, and operational phases of a development.

The adverse direct impacts of the development on biodiversity values must be assessed by the assessor using the information and data collected at a development site through completing Sections 2–5 of the FBA.

6.2 What are indirect impacts?

Indirect impacts occur when development related activities affect threatened species, threatened species habitat, populations or ecological communities in a manner other than direct impact. Compared to direct impacts, indirect impacts often:

- occur over a wider area than just at the site of the development
- have a lower intensity of impact in the extent to which they occur compared to direct impacts
- occur off site
- have a lower predictability of when the impact occurs
- have unclear boundaries of responsibilities.

The assessor is required to assess the indirect impacts of the development on biodiversity values using the information and data collected at a development site through completing Sections 2–5 of the FBA.

6.3 Demonstrating avoidance and minimisation of direct impacts on biodiversity values

Proponents must document in the Biodiversity assessment report the reasonable measures that they have taken to avoid and minimise the direct and cumulative negative impacts of the major project on biodiversity. The Biodiversity assessment report must also document the reasons why further avoidance and minimisation of impacts is not practicable.

Consideration of avoiding and minimising impacts to biodiversity must be incorporated into the entire project life cycle, including concept planning and design, construction and operational phases.

A proponent of a major project should seek to avoid the direct and indirect impacts of the project on all biodiversity values at the development site. In particular, major projects must attempt to avoid and minimise impacts on:

a) endangered and critically endangered ecological communities (EECs/CEECs), and

b) plant community types that contain threatened species habitat as defined in Section 5.2 of the FBA, and

c) Areas that contain habitat for threatened species and endangered populations that cannot withstand further loss in a major catchment area, as assessed in Section 5.4 of the FBA, and

d) an area of land that the Minister for Environment has declared as critical habitat in accordance with section 47 of the TSC Act, and

e) the riparian areas of 4th order or higher streams and rivers, and

f) state significant biodiversity links.

Where impacts cannot be avoided, consideration must then be given to identifying reasonable actions and strategies that can be used to minimise the impact of development on biodiversity values. This means making the remaining impacts less severe. Where impacts have been avoided and minimised as far as practicable, offsets can then be used to compensate for the remaining loss of biodiversity values.

Minimising impacts on biodiversity values may include reasonable measures that a proponent proposes to undertake, as part of the project approval phase. Measures that minimise the impact on biodiversity may be required for a particular threatened species, or apply to a particular phase of the project life cycle. These measures must be set out in the Biodiversity assessment report.

Determination of the reasonableness of measures aimed at minimising impacts on biodiversity can take into account:

- the cost-effectiveness of the proposed measure (being the cost of undertaking the measure compared to the cost of compensatory biodiversity conservation achieved through an offset)
- industry best practices and standards that avoid and minimise impacts
- the proportion of the total cost of the major project that is dedicated to biodiversity protection
- the risk of failure of the measure.

(i) Demonstrating avoidance and minimisation of direct impacts to biodiversity values at the site selection and design/design phase

Site selection phase

Selecting a suitable development site for a major project should be informed through a preliminary assessment (where possible) of the biodiversity values on the proposed development site.

This preliminary assessment should include a desktop assessment of biodiversity values at the proposed development site, and on adjoining land to identify areas of potential native vegetation on the proposed development site, including any EECs and CEECs and potential habitat for threatened species.

The site selection process should include consideration and analysis of the biodiversity constraints of the proposed development site and consider the feasibility of the major project based on the types of biodiversity values present on the development site.

When considering and analysing the biodiversity constraints for the purpose of selecting a development site, the following matters should be addressed:

- Are there alternative sites within the property where siting the proposed major project would avoid and minimise impacts on biodiversity values?
- Site selection – how was the development site selected to avoid and minimise impacts on biodiversity values as far as practicable?
- Why is an alternative development site that avoids adversely impacting on biodiversity values not feasible?

A description of the methods used to select a development site must be included in the biodiversity assessment report. If no method was used to select a site, the reasons for this must also be provided in the biodiversity assessment report.

Planning/design phase

Once a suitable development site has been selected, further analysis of the biodiversity constraints of the proposed development site can then be used to inform concept planning, project siting and design. This includes the proposed location of temporary construction infrastructure such as roads, camps, stockpile sites and parking bays.

To demonstrate avoidance and minimisation of impacts to biodiversity at the planning/design phase of the major project, the biodiversity assessment report must address the following matters:

- Siting of the project – how the siting and layout of the major project (including associated temporary construction infrastructure) was selected to avoid and minimise adverse impacts on biodiversity values from the major project. The major project should be located in areas on the development site where the native vegetation or threatened species habitat is in the poorest condition (i.e. have a lower site value) or avoids an EEC or CEEC.
- Minimise the amount of clearing or habitat loss – the major project (and associated construction infrastructure) should be located in areas on the development site that do not have native vegetation, or in areas that require the least amount of vegetation to be cleared, and/or in areas where other impacts to biodiversity will be the lowest. If there are areas that contain less vegetation or lower biodiversity impact potential on the development site, an explanation must be provided as to why it is not reasonable for the major project to be sited on those areas.
- Other development site constraints – identify any other constraints on the development site that the assessor has considered in determining the siting and layout of the development footprint, e.g. bushfire protection requirements including clearing for asset protection zones, flood planning levels, servicing constraints.

The results of this analysis must be included in the Biodiversity assessment report to enable the proponent of a major project to demonstrate that impacts on biodiversity values have been avoided and minimised at the site selection, planning and design phase as far as possible.

(ii) Demonstrating avoidance and minimisation of direct impacts to biodiversity values at the construction phase

The construction phase of the major project can have additional direct impacts on biodiversity values. Additional impacts must be avoided and minimised during the construction phase of the project where reasonable.

To demonstrate avoidance and minimisation of impacts to biodiversity at the construction phase, the biodiversity assessment report must address how impacts on biodiversity values on the development site are proposed to be avoided and minimised through the following matters:

- Method of clearing – consideration of how the method of clearing used during the construction phase can avoid damage to retained native vegetation or reduce soil disturbance. For example, removal of native vegetation by chain-saw, rather than heavy machinery is preferable in situations where partial clearing is proposed.
- Clearing operations – consideration of how direct harm to native fauna may be minimised during actual clearing operations through onsite measures such as undertaking pre-clearing surveys, inclusion of daily fauna surveys and the presence of a trained ecologist during clearing events.
- Timing of clearing – assessing the feasibility and types of measures that minimise the impacts on biodiversity. For example, timing construction for when migratory species are absent from the site, or when particular species known or likely to use the habitat are not breeding/nesting can minimise the impacts of construction activities on biodiversity.
- Noise, dust or light spill – consideration of onsite measures that can minimise the impacts on biodiversity values from noise, dust or light spill during the construction phase. For example, only undertake construction during daylight hours to avoid impacts from light-spill where this may be detrimental to species habitat on adjoining lands.
- Development site measures that minimise adverse impacts of the major project on the biodiversity values of the development site – consideration of measures such as: installing temporary fencing to protect significant environmental features such as riparian zones, promoting the hygiene of construction vehicles to minimise spread of weeds or pathogens, appropriately training and inducting project staff and contractors so that they can implement all development site measures that minimise inadvertent adverse impacts of the major project on biodiversity values of the development site.
- Sedimentation and run-off – consideration of sediment barriers or sedimentation ponds to minimise adverse impacts of the major project on biodiversity values on land that is not part of the development site.

All development site measures that are proposed to avoid and minimise adverse impacts during the construction phase of the major project should be documented in the biodiversity assessment report.

(iii) Demonstrating avoidance and minimisation of direct impacts to biodiversity values at the operational phase

The operational phase of the major project can have additional adverse direct impacts on biodiversity values. Reasonable measures implemented on the development site must be considered by the proponent of the major project to avoid and minimise any additional impacts that may occur during the operational phase of the major project.

To demonstrate avoidance and minimisation of impacts to biodiversity at the operational phase, the biodiversity assessment report must address the following matters:

- Indirect impacts – consideration of measures to avoid or minimise the indirect impacts on adjoining threatened species and threatened species habitat, migratory species or flight pathways as a result of the operation of the development. This may include (but is not limited to) avoiding and minimising trampling, rubbish dumping, noise, light-spill, weed encroachment, nutrient run-off, increased risk of fire and pest animals.
- Seasonal impacts – considering whether there are likely to be any impacts that occur during specific seasons. Minimisation may include amending operational times during periods when seasonal events such as breeding or species migration occur.
- Use of artificial habitats – where they can be demonstrated to be effective in minimising impacts, 'artificial habitats' should be used. These include nest boxes, glider-crossings or habitat bridges.
- Monitoring operational impacts – where there is likely to be ongoing indirect impacts on biodiversity, a program to monitor the extent of these impacts should be set out in the Biodiversity assessment report. Development of a monitoring program will involve determining the base-line information that will be necessary to support this. It will also involve determining how the results of the monitoring program can be used to inform ongoing operations in order to reduce the extent of indirect impacts.

All measures that are proposed to avoid and minimise impacts during the operational phase should be documented in the biodiversity assessment report. Well designed and reasonable onsite minimisation measures taken at the development site can be effective in minimising the impact of development on biodiversity values adjacent to the development site and in the surrounding area.

6.4 Demonstrating minimisation of indirect impacts on biodiversity values using reasonable onsite measures

The biodiversity assessment report must:

- include an assessment of the adverse indirect impacts of the major project on biodiversity values
- identify and assess any relevant negative indirect impacts that the development is likely to have on biodiversity values that occur during the construction phase and those that occur once the development is operational
- contain any reasonable onsite measures that minimise the indirect impacts of the development.

When assessing indirect impacts, consideration must be given to all adverse impacts that can reasonably be predicted to result from the development. Indirect impacts on biodiversity must be considered where they are sufficiently related to the development to be considered a consequence of the development.

Well designed and reasonable onsite minimisation measures taken at the development site can be effective in minimising the indirect impacts of the development on biodiversity values on land that adjoins the development site and in the surrounding area.

The types of indirect impacts where consideration of onsite measures is required to minimise any indirect impacts on biodiversity that may arise from the development include, but are not limited to:

- sedimentation and run-off (as described in Section 6.3)
- noise, dust or light spill (as described in Section 6.3)
- inadvertent impacts on adjacent habitat or vegetation, including consideration of measures such as retaining vegetation on the development site as a buffer to protect significant environmental features (e.g. riparian zones, likely or known threatened species habitat)
- feral pest, weed and/or pathogen encroachment into vegetation on land adjoining the development site (e.g. such as using protocols for hygiene that minimise the likelihood of construction vehicles spreading weeds or pathogens from the development site into native vegetation on land adjoining the development site)
- impacts that are infrequent, cumulative or difficult to measure – where there is like to be indirect impacts on biodiversity that are infrequent, cumulative or difficult to measure over time, consideration should be given to how an operational monitoring program can be used to assess the timing and/or extent of these impacts. A proposal for an operational monitoring program should be set out in the biodiversity assessment report. Development of a monitoring program may involve determining the base-line information that will be necessary to measure the impact over time. It should also consider how the results of the monitoring program could be used to inform ongoing operations in order to reduce the extent of indirect impacts
- loss of connectivity – some developments can impact on the connectivity and movement of species through areas of habitat that surround the development site. Minimisation measures may include the construction of structures that allow movement of species across barriers or hostile gaps
- use of artificial habitats (as described in Section 6.3) where they can be demonstrated to be effective in minimising indirect impacts on biodiversity values.

All onsite measures that are proposed to avoid and minimise the indirect impacts of the major project should be documented in the biodiversity assessment report.

7 Calculate loss of biodiversity values at a development site

7.1 Ecosystem credits and species credits

Ecosystem credits and species credits are the two classes of biodiversity credits that are used to measure the loss of biodiversity from the remaining adverse impacts of a major project after all reasonable measures have been taken to avoid and minimise impacts of development on biodiversity.

Ecosystem credits and species credits are also created in respect to the management actions that improve biodiversity values at an offset site. Ecosystem credits and species credits created at an offset site can be used to offset the impacts of a major project that are assessed according to the FBA.

7.2 Assessing change in site value from the direct impacts of development

The future site value must be assessed for each vegetation zone that is directly impacted on by the major project, by considering the extent to which the development will impact on each site attribute. The assessor assigns each site attribute as 0, 1, 2 or 3 as shown in Table 1.

The change in site value score (loss) is the difference between the current site value score and the future site value score for the vegetation zone following clearing for the development, using Equation 2. The change in site value score (loss) is then used in Equation 4 to calculate the number of ecosystem credits required for the development.

A different level of impact may be determined for separate parts of a vegetation zone where partial clearing for the development occurs.

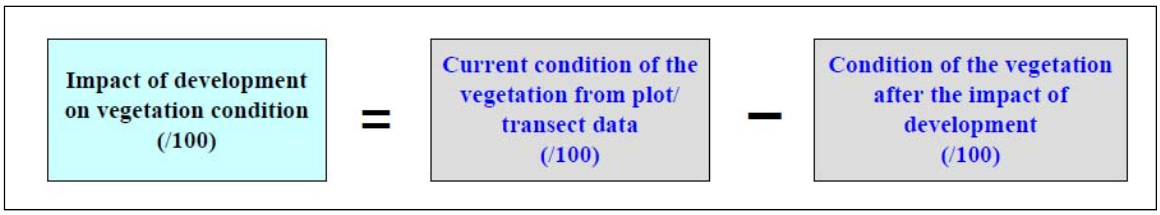
No offset is required under this FBA for the impact of the development on biodiversity values for:

- vegetation zones on a development site that have a Site value score less than 17 as determined according to Section 3.4.2 of the FBA

or

- Vegetation zones on a development site that contain a PCT that in the opinion of the assessor is not listed as a critically endangered or endangered ecological community under the TSC Act or EPBC Act, and the PCT identified by the assessor is not threatened species habitat as determined in accordance with Section 5.3 of the FBA.

Equation 2: Calculate the change in site value score at the development site



7.3 Assessing the change in landscape value from the development

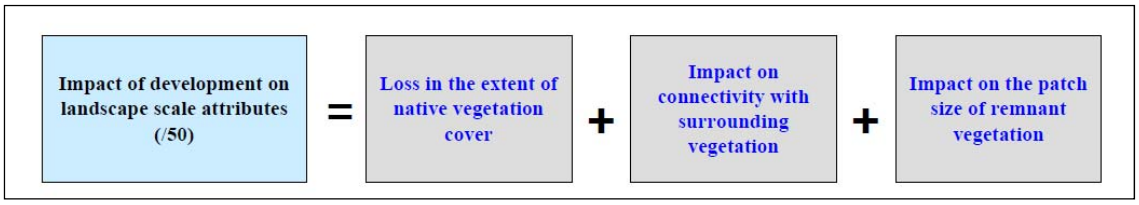
The components used to consider the landscape value of the development must be assessed in accordance with the method set out in Appendix 5 or Appendix 6.

A development that has a site based and linear shaped development footprint may use different landscape value assessments to assess the different impacts that the development may have on the landscape.

The change in landscape value score at the development site must be calculated as the difference between the current landscape value score and the predicted landscape value score after development, using Equation 3.

The score for the change in landscape value must be used in Equation 4 to calculate the number of ecosystem credits required for the major project.

Equation 3: Calculate the change (loss) in landscape value with development



7.4 Calculating the direct impact on vegetation that is an EEC or contains threatened species habitat

Ecosystem credits for PCTs on a development site must be calculated if the PCT:

- is identified as an EEC or CEEC under the TSC Act or EPBC Act under Section 3.2 of the FBA, or
- contains habitat for a threatened species that is likely to use land on the development site as determined under Section 5.3 of the FBA.

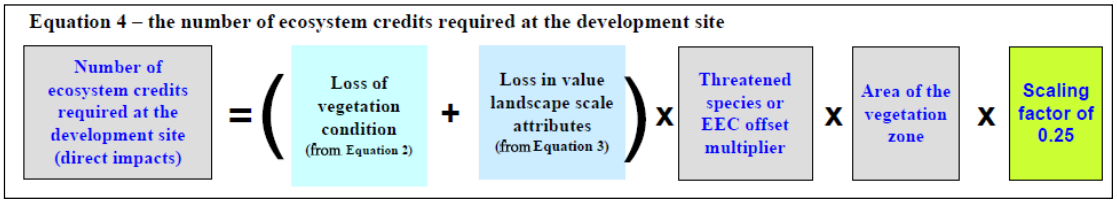
The number of ecosystem credits required where threatened species are identified includes the Threatened Species Offset Multiplier.

For PCTs that are an EEC or a CEEC, the Threatened Species Offset Multiplier to be used in Equation 4 is three (3), which is equivalent to the highest offset multiplier for threatened species that are assessed as ecosystem credits.

The number of ecosystem credits for a vegetation zone must be calculated in accordance with Equation 4. The number of ecosystem credits required at the development 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 being rounded is less than one, in which case the number of credits is rounded to one.

The biodiversity credit assessment report (biodiversity credits) produced from the Credit Calculator sets out the number and type of ecosystem credits required to offset the remaining impacts of development.

Equation 4: Calculate the number of ecosystem credits required for the impact on vegetation that is an EEC or contains threatened species habitat



7.5 Calculating the direct impact on threatened species and populations at a development site

The species to which the calculation of species credits applies are identified through the assessment process set out in Section 5.4.

The number of species credits calculated for the loss of threatened species and/or habitat at the development site is based on the area of habitat or number of individuals likely to be impacted by development in a species polygon using Equation 5.

The number of species credits at the development site is 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.

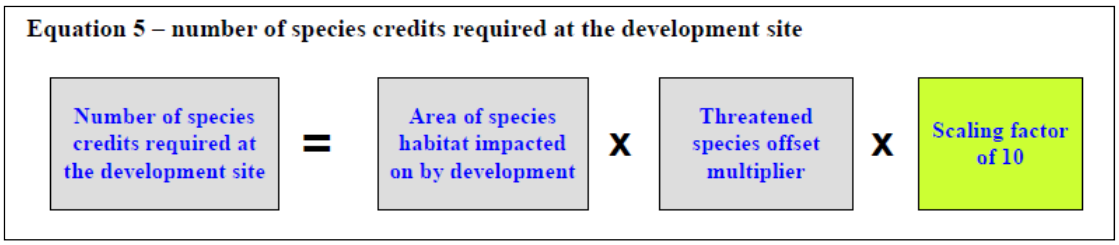
No offset is required under this FBA where no threatened species or habitat components that require species credits have been identified after completing Step 3 in Section 5.3 of the FBA.

Where the assessment of biodiversity values is determined to be below an offset threshold, an assessment of the impacts of the development on those biodiversity values as set out in Stage 2 of the FBA is not required. The assessor must include this determination in the Biodiversity assessment report.

For threatened species, the assessor is required to document the method, timing and survey effort for the targeted survey of threatened species undertaken in Steps 1–3 of Section 5.3 of the FBA.

The biodiversity credit assessment report (biodiversity credits) produced from the Credit Calculator will set out the number and type of species credits required to offset the remaining impacts of development.

Equation 5: Calculate the number of species credits required for the loss of individual threatened species and populations at a development site



7.6 Assessing indirect impacts on biodiversity values

Where the FBA can be used to measure the indirect impact on the biodiversity values of an area of land, biodiversity credits must be calculated to offset the remaining adverse indirect impacts of development after all reasonable onsite measures have been considered according to Section 6.4 of the FBA.

After considering measures to avoid and minimise the indirect impacts on land adjoining the development site, an assessor is required to consider whether the development has any remaining adverse indirect impacts that mean threatened species are unlikely to use that land as habitat.

The assessor must use a buffer zone around the development site, or parts of the development site, to assess the indirect impacts on species habitat from any remaining indirect impacts such as human disturbance, weed encroachment, noise and light spill, or edge effects.

The assessor must use the PCT and the site value data (condition) in Section 3.4 of the FBA from the development site. This data is extrapolated to the buffer area to identify vegetation zones and the current site value score for each vegetation zone.

The assessor must use data collected at the development to determine the PCT and the site value (condition) and extrapolate this data to vegetation in the buffer area. The assessor must then consider any adverse indirect impacts on each site attribute to determine the future site value score.

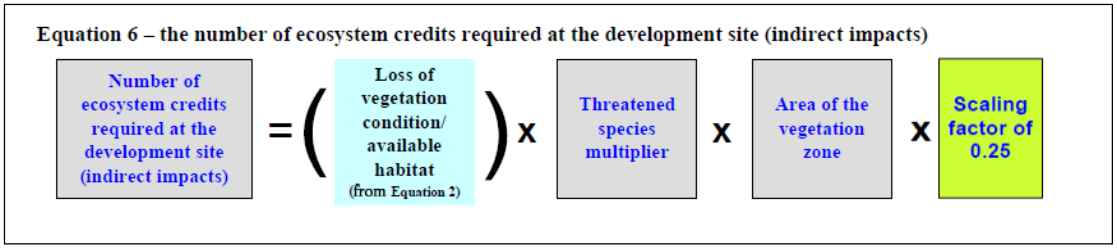
The change in site value score (loss) for vegetation zones in the buffer area is the difference between the current site value score and the future site value score using Equation 2.

The number of ecosystem credits that are required for the adverse indirect impacts on biodiversity values in the buffer area is then calculated according to Equation 6 of the FBA.

The number of ecosystem credits at an offset site is scaled by a factor of 0.25.

The biodiversity credit assessment report (biodiversity credits) produced from the Credit Calculator will set out the number and type of ecosystem credits required to offset the remaining indirect impacts of development.

Equation 6: Calculate the number of ecosystem credits required for the indirect impacts on vegetation that contains threatened species habitat



Species credits may also be calculated for an area of habitat which is no longer used by a species due to the indirect impacts of the development. This can include habitat that has been fragmented by the development, or habitat that is in a buffer area immediately surrounding the development.

The assessor must determine the area of habitat, or the number of individual species on which the development indirectly impacts. Species credits for indirect impacts must be calculated using Equation 5 of the FBA.

The biodiversity assessment report must outline which indirect impacts will be offset and any remaining indirect impacts that cannot be offset. For the remaining indirect impacts that cannot be offset, clear reasons must be provided as to why this was not reasonably possible.

8 Impacts on biodiversity that require further consideration

Certain impacts on biodiversity values will require further consideration by the consent authority. These are impacts that are considered to be complicated or severe. A decision will be made by the consent authority on whether it is appropriate for these impacts to occur. The consent authority may determine:

- the major project cannot be approved with that particular impact
- modifications are required to the major project to reduce the severity of the impact
- the major project can be approved but it will require additional offsets, supplementary measures or other actions to be undertaken with respect to that impact.

The categories of impacts that require further consideration are:

1. an impact that is likely to cause the extinction of a species, population or ecological community from an IBRA subregion, including where it will significantly reduce the viability of a species, population or ecological community
2. impacts on areas of land that the Minister for Environment has declared as critical habitat in accordance with section 47 of the TSC Act and that are listed on the Register of Critical Habitat in NSW (see www.environment.nsw.gov.au/criticalhabitat/CriticalHabitatProtectionByDoctype.htm).
3. impacts that will substantially reduce the width of vegetation in the riparian buffer zone bordering significant streams and rivers
4. impacts that will prevent species movement along corridors that have been identified as providing significant biodiversity linkages across the state.

Further information on how these impacts are defined for each category is set out below.

1. Likely to cause extinction or significantly reduce viability of a species, population or ecological community

This category includes:

a) any impact of development on a critically endangered species and/or a critically endangered ecological community, or

b) any impact of development on an endangered or vulnerable threatened species or population or an endangered ecological community where the impact would mean that the remaining area of habitat (or number of individuals) for a threatened species or population or the remaining extent of the ecological community in the IBRA subregion is less than the area (or number of individuals) that would be required to offset the impact on that entity according to the FBA, or

c) an impact on a species, population or ecological community in an IBRA subregion that is listed in Schedule X [this Schedule will include species, populations and ecological communities that are known to have limited range/viability in a particular IBRA subregion and any adverse impacts of development mean the species, population or ecological community is likely to become extinct in the IBRA subregion].

Notes

- The remaining area of habitat (or number of individuals) for a threatened species or population or the remaining extent of the ecological community in the IBRA subregion is a measure to determine if there is a likelihood that the local population or CEEC/EEC will become extinct either in the short term *or* in the long term as a result of direct or indirect impacts on the viability of that population or CEEC/EEC.
- The remaining area of habitat (or number of individuals) for a threatened species or population or the remaining extent of the ecological community in the IBRA subregion does not necessarily need to be available as an offset. Therefore, determining how much of the entity is remaining in the IBRA subregion may include consideration of all land tenures, including areas that are currently reserved for conservation purposes.
- The 'Offset rules for biodiversity values' set out in Section 10 of the FBA do not apply to this section. Only the remaining area of habitat (or number of individuals) for a threatened species or population or the remaining extent of the ecological community that is being impacted on can be included in this assessment (e.g. same species or ecological community).

2. Impacts on critical habitat

This category includes any impact of development on areas declared 'critical habitat' under section 47 of the TSC Act.

3. Impacts reducing width of riparian buffer

This category includes any impact of development on areas of native vegetation within:

- 20 m either side of a 4th and 5th order stream, or
- 50 m either side of a 6th order stream or higher, or
- 50 m around an estuarine area.

4. Impacts on movement along corridors

This category includes any impact of development on areas of native vegetation on land that is mapped or defined as a state biodiversity link (in an OEH approved plan) and the impact:

- creates a gap greater than 100 m between two areas of moderate to good condition native vegetation with a patch size greater than 1 ha (30 m for grassy ecosystems), or
- degrades vegetation within the state biodiversity link to below moderate condition and hence creates a gap greater than 100 m between two areas of moderate to good condition vegetation with a patch size greater than 1 ha (30 m for grassy ecosystems), or
- creates a hostile link, such as a dual carriageway, wider highway or similar hostile link.

Information to be provided with impacts that require further consideration

If a major project proposal has an impact on biodiversity that is severe or complicated and requires further consideration (i.e. falls within the above categories), the biodiversity assessment report must contain the details of the assessment of impacts on these matters in accordance with Section 8 of the FBA.

The proponent will need to provide additional information for further consideration by the consent authority on the severe impact in the Biodiversity assessment report. The proponent is required to contact OEH for advice on the criteria that must be included in the Biodiversity assessment report.

If it is unclear whether an impact falls into one of the above categories, the proponent must seek advice from OEH. Where there is still uncertainty on whether an impact falls into one of the above categories, the assumption will be that the proposed development will have an impact on biodiversity that will require further consideration.

Stage 3 – Biodiversity offset strategy requirements

9 Matters relating to the biodiversity offset strategy

9.1 Format and content of the biodiversity offset strategy

The biodiversity offset strategy must set out how the adverse impacts on biodiversity at the development site are to be offset in accordance with Sections 9–13 of the FBA.

To offset the impacts of the proposed development, the biodiversity offset strategy can include components of:

1. land-based offset where ecosystem and/or species credits are created on land secured by the proponent (Section 11.3 and Section 11.4), and/or
2. supplementary measures (Section 12).

The biodiversity offset strategy must be submitted to the Department of Planning and Infrastructure as part of the application for approval.

The biodiversity offset strategy must include:

a) the means by which the offset requirement will be met using the options to meet an offset requirement described in Section 9.2. The number and type of credits to be met through each option must be identified. The options to meet an offset requirement include:
    - purchase and retirement of biodiversity credits
    - the creation of biodiversity credits on land identified to be used as an offset (Section 11.3 and Section 11.4)
    - the creation of biodiversity credits on previously mined land through ecological rehabilitation
    - funding of supplementary measures
b) calculation of the number of ecosystem credits and species credits to be created on land identified to be used as an offset including:
    - the calculated security gain score at the offset site for any vegetation that has a site value score greater than 60
    - the calculated number of ecosystem credits created for the improvement in biodiversity values for each vegetation zone at an offset site
    - the calculated number of species credits created for each threatened species that occurs on the offset site
c) calculation of the number of biodiversity credits to be created on land identified for ecological rehabilitation and other information about the proposed ecological rehabilitation including:
    - the sustainable post mining land-use goal to restore a self-sustaining Plant Community Type
    - the rehabilitation objectives for the types of ecosystems to be rehabilitated including specifying the target PCTs that are the target of the rehabilitation.

Only PCTs listed in the VIS Classification Database can be used to create biodiversity credits

- for each PCT, the increase in the site attribute score that will be achieved for each site attribute set out in Table 7
- the total number of biodiversity credits proposed to be created for the ecological rehabilitation for each PCT that is the target of the rehabilitation

d) calculation of the amount of money to be spent on supplementary measures based on the estimated offset cost (following the method described in the offset policy) and a description of the actions proposed to be funded.

The biodiversity offset strategy is to be submitted to the Department of Planning and Infrastructure as part of the application for approval.

9.2 Options that can be used to provide an offset

The conservation measures that may be used in a biodiversity offset strategy include:

1. a land-based offset:
    - reservation of land under the *National Parks and Wildlife Act 1974* or the *Crown Lands Act 1989*
    - entering into a biobanking agreement with respect to the land under Part 7A of the TSC Act
    - acquisition and retirement of biodiversity credits from the biodiversity register established under Part 7A of the TSC Act
2. supplementary measures as defined by Section 12 of the FBA
3. ecological rehabilitation of previously mined land in accordance with Section 11.5 of the FBA.

10 Offset rules for biodiversity values

This section sets out the rules which govern how impacts on the biodiversity values at a development site are offset by the improvements in biodiversity values at an offset site.

Under the offsetting rules established in the FBA, the credit profiles for biodiversity credits created at an offset site are matched with the credit profiles for the type of biodiversity credits required to offset the impacts on biodiversity values at a development site.

A credit profile contains attributes relating to a PCT, threatened species, population and/or an IBRA subregion in order to determine whether the credits created on the offset site can be used to offset the impacts of development.

The purpose of these offset rules is to ensure that losses of biodiversity values are offset by improvements on land with the same or similar biodiversity values.

10.1 Defining a suitable offset for PCTs and threatened species habitat

For ecosystem credits that are required to offset the adverse impacts of a major project, the credit profile consists of the following two attributes:

- plant community type – this attribute identifies the PCT/s from which a credit from an offset site can be matched to a credit created at a development site
- IBRA subregion/s – this attribute identifies the IBRA subregion/s from which a credit from an offset site can be matched to a credit created at a development site.

The credit profile is established according to Table 3 and forms part of the biodiversity credit assessment report (biodiversity credits) produced from the Credit Calculator which sets out the number and type of ecosystem credits required to offset the remaining indirect impacts of development in accordance with Section 7.4 and Section 7.6 of the FBA.

Table 3: Attributes of the credit profile for ecosystem credits

Credit profile attribute	Credit profile for ecosystem credits at a development site
Attribute 1: Plant community types	Plant community types that meet the following criteria will appear on the credit profile for ecosystem credits at a development site: (a) the PCT for which the ecosystem credit is required for the impacts of development (b) any PCT of the same vegetation class as identified in a) that has: • a percent cleared value of the PCT in the major catchment area equal to or greater than the percent cleared of the PCT specified in a) or • a percent cleared value up to 10% lower than the PCT specified in a) if the percent cleared of the PCT specified in a) is less than or equal to 70% cleared.

	Note: To illustrate condition b), a PCT proposed to be cleared that is 60% cleared in the major catchment area may be offset by a PCT that is no less than 50% cleared in the major catchment area where it is of the same vegetation formation.
Attribute 2: IBRA subregions	IBRA subregions that meet the following criteria will appear on the credit profile for ecosystem credits at a development site: (a) the IBRA subregion in which the development occurs (b) the adjoining IBRA subregions within the same IBRA region as identified in a) (c) any other adjoining IBRA subregions that immediately adjoin the IBRA subregion identified in a) (d) any other IBRA subregions that have the same geographic distribution of the threatened species assessed for the ecosystem credit in accordance with Section 5.2.

10.1.1 Offset rules for matching ecosystem credits (for ecological communities and threatened species habitat) to an offset site

The ecosystem credits created at an offset site in accordance with Section 11.3 and Section 11.5 of the FBA may be used to offset the impacts of development on biodiversity values if the following conditions are met:

- the PCT identified in the credit profile for the offset site is the same as any of the PCT(s) identified in attribute 1 of the credit required for the development site

  and

- the IBRA subregion identified in the credit profile for the offset site is the same as any of the IBRA subregion(s) identified in attribute 2 of the credit required for the development site.

10.1.2 Variation of the offset rules for matching ecosystem credits (for ecological communities and threatened species habitat)

The consent authority may approve a variation of the offset rules for using ecosystem credits where a proponent can demonstrate in the biodiversity offset strategy that:

(a) all reasonable steps have been taken to secure the number and type of ecosystem credits impacted on at the development site, and

(b) the PCT to which the ecosystem credit relates is not associated with an ecological community that is listed on the EPBC Act or listed as a critically endangered ecological community on the TSC Act.

In addition the variation will only be approved if the alternative ecosystem credits:

- are from same vegetation formation as the PCT, and
- have a percent cleared value in the major catchment area equal to or greater than the percent cleared of the PCT for which the ecosystem credits are required for the impacts of development.

10.2 Defining a suitable offset for individual threatened species

The credit profile of a species credit relates only to the threatened species or population which is impacted on at a development site or that is being managed at an offset site.

10.2.1 Offset rules for matching species credits species to an offset site

Threatened species that require species credits must be offset with species credits created for the same species that is impacted on at the development site.

Species credits that are required for the breeding habitat component of threatened species that are assessed for ecosystem credits must also be offset with species credits for the breeding habitat component that is impacted on at the development site.

10.2.2 Variation of the offset rules for species credits species

The consent authority may approve a variation of the offset rules for using species credits, by allowing the species credits created at an offset site for another species to that impacted by the proposed development where a proponent can demonstrate in the biodiversity offset strategy that:

(a) all reasonable steps have been taken to secure the number and types of species credits impacted on at the development site, and

(b) the species to which the species credit relates is not listed on the EPBC Act or listed as critically endangered on the TSC Act.

In addition the variation will only be approved if the alternative species credits:

(c) relate to a species or population from the same Order (for fauna species), or the same Family (for flora species) as the species identified in the credit profile in accordance with Section 10.1 of the FBA, and

(d) are generated from conservation measures located on land within the same IBRA region as the land proposed for development, and

(e) where the species credit required for the proposed development relates to a species or population listed in Schedule 1 of the TSC Act, it relates to a species or population listed in either Schedule 1 or 1A of the TSC Act, **or**

(f) where the species credit required for the proposed development relates to a species or population listed in Schedule 2 of the TSC Act, it relates to a species or population listed in either Schedule 1, 1A or 2 of the TSC Act.

The justification for applying a variation to the offset rules for individual threatened species or populations and, the alternative species credits proposed to meet offset requirements, must be included in the biodiversity offset strategy.

11 Calculating gain in biodiversity values at an offset site

Where the proponent of the major project proposes to include a land based offset as part of the biodiversity offset strategy, the offset site must be assessed to determine the biodiversity values according to Sections 3, 4 and 5 of the FBA. This information is then used to determine the number of ecosystem credits and/or species credits that can be created at the offset site according to this section of the FBA.

11.1 Calculating the change in site value score at an offset site

The change in site value score at an offset site is based on the improvement in the condition of native vegetation and threatened species habitat on that land with the management actions listed in Section 11.5.1 of the FBA.

The change in site value score is calculated as the difference between the current site value score and the predicted future Site value score according to Equation 7. The future site value score is determined by increasing the current site attribute scores by the predicted gain for that site attribute with management actions, according to the increase allowed for each attribute set out in Table 4.

The assessor may increase or decrease the predicted incremental improvement where the improvement is predicted to be higher or lower than the increase shown in Table 4 where the offset management plan includes additional management. Any increase to the site attribute score must be in accordance with Appendix 8.

Equation 7: Calculate the change in site value score at the offset site

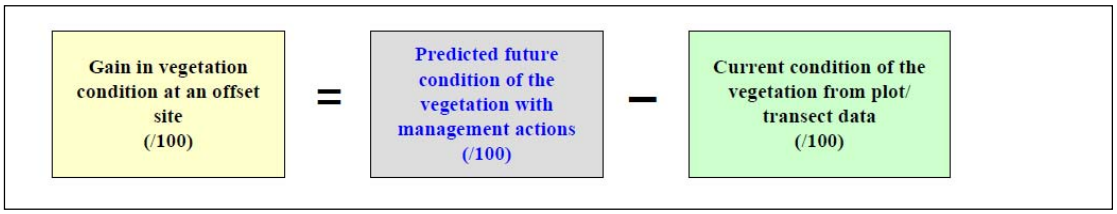


Table 4: Predicted improvement in the site attribute score for each site attribute with management at an offset site

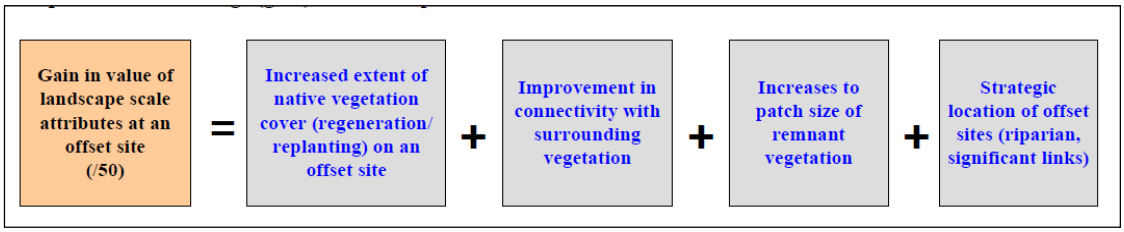
Site attribute		Increase in current site attribute score			
		0	1	2	3
a)	Native plant species richness	+0.5	+0.5	+1	No change
b)	Native over-storey cover	+1	+1	+1	No change
c)	Native mid-storey cover	+1	+1	+1	No change
d)	Native ground cover (grasses)	+1	+1	+1	No change
e)	Native ground cover (shrubs)	+1	+1	+1	No change
f)	Native ground cover (other)	+1	+1	+1	No change
g)	Exotic plant cover	0.5	0.5	+1	No change
h)	Number of trees with hollows	0	+0.5	+1	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

11.2 Calculating the change in landscape value at the offset site

The assessment of the components used to consider the landscape value of an offset site must be according to the method set out in Appendix 8 of the FBA.

The change in landscape value score at an offset site is calculated as the difference between current landscape value score and predicted landscape value score with management actions, using Equation 8.

Equation 8: Calculate the change (gain) in landscape value with offset



At an offset site, the weighting for each landscape attribute is 1; except for percent native vegetation cover within the 1000-ha circle and the connectivity value, which are weighted by 0.625 and 0.75 respectively. These reduced weightings are to accommodate for the attribute that assesses the strategic location of the offset site. The maximum score for each attribute is shown in Table 5.

Table 5: Maximum score of landscape value attributes with weightings

Landscape value attribute	Maximum score with relative weighting
	Offset site
Percent native vegetation cover within an outer assessment circle (minimum of 1000 ha)	10
Percent native vegetation cover within an inner assessment circle (minimum of 100 ha)	10
Connectivity value	9
Total adjacent remnant area	12
Strategic location of an offset site	9
Total for landscape value at an offset site	**50**

11.3 Calculating the number of ecosystem credits created at an offset site

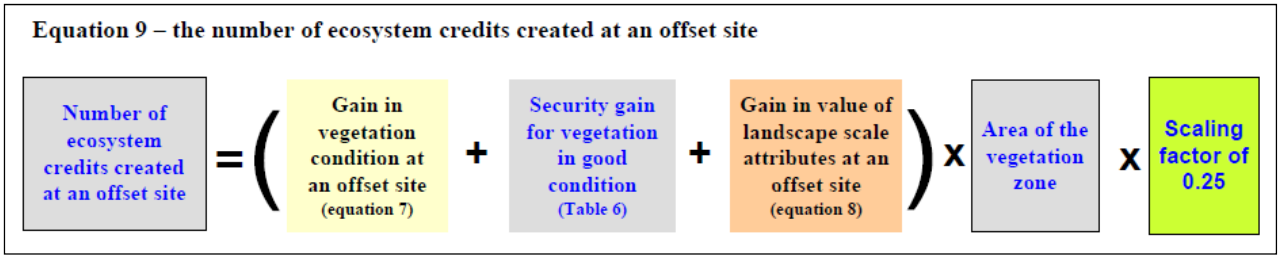
Ecosystem credits are created for the improvement in biodiversity values at an offset site by undertaking the management actions set out in Section 11.5.1 of the FBA. The number of ecosystem credits must be calculated for each vegetation zone on the offset site in accordance with Equation 9.

The calculation of ecosystem credits at an offset site includes a security gain score. A higher weighting for the security gain score may be applied to offset sites on land where the land-use planning zone has a primary purpose for development and/or production. This includes but is not restricted to land that is zoned: Residential, Business, Industrial, Special Purpose (SP2 Infrastructure only) and Rural (RU1 Primary production, RU6 Transition only). Land-use planning zones are described under the Standard Local Environment Plan (see LEP Practice Note PN 11–002 at www.planning.nsw.gov.au/Portals/0/planningsystem/pdf/circulars/PN_11_002_Preparing%20LEPs%20standard%20zones.pdf).

Table 6: Security gain at an offset site

Current site value score	Proportionate weighting % on the current site value score (land-use planning zones for development and production)	Proportionate weighting % on the current site value score (all other land-use planning zones)
<60	0	0
60 – <70	10	5
70 – <80	15	7.5
80 – <90	20	10
≥90	30	15

Equation 9: Calculate the number of ecosystem credits at an offset site

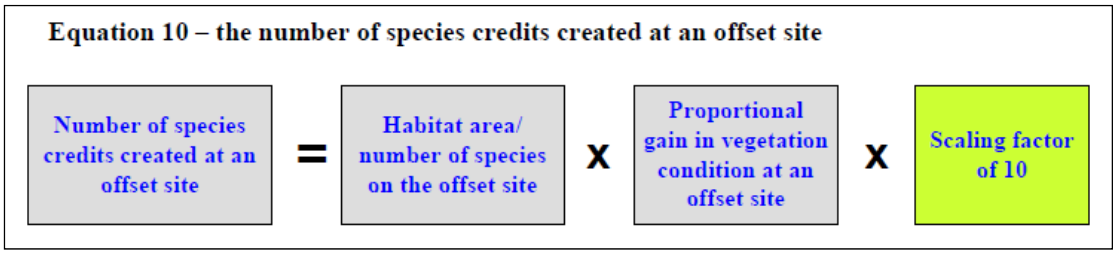


The number of ecosystem credits at an offset site is scaled by a factor of 0.25. The number of credits is rounded to the nearest whole number using conventional rounding rules, except if the number being rounded is less than one, in which case the number of credits is rounded to one.

11.4 Calculating the number of species credits created at an offset site

The number of species credits created at an offset site must be calculated for individual species based on the area of habitat or number of individuals predicted to be impacted positively by management actions within a species polygon using Equation 10.

Equation 10: Calculate the gain for threatened species at an offset site



The number of species credits at the development site must be 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.

11.5 Generating biodiversity credits for ecological rehabilitation of previously mined land

Ecological rehabilitation of previously mined land may be used to generate biodiversity credits to meet an offset requirement for an approval of a major project.

Ecological rehabilitation of previously mined land is land that is subject to an application for a major project (the development site) where the post mining land use is ecological rehabilitation to achieve a self-sustaining and recognisable PCT.

Biodiversity credits can only be generated on land where the post mining land-use goal is to achieve the rehabilitation of self-sustaining and recognisable PCTs.

Generation of biodiversity credits through ecological rehabilitation of previously mined land is assessed in two stages:

Stage 1: Credits are generated to achieve a self-sustaining and recognisable PCT. These credits can be used to offset a proponent's current development proposal.

Stage 2: Where rehabilitation objectives have been achieved and relevant performance indicators and completion criteria have been met,

additional biodiversity credits can be generated where the land is secured by an in-perpetuity conservation measure. These credits cannot be used to offset a proponent's current development but can be sold or used to offset future development.

Generally only ecosystem credits can be generated for ecological rehabilitation undertaken on a site post mining closure in Stage 1. In some circumstances, it may be possible to create species credits for a threatened fauna and flora species, such as grasses.

Biodiversity offset strategy

Stage 1: Credits generated to achieve a self-sustaining and recognisable PCT

A Biodiversity offset strategy that is prepared as part of an application for approval of a major project may include ecological rehabilitation of mined land as part of the offset strategy.

The calculation of the number of biodiversity credits created for ecological rehabilitation of post mined land must be in accordance with Section 11.5.1. Ecosystem credits created for a PCT from the ecological rehabilitation of post mined land must only be used to offset the credit requirement for a major project when:

(a) the PCT for which the ecosystem credit is required for the impacts of the major project is from the same vegetation formation as (b),the PCT that is the target of the ecological rehabilitation, and

(b) the PCT that is the target of the ecological rehabilitation occurs naturally within the same IBRA subregion or the surrounding IBRA subregions.

Where ecological rehabilitation of mined land is proposed as part of an offset, the biodiversity offset strategy must set out:

- the sustainable post mining land-use goals and objectives for the types of ecosystems to be rehabilitated
- the rehabilitation objectives including specifying the target PCTs that are the target of the rehabilitation. Only PCTs listed in the VIS Classification Database can be used to create biodiversity credits.
- a description of the natural distribution of the PCT within the IBRA subregion and the surrounding IBRA subregions
- the rehabilitation objectives and completion criteria for each PCT, written so that they are specific, produce measureable data and demonstrate that the proposed outcomes are achievable and realistic within the timeframe specified
- for each PCT, specifying the increase in the site attribute score that will be achieved for each site attribute set out in Table 7
- the total number of biodiversity credits proposed to be created for the ecological rehabilitation for each PCT that is the target of the rehabilitation in accordance with Section 11.5.1 of the FBA
- the PCT/s to which the proposed biodiversity credits will be used to offset the impact of the major project.

The biodiversity offset strategy is to be submitted to the consent authority as part of the application for approval of the major project.

Conditions of consent relating to rehabilitation will be carried over to the proponent's mining licence under the *Mining Act 1992*, and will include requirements for lodging security, specific and measurable objectives for rehabilitation, completion criteria,

performance indicators and other relevant requirements for successful completion of the rehabilitation.

Stage 2: Ongoing management of rehabilitated areas

Further biodiversity credits can only be created where the rehabilitated lands are secured and managed under an in-perpetuity conservation measure once the rehabilitation has been completed. The in-perpetuity conservation measure must meet the criteria under the NSW biodiversity offsets policy for major projects. The calculation of biodiversity credits in Stage 2 must be made in accordance with the FBA that is in force at the time that an in-perpetuity conservation measure is entered into for ongoing management of the rehabilitated land.

11.5.1 Calculating biodiversity credits for the proposed rehabilitation of mined land

Ecosystem credits are generated for the PCT that is the target of the rehabilitation. A PCT different to the one that originally occurred on the site prior to development can be chosen, but must still represent a PCT listed in the VIS Classification Database.

The current site value for mine rehabilitation is the site value taken immediately before the commencement of restorative actions. This means that the score for each site attribute must start at 0 and the overall site value score is also 0.

The future site value score that is to be achieved from the ecological rehabilitation must be assessed against the benchmark values for the PCT that is the target of the rehabilitation.

To calculate the number of ecosystem credits that can be generated for ecological rehabilitation, the biodiversity offset strategy must specify the:

a) PCT that is to be restored

b) standard of restoration that is to be achieved for each site attribute against the benchmark for the PCT according to the criteria provided in Table 7, and

c) the area of land that is to be restored to a self-sustaining and recognisable PCT.

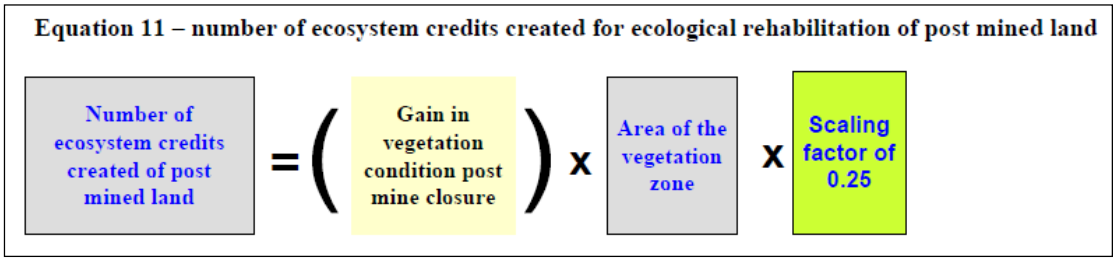
Equation 11 is then used to determine the number of ecosystem credits that can be created for the proposed ecological rehabilitation.

For some site attributes, a range of condition scores are provided in Table 7. The biodiversity offset strategy must set out the rehabilitation objectives for each PCT and address how the proposed ecological rehabilitation works will contribute to reaching the specified condition level chosen for each site attribute.

The rehabilitation objectives for each PCT must be written so that they are specific, produce measureable data and demonstrate that the proposed outcomes are achievable and realistic within the timeframe specified. The timeframe that is specified is generally the timeframe in which the completion criteria are to be completed or achieved.

The use of habitat augmentation features such as logs and nest boxes may be used to achieve the expected improvement in condition for site attributes in accordance with the criteria for that attribute. These may also be used to support habitat for threatened species that are assessed for species credits.

Equation 11: Calculate the number of ecosystem credits created for ecological rehabilitation of post mined land



The attributes for landscape value are not considered in the calculation of ecosystem credits during Stage 1 and Stage 2. This means that ecosystem credits can only be generated for the biodiversity values that occur on the site. Once the completion criteria for establishing a self-sustaining PCT have been met, the biodiversity value of the ecological rehabilitation at the landscape value scale can be assessed and used to contribute to the generation of further biodiversity credits (Stage 3).

Species credits are calculated for species that are assessed for species credits according to Equation 12. The biodiversity offset strategy must set out the rehabilitation objectives for each threatened species and address how the proposed ecological rehabilitation works will contribute to the restoration of habitat for the species.

Equation 12: Calculate the number of credits created for ecological rehabilitation of post mined land

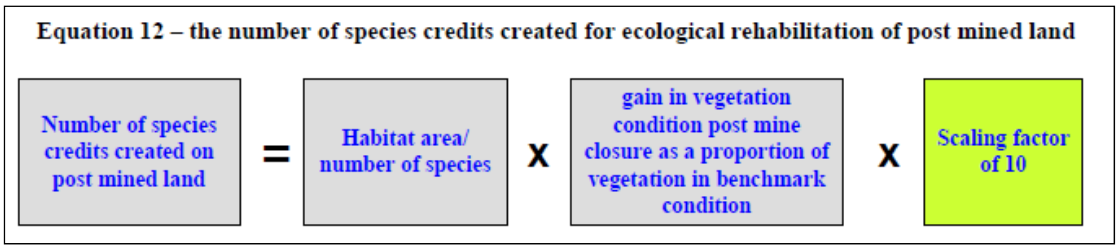


Table 7: Maximum allowable additional increases in the site attribute score for the rehabilitation of post mined land

	Increase in site attribute score for rehabilitation	
Site attribute	**Maximum increase in the site attribute condition score from 0**	**Completion/relinquishment criteria for assessing the site attribute condition against the benchmark for the PCT**
Native plant species richness	Attribute score may increase by: • 0.5, or • 1.0	Only plant species characteristic of the target plant community type may be counted towards native plant species richness. • Completion/relinquishment criteria – the rehabilitation will achieve >25% of the native plant species richness benchmark for the nominated PCT • Completion/relinquishment criteria – the rehabilitation will achieve >50% of the native plant species richness benchmark for the nominated PCT
Over-storey cover	Attribute score may increase by: • 0.5, or • 1	Only-over-storey plant species characteristic of the target PCT may be counted towards percent native over-storey cover. • Completion/relinquishment criteria for an increase in 0.5 – the rehabilitation will achieve >10 - <25% or >200% of the percent native over-storey cover benchmark for the nominated PCT • Completion/relinquishment criteria for an increase in 1 – the rehabilitation will achieve >25 - <50% or >150% - <200% of the percent native over-storey cover benchmark for the nominated PCT
Mid-storey cover	Attribute score may increase by: • 0.5, or • 1	Only mid-storey plant species characteristic of the target plant community type may be counted towards percentage native over-storey cover. • Completion/relinquishment criteria – the rehabilitation will achieve >10 and <25%, or > 200% of the percent native mid-storey cover benchmark for the nominated PCT • Completion/relinquishment criteria – the rehabilitation will achieve >25 and <200% of the percent native mid-storey cover benchmark for the nominated PCT
Native ground cover (grasses)	Attribute score may increase by: • 0.5, or • 1.0	Only native ground cover (grass) plant species characteristic of the target plant community type may be counted towards percentage native over-storey cover. • Completion/relinquishment criteria – the rehabilitation will achieve >10 and <25%, or > 200% of the percent native ground cover (grasses) benchmark for the nominated PCT • Completion/relinquishment criteria – the rehabilitation will achieve >25 and <200% of the percent native ground cover (grasses) benchmark for the nominated PCT
Native ground cover (shrubs)	Attribute score may increase by: • 0.5, or • 1.0	Only native ground cover (shrub) plant species characteristic of the target plant community type may be counted towards percentage native over-storey cover. • Completion/relinquishment criteria – the rehabilitation will achieve >10 and <25%, or > 200% of the percent native ground cover (shrubs) benchmark for the nominated PCT • Completion/relinquishment criteria – the rehabilitation will achieve >25 and <200% of the percent native ground cover (shrubs) benchmark for the nominated PCT
Native ground cover (other)	Attribute score may increase by: • 0.5, or • 1.0	Only native ground cover (other) plant species characteristic of the target plant community type may be counted towards percentage native over-storey cover. • Completion/relinquishment criteria – the rehabilitation will achieve >10 and <25%, or > 200% of the percent native ground cover (other) benchmark for the nominated PCT • Completion/relinquishment criteria – the rehabilitation will achieve >25 and <200% of the percent native ground cover (other) benchmark for the nominated PCT

	Increase in site attribute score for rehabilitation	
Site attribute	**Maximum increase in the site attribute condition score from 0**	**Completion/relinquishment criteria for assessing the site attribute condition against the benchmark for the PCT**
Exotic plant cover	Attribute score may increase by: • 0.5 • 1.0	Exotic plant cover is measured as total percent foliage cover of all exotics in all strata. • Completion/relinquishment criteria – the exotic plant cover will be in a range >45 and <60%. Exotic plant cover must be calculated as a percentage of the total ground and mid-storey cover. • Completion/relinquishment criteria – the exotic plant cover will be <45%. Exotic plant cover must be calculated as a percentage of the total ground and mid-storey cover.
Number of trees with hollows	Attribute score may increase by: • 0.5	Only stags brought onto the site from an adjoining development area and already contain hollows and are properly secured may be used as habitat augmentation for this attribute
Over-storey regeneration	Attribute score may increase by: • 0.5	Over-storey regeneration is when a second generation of over-storey plants naturally regenerate on the site as a result of reproduction of established over-storey species. Over-storey regeneration does not include juvenile or young plants which have been planted or seeded. Over-storey regeneration must be present across the vegetation zone. • Completion/relinquishment criteria for an increase in 0.5 – at least >25% and <50% of over-storey species for the nominated PCT are naturally regenerating.
Total length of fallen logs	Attribute score may increase by: 0.5	The active placement of hollow logs that are brought onto the site from an adjoining development area and are placed in a configuration that reflects natural systems can be used as habitat augmentation • Completion/relinquishment criteria for an increase in 0.5 – the length of coarse woody debris will be in a range >25% and <50% of the total length of fallen logs benchmark for the nominated PCT.
Native plant species richness	Attribute score may increase by: • 0.5, or • 1.0	Only plant species characteristic of the target plant community type may be counted towards native plant species richness. • Completion/relinquishment criteria – the rehabilitation will achieve >25% of the native plant species richness benchmark for the nominated PCT • Completion/relinquishment criteria – the rehabilitation will achieve >50% of the native plant species richness benchmark for the nominated PCT
Over-storey cover	Attribute score may increase by: • 0.5, or • 1	Only-over-storey plant species characteristic of the target PCT may be counted towards percent native over-storey cover. • Completion/relinquishment criteria for an increase in 0.5 – the rehabilitation will achieve >10 - <25% or >200% of the percent native over-storey cover benchmark for the nominated PCT • Completion/relinquishment criteria for an increase in 1 – the rehabilitation will achieve >25 - <50% or >150% - <200% of the percent native over-storey cover benchmark for the nominated PCT
Mid-storey cover	Attribute score may increase by: • 0.5, or • 1	Only mid-storey plant species characteristic of the target plant community type may be counted towards percentage native over-storey cover. • Completion/relinquishment criteria – the rehabilitation will achieve >10 and <25%, or > 200% of the percent native mid-storey cover benchmark for the nominated PCT • Completion/relinquishment criteria – the rehabilitation will achieve >25 and <200% of the percent native mid-storey cover benchmark for the nominated PCT

	Increase in site attribute score for rehabilitation	
Site attribute	**Maximum increase in the site attribute condition score from 0**	**Completion/relinquishment criteria for assessing the site attribute condition against the benchmark for the PCT**
Native ground cover (grasses)	Attribute score may increase by: • 0.5, or • 1.0	Only native ground cover (grass) plant species characteristic of the target plant community type may be counted towards percentage native over-storey cover. • Completion/relinquishment criteria – the rehabilitation will achieve >10 and <25%, or > 200% of the percent native ground cover (grasses) benchmark for the nominated PCT • Completion/relinquishment criteria – the rehabilitation will achieve >25 and <200% of the percent native ground cover (grasses) benchmark for the nominated PCT
Native ground cover (shrubs)	Attribute score may increase by: • 0.5, or • 1.0	Only native ground cover (shrub) plant species characteristic of the target plant community type may be counted towards percentage native over-storey cover. • Completion/relinquishment criteria – the rehabilitation will achieve >10 and <25%, or > 200% of the percent native ground cover (shrubs) benchmark for the nominated PCT • Completion/relinquishment criteria – the rehabilitation will achieve >25 and <200% of the percent native ground cover (shrubs) benchmark for the nominated PCT
Native ground cover (other)	Attribute score may increase by: • 0.5, or • 1.0	Only native ground cover (other) plant species characteristic of the target plant community type may be counted towards percentage native over-storey cover. • Completion/relinquishment criteria – the rehabilitation will achieve >10 and <25%, or > 200% of the percent native ground cover (other) benchmark for the nominated PCT • Completion/relinquishment criteria – the rehabilitation will achieve >25 and <200% of the percent native ground cover (other) benchmark for the nominated PCT
Exotic plant cover	Attribute score may increase by: • 0.5 • 1.0	Exotic plant cover is measured as total percent foliage cover of all exotics in all strata. • Completion/relinquishment criteria – the exotic plant cover will be in a range >45 and <60%. Exotic plant cover must be calculated as a percentage of the total ground and mid-storey cover. • Completion/relinquishment criteria – the exotic plant cover will be <45%. Exotic plant cover must be calculated as a percentage of the total ground and mid-storey cover.
Number of trees with hollows	Attribute score may increase by: • 0.5	Only stags brought onto the site from a development area and already contain hollows and are properly secured may be used as habitat augmentation for this attribute
Over-storey regeneration	Attribute score may increase by: • 0.5	Over-storey regeneration is when a second generation of over-storey plants naturally regenerate on the site as a result of reproduction of established over-storey species. Over-storey regeneration does not include juvenile or young plants which have been planted or seeded. Over-storey regeneration must be present across the vegetation zone. • Completion/relinquishment criteria for an increase in 0.5 – at least >25% and <50% of over-storey species for the nominated PCT are naturally regenerating.
Total length of fallen logs	Attribute score may increase by: 0.5	The active placement of hollow logs that are brought onto the site from an adjoining development area and are placed in a configuration that reflects natural systems can be used as habitat augmentation • Completion/relinquishment criteria for an increase in 0.5 – the length of coarse woody debris will be in a range >25% and <50% of the total length of fallen logs benchmark for the nominated PCT.

11.6 Management actions that improve biodiversity values

Biodiversity credits may be created for improvement in biodiversity values from management actions at an offset site. Ecosystem credits and/or species credits can be created for management actions that are, or are proposed to be, carried out at an offset site. All management actions must be recorded in a management plan designed for the offset site in accordance with requirements of the conservation measure that is used to secure the offset site.

11.6.1 Management actions for creating ecosystem credits and species credits

Ecosystem credits may be created based on the following standard management actions:

- management of grazing for conservation (strategic grazing)
- weed control
- application of ecological fire management
- management of human disturbance
- retention of regrowth and remnant native vegetation
- replanting or supplementary planting where natural regeneration will not be sufficient
- retention of dead timber (fallen and standing)
- erosion control, and/or
- retention of rocks.

All the above management actions must be implemented on the offset site to achieve the predicted gain in site value, as determined by using Table 4 and Equation 7.

Additional management actions may be required at an offset site for particular threatened species. These management actions are additional to the standard management actions and may be required to create ecosystem credits or species credits.

Examples of additional actions that may be required for relevant species as identified in the Threatened Species Profile Database are:

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

Additional management actions must be listed in the management plan for the offset site. The additional management actions will only be required where they are identified by the Threatened Species Profile Database for the species.

The management plan for an offset site will include the details of how each management action will be implemented at the site, the area to which it applies and the timeframe for implementation.

11.7 Use of offsets in respect of lands with existing conservation obligations

Ecosystem and species credits may be created by management actions proposed to be carried out on an offset site only where the management actions are additional to any biodiversity conservation measures, or other actions, that are existing obligations. For example, obligations required for land which is subject to:

a) a restriction on use or public positive covenant under Part 4A of the *Crown Lands Act 1989*

b) a conservation agreement entered into under the National Parks and Wildlife Act

c) a trust agreement entered into under the *Nature Conservation Trust Act 2001*

d) any agreement entered into with a public authority under which the owner of the land received funding for biodiversity conservation purposes (other than biobanking agreements)

e) in the case of publically owned land, any legislative requirements to manage the land for biodiversity conservation purposes.

Existing conservation obligations do not apply to management actions that are undertaken voluntarily and which are not secured by any legal obligation.

Where an offset site is proposed on land on which there is an existing conservation obligation (e.g. those listed a) to e) above) the number of biodiversity credits calculated in accordance with Section 11.3 and Section 11.4 are then discounted.

The method for discounting the number of ecosystem credits and species credits created at an offset site for which conservation obligations exist is:

Step 1: Calculate credits for the proposed offset site

Calculate the number of ecosystem credits and species credits that are created for the offset site in accordance with Equation 9 (for ecosystem credits) and Equation 10 (for species credits).

Step 2: Identify the management actions required for the existing conservation obligations

The management actions referred to in Section 11.6.1 that are required for the existing conservation obligation, and the timeframe for which they are required, should be identified.

Step 3: Determine the management action discount percentage required for the existing conservation obligations

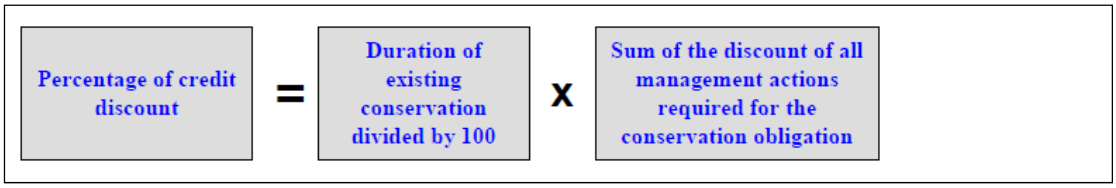
The number of credits as determined in Step 1 for the offset site is scaled back according to the management actions that the landholder is already obliged to perform under the existing obligation and the percentage discount for each management action according to Table 8 for ecosystem credits and Table 9 for species credits.

Where an existing obligation only partially aligns with a management action (e.g. ‘exclusion of domestic stock’ rather than ‘management of grazing for biodiversity enhancement’), the credit allocation is discounted by 5% rather than by 7.5%.

Step 4: Identify the duration of the existing conservation obligation/s and finalise the credit discount percentage

The timeframe for which the management action/s under the existing conservation obligation, identified in Step 2, must be identified. The final discount percentage must be determined in accordance with Equation 13.

Equation 13: Calculate the final credit discount percentage for existing conservation obligations



The number of ecosystem credits and of species credits as determined in Step 1 are then scaled back according to the final discount percentage.

Table 8: Percentage discount for ecosystem credits

Conservation measures or actions	Percentage discount in ecosystem credit allocation where the existing conservation obligation is in-perpetuity
Strategic stock grazing for conservation (or domestic stock grazing exclusion)	7.5% (5% if obligation is only for domestic stock grazing exclusion)
Weed control	7.5%
Application of ecological fire management (or Do not burn)	7.5% (5% if obligation is only fire exclusion)
Manage human disturbance	7.5%
Retain regrowth and remnant native vegetation	5%
Replant/supplementary planting	7.5%
Retention of all dead timber (standing and fallen)	7.5% (0% if obligation only excludes commercial use as this is required under the *Native Vegetation Act 2003*)
Nutrient control	5%
Erosion control	7.5%
Retention of rocks	5%
Control feral and/or overabundant native herbivores	7.5%
Control feral pigs	7.5%
Exclude miscellaneous feral species	7.5%
Control exotic pest fish species (within dams)	7.5%
Maintain or re-introduce natural flow regimes	7.5%
Fox control	7.5%

Table 9: Percentage discount for species credits

Conservation measures or actions	Percentage discount in species credit allocation where the existing conservation obligation is in-perpetuity
Control feral herbivores (and/or overabundant natives)	7.5%

Control feral pigs	7.5%
Exclude miscellaneous feral species	7.5%
Control exotic pest fish species (within dams)	5%
Maintain or re-introduce natural flow regimes	5%
Nutrient control	5%
Exclude commercial apiaries	5%
Fox control	7.5%
Any other management action for species credits	7.5% (for each additional action)

Existing conservation obligations and the process for discounting conservation actions must be outlined in the biodiversity offsets strategy.

12 Use of supplementary measures

Supplementary measures are actions that are taken to improve biodiversity or other environmental values. These can be used to meet offset requirements under specific circumstances. The rules surrounding the implementation and use of supplementary measures and the calculations used to derive the financial contribution to meet offset requirements are outlined in Appendix 1 of the Draft NSW Biodiversity Offsets Policy for Major Projects.

Other matters relating to the FBA

13 Administration of the FBA

13.1 Application of the FBA

For the purpose of preparing a biodiversity assessment report and a biodiversity offset strategy, the application of the FBA to determine the number of biodiversity credits required at a development site or to be created at an offset site must be made by a person accredited in accordance with section 142B(1)(c) of the TSC Act.

13.2 Use of certified local data

The consent authority may certify that more appropriate local data can be used instead of the data in the VIS Classification Database, Vegetation Benchmarks Database and the Threatened Species Profile Database.

Local data may be used if the consent authority is of the opinion that it more accurately reflects local environmental conditions than the data in the databases.

Benchmark data that more accurately reflect the local environmental conditions for a PCT may be collected from local reference sites, or obtained from relevant published sources using the procedures set out in Appendix 3.

The certified local data can then be used in applying the FBA in accordance with any procedures outlined in the Operational Manual.

13.3 Updates of the databases and decision support system

The databases used in the FBA are periodically updated in response to increased knowledge about biodiversity values and relevant biodiversity data. Changes to the databases may require an updated version of the decision support system (the Credit Calculator) to be issued by OEH.

An accredited assessor must use the Credit Calculator to undertake an assessment of the impacts of the major project on biodiversity values and to prepare a biodiversity assessment report. The Credit Calculator or the Biobanking Credit Calculator may be used by an accredited assessor to undertake an assessment of the biodiversity values of an offset site and to prepare a biodiversity offset strategy. OEH will notify persons accredited to use the FBA and Credit Calculator when an updated version of the Credit Calculator is available.

Applications for development consent must include the biodiversity assessment report and the biodiversity offset strategy must be made using the current version of the Credit Calculator available from OEH.

The databases used in the FBA include:

- Threatened Species Profile Database
- NSW VIS Classification Database
- Vegetation Benchmarks Database
- Over-cleared landscapes database (Mitchell landscapes)
- Important Wetlands database.

Definitions

References to legislation in the FBA are references to legislation as in force from time to time.

References to sections are references to sections of this FBA unless otherwise indicated.

The following terms are defined for the purposes of the FBA:

Adjacent remnant area: has the meaning given in Section 4.3.

Assessment circles: means two circles of 100 ha and 1000 ha (the inner and outer circle) in which the percent native vegetation cover in the landscape is assessed, taking into account both cover and condition of vegetation.

Assessor: means the person referred to in Section 13.1 and who has been engaged by the proponent.

Benchmarks: has the meaning given by Section 3.4.

Biodiversity assessment report: means the report that must be prepared in accordance with Section 2.1 of the FBA.

Biodiversity credit assessment report: the report produced by the Credit Calculator that sets out the number and type of biodiversity credits required to offset the remaining adverse impacts on biodiversity values at a development site, or sets out the number and type of biodiversity credits that are created at an offset site.

Biodiversity credits: the measure used to calculate biodiversity loss and gain on a development site or an offset site. Biodiversity credits are either ecosystem credits or species credits and each credit represents a specific type of ecosystem or species.

Biodiversity offset strategy: has the meaning given to it in Section 9.1.

Biodiversity offsets: are management actions that are undertaken to improve biodiversity values on areas of land in order to compensate for biodiversity losses from the impacts of development.

Biodiversity values: has the same meaning as at section 4A of the TSC Act but excludes marine mammals, wandering sea birds and biodiversity that is endemic to Lord Howe Island.

Certified local data: *see* **More appropriate local data**.

Connectivity: the measure of the degree to which an area(s) of native vegetation is linked with other areas of vegetation.

Connectivity value: has the meaning given in Section 4.2.

Consent authority: for major projects this will generally be the Minister for Planning and Infrastructure, or by delegation including the Planning Assessment Commission or senior officers of the Department of Planning and Infrastructure.

Credit Calculator: the computer program that provides decision support to assessors and proponents. The Credit Calculator applies the FBA and calculates the number and type of biodiversity credits required at a development site or created at an offset site.

Critically endangered ecological community (CEEC): an ecological community specified in Part 2 of Schedule 1A of the TSC Act.

Development: has the same meaning as development at section 4 of the EP&A Act and includes development as defined in s. 115T of the EP&A Act.

Development footprint: the area of land that is directly impacted on by a proposed major project that is under the EP&A Act.

Development site: an area of land that is subject to a proposed major project that is under the EP&A Act.

Ecosystem credits: means the class of biodiversity credits created in respect of management actions that are proposed to be carried out on or in respect of an offset site or required for the impact on general biodiversity values and some threatened species, i.e. for biodiversity values except threatened species or populations that require species credits. Species that require ecosystem credits are listed in the Threatened Species Profile Database.

Endangered ecological community (EEC): means an ecological community specified in Part 3 of Schedule 1 of the TSC Act.

EP&A Act: means the *Environmental Planning and Assessment Act 1979*.

Exotic plant cover: exotic plants are vascular plants not native to Australia. Exotic plant cover is measured as total percent foliage cover of all exotics in all strata.

Expert: a person who is accredited by the Director-General under section 142B(1)(b) of the TSC Act, or if arrangements for accreditation under section 142B(1)(b) are not in place, a person who has the relevant experience and/or qualifications to provide expert opinion in relation to the biodiversity values to which an expert report relates.

FBA: means this Framework for Biodiversity Assessment.

Grassland: means native vegetation classified in the vegetation formation 'Grasslands' in Keith (2004)[3]. Grasslands are generally dominated by large perennial tussock grasses, 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.

Habitat: means an area or areas occupied, or periodically or occasionally occupied, by a species, population or ecological community, including any biotic or abiotic component.

Habitat component: means the component of habitat that is used by a threatened species for either breeding, foraging or shelter.

Habitat surrogates: means the following measures of habitat for threatened species, populations and communities: IBRA subregion, PCT, percent vegetation cover and vegetation condition.

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

IBRA region: means a bioregion identified under the Interim Biogeographic Regionalisation for Australia (IBRA) system[4], which divides Australia into bioregions on the basis of their dominant landscape-scale attributes.

IBRA subregion: means a subregion of a bioregion identified under the Interim Biogeographic Regionalisation for Australia (IBRA) and based on major catchment areas as shown in Appendix 9.

Impact assessment: refers to an assessment of the impact or likely impact of a major project on biodiversity values which is prepared in accordance with the FBA.

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[3] 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.

[4] Thackway, R and Cresswell ID (1995), *An interim biogeographic regionalisation for Australia: a framework for setting priorities in the National Reserves System Cooperative Program*, Australian Nature Conservation Agency, Canberra.

Impacts on biodiversity values: refers to loss in biodiversity values from direct or indirect impacts of the major project in accordance with Section 6.

Individual: in relation to organisms, means a single, mature organism that is a threatened species defined in section 4(1) of the TSC Act, or any additional threatened species listed under Part 13 of the EPBC Act.

Initial desktop assessment of biodiversity values: an assessment undertaken as part of concept-planning, and that informs project siting and design. The assessment compiles all existing environmental information about the site, and where necessary, additional information relating to features of biodiversity significance.

Landscape value: has the meaning given in Section 4.

Major catchment area: means the area of operation of a former catchment management authority, as described in Schedule 2 of the *Catchment Management Authorities Act 2003* immediately before its repeal.

Major project: means State significant development or State significant infrastructure projects, such as mines, hospitals and highways.

Mitchell landscape: means landscapes with relatively homogeneous geomorphology, soils and broad vegetation types, mapped at a scale of 1:250,000.

More appropriate local data: means data used for the purpose of an assessment in accordance with the FBA that in the opinion of the assessor more accurately reflects local environmental conditions and is certified by the consent authority in relation to the Vegetation Benchmarks Database, the VIS Classification Database and the Threatened Species Profile Database.

Native ground cover: all native vegetation below 1 m in height, including all such species native to NSW (i.e. not confined to species indigenous to the area).

Native ground cover (grasses): Native ground cover contains all native vegetation below 1 m in height and includes all species native to New South Wales (i.e. it s not confined to species indigenous to the area).

Native ground cover (other): native ground cover contains all native vegetation below 1 m in height and includes all species native to New South Wales (i.e. it is not confined to species indigenous to the area). Native ground cover (other) refers to non-woody native vegetation (vascular plants only) <1 m that is not grass (e.g. herbs, ferns).

Native ground cover (shrubs): native ground cover contains all native vegetation below 1 m in height and includes all species native to New South Wales (i.e. it is not confined to species indigenous to the area). Native ground cover (shrubs) refers to native woody vegetation <1 m.

Native mid-storey cover: Native mid-storey contains all vegetation between the over-storey stratum and a height of 1 m (typically tall shrubs, under-storey trees and tree regeneration) and including all species native to NSW (i.e. native species not local to the area can contribute to mid-storey structure).

Native over-storey cover: Native over-storey is the tallest woody stratum present (including emergent) above 1 m and including all species native to NSW (i.e. native species not local to the area can contribute to over-storey structure). In a woodland community the over-storey stratum is the tree layer, and in a shrubland community the over-storey stratum is the tallest shrub layer. Some vegetation types (e.g. grasslands) may not have an over-storey stratum.

Native plant species richness: the number of different native vascular plant species that are characteristic of a PCT.

Native vegetation: has the same meaning as in section 6 of the *Native Vegetation Act 2003* (NV Act).

Number of trees with hollows: a count of the number of living and dead trees that have at least one hollow. A tree is considered to contain a hollow if: (a) the entrance can be seen; (b) the minimum entrance width is at least 5 cm across; (c) the hollow appears to have depth (i.e. you cannot see solid wood beyond the entrance); (d) the hollow is at least 1 m above the ground. Trees must be examined from all angles.

Offset rules: means the circumstances in which credits can be used (retired) for a development to improve or maintain biodiversity values.

Offset site: means an area of land that is subject to a land based conservation measure that is used to offset the impacts of development

Operational Manual: a guide to using the Credit Calculator and undertaking surveys. The Operational Manual is prepared by OEH and will be available on the OEH website (when published).

Percent cleared: means the percentage of a vegetation type that has been cleared within a major catchment area as a proportion of its pre-1750 extent, as identified in the VIS Classification Database.

Percent foliage cover: means the percentage of ground that would be covered by a vertical projection of the foliage and branches and trunk of a plant or plants.

Percent vegetation cover: means the percentage of native vegetation cover in the assessment circles (inner circle and outer circle) in which the development or offset site is located. The percent native vegetation cover within the assessment circles is visually estimated from aerial or satellite imagery, taking into account both cover and condition of vegetation.

Plant community type (PCT): means a NSW plant community type approved by the NSW Plant Community Type Control Panel and described in the NSW Vegetation Information System Classification Database. The VIS Classification Database is maintained by OEH and available at www.environment.nsw.gov.au/research/Visclassification.htm.

Plot: an area within a vegetation zone in which site attributes are assessed.

Priority Investment Areas (PIA) Map, PIA Map: an online map (when released) that displays strategic locations for investment in biodiversity protection and management. The PIA Map identifies core areas, which include areas that are rare, threatened and unique biodiversity assets, and biodiversity corridors of state and regional significance. The PIA Map is displayed on the Priority Investment Areas spatial viewer.

Proponent: an organisation seeking approval to develop a major site, for example, a developer, mine owner.

Reference sites: means the relatively unmodified sites that are assessed to obtain local benchmark information when benchmarks in the Vegetation Benchmark Database are too broad or otherwise incorrect for the PCT and/or local situation. Benchmarks can also be obtained from published sources.

Regeneration: means the proportion of over-storey species characteristic of the PCT that are naturally regenerating and have a diameter at breast height < 5 cm within a vegetation zone.

Site attributes: 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: has the meaning given by Section 3.4.

Site value score: the score calculated in accordance with Section 3.4.2.

Species credits: means the class of biodiversity credits created or required for the impact on 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: means the area of habitat, or number of individuals of a threatened species, impacted by clearing or development or by management actions at the offset site.

Species that cannot withstand further loss: means a species identified in the Threatened Species Profile Database as a species that cannot withstand further loss in the major catchment area because of one or more of the following:

- the species is naturally very rare, has few populations or a restricted distribution
- the species or population is critically endangered
- the species has threats that are beyond control (of the management actions undertaken on an offset site)
- the species' or its habitat's needs/response to management are poorly known.

State significant development: has the same meaning as in section 4 of the EP&A Act.

State significant infrastructure: has the same meaning as in section 4 of the EP&A Act.

Supplementary measures: means actions that can be taken to improve biodiversity or other environmental values

T_G value: the ability of a species to respond to improvement in Site value or other habitat improvement at an offset site with management actions. T_G is based on an assessment of: effectiveness of management actions, life history characteristics, naturally very rare species, and very poorly known species.

Threatened ecological community: means an ecological community specified in Part 3 of Schedule 1, Part 2 of Schedule 1A or Part 2 of Schedule 2 of the TSC Act and a threatened ecological community listed under Part 13 of the EPBC Act.

Threatened population: has the same meaning as in section 4(1) of the TSC Act.

Threatened species: critically endangered, endangered or vulnerable threatened species and populations as defined in section 4(1) of the TSC Act, or any additional threatened species listed under Part 13 of the EPBC Act as critically endangered, endangered or vulnerable.

Threatened Species Profile Database: contains information for all listed threatened species, populations and communities such as habitat, range, life history strategies, response to management actions, survey requirements and ability to withstand any further loss in numbers or extent. The Threatened Species Profile Database is part of the Bionet database and is maintained by OEH. The database is available from the Bionet website at www.bionet.nsw.gov.au/.

Threatened species survey: a targeted survey for threatened species undertaken in accordance with Section 5.4.

Total length of fallen logs: the total length of logs present in a vegetation zone that are at least 10 cm in diameter and at least 0.5 m long.

Transect: a line or narrow belt along which environmental data is collected.

TSC Act: means the *Threatened Species Conservation Act 1995*.

Type of biodiversity credits: defined by the attributes on a credit profile according to Section 10.1 for ecosystem credits and Section 10.2 for species credits.

Vegetation Benchmarks Database: a database of benchmarks for vegetation classes and some PCTs. The Vegetation Benchmarks Database is maintained by OEH and is part of the VIS Classification Database. It is available at www.environment.nsw.gov.au/research/Visclassification.htm.

Vegetation class: level of classification of vegetation communities defined in Keith (2004)[5]. There are 99 vegetation classes in NSW.

Vegetation formation: a broad level of vegetation classification as defined in Keith (2004)[5]. There are 12 vegetation formations in NSW.

Vegetation in low condition: refers to vegetation as defined in Section 3.3.

Vegetation zone: means a relatively homogenous area of native vegetation on a development site or an offset site that is the same PCT and broad condition. A single zone must not contain a mix of vegetation in low condition and not in low condition. Zones with the same PCT and in moderate to good condition (i.e. not in low condition) can be combined within one ecosystem credit profile (as a subzone). A zone may comprise one or more discontinuous areas.

VIS Classification Database: the master vegetation community-level classification for use in vegetation mapping programs, and impact assessment frameworks such as the FBA. The VIS Classification Database is maintained by OEH and available at www.environment.nsw.gov.au/research/Visclassification.htm.

Wetland: means native vegetation classified in the vegetation formation defined as Freshwater Wetland in Keith (2004)[5].

Woody native vegetation: means native vegetation that contains an over-storey and/or mid-storey that predominantly consists of trees and/or shrubs.

[5] 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.

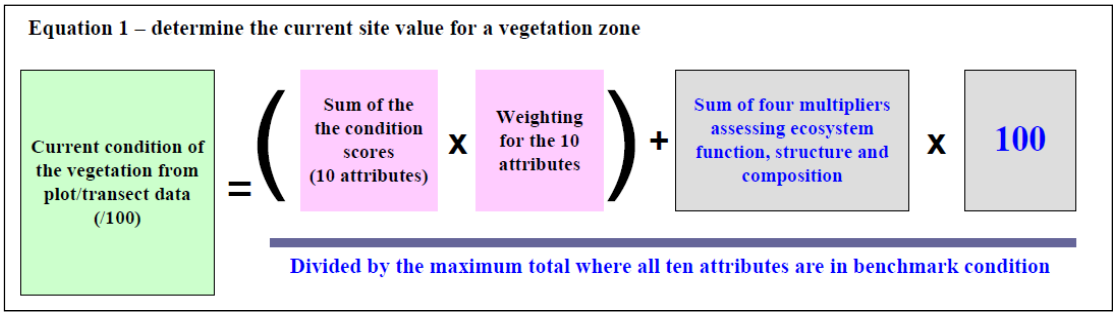
Appendix 1: Mathematical equations used in the FBA

The mathematical equations set out in this appendix correspond with the plain English versions set out in the relevant sections of the FBA. A decision-support system (the Credit Calculator) allows accredited assessors to efficiently undertake the calculations, based on the site survey data collected during Stage 1 – Biodiversity Assessment Requirements. The calculations used in the Credit Calculator are based on the mathematical equations as set out below.

Equation 1: Determine the current site value score for a vegetation zone

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

where
- SV_C is the current site value score of the vegetation zone
- a_v is the attribute score for the *v*th *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 *v*th *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 PCT when in benchmark condition (the maximum score varies depending on which attributes occur in the PCT under assessment).



Plain English explanation of the site value score calculation

Element	Explanation of each element in the site value calculation
SV_c	This represents the current condition of the vegetation based on a score out of 100 (Biometric score). The Biometric score is based on transect and plot data that is collected on site for each vegetation zone. The Biometric score considers ecosystem structure, composition and function.
$\sum_{v=a}^{j}(a_v w_v)$	a_V is the site attribute score for each of the 10 site attributes. The site attribute score is based on the condition of the attribute against the benchmark (0, 1, 2 or 3), W_V is the weighting given to that site attribute (shown in Table 1) based on its ecological importance. Each site attribute score is multiplied by its weighting and summed together. This part of the Site value calculation considers ecosystem structure, composition and function
$(a_a a_g)$	a_a is the attribute score for *Native plant species richness.* It is multiplied by the attribute score for *Exotic plant cover* (represented by a_g). The total is then multiplied by 5. This part of the calculation considers ecosystem composition and function.

$(a_b a_i)$	a_b is the attribute score for *Native over-storey cover.* It is multiplied by the attribute score for *Proportion of over-storey cover species occurring as regeneration* (represented by a_i). The total is then multiplied by 5. This part of the calculation considers ecosystem composition and function.
$(a_h a_j)$	a_h is the attribute score for *Number of trees with hollows.* It is multiplied by the attribute score for *Total length of fallen logs* (represented by a_j). The total is then multiplied by 5. This part of the calculation considers ecosystem composition and function.
$(a_c a_k)$	a_c is the attribute score for *Native mid-storey cover.* It is multiplied by the average of the attribute scores for *Native ground cover grasses, Native ground cover shrubs* and *Native ground cover other* (collectively represented by a_k). The total is then multiplied by 5. This part of the calculation considers ecosystem composition.
x 100	The totals for each of the elements are summed together and multiplied by 100. This final total for the calculation above the line is the numerator.
$\frac{}{c}$	c is the maximum score that can be achieved for a particular PCT (i.e. where all site attributes are in benchmark). The maximum score for c can vary according to whether a particular attribute occurs in a PCT. The maximum score for c is called the denominator. The total for the numerator is divided by the total for the denominator. This is the Site value score for that vegetation zone.

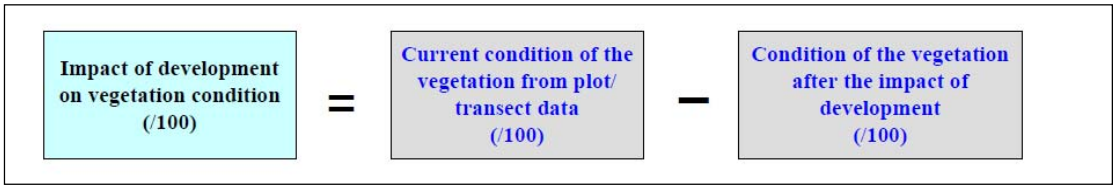
Equation 2: Calculate the change in site value score at the development site

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

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 or development) site value score, as determined by Equation 1.



Element	Explanation of each element in the Site value calculation
$S_{current}$	$S_{current}$ is the site value score for the vegetation zone in its current state. It represents the condition of the vegetation in the zone compared to the vegetation in benchmark condition. It is calculated using Equation 1.
S_{future}	S_{future} is the site value score for the vegetation zone after the impact of the clearing or development is taken into account. It is calculated using Equation 1 and the future score for each site attribute. Where native vegetation is to be totally cleared, S_{future} may be zero. The S_{future} score can also take into account partial clearing for purposes such as creating an asset protection zone.
ΔS_{Loss}	ΔS_{Loss} represents the quantified impact of the development on the vegetation condition. It is based on the loss in site value by calculating the difference in the condition of the vegetation in its current state, compared to its future condition state after the impacts of development are taken into account.

Equation 3: Calculate the change (loss) in Landscape value with development

$$LV_{development\ site} = \left(\sum_{v=a}^{d}(s_v w_v) + c + d\right)_{Current} - \left(\sum_{v=a}^{c}(s_v w_v)\right)_{With\ development}$$

where: s_v is the score for the *v*th variable (a–b) as defined below

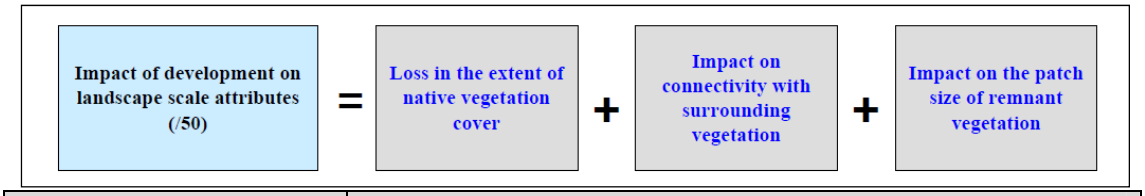
w_v is the weighting for the *v*th variable as defined in Table 12

a = percent native vegetation cover within an outer assessment circle of the site or development footprint buffer area (minimum of 1000 ha)

b = percent native vegetation cover within an inner assessment circle for the site (minimum of 100 ha)

c = connectivity value

d = total adjacent remnant area



Element	Explanation of each element in the change (loss) in Landscape value calculation (Equation 3)
$\left(\sum_{v=a}^{d}(s_v w_v) + c + d\right)_{Current}$	In this part of the calculation, the scores for each of the four landscape attributes are simply summed together. ***S*v** and ***W*v** represent the current extent of native vegetation cover in the landscape surrounding the major project (the percent native cover score) This is assessed using an inner and an outer assessment circle at a scale of 100 ha and 1000 ha or greater, respectively. ***c*** represents the impact of the development on connectivity (the connectivity value score). This score was determined in Section 4.2. ***d*** represents the value of the size of the remnant vegetation which the development is part of (the adjacent remnant area score) This score was determined in Section 4.3.
$\left(\sum_{v=a}^{c}(s_v w_v)\right)_{With\ development}$	***S*v** and ***W*v** represent the future extent of native vegetation cover in the landscape after the impacts of the development are taken into account (the percent native cover score) This is assessed using an inner and an outer assessment circle at a scale of 100 ha and 1000 ha or greater, respectively. The sum of these two attributes is subtracted from the first part of the calculation.
$LV_{development\ site}$	$LV_{development\ site}$ then represents the impact of the development on the surrounding landscape (the loss in landscape value) from development or clearing. This value is then used in Section 7.4 to calculate the number of ecosystem credits for the site

Equation 4: Calculate the number of ecosystem credits required for the impact on vegetation that is an EEC or contains threatened species habitat

Ecosystem credits required at a development site

$$= \sum_{i=1}^{n} \left[\left\{ \left(\Delta S_{Loss} \times \frac{1}{T_{G\ spp1}} \times A \right) + \left(\%\Delta LV_{loss} \times A \right) \right\} \right] \times 0.25$$

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

ΔS_{Loss} is the change (loss) in the site value score of a vegetation zone at the development site as determined by Equation 2

$\%\Delta LV_{loss}$ is the total landscape value change (loss) score for the development site as determined by Equation 3, apportioned to the vegetation zone

$1/T_{G\ spp1}$ is the species offset multiplier. The T_G value is based on the ability of a species to respond to improvement in Site value with management actions at an offset site. A T_G value is identified for each species in the Threatened Species Profile Database and has values between 0.1 and 1. Species 1 ($_{spp1}$) is the species with the highest offset multiplier that is predicted to use habitat in the vegetation zone

A is the area in hectares of the vegetation zone.

Equation 6 – the number of ecosystem credits required at a development site

Number of ecosystem credits required at a development site = (Impact of development on vegetation condition (Equation 2) + Impact of development on landscape scale attributes (Equation 4)) x Threatened species/EEC offset multiplier x Area of the vegetation zone

Element	Explanation of each element in Equation 4
$= \sum_{i=1}^{n}$	This means that the equation is to apply to each vegetation zone that has been mapped at the development site according to Section 3.3
$(\Delta S_{Loss} + \%\Delta LV_{loss})$	The loss in site value score is the difference in the condition of the vegetation in its current state, compared to its future condition after the impacts of development on biodiversity values is taken into account according to Section 7.2. The loss in landscape value is the change (loss) after the impacts of development on connectivity, loss in the extent of native vegetation cover and patch size of remnant vegetation have been assessed according to Section 7.3.
$\frac{1}{T_{G\ spp1}}$	The threatened species offset multiplier is only applied at the development site. It reflects the ability of a species to respond to improvements in vegetation condition from management actions undertaken at an

	offset site. Species 1 ($_{spp1}$) is the species which is most vulnerable to the loss of habitat. Therefore it is the species that requires the highest number of credits.
A	This is the area of the vegetation zone.
0.25	This is a scaling factor that is applied equally to the calculation of ecosystem credits at a development site and at an offset site.

Equation 5: Calculate the number of species credits required for the loss of individual threatened species and populations at a development site

$$\text{Number of species credits required for a threatened species at the development site} = H_{loss} \times \frac{1}{T_{G\ spp1}} \times 10$$

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 lost at the development site, as determined in accordance with Section 5.3.
- $1/T_{G\ spp1}$ is the species offset multiplier. It is based on the ability of the species to respond to improvement in Site value with management actions at an offset site. T_G is a value identified for each species in the Threatened Species Profile Database and has values between 0.1 and 1.

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 lost at the development site, as determined in accordance with Section 5.3.
- $1/T_{G\ spp1}$ is the species offset multiplier. It is based on the ability of the species to respond to improvement in Site value with management actions at an offset site. T_G is a value identified for each species in the Threatened Species Profile Database and has values between 0.1 and 1.

Equation 5 – number of species credits required at the development site

Number of species credits required at the development site = Area of species habitat impacted on by development x Threatened species offset multiplier x Scaling factor of 10

Element	Explanation of each element in Equation 5
H_{loss}	This is the area of habitat for the species, or the number of individual flora species impacted on by the development.

$\frac{1}{T_{G\ spp1}}$	The threatened species offset multiplier is only applied at the development site. It reflects the ability of a species to respond to improvements in vegetation condition from management actions undertaken at an offset site. Species 1 ($_{spp1}$) is the species which is being impacted on by the development.
10	This is a general scaling factor that is applied equally to species credits at a development site and at an offset site.

Equation 6: Calculate the number of ecosystem credits required for the indirect impacts on vegetation that contains threatened species habitat

$$\text{Ecosystem credits required for indirect impacts of the development} = \sum_{i=1}^{n} \left[\left\{ \Delta S_{Loss} \times \frac{1}{T_{G\ spp1}} \times A \right\} \right] \times 0.25$$

where *i* is the *i* th vegetation zone, usually in a buffer area around the development site

ΔS_{Loss} is the change (loss) in the site value score of a vegetation zone from the indirect impacts of the development, and determined using Equation 2

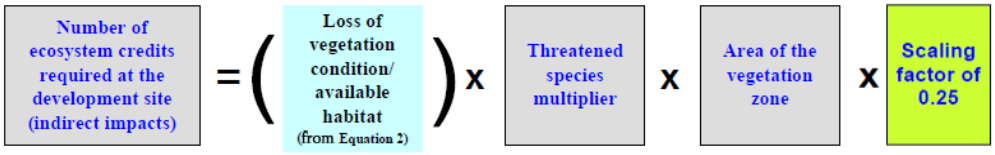
$1/T_{G\ spp1}$ is the species offset multiplier. The T_G value is based on the ability of a species to respond to improvement in Site value with management actions at an offset site. A T_G value is identified for each species in the Threatened Species Profile Database and has values between 0.1 and 1. Species 1 ($_{spp1}$) is the species with the highest offset multiplier that is predicted to use habitat in the vegetation zone

A is the area in hectares of the vegetation zone.

Element	Explanation of each element in Equation 6
$\sum_{i=1}^{n}$	This means that the equation is to apply to each vegetation zone that has been mapped in a buffer area around, or along any part of the development site.
(ΔS_{Loss})	The loss in site value score is the difference in the condition of the habitat available for threatened species in the buffer area in its current state, compared to its future condition after the indirect impacts of development on the habitat value is taken into account according to Section 7.2.
$\frac{1}{T_{G\ spp1}}$	The threatened species offset multiplier is only applied at the development site. It reflects the ability of a species to respond to improvements in vegetation condition from management actions undertaken at an offset site. Species 1 ($_{spp1}$) is the species which is most vulnerable to the loss of habitat. Therefore it is the species that requires the highest number of credits.
A	This is the area of the vegetation zone

0.25	This is a scaling factor that is applied equally to the calculation of ecosystem credits at a development site and at an offset site.

Equation 6 – the number of ecosystem credits required at the development site (indirect impacts)



Equation 7: Calculate the change in site value score at the offset site

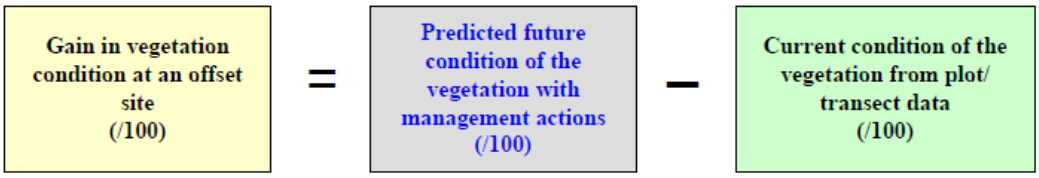
$$\Delta S_{Gain} = S_{future} - S_{current}$$

where ΔS_{Gain} is the change (gain) in the site value score of a vegetation zone at the offset 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.

Equation 7 – change in Site Value score at the offset site



Element	Explanation of each element in the site value calculation
ΔS_{Gain}	ΔS_{Gain} represents the quantified improvement in the condition of the vegetation that is predicted to occur from the management actions undertaken at the offset site. The ΔS_{Gain} is the basis for creating ecosystem credits at an offset site.
S_{future}	S_{future} is the site value score for the vegetation zone taking into account the improvement in each condition attribute with management and protection. It is calculated using Equation 1.
$S_{current}$	$S_{current}$ is the site value score for the vegetation zone in its current state. It is calculated using Equation 1.

Equation 8: Calculate the change (gain) in landscape value with offset

$$LV_{offset\ site} = \left(\sum_{v=a}^{d} (s_v w_v) + c + d + e \right)_{With\_management} - \left(\sum_{v=a}^{c} (s_v w_v) \right)_{Current}$$

where: s_v is the score for the vth variable (a–b) as defined below

w_v is the weighting for the vth variable as defined in Table 5

a = percent native vegetation cover within an outer assessment circle for the site (minimum of 1000 ha)

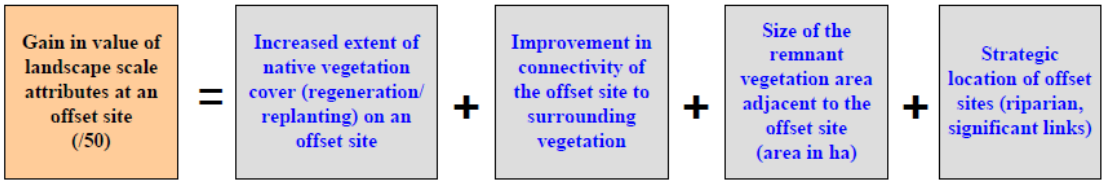
b = percent native vegetation cover within an inner assessment circle for the site (minimum of 100 ha)

c = connectivity value

d = total adjacent remnant area

e = strategic location of offset site

Equation 8 - the change (gain) in Landscape Value with the offset site



Element	Explanation of each element in the landscape value calculation
$\left(\sum_{v=a}^{d}(s_v w_v)+c+d+e\right)_{With\_management}$	In this calculation, the scores for each of the five attributes are simply summed together. ***S_v*** and ***W_v*** represent the future extent of native vegetation cover in the landscape surrounding the offset site (the percent native cover score). This accounts for any increase in vegetation from management actions taken at the site. This is assessed at the 1000 ha scale and 100 ha scale (the assessment circles). ***c*** represents the improvement in connectivity proposed at the offset site (the connectivity value score). This score was determined in Appendix 7. ***d*** represents the value of the size of the remnant vegetation which the offset site is part of (the adjacent remnant area score) This score was determined Appendix 7. ***e*** represents the proportion of the offset site that contains a riparian area (the riparian area score).
$\left(\sum_{v=a}^{c}(s_v w_v)\right)_{Current}$	***S_v*** and ***W_v*** represent the current extent of native vegetation cover in the landscape surrounding the offset site (the percent native cover score) This is assessed at a minimum 1000-ha scale and 100-ha scale (the assessment circles). The sum of these two attributes is subtracted from the first part of the calculation. This is to score the gain in increased extent of native vegetation.
$LV_{offset\ site}$	$LV_{offset\ site}$ then represents the improvement of the offset site on the surrounding landscape (the gain in landscape value) from the management actions undertaken on the offset site. This value is then used in Section 11.3 to calculate the number of ecosystem credits for the site.

Equation 9: Calculate the number of ecosystem credits created at an offset site

Number of ecosystem credits created at an offset site = $\sum_{i=1}^{n}$ {(ΔS_{gain} + $\%\Delta LV_{gain}$) + ($S_{current}$ x %sg) x A} x 0.25

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

ΔS_{gain} is the change (gain) in the site value score of a vegetation zone at the offset site, as defined by Equation 7.

$\%\Delta LV_{gain}$ is the proportion of the total landscape value gain score for the offset site, as determined by Equation 8, apportioned to the vegetation zone.

$\Delta S_{current}$ is the current site value score of a vegetation zone at the offset site, as defined by Equation 1.

%sg is the gain for securing the management of vegetation in good condition on an offset site. It is applied as a proportionate weighting to the current site value score as defined in Table 7

A is the area in hectares of the *i* th vegetation zone.

Equation 9 – the number of ecosystem credits created at an offset site

Number of ecosystem credits created at an offset site = (Gain in vegetation condition at an offset site (equation 7) + Security gain for vegetation in good condition (Table 6) + Gain in value of landscape scale attributes at an offset site (equation 8)) x Area of the vegetation zone x Scaling factor of 0.25

Element	Explanation of each element in Equation 9
$= \sum_{i=1}^{n}$	This means that the calculation of ecosystem credits applies to all vegetation zones that are mapped at an offset site according to Section 3.3.
$(S_{current} \times \%sg)$	This element recognises the benefit of gaining native vegetation in good condition as part of an offset site. The gain in security is scaled proportionately according to the current condition of the vegetation.
$(\Delta S_{gain} + \%\Delta LV_{gain})$	The gain in site value score is the difference in the condition of the vegetation in its current state, compared to its future condition with the benefit of the management actions taken to improve the condition of vegetation at the offset site according to Equation 7. The gain in landscape value is the improvement in connectivity, increases in extent of native vegetation cover and increases in the patch size of remnant vegetation at an offset site according to Equation 8.
A	This is the area of the vegetation zone at the offset site.
0.25	This is a scaling factor that is applied equally to the calculation of ecosystem credits at a development site and at an offset site.

Equation 10: Calculate the gain for threatened species at the offset site

Number of species credits created for a species at an offset site = $H_{current}$ x 0.71 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:

- $H_{current}$ is the current area of habitat in hectares for the species that will be improved by the management actions at an offset site, as determined in accordance with Section 5.3
- 0.71 is the proportional gain in site value for vegetation on an offset site that is in moderate condition. In moderate condition vegetation, the site value score increases from 58.3 to 100, or an increase of 41.7. This corresponds to a 71% increase in site value (i.e. 41.7/58.3 x 100)

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:

- $H_{current}$ is the current number of individuals of the species that will be increased by the management actions at the offset site, as determined in accordance with Section 5.3
- 0.71 is the proportional gain in site value for vegetation on an offset site that is in moderate condition. In moderate condition vegetation, the site value score increases from 58.3 to 100, or an increase of 41.7. This corresponds to a 71% increase in site value (i.e. 41.7/58.3 x 100).

Equation 10 – the number of species credits created at an offset site

Number of species credits created at an offset site	=	Habitat area/ number of species on the offset site	x	Proportional gain in vegetation condition at an offset site	x	Scaling factor of 10

Element	Explanation of each element in Equation 10
$H_{current}$	This is the area of habitat for the species, or the number of individual flora species present on an offset site.
0.71	0.71 is the proportional improvement in vegetation condition at the offset site. The improved condition is used as a surrogate for improved habitat for threatened species. 0.71 is the proportional gain in site value for vegetation on an offset site that is in moderate condition. In moderate condition vegetation, the site value score increases from 58.3 to 100, or an increase of 41.7. This corresponds to a 71% increase in site value (i.e. 41.7/58.3 x 100).
10	This is a general scaling factor that is applied equally to species credits at a development site and at an offset site.

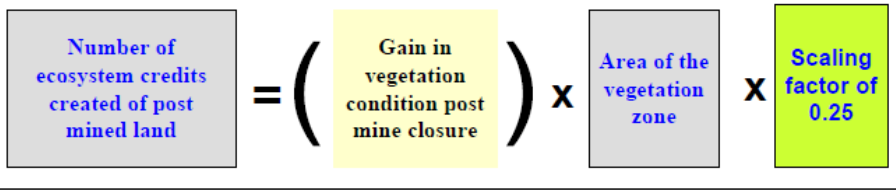
Equation 11: Calculate the number of ecosystem credits created for ecological rehabilitation of post mined land

Number of ecosystem credits created on post mined land	= $\sum$	$\{\Delta S_{rehab} \times A\} \times 0.25$

where i is the i th vegetation zone to be managed at the offset site.
ΔS_{rehab} is the future site value score for the PCT that is to be achieved from the ecological rehabilitation works on the post mined land as defined by Equation 1 of the FBA.

A is the area of land in hectares that is subject to ecological rehabilitation works for the PCT.

Equation 11 – number of ecosystem credits created for ecological rehabilitation of post mined land



Element	Explanation of each element in Equation 11
ΔS_{rehab}	This represents the extent of improvement in the condition of vegetation on land where the ecological rehabilitation has occurred and the completion criteria have been achieved.
A	This is the area of land where the ecological rehabilitation has occurred.
0.25	This is a scaling factor that is applied equally to the calculation of ecosystem credits at a development site and an offset site.

Equation 12: Calculate the number of credits created for ecological rehabilitation of post mined land

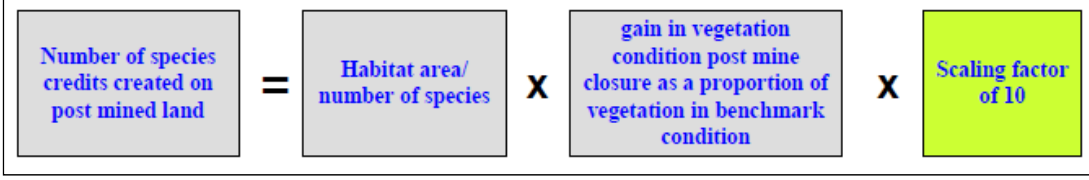
Number of species credits created for a species on post mined land $= H_{area} \times (\Delta S_{rehab}/100) \times 10$

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_{area} is the area of habitat in hectares for the species that will be restored on the post mined land
- $(\Delta S_{rehab}/100$ is the proportion of improvement in the condition of vegetation that is achieved on land where the ecological rehabilitation has occurred, compared to the vegetation in benchmark condition. S_{rehab} is determined using Equation 11.

Element	Explanation of each element in Equation 12
H_{area}	This is the area of habitat for the species on land where the ecological rehabilitation is to occur.
$(\Delta S_{rehab}/100$	This represents the proportion of improvement in the condition of vegetation that is achieved on land where the ecological rehabilitation is to occur, compared to the vegetation in benchmark condition.
10	This is a scaling factor that is applied equally to the calculation of species credits at a development site and an offset site.

Equation 12 – the number of species credits created for ecological rehabilitation of post mined land



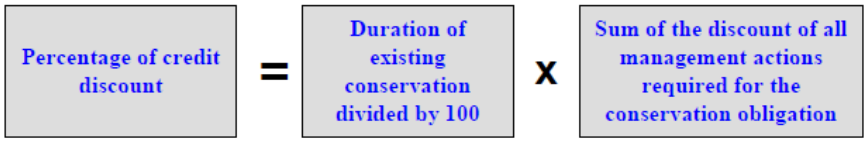
Equation 13: Calculate the final credit discount percentage for existing conservation obligations

The final credit discount percentage = $\{(a/100) \times b\%\}$

Where a is the duration for which the existing conservation obligation applies

b is the sum of the percentage discount for each management action under the existing conservation obligation according to Table 8 for ecosystem credits and Table 9 for species credits.

Equation 13 – calculating the percentage of credit discount for an existing conservation obligation



Appendix 2: Definition of water courses and riparian buffer distances

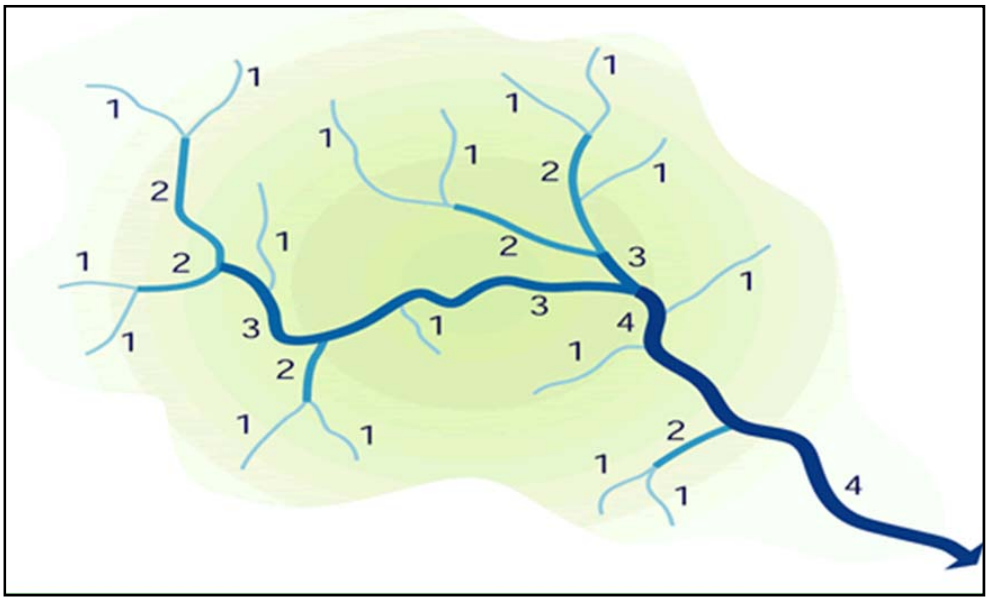
Strahler stream ordering system is a classification system that gives waterways an 'order' according to the number of tributaries associated with each waterway (Strahler 1952[6]).

Figure 4 illustrates the Strahler stream ordering process. Numbering begins at the top of a catchment with headwater ('new') flow paths being assigned the number 1.

Where two flow paths of order 1 join, the section downstream of the junction is referred to as a second order stream. Where two second order streams join, the waterway downstream of the junction is referred to as a third order stream, and so on. Where a lower order stream (e.g. first order) joins a higher order stream (e.g. third order), the area downstream of the junction will retain the higher number (i.e. it will remain a third order stream).

The stream ordering system is designed to produce results that are consistent between catchments, but also recognises regional differences.

Figure 4: Strahler stream ordering system



Source: www.fgmorph.com/fg_4_8.php

Riparian buffer distances are measured on both sides of the stream from top of bank, if this is defined, otherwise from the centre of the stream. Where a stream has more than one bank on either side, the bank closest to the main channel must be used, to protect vegetation on and within the stream banks.

The riparian buffer distances for various water bodies are set out in Table 10.

[6] Strahler, AN 1952, 'Hypsometric (area-altitude) analysis of erosional topology', *Geological Society of America Bulletin* **63** (11): 1117–1142.

Table 10: Riparian buffer distances

Water body type	Riparian corridor width (each side of watercourse)	Total riparian corridor width
Unmapped stream	10	20
1st order stream	10	20
2nd order	20	40
3rd order	30	60
4th & 5th order	40	80
6th,7th,8th & 9th order	40	80
Local wetland	20	n/a
Regionally significant wetlands	30	n/a
Important wetlands	40	n/a
Estuarine area	30	n/a

Important wetland means a wetland that is listed in the Important Wetlands Database or is a SEPP 14 wetland.

Appendix 3: Guidelines for the use of benchmark data from local reference sites or published sources

Benchmark data from local reference sites may be used where that data more accurately reflects the local environmental conditions and condition attributes for a PCT. Where local benchmark data is developed, it must be derived from measurements taken on reference sites that measure the same PCT in a relatively unmodified condition or from published sources. The consent authority must approve the use of benchmark data from local reference sites or published sources.

Locating reference sites

Reference sites are sites with relatively little evidence of modification by humans since European (post-1750) settlement, as indicated by 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, dieback not in excess of normal senescence, no evidence of very recent major perturbation such as fire or flood, not subject to high frequency burning, and evidence of recruitment of native plant species.

It may be difficult to find totally unmodified sites, particularly in highly cleared regions. Vegetation in relatively unmodified condition can be found in some travelling stock routes and reserves, national parks and nature reserves, state forests (especially flora reserves), cemeteries, roadsides and commons. Reference sites can occur in small remnants, such as narrow roadsides and cemeteries.

Number of reference plots

To obtain a reasonable composite picture that encompasses the variation in condition variables, a minimum of three reference plots/transects for each variable should be measured for each PCT (or vegetation class), with more plots/transects being desirable.

Published sources

Benchmarks may also be obtained from published sources.

Appendix 4: Survey design – stratification and survey effort

Information on survey design and the visual and computer-based interpretation of remotely sensed imagery for the assessment of a site is adapted from section 3, section 4 and Appendix 2C of the *Native Vegetation Interim Type Standard*. The *Native Vegetation Interim Type Standard* addresses the nature and quality of the scientific process for native PCT activities including remote sensing interpretation, field survey, data manipulation, data management and mapping.

For this FBA, the stratification and survey effort relate to the mapping of vegetation zones based on PCT and condition, and the extent to which the number of plots and transects used to collect condition attribute data to determine the condition of the vegetation zone.

The *Native Vegetation Interim Type Standard* is available from the OEH website at www.environment.nsw.gov.au/research/VISplot.htm.

Survey design for assessing sites

Rigorous survey design (stratification and survey effort) ensures field-based vegetation activities are efficient. The required outcomes for the FBA include mapping of PCTs based on the VIS Classification Database, and collection of vegetation zone condition data. This is achieved when:

1 field-based vegetation activities are conducted systematically using explicit and repeatable processes

2 data are collected with minimum bias and are compatible amongst activities

3 field effort is commensurate with the spatial and thematic scales of the site, and

4 field-based activities yield verifiable data which facilitates multiple uses.

Stratification and survey effort

Field survey that is based on a clearly described survey design is essential for vegetation field sampling. Unambiguous design and execution of field sampling reduces bias and variance in the data.

Field survey provides vegetation data from which native vegetation products are derived. Absolute numbers of plots are not stipulated in the *Native Vegetation Interim Type Standard* as survey effort is determined by a variety of factors that will vary widely across the state.

Random stratified sampling is adopted as best practice for the *Native Vegetation Interim Type Standard*.

Three important principles underpin determination of survey effort in the *Native Vegetation Interim Type Standard* which is adopted for this FBA. These include:

- **Representation**: Vegetation zones represent unique combinations of environmental and biotic factors. By stratifying vegetation into zones on a site and in proportion to its total area, a representative sample can be compiled.
- **Replication**: Each vegetation zone must be sampled by the assessor at several locations (see Appendix 4 of the Standard).
- **Randomisation**: Plots/transects are located randomly within the vegetation zone but may be subject to rules regarding relationships with boundaries, clumping and access (see Appendix 3 of the Standard).

Visual interpretation of imagery

Interpretation of remote-sensed imagery or an aerial photograph may provide a primary spatial data layer. It can also define the spatial extent of patterns in native vegetation through expert systems or computer modelling.

For the FBA, the primary function of Remote Image Interpretation (RII) is recognising and delineating spatial patterns in native vegetation that can be used to delineate changes in PCTs and condition into vegetation zones.

In the context of assessing a development site, vegetation zones are attributed with existing PCTs according to the VIS Classification Database. Remotely observed patterns are linked to the PCTs based on:

a) prior knowledge of the regional vegetation

b) linkage of plot data, used in defining the types, with remotely observed patterns

c) direct field observation from rapid survey.

This process often requires application of all of the above, and interaction between persons with knowledge in the interpretation of remote imagery and ecologists with knowledge of the area.

Further information on the visual interpretation of remote or aerial imagery can be found in Appendix 2 Part C of the Standard or provided by OEH.

Minimum numbers of transects and plots

Transects and plots are established in each vegetation zone. Vegetation zones are relatively homogeneous units within the site. Given there is always variation in native vegetation, transects and plots should be established in each zone in approximate proportion to the variation in condition within zones, to achieve a representative sample.

Table 11 sets out the minimum number of plots/transects that are required in each vegetation zone. If the condition of the vegetation is more variable across the zone, more transects and plots may be needed than the number in Table 11, particularly where the area of the vegetation zone is large.

Table 11: Minimum number of transects/plots required per zone area

Vegetation zone area (ha)	Minimum number of transects/plots
0–4	1 transect/plot per 2 ha (or part thereof) or 1 transect/plot if vegetation is in low condition
> 4–20	3 transects/plots or 2 transects/plots if vegetation is in low condition
> 20–50	4 transects/plots or 3 transects/plots if vegetation is in low condition
> 50–100	5 transects/plots or 3 transects/plots if vegetation is in low condition
> 100–250	6 transects/plots or 4 transects/plots if vegetation is in low condition
> 250–1000	7 transects/plots or 5 transects/plots if vegetation is in low condition

	More transects/plots may be needed if the condition of the vegetation is variable across the zone.
> 1000	8 transects/plots or 5 transects/plots if vegetation is in low condition or in a homogenous landscape in the Western Division More transects/plots may be needed if the condition of the vegetation is variable across the zone.

Appendix 5: Assessing landscape value for site-based developments

Site-based developments are usually within the boundary of a single property or a number of properties. Site-based developments typically include mines, quarries, hospitals, schools or industrial sites.

The attributes used to assess landscape value for site based developments include:

a) percent native vegetation cover in the landscape (assessment circle) as assessed in accordance with Section 4.1 of the FBA

b) connectivity value as defined in Section 4.2 of the FBA

c) adjacent remnant area (or patch size).

The assessment of the attributes for landscape value is set out below.

a) Assessing percent native vegetation cover

For site based developments, the percent native vegetation cover in the landscape assesses the change in the percent of native vegetation cover within an inner and an outer assessment circle. The inner and outer assessment circle can be scaled to fit the size of the development site.

The current and future native vegetation cover (extent and condition) in the assessment circle are calculated using a GIS. The future native vegetation cover is to take into account the extent of clearing for the proposed development.

The inner and outer assessment circles selected for a proposed development can be chosen from the following combinations:

Inner assessment circle (ha)	Outer assessment circle (ha)
100	1,000
200	2,000
300	3,000
400	4,000
500	5,000
1,000	10,000

The percent native vegetation cover score assesses the change (loss) in the overall percentage of native vegetation cover within the inner and outer assessment circles in which the site is located.

The inner and outer assessment circles are to be centred on the area of native vegetation that is most impacted by the proposed development. Current and future native vegetation cover (extent and condition) in the inner and outer circles are estimated in increments of 5% using a GIS and scored as shown in Table 12.

The change in percent native vegetation cover for the inner assessment circle is scored out of 10. The change in percent native vegetation cover for the outer assessment circle is scored out of 15.

The change in percent native vegetation cover score is the difference between the current percent native vegetation cover score and the future native vegetation cover score for the inner assessment circle and the outer assessment circle. The score for

each assessment circle is to be used in Section 4 of the FBA to determine the overall landscape value score for the proposed development.

Table 12: Determining percent native vegetation cover in the landscape

Percent native vegetation cover in the landscape – inner and outer assessment circle (%)	Score for percent native vegetation cover in the landscape – inner assessment circle	Score for percent native vegetation cover in the landscape – outer assessment circle
0	0	0
≤5	.75	1.25
6-10	1.5	2.5
11-15	2.25	3.75
16-20	3	5
21-25	3.75	6.25
26-30	4.5	7.5
31-35	5.1	8.45
36-40	5.7	9.4
41-45	6.3	10.35
46-50	6.9	11.3
51-55	7.3	11.95
56-60	7.7	12.6
61-65	8.1	13.25
66-70	8.5	13.9
71-75	8.75	14.25
76-80	9	14.6
81-85	9.25	14.95
86-90	9.5	15.3
91-95	9.75	15.65
96-100	10	16

b) Assessing the connectivity value

The impact of site based developments on connectivity value can be assessed by either:

a) using the connectivity value classes as set out in Table 13 – this approach is based on mapped state or regional biodiversity links, or riparian areas of rivers and streams, or

b) undertaking a site based assessment.

A connecting link is defined as when vegetation on the site is linked to adjoining vegetation and the vegetation:

- is in moderate to good condition, and
- has a patch size >1 ha, and
- is separated by a distance of <100 m (or <30 m for grassy ecosystems), or
- is not separated by a large water body, dual carriageway, wider highway or similar hostile link.

A site may have no, or more than one, connecting link.

Where a site has more than one connecting link, the assessor must determine the connectivity value score for each connecting link. The connecting link with the highest connectivity value score is referred to as the primary connecting link. The connectivity value score of the primary connecting link is used to score loss with development or gain with management actions.

The connectivity value of a site based development is determined according to the six step process set out below.

Step 1: Determine whether the development impacts on a state or regional biodiversity link

State or regional biodiversity links are defined in Table 13 below. A development impacts on a state or regional biodiversity link where the link is part of the development site and the vegetation in the biodiversity link has a Site value score greater than 25.

If the development site impacts on a state or regional biodiversity link, then the connectivity value score for the development is according to Table 13. The connectivity value score is used to determine the Landscape value score for the proposed development according to Section 4 of the FBA.

No further assessment of connectivity value is required for the development.

Table 13: Connectivity value classes for site based development

Connectivity value class	Defining criteria	Score
State biodiversity link	An area identified as being part of a state biodiversity corridor and in a plan approved by the Chief Executive, OEH OR A riparian buffer 50 m either side of a 6th order stream or higher OR A riparian buffer 50 m around an important wetland or an estuarine area	12
Regional biodiversity link	An area identified as being part of a regional biodiversity corridor and in a plan approved by the Chief Executive, OEH OR A riparian buffer 20 m either side of a 4th or 5th order stream Or A riparian buffer 30 m around a regionally significant wetland	9
Nil	None of the above – proceed to Step 2	

Note: The definition of stream orders, important wetlands and regionally significant wetlands is as defined in Appendix 2. The boundary around a SEPP 14 wetland may be adjusted according to the actual location of the wetland on the ground.

If the development does not impact on a state or regional biodiversity link, a site based assessment of connectivity is required using Steps 2–6 below.

Step 2: Determine the current linkage width class at a site

For a site based assessment, the connectivity value score is determined according to changes to linkage width classes and linkage condition classes. The loss in connectivity from development and gain in connectivity with management are determined according to changes to linkage width classes (Table 14) and linkage condition classes (Tables 15–16), and scored as shown in Table 17.

The connectivity value score is determined by assessing the impact of development or management actions on the width and average condition of a connecting link at a site.

The current linkage width class of a connecting link is determined by measuring the width of the connecting link at the narrowest area of the connecting link. This area may be located on or off the site.

The linkage width classes are set out in Table 14.

Table 14: Linkage width classes for site based developments

Linkage width classes (metres)				
0 – 5	>5 – 30	>30 – 100	>100 – 500	>500
Very Narrow	Narrow	Moderate	Wide	Very Wide

Step 2: Determine the number of linkage width classes that are crossed – lost or gained

The assessor then determines the linkage width class of the connecting link after accounting for the impacts of development, or from increases in the width of the connecting link from management actions at the offset site.

The number of linkage width classes that are lost or gained can then be determined as follows:

0 = no change or change is within the class, i.e. does not cross a threshold between the classes

1 = crosses one linkage width threshold, i.e. changes from one linkage width class to the next one across one threshold

2 = crosses two linkage width thresholds, i.e. changes from one class to another class across two thresholds

3 = crosses three linkage width thresholds, i.e. changes from one class to another class across three thresholds

4 = crosses four linkage width thresholds, i.e. changes from one class to another class across four thresholds.

The number of linkage width classes that are crossed as a result of development on a development site or as a result of management actions at an offset site is used in Step 5 to determine the connectivity value score for the connecting link.

Step 3: Determine the current linkage condition class

The linkage condition class is based on the average condition of the over-storey vegetation and an estimate of the average condition of either the mid-storey or

ground cover vegetation across the connecting link within the 1000 ha circle. If the site has more than one 1000 ha circle, the estimation of average condition of the connecting link is made within all of the 1000 ha circles.

Mid-storey or ground cover is used according to which stratum is the most appropriate for assessing connectivity for the PCTs that form the connecting link. For non-woody PCTs, only the average condition of the ground cover is assessed.

Exotic vegetation is to be considered in the assessment of the current linkage condition class on the site for over-storey and either mid-storey or ground cover.

The current linkage condition class is determined by assessing over-storey cover and mid-storey cover or ground cover according to the matrix in Table 15.

Linkage condition classes for non-woody PCTs are determined according to Table 16.

Table 15: Linkage condition classes (woody vegetation)

		Over-storey condition				
		No native over-storey or exotic vegetation with similar structure to the proposal	% foliage cover <50% of lower benchmark or exotic vegetation with similar structure to the proposal	% foliage cover >50% of lower benchmark to lower benchmark	% foliage cover within benchmark	
Mid-storey or ground cover condition	No mid-storey or ground cover or exotic vegetation with similar structure to the proposal	**0**	**0.5**	**1**	**1.5**	Linkage condition class
	% foliage cover of mid-storey or ground cover <50% lower end benchmark or exotic vegetation with similar structure to the proposal	**0.5**	**1**	**1.5**	**2**	
	% foliage cover of mid-storey or ground cover >50% of lower benchmark	**1**	**1.5**	**2**	**2.5**	
	% foliage cover of mid-storey or ground cover within benchmark	**1.5**	**2**	**2.5**	**3**	
		Linkage condition class				

Table 16: Linkage condition classes (non-woody vegetation)

Linkage condition class	Vegetation condition
0	Meets none of the definitions set out below
1	% foliage cover <50% of lower benchmark in native grassland, herbfield or wetland (herbaceous vegetation), or exotic vegetation with similar structure to the proposal
2	% foliage cover >50% of lower benchmark to lower benchmark in native grassland, herbfield or wetland (herbaceous vegetation)
3	% foliage cover is within benchmark in native grassland, herbfield or wetland (herbaceous vegetation)

Step 4: Determine the number of linkage condition classes that are crossed – lost or gained

At the development site, the assessor determines the linkage condition class of the connecting link by accounting for the impacts of the development on the average condition of the over-storey vegetation and the average condition of the mid-storey or ground cover across the connecting link within the 1000 ha circle, using Table 15 for woody vegetation or Table 16 for non-woody vegetation.

The number of linkage condition class thresholds that are crossed as a result of the impacts of development is used in Step 5 to determine the connectivity value score for that connecting link.

At an offset site, the assessor determines the linkage condition class of the connecting link following management of the site. The assessor accounts for the improvement of the average condition of the over-storey vegetation and the average condition of the mid-storey or ground cover from the management actions across the connecting link within the 1000-ha circle, using Table 15 for woody vegetation or Table 16 for non-woody vegetation.

The number of linkage condition class thresholds that are crossed as a result of the management actions at the offset site is used in Step 5 to determine the connectivity value score for that connecting link.

The number of linkage condition class thresholds that are crossed at a site is then scored as:

0 = no change or change is within the same linkage condition class

1 = crosses one linkage condition threshold, i.e. changes from one connectivity condition class to the next one across one threshold

2 = crosses two linkage condition thresholds, i.e. changes from one class to another class across two thresholds

3 = crosses three linkage condition thresholds, i.e. changes from one class to another class across three thresholds.

The number of linkage condition thresholds can include half points where the connectivity condition class crosses to another threshold for only one stratum, as can be seen in Table 15.

Step 5: Determine the connectivity value score

The final connectivity value score for the connecting link is calculated in Table 17 by considering both the number of linkage width classes that are crossed, as determined in Step 2 and the number of linkage condition classes that are crossed, as determined in Step 4. The connectivity value scores shown in Table 17 are derived from the number of linkage width and condition *thresholds* that are crossed, *not* the actual linkage width or condition class.

Where there is more than one linkage to the site, the connecting link with the highest connectivity value score is the primary connecting link. The primary connecting link is used to determine the change in landscape value score in Equation 3 in accordance with Section 4 of the FBA.

Table 17: Scores for loss/gain of linkage condition/width, based on number of thresholds crossed

		Number of linkage width thresholds crossed			
		0	**1**	**2**	**3 or 4**
Number of linkage condition thresholds crossed	**0**	0	2	4	6
	0.5	1	3	5	7
	1	2	4	6	8
	1.5	3	5	7	9
	2	4	6	8	10
	2.5	5	7	9	11
	3	6	8	10	12

c) Assessing the adjacent remnant area

The score for the adjacent remnant area is determined according to the criteria in Table 18. The adjacent remnant area score is derived from the percent native vegetation cleared in the Mitchell landscape in which most of the proposal occurs and the actual size of the adjacent remnant area.

Table 18: Criteria for assessing adjacent remnant area*

Adjacent remnant area class	Percent native vegetation cleared in the Mitchell landscape in which most of the proposal occurs				Adjacent remnant area (score d)
	<30%	30–70%	>70–90%	>90%	
Extra large	>1000 ha	>200 ha	>100 ha	>50 ha	12
Very large	>500–1000 ha	>100–200 ha	>50–100 ha	>20–50 ha	9
Large	>200–500 ha	>50–100 ha	>20–50 ha	>10–20 ha	6
Medium	>100–200 ha	>20–50 ha	>10–20 ha	>1–10 ha	3
Small	≤100 ha	≤20 ha	≤10 ha	≤1 ha	1
nil	0	0	0	0	0

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

Appendix 6: Assessing landscape value for linear shaped developments, or multiple fragmentation impacts

Linear-shaped developments are developments that have a development footprint that extends across the landscape for a distance greater than 3.5 km (the diameter of a 1000 ha assessment circle). Linear-shaped developments are generally less than 200 m wide and include pipelines, roads, highways and railways lines.

Linear-shaped developments that are less than 3.5 km in length are to be assessed according to Appendix 5, *Assessing landscape value for site based developments*.

The landscape value components that are to be assessed for the impacts of development on landscape values include:

a) percent native vegetation cover in the landscape as described in Section 4.1 of the FBA (based on the development footprint buffer area)

b) connectivity value as described in Section 4.2 of the FBA

c) adjacent remnant area (or patch size) as described in Section 4.3 of the FBA.

The method to assess each of these components is set out below.

a) Assessing percent native vegetation cover

For linear shaped development footprints, and development that has multiple fragmentation impacts, the percent native vegetation cover in the landscape assesses the change in the overall percentage of native vegetation cover within a development footprint buffer area. The current and future native vegetation cover (extent and condition) in the development footprint buffer area are calculated using a GIS.

The percent of native vegetation cover in the landscape is determined according to the following four steps:

Step 1: Using a GIS, establish a 550 m buffer along each side of the centre point of the linear development. The buffer should also extend 550 m beyond each end point. Calculate the land area within the development footprint buffer.

Step 2: Calculate the area of native vegetation cover that is on land within the development footprint buffer. Determine the score for current percent of native vegetation cover according to Table 19 below.

Step 3: Determine the score for the future percent of native vegetation cover remaining on land within the development footprint buffer (taking into account the impact of clearing) according to Table 19 below. For development that has multiple fragmentation impacts, the total area of clearing within the buffer area must be calculated.

Step 4: The score for the percent native vegetation cover is used in Section 7.3 to determine the overall impact of development on landscape value.

Table 19: Determining percent native vegetation cover in the landscape (550 m buffer from the centre point of the development)

Percent native vegetation cover in the landscape – linear development buffer area (%)	Score for percent native vegetation cover in the landscape – linear development buffer area
0	0
≤5	1.25
6-10	1.25
11-15	2.5
16-20	3.75
21-25	5
26-30	6.25
31-35	7.5
36-40	8.5
41-45	9.5
46-50	10.5
51-55	11
56-60	11.5
61-65	12
66-70	12.5
71-75	13
76-80	13.4
81-85	13.8
86-90	14.2
91-95	14.6
96-100	15

Example

Area of development footprint buffer (ha) (Step 1)	Area of native vegetation cover (pre development) (ha) (Step 2)	Percent of native vegetation cover (pre development) (Step 3)	Percent of native vegetation cover (post development) (Step 4)	Score for percent native vegetation cover in the development footprint buffer area (S.4.1)
1200	800	66 (score 17)	50 (score 13.8)	3.2

b) Assessing the connectivity value

The impacts of linear shaped and multiple fragmentation developments on connectivity value are assessed using the connectivity value classes approach as set out in Table 20.

It is likely that a linear shaped development will impact on more than one connectivity value class. The highest connectivity value class impacted on by the development must be used in Section 7.3 to determine the impact of development on connectivity value.

Proposed measures that minimise the impact of development on connectivity can be considered when determining the connectivity value class that is most impacted on by the proposed development.

For example, measures that provide an overpass across the riparian buffer of a 6th order stream may mean that the development has no impact on the connectivity value on a state biodiversity link. Where minimisation measures are sufficient to minimise the impact of development on a higher connectivity value class, an assessor may select a lower connectivity value class.

A connecting link is where vegetation on the site is linked to adjoining vegetation and the vegetation:

- is in moderate to good condition, and
- has a patch size >1 ha, and
- is separated by a distance of <100 m (or <30 m for grassy ecosystems), or
- is not separated by a large water body, dual carriageway, wider highway or similar hostile link
- meets the width of the link as specified to be a local area, large area or a very large area link.

Table 20: Connectivity value classes for linear shaped developments

Connectivity value class	Defining criteria	Score
State biodiversity link	An area identified as being part of a state biodiversity corridor and in a plan approved by the Chief Executive, OEH OR A riparian buffer 50 m either side of a 6th order stream or higher OR A riparian buffer 50 m around an important wetland or an estuarine area	15
Regional biodiversity link	An area identified as being part of a regional biodiversity corridor and in a plan approved by the Chief Executive, OEH OR A riparian buffer 20 m either side of a 4th or 5th order stream OR A riparian buffer 30m around a regionally significant wetland	12.5
Very large area link	Links areas of native vegetation in moderate to good condition that are greater than 5000 ha AND Width of vegetation in moderate to good condition that is connecting the area is greater than 500 m	10
Large area link	Links areas of native vegetation in moderate to good condition that are between 1000 ha and > 5000 ha AND Width of vegetation in moderate to good condition that is connecting the area is greater than 100 m	7.5
Local area link	Links areas of native vegetation in moderate to good condition that are between 250 ha and < 1000 ha AND Width of vegetation in moderate to good condition that is connecting the area is greater than 30 m	5
Nil	None of the above	0

Note: The definition of stream orders, important wetlands and regionally significant wetlands is as defined in Appendix 2. The boundary around a SEPP 14 wetland may be adjusted according to the actual location of the wetland on the ground.

c) Assessing the adjacent remnant area

Adjacent remnant area is the area of moderate to good condition native vegetation of which the site is a part, which is less than 100 m from the next area of moderate to good native vegetation. An adjacent remnant area may extend onto land adjoining the development.

For linear-shaped and multiple fragmentation developments, the adjacent remnant area is assessed for each Mitchell landscape in which the development occurs. The score for adjacent remnant area for each Mitchell landscape is assessed according to the percent of native vegetation cleared in the Mitchell landscape and the size class of the adjacent remnant area shown in Table 21.

The average for the adjacent remnant area scores for each Mitchell landscape in which the development occurs is the adjacent remnant area score for the proposed development.

The adjacent remnant area score is then used in Section 7.3 to determine the impact on Landscape value score for the proposal.

Table 21: Criteria for assessing adjacent remnant area*

Adjacent remnant area class	Percent native vegetation cleared in the Mitchell landscape in which most of the proposal occurs				Adjacent remnant area (score d)
	<30%	30–70%	>70–90%	>90%	
Extra large	>1000 ha	>200 ha	>100 ha	>50 ha	15
Very large	>500–1000 ha	>100 –200 ha	>50–100 ha	>20–50 ha	12
Large	>200–500 ha	>50–100 ha	>20–50 ha	>10–20 ha	9
Medium	>100–200 ha	>20–50 ha	>10–20 ha	>1–10 ha	6
Small	≤100 ha	≤20 ha	≤10 ha	≤1 ha	3
nil	0	0	0	0	0

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

Appendix 7: Assessing landscape value for offset sites

The attributes that must be used to assess landscape value at an offset site include (as shown in Figure 5):

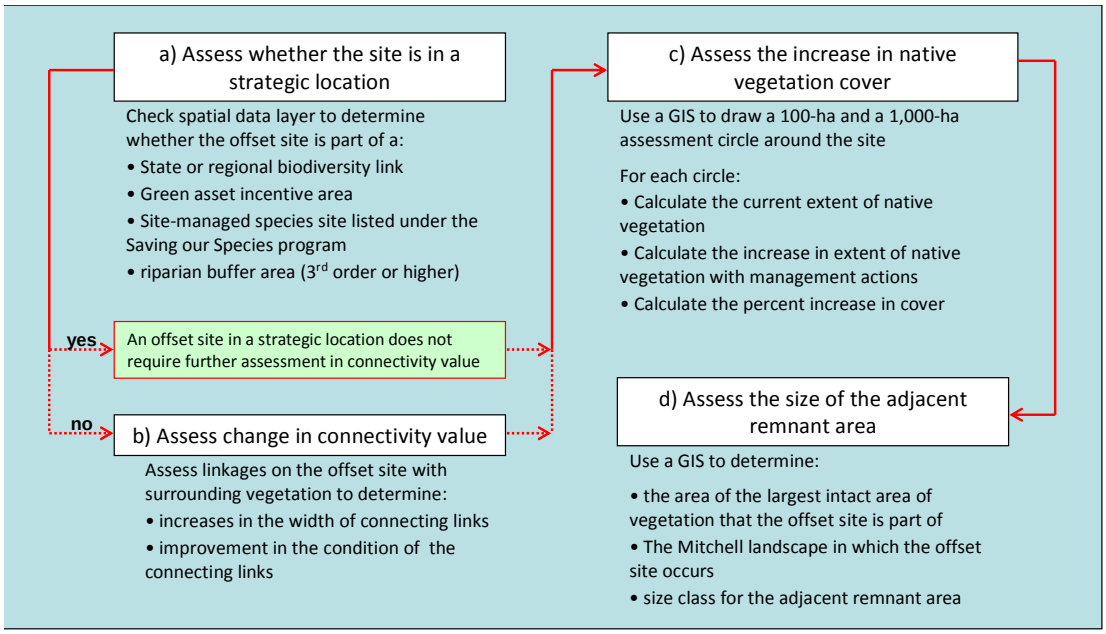
a) strategic location of offset sites (for offsets sites only) as defined in Section 4.4 of the FBA

b) connectivity value

c) percent native vegetation cover in the landscape (inner and outer assessment circle) as defined in Section 4.1 of the FBA

d) adjacent remnant area as defined in Section 4.3 of the FBA.

Figure 5: Indicative workflow to assess landscape value at an offset site



Landscape value components are assessed beyond the boundary of the offset site and require the use of Geographical Information Systems (GIS) for optimal accuracy and consistency.

a) Assessing the strategic location of the offset site

Land that is proposed as an offset is assessed to determine whether the offset site is within a strategic location.

Offset sites that are strategically located in the landscape may provide additional benefits in biodiversity values. Strategic locations for offset sites are defined as comprising either:

i. green Assets, as identified within the Biodiversity Investment Opportunities (BIO) Map[7], which include areas that are rare, threatened and unique biodiversity assets, or

[7] The *Biodiversity Investment Opportunity (BIO) Map*, when released, is an online map that displays strategic locations for investment in biodiversity protection and management. The BIO Map identifies green assets, which include areas that are rare, threatened and unique biodiversity assets, and

ii. state significant biodiversity corridors, as identified within the BIO Map, or

iii. regionally significant biodiversity corridors, as identified within the BIO Map, or

iv. a site identified as a priority for conservation in the *Saving our Species* program (e.g. an area identified for site-managed species[8]), or

v. riparian areas of 4th order streams or higher; important or regionally significant wetlands; or estuarine areas (as defined in Table 22).

The strategic locations for offset sites can be viewed on the PIA Map spatial viewer[9] (when available).

Where an offset site includes land that meets any of these criteria, the offset site is assessed as being within a strategic location. No further assessment of the connectivity value of the offset site is required for sites that are within a strategic location. The score for connectivity value is then added to the score for assessing the strategic location of an offset site. This means that assessing the strategic location of an offset site is a score out of 18.

The score for the strategic location of an offset site is to be used in Section 11.2 of the FBA to determine the overall landscape value score for the proposed offset.

biodiversity corridors of state and regional significance. The BIO Map is displayed on the Biodiversity Investment spatial viewer.

[8] Site-managed species are identified through the *Saving our Species* program. Through carrying out targeted management actions that are specific for that species at identified sites, site-managed species can be successfully secured in the wild in NSW.

[9] The *Biodiversity Investment spatial viewer* is the online computer platform that displays the BIO Map, the location of site-managed species identified through the *Saving our Species* program, riparian areas, important or regionally significant wetlands and estuarine areas.

Table 22: Score for strategic location of the offset site

An offset site is in a strategic location if it includes:	Score
• Riparian buffer area on both sides of a 6th order stream or higher, or • Riparian buffer area of an important wetland, or • An estuarine area	18
• An area identified as being part of a state significant biodiversity corridor within the PIA Map, or • Riparian buffer area on both sides of a 4th or 5th order stream, or • Riparian buffer area on one side of a 6th order stream or higher, or • Riparian buffer area of a regionally significant wetland	15
• An area identified as being part of a regionally significant biodiversity corridor within the PIA Map, or • Riparian buffer area on one side of a 4th or 5th order stream, or • Confirmed population within an area identified for a site-managed species in the *Saving our Species* program	12
• An area identified as being part of a Core Area within the PIA Map • Riparian buffer area on both sides of a 3rd order stream	9
• Riparian buffer area on one side of a 3rd order stream	6

Note: The definition of stream orders, important wetlands and regionally significant wetlands is as defined in Appendix 2. The boundary around a SEPP 14 wetland may be adjusted according to the actual location of the wetland on the ground.

b) Assessing the connectivity value

An assessment of the connectivity value of an offset site must be undertaken where the offset site is not within a strategic location as identified by the criteria in **a) Assessing the strategic location of an offset site**.

Connectivity value assesses the change in connectivity at a site with the surrounding vegetation, by taking into account the change in connectivity from the management actions.

The connectivity value score is determined according to changes to linkage width classes and linkage condition classes. The gain in connectivity with management actions are determined according to increases in linkage width classes (Table 23) and improvement in linkage condition classes (Tables 24–25). The final connectivity value score for the offset site is determined in Table 26.

A connecting link is when vegetation on the offset site is linked to adjoining vegetation and the vegetation:

- is in moderate to good condition, and
- has a patch size >1 ha, and
- is separated by a distance of <100 m (or <30 m for grassy ecosystems), or
- is not separated by a large water body, dual carriageway, wider highway or similar hostile link.

A site may have no, or more than one, connecting link.

Where a site has more than one connecting link, the assessor must determine the connectivity value score for each connecting link. The connecting link with the highest connectivity value score is referred to as the primary connecting link. The connectivity value score of the primary connecting link is used to score the gain with management actions.

The connectivity value score for a site is determined according to the five step process set out below.

Step 1: Determine the current linkage width class at a site

The current linkage width class of a connecting link is determined by measuring the width of the connecting link at the narrowest area of the connecting link across the connecting link within the outer assessment circle. This area may be located on or off the site.

The linkage width classes are set out in Table 23.

Table 23: Linkage width classes for an offset site

Linkage width classes (metres)				
0 – 5	>5 – 30	>30 – 100	>100 – 500	>500
Very Narrow	Narrow	Moderate	Wide	Very Wide

Step 2: Determine the number of linkage width classes that are crossed – lost or gained

The assessor then determines the linkage width class of the connecting link after accounting for any increases in the width of the connecting link from management actions at the offset site.

The number of linkage width classes that are gained can be determined as follows:

0 = no change or change is within the class, i.e. does not cross a threshold between the classes

1 = crosses one linkage width threshold, i.e. changes from one linkage width class to the next one across one threshold

2 = crosses two linkage width thresholds, i.e. changes from one class to another class across two thresholds

3 = crosses three linkage width thresholds, i.e. changes from one class to another class across three thresholds

4 = crosses four linkage width thresholds, i.e. changes from one class to another class across four thresholds.

The number of linkage width classes that are crossed as a result of management actions at an offset site is used in Step 5 to determine the connectivity value score for the connecting link.

Step 3: Determine the current linkage condition class

The linkage condition class is based on the average condition of the over-storey vegetation and an estimate of the average condition of either the mid-storey or ground cover vegetation across the connecting link within the outer assessment circle.

Mid-storey or ground cover is used according to which stratum is the most appropriate for assessing connectivity for the PCTs that form the connecting link. For non-woody PCTs, only the average condition of the ground cover is assessed.

Exotic vegetation is to be considered in the assessment of the current linkage condition class on the site for over-storey and either mid-storey or ground cover.

The current linkage condition class is determined by assessing over-storey cover and mid-storey cover or ground cover according to the matrix in Table 24.

Linkage condition classes for non-woody PCTs are determined according to Table 25.

Table 24: Linkage condition classes (woody vegetation)

		Over-storey condition				
		No native over-storey or exotic vegetation with similar structure to the proposal	% foliage cover <50% of lower benchmark or exotic vegetation with similar structure to the proposal	% foliage cover >50% of lower benchmark to lower benchmark	% foliage cover within benchmark	
Mid-storey or ground cover condition	No mid-storey or ground cover or exotic vegetation with similar structure to the proposal	**0**	**0.5**	**1**	**1.5**	Linkage condition class
	% foliage cover of mid-storey or ground cover <50% lower end benchmark or exotic vegetation with similar structure to the proposal	**0.5**	**1**	**1.5**	**2**	
	% foliage cover of mid-storey or ground cover >50% of lower benchmark	**1**	**1.5**	**2**	**2.5**	
	% foliage cover of mid-storey or ground cover within benchmark	**1.5**	**2**	**2.5**	**3**	
		Linkage condition class				

Table 25: Linkage condition classes (non-woody vegetation)

Linkage condition class	Vegetation condition
0	Meets none of the definitions set out below
1	% foliage cover <50% of lower benchmark in native grassland, herbfield or wetland (herbaceous vegetation), or exotic vegetation with similar structure to the proposal
2	% foliage cover >50% of lower benchmark to lower benchmark in native grassland, herbfield or wetland (herbaceous vegetation)
3	% foliage cover is within benchmark in native grassland, herbfield or wetland (herbaceous vegetation)

Step 4: Determine the number of linkage condition classes that are crossed (gained)

At an offset site, the assessor determines the linkage condition class of the connecting link following management of the site. The assessor accounts for the improvement of the average condition of the over-storey vegetation and the average condition on the mid-storey or ground cover from the management actions across the connecting link within the 1000 ha circle, using Table 24 for woody vegetation or Table 25 for non-woody vegetation.

The number of linkage condition class thresholds that are crossed as a result of the management actions at the offset site is used in Step 5 to determine the connectivity value score for that connecting link.

The number of linkage condition class thresholds that are crossed at a site is then scored as:

0 = no change or change is within the same linkage condition class

1 = crosses one linkage condition threshold, i.e. changes from one connectivity condition class to the next one across one threshold

2 = crosses two linkage condition thresholds, i.e. changes from one class to another class across two thresholds

3 = crosses three linkage condition thresholds, i.e. changes from one class to another class across three thresholds.

The number of linkage condition thresholds can include half points where the connectivity condition class crosses to another threshold for only one stratum, as can be seen in Table 24.

Step 5: Determine the connectivity value score

The final connectivity value score for the connecting link is calculated in Table 26 by considering both the number of linkage width classes that are crossed, as determined in Step 2 and the number of linkage condition classes that are crossed, as determined in Step 4. The connectivity value scores shown in Table 26 are derived from the number of linkage width and condition *thresholds* that are crossed, *not* the actual linkage width or condition class.

Where there is more than one linkage to the site, the connecting link with the highest connectivity value score is the primary connecting link. The primary connecting link is used to determine the change in Landscape value score in Equation 8 in accordance with Section 11.2 of the FBA.

Table 26: Scores for gain of linkage condition/width, based on number of thresholds crossed

		Number of linkage width thresholds crossed			
		0	**1**	**2**	**3 or 4**
Number of linkage condition thresholds crossed	**0**	0	2	4	6
	0.5	1	3	5	7
	1	2	4	6	8
	1.5	3	5	7	9
	2	4	6	8	10
	2.5	5	7	9	11
	3	6	8	10	12

c) Assessing percent native vegetation cover

At an offset site, the percent native vegetation cover in the landscape assesses the change in the percent of native vegetation cover within an inner and an outer assessment circle. The inner and outer assessment circles can be scaled to fit the size and configuration of the offset site.

The inner and outer assessment circles selected for a proposed offset site can be chosen from the following combinations:

Inner assessment circle (ha)	Outer assessment circle (ha)
100	1,000
200	2,000
300	3,000
400	4,000
500	5,000
1,000	10,000

The current and future native vegetation cover (extent and condition) in the assessment circles are calculated using a GIS. Current and future native vegetation cover (extent and condition) in the inner and outer circles are estimated in increments of 5% using a GIS and scored as shown in Table 27. The future percent of native vegetation cover in the assessment circles is to take into account increases in the extent of vegetation cover from management actions undertaken at the offset site.

The percent native vegetation cover score assesses the change (gain) in the overall percentage of native vegetation cover within the inner and outer assessment circles in which the offset site is located.

The inner and outer assessment circles are to be centred on the area of the offset site that contain the greatest increase in native vegetation cover.

The change in percent native vegetation cover for the inner assessment circle is scored out of 10. The change in percent native vegetation cover for the outer assessment circle is scored out of 16.

The change in percent native vegetation cover score is the difference between the current percent native vegetation cover score and the future native vegetation cover score for the inner assessment circle and the outer assessment circle. The score for each assessment circle is to be used in Section 11.2 of the FBA to determine the overall Landscape value score for the proposed offset.

Table 27: Determining percent native vegetation cover in the landscape

Percent native vegetation cover in the landscape – inner and outer assessment circle (%)	Score for percent native vegetation cover in the landscape – inner assessment circle	Score for percent native vegetation cover in the landscape – outer assessment circle
0	0	0
≤5	.75	1.25
6-10	1.5	2.5
11-15	2.25	3.75
16-20	3	5
21-25	3.75	6.25
26-30	4.5	7.5
31-35	5.1	8.45
36-40	5.7	9.4
41-45	6.3	10.35
46-50	6.9	11.3
51-55	7.3	11.95
56-60	7.7	12.6
61-65	8.1	13.25
66-70	8.5	13.9
71-75	8.75	14.25
76-80	9	14.6
81-85	9.25	14.95
86-90	9.5	15.3
91-95	9.75	15.65
96-100	10	16

d) Assessing the adjacent remnant area

Adjacent remnant area is the area of moderate to good condition native vegetation of which the site is a part, which is less than 100 m from the next area of moderate to good native vegetation. An adjacent remnant area may extend onto adjoining land. The score for adjacent remnant area is determined according to the Mitchell landscape in which most of the proposal occurs as shown in Table 28.

The score for the adjacent remnant area is determined according to the criteria in Table 28. The adjacent remnant area score is derived from the percent native vegetation cleared in the Mitchell landscape in which most of the proposal occurs and the actual size of the adjacent remnant area.

Table 28: Criteria for assessing adjacent remnant area*

Adjacent remnant area class	Percent native vegetation cleared in the Mitchell landscape in which most of the proposal occurs				Adjacent remnant area (score d)
	<30%	30–70%	>70–90%	>90%	
Extra large	>1000 ha	>200 ha	>100 ha	>50 ha	12
Very large	>500–1000 ha	>100–200 ha	>50–100 ha	>20–50 ha	9
Large	>200–500 ha	>50–100 ha	>20–50 ha	>10–20 ha	6
Medium	>100–200 ha	>20–50 ha	>10–20 ha	>1–10 ha	3
Small	≤100 ha	≤20 ha	≤10 ha	≤1 ha	1
nil	0	0	0	0	0

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

Appendix 8: Guidelines for varying the increase in site value with additional management actions

The gain in the site attribute score may be increased beyond the default scores (set out in Table 4 of the FBA) where it is demonstrated that additional and/or more tailored actions are being undertaken at an offset site. Additional gain in site value may also be used where the extent and/or degree to which the management actions are being undertaken is likely to provide a greater increase in site value than that shown in Table 4 of the FBA.

Any increase in site value greater than that shown in Table 4 of the FBA must be documented in the biodiversity offset strategy.

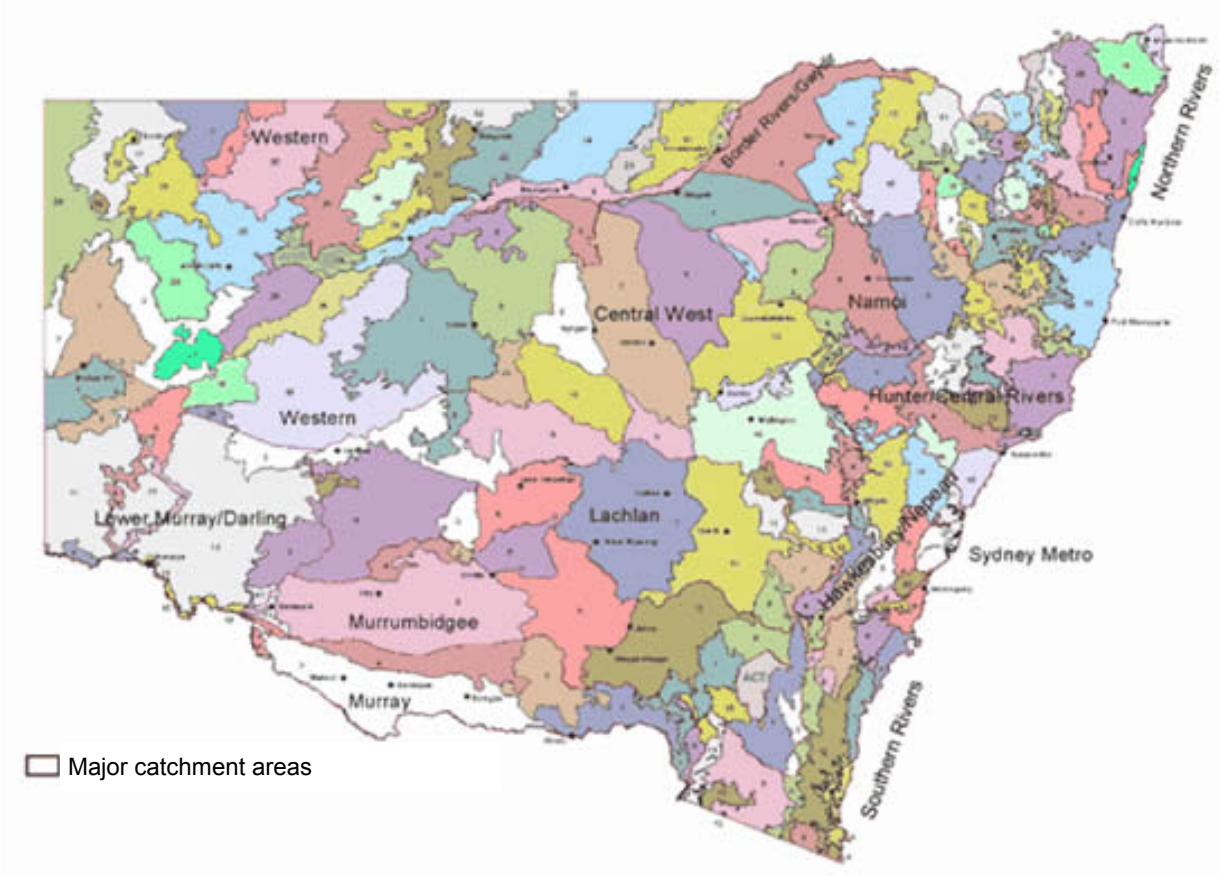
Table 29: Allowable additional increases in predicted improvement in site attribute scores with management actions under certain circumstances

	Increase in site attribute score from current condition			
Site attribute	**0**	**1**	**2**	**Example of required management actions**
Species richness	Increase by 1 rather than by 0.5	Increase by 1 rather than by 0.5	No additional gain (i.e. increase by 1)	Where strategic replanting is undertaken using seed sourced from vegetation on or adjacent to the site, a diverse range of species from different strata is used. A value lower that the default increase may be used where replanting includes exotic species or non-indigenous local species.
Over-storey cover	Increase by 1.5 rather than by 1	Increase by 1.5 rather than by 1	No additional gain (i.e. increase by 1)	Appropriate site preparation is undertaken prior to planting/seeding. Planting is restricted to indigenous local species relevant to PCT, landscape position and over-storey structural class. Seeds and seedlings sourced from local provenance. Planting configuration reflects natural density and patchiness. Grazing exclusion applies until seedlings are established. Follow-up management must include watering, grazing management, and control of weeds and other competing species. A value lower that the default increase may be used where replanting does not re-establish over-storey cover, or does not use indigenous local species.
Mid-storey cover	Increase by 1.5 rather than by 1	Increase by 1.5 rather than by 1	No additional gain (i.e. increase by 1)	Appropriate site preparation is undertaken prior to planting/seeding. Planting is restricted to indigenous local species relevant to PCT, landscape position and mid-storey structural class. Seeds and seedlings sourced from local provenance. Planting configuration reflects natural density and patchiness. Grazing exclusion applies until seedlings are established. Follow-up management must include watering, grazing management, and control of weeds and other competing species. A value lower than the default increase may be used where replanting does not re-establish mid-storey cover, or does not use indigenous local native species.

	Increase in site attribute score from current condition			
Site attribute	**0**	**1**	**2**	**Example of required management actions**
Native ground cover (grasses)	Increase by 1.5 rather than by 1	Increase by 2 rather than by 1	No additional gain (i.e. increase by 1)	Appropriate site preparation is undertaken prior to planting/seeding. Planting is restricted to indigenous local species relevant to PCT, landscape position and ground cover structural class. Seeds and seedlings sourced from local provenance. Planting configuration reflects natural density and patchiness. Grazing exclusion applies until seedlings are established. Follow-up management must include grazing management, and control of weeds and other competing species. A value lower than the default increase may be used where replanting does not re-establish ground cover using indigenous local native grasses.
Native ground cover (shrubs)	No additional gain (i.e. increase by 1)	Increase by 1.5 rather than by 1	No additional gain (i.e. increase by 1)	Appropriate site preparation is undertaken prior to planting/seeding. Planting is restricted to indigenous local species relevant to PCT, landscape position and ground cover structural class. Seeds and seedlings sourced from local provenance. Planting configuration reflects natural density and patchiness. Grazing exclusion applies until seedlings are established. Follow-up management must include grazing management, control of weeds and other competing species. A value lower than the default increase may be used where replanting does not re-establish native shrubs as part of the ground cover, or does not use indigenous local species.
Native ground cover (other)	No additional gain (i.e. increase by 1)	No additional gain (i.e. increase by 1)	No additional gain (i.e. increase by 1)	No change from the default.
Exotic plant cover	No additional gain (i.e. increase by 0.5)	Increase by 1 rather than by 0.5	No additional gain (i.e. increase by 1)	Where an integrated weed management plan is implemented. Plan includes monitoring of exotic species and action if cover increases.
Number of trees with hollows	Increase by 0.5 rather than zero increase	No additional gain (i.e. increase by 0.5)	No additional gain (i.e. increase by 1)	Allow for habitat augmentation via nest boxes or the securing of stags which already contain hollows
Over-storey regener-ation	Increase by 1 rather than by 0.5	No additional gain (i.e. increase by 1)	No additional gain (i.e. increase by 1)	Appropriate site preparation is undertaken prior to planting/seeding. Planting is restricted to indigenous local species relevant to PCT, landscape position and ground cover structural class. Seeds and seedlings sourced from local provenance. Planting configuration reflects natural density and patchiness and should augment any natural regeneration occurring on the site. Grazing exclusion applies until seedlings are established. Follow-up management must include grazing management, and control of weeds and other competing species. A value lower than the default increase may be used where replanting with the original over-storey species is not carried out.
Total length of fallen logs	Increase by 0.5 rather than zero increase	Increase by 1 rather than by 0.5	No additional gain (i.e. increase by 1)	Where hollow logs are brought onto the site from an adjoining development area and are placed in a configuration that reflects natural systems. An increase may also apply where the site contains some scattered mature or senescent trees.

Appendix 9: Map of IBRA subregions in major catchment areas of NSW

Figure 6: Map of IBRA subregions in major catchment areas of NSW



IBRA subregions of major catchment areas in NSW Key to map	
Border Rivers/Gwydir major catchment area	
1	Beardy River Hills
2	Binghi Plateau
3	Bundarra Downs
4	Castlereagh-Barwon
5	Deepwater Downs
6	Eastern Nandewars
7	Glenn Innes–Guyra Basalts
8	Inverell Basalts
9	Kaputar

10	Moredun Volcanics
11	Nandewar, Northern Complex
12	Northeast Forest Lands
13	Northern Basalts
14	Northern Outwash
15	Peel
16	Severn River Volcanics
17	Tenterfield Plateau
18	Tingha Plateau
19	Yarrowyck–Kentucky Downs
Central West major catchment area	
1	Bathurst
2	Bogan–Macquarie
3	Canbelego Downs
4	Capertee
5	Castlereagh–Barwon
6	Hill End
7	Kerrabee
8	Liverpool Range
9	Lower Slopes
10	Nymagee–Rankins Springs
11	Oberon
12	Orange
13	Pilliga
14	Pilliga Outwash
15	Talbragar Valley
16	Upper Slopes
17	Wollemi
Hawkesbury/Nepean major catchment area	
1	Bathurst
2	Bungonia
3	Burragorang

4	Capertee
5	Crookwell
6	Cumberland
7	Kanangra
8	Monaro
9	Moss Vale
10	Oberon
11	Pittwater
12	Sydney Cataract
13	Wollemi
14	Yengo
Hunter/Central Rivers and Sydney Metro major catchment area	
1	Barrington
2	Comboyne Plateau
3	Ellerston
4	Hunter
5	Karuah Manning
6	Kerrabee
7	Liverpool Range
8	Macleay Hastings
9	Mummel Escarpment
10	Pilliga
11	Tomalla
12	Upper Hunter
13	Walcha Plateau
14	Wollemi
15	Wyong
16	Yengo
Lachlan major catchment area	
1	Barnato Downs
2	Crookwell
3	Darling Depression

4	Kanangra
5	Lachlan
6	Lachlan Plains
7	Lower Slopes
8	Murrumbateman
9	Nymagee–Rankins Springs
10	Oberon
11	Orange
12	South Olary Plain, Murray Basin Sands
13	Upper Slopes
Lower Murray/ Darling major catchment area	
1	Barrier Range
2	Barrier Range Outwash, Fans and Plains
3	Darling Depression
4	Great Darling Anabranch
5	Lachlan
6	Menindee
7	Murray Scroll Belt
9	Pooncarie–Darling
10	Robinvale Plains
11	South Olary Plain, Murray Basin Sands
Murray major catchment area	
1	Bondo
2	Lower Slopes
3	Murray Fans
4	Murrumbidgee
5	New South Wales Alps
6	South Olary Plain, Murray Basin Sands
7	Upper Slopes
Murrumbidgee major catchment area	
1	Bondo

2	Darling Depression
3	Kybeyan – Gourock
4	Lachlan
5	Lachlan Plains
6	Lower Slopes
7	Monaro
8	Murrumbateman
9	Murrumbidgee
10	New South Wales Alps
11	South Olary Plain, Murray Basin Sands
12	Upper Slopes
Namoi major catchment area	
1	Castlereagh–Barwon
2	Eastern Nandewars
3	Kaputar
4	Liverpool Plains
5	Liverpool Range
6	Northern Basalts
7	Peel
8	Pilliga
9	Pilliga Outwash
10	Walcha Plateau
Northern Rivers major catchment area	
1	Armidale Plateau
2	Carrai Plateau
3	Cataract
4	Chaelundi
5	Clarence Lowlands
6	Clarence Sandstones
7	Coffs Coast & Escarpment
8	Comboyne Plateau
9	Dalmorton

10	Ebor Basalts
11	Glenn Innes–Guyra Basalts
12	Guy Fawkes
13	Macleay Gorges
14	Macleay Hastings
15	Murwillumbah (Qld – Southeast Hills and Ranges)
16	Nightcap
17	Northeast Forest Lands
18	Richmond – Tweed (Qld – Scenic Rim)
19	Rocky River Gorge
20	Round Mountain
21	Stanthorpe Plateau
22	Upper Manning
23	Walcha Plateau
24	Washpool
25	Wongwibinda Plateau
26	Woodenbong
27	Yuraygir
Southern Rivers major catchment area	
1	Bateman
2	Bungonia
3	Burragorang
4	East Gippsland Lowlands (EGL)
5	Ettrema
6	Illawarra
7	Jervis
8	Kybeyan – Gourock
9	Monaro
10	Moss Vale
11	New South Wales Alps
12	South East Coastal Ranges
13	South East Coastal Plains

Western major catchment area	
1	Barnato Downs
2	Barrier Range
3	Barrier Range Outwash, Fans and Plains
4	Bogan–Macquarie
5	Boorindal Plains
6	Bulloo Dunefields
7	Bulloo Overflow
8	Canbelego Downs
9	Castlereagh–Barwon
10	Central Depression
11	Central Downs – Fringing Tablelands and Downs
12	Core Ranges
13	Core Ranges
14	Culgoa–Bokhara
15	Darling Depression
16	Kerribree Basin
17	Louth Plains
18	Menindee
19	Moonie – Barwon Interfluve, Collarenebri Interfluve
20	Mootwingee Downs
21	Narrandool
22	Nebine Plains, Block Range
23	Nymagee–Rankins Springs
24	Paroo Overflow
25	Paroo Sand Sheets, Cuttaburra–Paroo
26	Paroo–Darling Sands
27	Scopes Range
28	South Olary Plain, Murray Basin Sands
29	Strzelecki Desert, Western Dunefields
30	Urisino Sandplains
31	Warrambool–Moonie
32	Warrego Plains
33	Warrego Sands

34	West Warrego – Tablelands and Downs
35	White Cliffs Plateau
36	Wilcannia Plains

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