



# Assessing partial loss of biodiversity values

Biodiversity Assessment Method guide – consultation draft

Department of Climate Change,  
Energy, the Environment and Water



## Acknowledgement of Country

Department of Climate Change, Energy, the Environment and Water acknowledges the Traditional Custodians of the lands where we work and live.

We pay our respects to Elders past, present and emerging.

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Cover photo: Transmission line easement through patch of Watagan Range Turpentine-Mahogany Grassy Forest, Jiliby State Conservation Area. Ben Ellis/DCCEEW

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Environment and Heritage

Department of Climate Change,

Energy, the Environment and Water

Locked Bag 5022, Parramatta NSW 2124

Phone: +61 2 9995 5000 (switchboard)

Phone: 1300 361 967 (Environment and Heritage enquiries)

TTY users: phone 133 677, then ask for 1300 361 967

Speak and listen users: phone 1300 555 727, then ask for 1300 361 967

Email [info@environment.nsw.gov.au](mailto:info@environment.nsw.gov.au)

Website [www.environment.nsw.gov.au](http://www.environment.nsw.gov.au)

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# 1. Introduction

## 1.1 Purpose of this guide

The Biodiversity Assessment Method (BAM) is a transparent, consistent and scientifically robust way to assess impacts on or improvements in, biodiversity under the Biodiversity Offsets Scheme (the scheme).

This *Assessing partial loss of biodiversity values Biodiversity Assessment Method guide – consultation draft* (the guide) is to be used by accredited assessors in applying the BAM to assess partial loss of biodiversity values, including as part of assessment, calculations and documentation.

If a Biodiversity Development Assessment Report (BDAR) or Biodiversity Certification Assessment Report (BCAR) is proposed to assess partial loss, relevant parts of the guide are to be referenced. Appendix A: Online resources and references identifies key resources to assist with report preparation.

## 1.2 Application of this guide

The guide is to be used for:

- major projects, where the Secretary’s Environmental Assessment Requirements are issued after 1 October 2024
- Part 4 local developments, where those projects are submitted to the consent authority after 1 October 2024
- Part 5 activities, at the discretion of the government department responsible for assessments
- strategic biodiversity certification proposals where the Minister for the Environment issues a declaration after 1 October 2024.

All projects must adhere to the guide when scoring partial loss as part of the BDAR or BCAR preparation. If an accredited assessor is not applying the guide to score partial loss or proposes to modify the assessment in a way that is not provided for under the guide, the accredited assessor should seek a decision from the department through the BOS Help Desk.

The department will publish decisions so accredited assessors can apply the guide consistently. The guide will also be updated periodically to incorporate agreed positions and other new information.

## 1.3 Deciding when to use partial loss scores in assessment

Partial loss is when impacts are proposed that will not result in full loss of biodiversity values. The values will be maintained in the impacted area including during site preparation, construction, operation and maintenance. This may require consideration of management controls over the impacted area for the life of the project, including future

vegetation management or other activities (such as applying fertiliser or potential for weed encroachment).

If the impact is uncertain or there is insufficient evidence-based justification for partial loss, the impacts must be assessed as full loss. For example, where:

- vegetation will be cleared but may regenerate
- future maintenance of the impact site to allow retention of some biodiversity values is uncertain or may be subject to change over time.

Partial loss is difficult to predict. Use a conservative approach and provide full justification.

Partial loss should not be used where there is full loss of biodiversity values temporarily or in the short or long term.

Advice on the application of the guide can be sought from the BOS Help Desk.

Seek a decision from the department for approaches to scoring partial loss that do not adhere to the guide and include the written confirmation of support in the BDAR or BCAR.

## 1.4 Partial loss and scheme entry requirements

To determine if the scheme applies to a project (e.g. in applying area thresholds), consider the total area subject to impacts, including all full and partial loss areas.

## 1.5 Avoidance and minimisation

Avoidance and minimisation should be applied in relation to impacts that are proposed to be a partial loss of biodiversity values. This is a requirement of the *Biodiversity Conservation Act 2016*.

## 2. Identifying and assessing partial loss

In undertaking assessments under the BAM, the vegetation integrity (VI) score for full loss will be zero. For partial loss, the predicted future VI score may be greater than zero. An evidence-based justification for predicted future condition is required if VI scores are greater than zero, as this assessment relies on predictions of future site condition.

Section 4.3 outlines the documentation required for partial loss calculations. When providing evidence for partial loss include:

- measures for the ongoing management of biodiversity values that clearly link to the partial loss scores
- a partial loss management plan in accordance with Appendix C: Partial loss management plan.

### 2.1 Direct impacts

Direct impacts resulting in partial loss can occur from site preparation, construction and operation activities. Assessment of partial loss for direct impacts may be considered:

- for asset protection zones (APZs) where midstory shrubs and understory vegetation are removed by slashing or mowing to a specified height
- when trees are to be removed but the understorey of the vegetation community is to be retained (e.g. for the establishment and operational maintenance of electricity transmission lines)
- for service easements that result in the removal of all shrubs and trees
- for airfields where tree thinning to maintain obstacle limitation surfaces for an aircraft is undertaken but other elements of the vegetation are retained.

Types of direct impacts that are not partial loss include construction of buildings or infrastructure that will result in complete loss and other land uses where the VI is reduced to zero over time (e.g. sporting fields or recreational open spaces).

For all direct impacts that are proposed to result in partial loss, include the calculations and justification in the BDAR or BCAR as set out in Section 4.

### 2.2 Indirect impacts

Indirect impacts are those that affect biodiversity values beyond the development footprint or within retained areas on the subject land, including impacts from activities related to site preparation, construction and operation.

Assessment of partial loss for indirect impacts may be appropriate when retained biodiversity values are permanently degraded due to any of the following:

- edge effects along pipelines or roads/tracks, including from changes to hydrology or weed encroachment

- edge effects of urban and industrial development
- wind-swept areas of wind turbines
- shading or increased reflection from buildings/structures
- a localised reduction/loss of the stored aerial and soil seed bank through the removal and disturbance of topsoil and the loss of serotinous flora species
- a localised change in the microclimate of the plant community type (PCT) and habitat such as changes in temperature, wind, light and humidity from the loss of canopy cover
- change in the hydrology that will impact the vegetation assemblage and habitat (e.g. changes in surface water flows as a result of the loss of structural features that capture surface water)
- change in soil conditions of the vegetation assemblage and habitat (e.g. increased sedimentation and nutrient availability)
- change in biodiversity values caused by reductions in pollination and seed dispersal.

For all indirect impacts that result in partial loss, include the calculations and justification in the BDAR or BCAR as set out in Section 4.

## 2.3 Prescribed impacts

Assessment requirements for prescribed impacts are described in BAM Section 6. Prescribed impacts may be direct or indirect impacts. They may result in full or partial loss.

Examples of where partial loss can be scored for prescribed impacts include:

- a proposed upgrade to a bridge that modifies microbat roosting habitat in a way that does not cause complete loss of the roosting habitat
- a proposed dam that causes prescribed downstream impacts due to changes in hydrology
- underground mining that impacts threatened species habitat or a threatened ecological community (TEC), which results in a lower condition state of habitat due to hydrology changes or mine subsidence.

## 2.4 Uncertain impacts and adaptive management for partial loss

Uncertain impacts are difficult to measure prior to development (BAM Section 8.5). For example, it may be difficult to predict the long-term response of a threatened forb after removing tall trees and shrubs to maintain a transmission line. The impact will expose ground cover to increased radiant heat and light, over time resulting in the loss of habitat features used by the species.

Seek advice from the BOS Help Desk on addressing uncertain impacts.



## 3. Applying partial loss

### 3.1 Demonstrating biodiversity values will be maintained

To justify using a partial loss score as part of the BDAR or BCAR, demonstrate that the remaining biodiversity values will be maintained and persist throughout all phases of the development (including post-construction and operation). Consider needs and limitations through these phases and how these will impact partial loss scoring (e.g. terrain, use of heavy machinery involved in construction, need for roads and accessways). Provide details of management that will enable biodiversity values to be retained. Where there is uncertainty that vegetation will be retained, score the impacts as full loss.

#### 3.1.1 Calculating partial loss for direct impacts

The future value of each vegetation composition, structure and function attribute is amended in the Biodiversity Assessment Method Calculator (BAM-C) to reflect both the impacts from partially clearing the vegetation zone and associated future management to retain biodiversity values.

Demonstrate that methods used for calculating partial loss are ecologically valid and scientifically robust.

To include partial loss of biodiversity values due to direct impacts in the BDAR or BCAR, refer to the BAM-C online user guide and do the following:

1. Map all vegetation zones subject to partial loss. Where a mixture of full and partial clearing occurs in the same vegetation zone, map and identify these as separate vegetation zones.
2. Assess the VI of the subject land as per the BAM Section 4.3.
3. Use the composition, structure and function scores from the plot survey data to determine the current VI score for each vegetation zone.
4. To adjust the future VI score for each vegetation zone, click on each vegetation attribute score and adjust with respect to the BAM plot survey data, ongoing management actions for the site, relative to the benchmark condition value for each of the condition attributes.
5. **Composition condition score:** click in the cell for the 'Future mean ( $\bar{x}$ )' value for the required growth form group column to change the value from zero to the expected future species richness (number of species).
6. **Structure condition score:** click in the cell for the 'Future mean ( $\bar{x}$ )' value for the required growth form group column to change the value from zero to the expected future foliage cover percentage (%) for each growth form.

7. **Function condition score:** click in the cell for the 'Future mean ( $\bar{x}$ )' value for the required growth form group column to change the value from zero to the expected future attribute score.
8. The future VI score, change in VI score, and full VI loss will auto-populate in the BAM-C.

When assessing partial loss, calculate a future VI score that considers the loss specific to the impact. Incorporate any likely ongoing degradation from changed land-use patterns in the future VI score. If it is likely that partially cleared areas will continue to degrade, or ongoing management of the remaining biodiversity values is not proposed, assess this as full loss.

To document and justify the future VI score include each composition, structure and function attribute as per Section 4 in the BDAR. Include supporting information such as:

- reference sites where similar partial loss of biodiversity values has occurred
- relevant published scientific literature that demonstrates persistence of biodiversity values in similar situations
- a comparable (previous or current) biodiversity monitoring program is to be included as part of the evidence-base.

Examples are provided in case studies in Sections 5.1 and 5.2.

### 3.1.2 Calculating partial loss for indirect impacts

To consider the extent of indirect impacts, use the VI data from vegetation zones (see BAM Section 4.3). Attribute a partial loss by reducing the current observed value of the attributes for the vegetation zone in the BAM-C using a similar method as described in Subsection 3.1.1.

An example is provided in the case study in Section 5.3.

## 3.2 Partial loss and credit generation in the BAM-C

### 3.2.1 Ecosystem credits

Ecosystem credits are based on the change in VI score of the proposed development on native vegetation and threatened species habitat through partial clearing. These credits are automatically calculated for each vegetation zone in the BAM-C where scoring partial loss is applied.

### 3.2.2 Species credit candidate species

Partial loss of threatened species habitat will affect species credit generation. This includes the species credit component of dual credit species.

Consider the species that will remain in or use the impacted area with respect to the retained native vegetation. For example, where all trees are removed for a transmission

line development, it may be appropriate to assess a partial loss of biodiversity values for ground-dwelling species that continue to use the retained vegetation as habitat.

### 3.2.3 Partial loss will not apply to all threatened entities

Partial loss of native vegetation may result in the degradation of habitat for a species such that the species is no longer able to persist in or use the site. Assess each of the species individually to determine how the project will impact habitat.

For example, where koala are present on the site and the development proposal will result in the removal of all use trees (as defined in DPE 2022) but other elements of vegetation are retained and managed (e.g. ground cover or regrowth), the area will no longer meet the definition of suitable habitat for koala and the impact is to be scored as a full loss for the species. In the BAM-C, select the 'complete loss' tick box at Tab 6.

## 3.3 Management plan

Where partial loss assessment is based on future management, a partial loss management plan is to be included in the BDAR or BCAR (Appendix C: Partial loss management plan) and included in the project Construction Environmental Management Plan (CEMP), Biodiversity Management Plan (BMP) or Vegetation Management Plan (VMP). Draft the management plan in language and terminology that will support implementation.

Support calculations of partial loss that rely on a management plan with pre-development baseline assessment and monitoring data. The monitoring program needs to support the objectives of the management plan (Appendix C: Partial loss management plan).

## 4. Documenting partial loss in a BDAR or BCAR

### 4.1 Avoid and minimise

Document an analysis of all available options to avoid, minimise and mitigate partial loss impacts in the BDAR or BCAR (Appendix B). For example, avoidance of areas to minimise application of partial loss, and mitigation measures to reduce area of impact resulting in partial loss.

### 4.2 Identify and map partial loss impacts

Provide detailed maps (including digital spatial data) that clearly identify partial loss vegetation zones. Further stratification using management zones may be required to distinguish partial loss from full loss, as well as different levels or types of partial loss that are referenced in the BDAR or BCAR, such as an inner protection zone and outer protection zone of an APZ.

Ensure species polygon maps clearly identify areas that are subject to partial loss calculations.

### 4.3 Evidence-based justification

Support the application of partial loss in the BDAR or BCAR with appropriate evidence-based justifications to assist the decision-maker when reviewing the assessment.

Include in the BDAR or BCAR:

- details of the current and future VI score for partial loss assessment areas
- a detailed justification for the methods used to calculate partial loss in line with the guide
- a description of the justification for the VI scores used (apply a conservative estimate to VI scores in the absence of a strong evidence base)
- a table of the clearing activity, attributes affected, and attributes not affected (as per Table 1 BAM Operational Manual – Stage 2) to support the partial loss calculations
- a table of the predicted future VI scores for each vegetation or management zone alongside the evidence-based justification for each composition, structure and function growth form attribute (an example is given in Table 4)
- a description of how the predicted reduction in VI score is proportional to the amount and degree of partial impact
- a description of how the predicted reduction in VI score relates to the future management actions that justify the calculations
- credit obligations for each partial loss impact alongside each vegetation or management zone

- the finalised BAM-C report with credit obligations for each partial loss vegetation management zone.

The BDAR or BCAR is to include any details that relate to VI estimations, mitigation measures or adaptive management actions, and credit offset calculations. All references to associated guidance that was used in partial loss calculations are also to be included.

Where future VI scores rely on proposed ongoing management, demonstrate how management actions and monitoring will be secured and maintained for the phases of the development (Appendix C: Partial loss management plan).

## 5. Case studies

The case studies in the guide are provided to illustrate implementation of partial loss in different situations. It is important the detailed requirements in Sections 1 to 4 above are followed, rather than relying on the case studies alone.

### 5.1 Asset protection zones

A single-storey aged care facility has been proposed adjacent to a golf course. The subject land supports a single PCT – 3250 Northern Foothills Blackbutt Grassy Forest.

Three vegetation zones are initially identified: planted vegetation, planted and remnant mix, and moderate condition native vegetation. The native vegetation is not considered part of a TEC. Candidate species credit species were assessed by targeted survey, but none were recorded.

Steps to avoid and minimise the development footprint are outlined in the BDAR.

Direct impacts arising from the development will include complete clearing for the construction of the aged care facility and installation of a stormwater pipe. Partial clearing for APZs and the intensification of the site will also occur. As a result, 6 management zones were identified after considering areas of full and partial loss (Figure 1, Table 1 to Table 3).

The clearing of native vegetation for the purposes of constructing the aged care facility and installation of the stormwater pipe will result in full loss, and all future VI scores in these management zones (Zones 1 and 3) were set to zero.

Zone 2 (Planted\_APZ\_north) is maintained as an APZ and mown regularly. For the future VI score, current tree composition and structure condition scores were maintained. Composition and structure condition scores for all other growth forms were set to zero. Function scores were also set to zero or absent.

Zones 4 (Remnant\_APZ\_south), 5 (Planted\_remnant\_APZ\_east) and 6 (Planted\_remnant\_APZ\_west) require significant mowing and foliage cover management to achieve APZ requirements.

Within the APZs of Zones 4, 5 and 6, the future VI score was justified based on the recommendations in the bushfire assessment report, including:

- thinning of foliage cover to 30% of the existing foliage cover for the tree structure condition score
- removal of shrubs and regenerating trees within 1 m of existing trees
- removal of woody debris.

Current tree composition condition score was maintained in each of Zones 4–6. The tree structure condition score was reduced to 30%. All other structure condition scores and function condition scores were set to zero.

The project resulted in a total of 29 credits required to offset impacts to 1.69 ha of native vegetation. The credit obligation would have been 31 credits without the partial loss consideration, an 8% reduction.

The BDAR provided a summary of the discussion with the consent authority and the relevant Biodiversity, Conservation and Science (BCS) regional planning team. The BDAR presented the partial loss calculations, the description of how the predicted reduction in VI score is proportional to the APZ partial impact, the BAM-C report and the available planning mechanisms that can facilitate the proposed management actions. Measures for mitigating indirect impacts on native vegetation and habitat were documented in the BDAR, for example, low-impact methods of vegetation clearing in management zones.

A management plan was included outlining the APZ management actions for the partial loss management zones to be implemented as part of conditions of development consent.

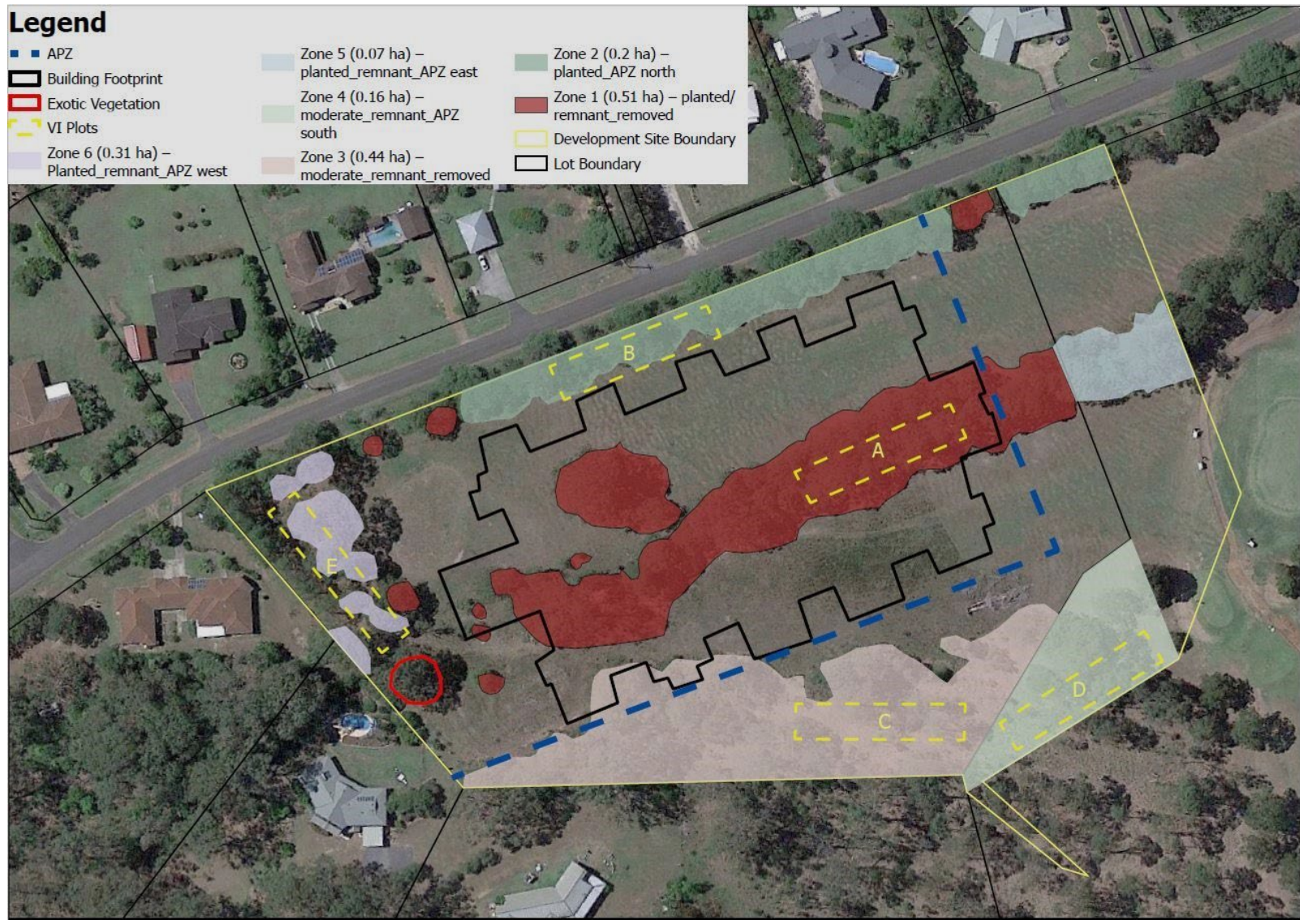


Figure 1 Aged care facility vegetation zones



**Table 1**      **Vegetation zones and credit requirement for the aged care facility**

Zone	PCT	Vegetation zone	Management action	Area	Current VI score	Future VI score	Change in VI score	Credits
1	3250	Planted_remnant	Full loss	0.51	27.7	0	-27.7	5
2	3250	Planted_APZ_north	APZ_north – maintenance of existing APZ	0.20	12.9	12.9	0	0
3	3250	Remnant_removed	Full loss	0.44	95.2	0	-95.2	16
4	3250	Remnant_APZ_south	APZ_south – partial loss	0.16	95.2	12.9	-82.3	5
5	3250	Planted_remnant_APZ_east	APZ_east – partial loss	0.07	27.7	12.9	-14.8	1
6	3250	Planted_remnant_APZ_west	APZ_west – partial loss	0.31	27.7	12.9	-14.8	2
<b>Total</b>				<b>1.69</b>				<b>29</b>

**Table 2**      **Current VI score for the aged care facility**

Zone	PCT	Vegetation zone	Management action	Composition condition score	Structure condition score	Function condition score	Current VI score
1	3250	Planted_remnant	Full loss	50.2	55.5	7.6	27.7
2	3250	Planted_APZ_north	APZ_north – maintenance of existing APZ	17.6	15.9	7.6	12.9
3	3250	Remnant_removed	Full loss	100	100	86.2	95.2
4	3250	Remnant_APZ_south	APZ_south – partial loss	100	100	86.2	95.2
5	3250	Planted_remnant_APZ_east	APZ_east – partial loss	50.2	55.5	7.6	27.7
6	3250	Planted_remnant_APZ_west	APZ_west – partial loss	50.2	55.5	7.6	27.7

**Table 3** Future VI score for the aged care facility

Zone	PCT	Vegetation zone	Management action	Composition condition score	Structure condition score	Function condition score	Future VI score
1	3250	Planted_remnant	Full loss	0	0	0	0
2	3250	Planted_APZ_north	APZ_north – maintenance of existing APZ	17.6	15.9	7.6	12.9
3	3250	Remnant_removed	Full loss	0	0	0	0
4	3250	Remnant_APZ_south	APZ_south – partial loss	17.6	15.9	7.6	12.9
5	3250	Planted_remnant_APZ_east	APZ_east – partial loss	17.6	15.9	7.6	12.9
6	3250	Planted_remnant_APZ_west	APZ_west – partial loss	17.6	15.9	7.6	12.9

## 5.2 Transmission line and easement

A proponent is proposing to construct a transmission line and easement through an area of state forest. The project will involve direct impacts from clearing of all canopy trees and native vegetation at a height of 2 m and above, over an area of 220 ha of construction (including transmission lines, tower locations, laydown areas and access tracks).

The subject land supports one PCT (4000 – Northern Estuarine Paperbark Sedge Forest) generally in high condition with minimal disturbance. The PCT is not considered to be a TEC.

Three fauna species credit species were located via targeted survey on the subject land: rufous bettong (*Aepyprymnus rufescens*), common planigale (*Planigale maculata*) and squirrel glider (*Petaurus norfolcensis*).

Direct impacts are expected to be permanent given the life of the project.

### **Ecosystem credits**

The partial loss VI score for the direct impact of removal and maintenance of vegetation above 2 m in height was calculated.

To determine the likely future VI score for the impact area, the condition of representative vegetation from an existing transmission line easement was sampled.

The representative easement occurred in the same subregion as the impact site and supported PCT 4000. The vegetation within the easement had been maintained for over 15 years in accordance with the maintenance company's biodiversity management plan and the same management actions will be applied to the proposed transmission line project, including maintenance of vegetation to a height of 2 m.

As such, determination of the current VI score from the representative easement provided an ecologically valid example of future vegetation condition under the proposed management.

Sampling in the representative easement was carried out in accordance with Sections 4.2 to 4.4 of the BAM. The survey within the easement was stratified to ensure variation in condition was sampled. Importantly, data were collected immediately following scheduled maintenance clearing within the representative easement, meaning vegetation condition within that easement was at its lowest.

The vegetation plot data collected were then entered into the BAM-C to determine the future VI score of the impact area.

The BDAR set out the justification for the calculation of partial loss, shown in Table 4. It relied on the vegetation data sampled at the representative easement and described the similarity of the proposed vegetation maintenance practices within the zones where partial loss is anticipated to those applied at the representative easement.

Changes in VI score within the easement and resultant credit obligations are shown in Table 5. For partial loss, the assessment resulted in a total obligation of 4,072 ecosystem credits.

The credit obligation would have been 5,866 credits without the partial loss consideration.

### **Species credits**

Squirrel gliders require living and dead trees from 50–63 cm diameter at breast height as den trees. The species prefers a den entrance height 7–12 m above the ground (Beyer et al. 2008).

A review of impacts to species credit species indicated the glider would be unlikely to use the transmission easements for breeding and sheltering, due to loss of trees and associated hollows above 2 m.

Given the easement is bound by areas of relatively intact forest, consideration was given to the value of the retained vegetation in supporting movement of gliders between areas of suitable habitat. Research indicates that trees are critical for movement and typically need to be less than 50 m apart (Goldingay and Taylor 2009). The transmission lines will create a treeless corridor of approximately 70 m, with gliders unlikely to move through the impacted area.

Full loss was scored for the species and applied across the areas of habitat the length of the transmission line.

Partial loss was justified for common planigale and rufous bettong, given these species can persist in and use habitat within the easement. Partial loss is applied along the length of the transmission line for these species.

Changes in VI score within the easement and resultant species credit obligations are shown in Table 5. For partial loss, the assessment resulted in a credit obligation of 5,430 rufous bettong species credits and 5,430 common planigale species credits.

The credit obligation would have been 7,822 credits for each species, assuming full loss.

### **Ongoing management**

A partial loss management plan is included in the BDAR. This plan outlines the future management actions for the partial loss management zone that will be implemented as part of the development, including during the maintenance phase (Appendix C: Partial loss management plan). The partial loss management plan will be incorporated into the maintenance contract for the transmission line.

**Table 4** Averaged attribute scores collected at representative easement and used to calculate partial loss of VI of PCT 4000

Attribute	Attribute values (BAM-C*)	Description of data inputs and observations
Composition – tree	0	No species in the ‘tree’ growth form were recorded in the representative easement
Composition – shrub	1	Average ‘shrub’ growth form species count recorded at representative easement While shrubs over 2 m were removed and regrowth suppressed during operational maintenance, an average of 1 seedling in the ‘shrub’ growth form was recorded in the representative easements
Composition – grass	6	Recorded average of relevant growth form species count from representative easement
Composition – forb	1	
Composition – fern	0	
Composition – other	0	
Structure – tree	1	Average cover scores for all growth form groups recorded at representative easement
Structure – shrub	2	
Structure – grass	25	
Structure – forb	1	
Structure – fern	0	
Structure – other	0.5	
Function – no. large trees	0	Zero large trees were present within easement
Function – tree regeneration	Present (1)	Recorded as either present or absent from sampled representative plots As evidenced by data collected from the sampled easement, ongoing maintenance allows limited regeneration to occur. However, regeneration is suppressed during maintenance works, i.e. limited to a height of less than 2 m
Function – tree stem size classes	1	No tree stems greater than 5 cm diameter at breast height were observed
Function – total length of fallen logs	0	Average total length of fallen logs observed in representative easement plots As demonstrated at the sampled easement, easement maintenance works have resulted in a full loss of fallen logs

Function – litter cover	5	Average litter cover score from representative easement
Function – high threat weeds	1	Average high threat weed cover score from representative easement

\* Values used are actual average scores recorded from within random and stratified plots placed within the representative easement.

**Table 5 Comparison of partial and full loss credit calculations \***

Ecosystem credits (PCTs)					
Vegetation zone	PCT	Extent of loss	Current VI score	Future VI score	Credits
4000_partial	4000 – Paperbark Sedge Forest	Partial	71.1	21.7 (-49.4)	4,072
Species credits					
Vegetation zone	Species	Extent of loss	Current VI score	Future VI score	Credits
4000_partial	<i>Aepyprymnus rufescens</i> (rufous bettong)	Partial	71.1	21.7 (-49.4)	5,430
4000_partial	<i>Planigale maculata</i> (common planigale)	Partial	71.1	21.7 (-49.4)	5,430
4000_full	<i>Petaurus norfolcensis</i> (squirrel glider)	Full	71.1	0	7,822
				Ecosystem credits total	4,072
				Species credit total	18,682
				<b>Total</b>	<b>22,754</b>
				<b>Total if full loss was assumed</b>	<b>29,332</b>

\* Area of impact set at 220 ha for all scenarios. Similarly, polygons for species credit species assumed to occupy all 220 ha.

## 5.3 Road upgrade project – partial loss from indirect impacts

A NSW Government department is assessing a road upgrade under Part 5 of the *Environmental Planning and Assessment Act 1979*. A major road will be duplicated and works will include additional stormwater drainage to address local flooding issues. The subject land is located within a matrix of cleared areas and native vegetation.

The subject land supports one PCT – 3250 Northern Foothills Blackbutt Grassy Forest. Native vegetation is found to be in high condition within the PCT. No threatened species were recorded during targeted surveys.

The project will involve full loss of biodiversity values for the road and stormwater drainage, over 50 ha. There is a high risk of indirect weed impacts on the condition of retained high condition vegetation on the subject land. The weed impact will result in a partial loss of biodiversity values on the edge of the road corridor.

For possible indirect impacts, the accredited assessor recorded the VI score using BAM plots and weed cover along edges of existing roads in the local area. The accredited assessor used the local data and peer-reviewed literature to support an evidence-based justification for calculating partial loss. The analysis informed the assessment of indirect impacts from weed cover. The future VI scores for indirect impacts were calculated for 20 ha based on the following:

- the current structure (cover) scores for ‘grass’, ‘forbs’, ‘ferns’ and ‘other’ growth forms were reduced by 10%, leaving all other growth forms at the current score
- the function score for litter cover was reduced by 5%
- future VI scores for both full and partial loss management zones are shown in Table 6, along with the resulting offset requirements.

Construction works for the road and stormwater drainage was assumed to result in full clearing of 50 ha, hence the future VI score was set to zero.

The ecosystem credit calculations are shown in Table 6. The assessment resulted in a total obligation of 1,753 ecosystem credits, including 1,737 credits for 50 ha of full loss, and 16 credits for 20 ha of partial loss of biodiversity impacts.

**Table 6 Ecosystem credit calculations – road upgrade example**

<b>Zone</b>	<b>PCT</b>	<b>Vegetation zone</b>	<b>Area</b>	<b>Current VI score</b>	<b>Future VI score</b>	<b>Change in VI score</b>	<b>Credits</b>
1	3250	Full loss	50	92.7	0	-92.7	1,737
2	3250	Partial loss – indirect impact weed cover	20	92.7	91.8	-0.9	16
<b>Total</b>			<b>70</b>				<b>1,753</b>



# Appendix A: Online resources and references

## Online resources

- [Application for login access to BioNet](#)
- [Assessor resources](#)
- [Biobanking agreements under the former Threatened Species Conservation Act](#)
- [Biobanking public registers](#)
- [Biodiversity Assessment Method 2020](#)
- [Biodiversity Assessment Method 2020 Operational Manual – Stage 1](#)
- [Biodiversity Assessment Method 2020 Operational Manual – Stage 2](#)
- [Biodiversity Assessment Method 2020 Operational Manual – Stage 3](#)
- [Biodiversity Assessment Method Calculator \(BAM-C\)](#)
- [Biodiversity Assessment Method Calculator User Guide](#)
- [Biodiversity Conservation Act 2016](#)
- [Biodiversity Conservation Regulation 2017](#)
- [Biodiversity Credits Supply Fund and Taskforce](#)
- [Biodiversity experts](#)
- [Biodiversity Offsets and Agreement Management System \(BOAMS\)](#)
- [Biodiversity stewardship agreements](#)
- [Biodiversity Offsets Scheme \(BOS\) Help Desk](#)
- [BioNet Atlas – Species sightings](#)
- [BioNet Resources](#)
- [BioNet Systematic Flora Survey data collection](#)
- [BioNet Threatened Biodiversity Data Collection \(TBDC\)](#)
- [BioNet Vegetation Classification](#)
- [BioNet Vegetation Classification user manual](#)
- [BioNet Vegetation maps](#)
- [BioNet Web Services – How to access the BioNet Web Service using Excel and Power Query: A BioNet Quick Guide](#)
- [BioNet Web Services](#)
- [Conservation agreements under the BC Act](#)
- [Department of Planning and Environment – NSW Planning Portal Major Projects](#)
- [Department of Planning and Environment – public registers](#)
- [Directory of Important Wetlands in Australia \(DIWA\)](#)
- [Environment Protection and Biodiversity Conservation Act – referrals list](#)

- [Historical Imagery Viewer](#)
- [Native Vegetation Act public register](#)
- [NSW \(Mitchell\) Landscapes – Version 3.1](#)
- [NSW Interim Biogeographic Regions of Australia \(IBRA region and subregions\) – Version 7](#)
- [NSW Threatened species](#)
- [PlantNET NSW](#)
- [Property vegetation plans \(PVPs\) under the former Native Vegetation Act](#)
- [Saving our Species program](#)
- [SEED data portal \(Sharing and Enabling Environmental Data\)](#)
- [Spatial Data Catalogue – digital cadastral database](#)
- [State Vegetation Type Map](#)
- [Threatened species profile search](#)
- [Vegetation Condition Benchmarks](#)

## References

Beyer GL, Goldingay RL and Sharpe DJ (2008) 'The characteristics of squirrel glider (*Petaurus norfolcensis*) den trees in subtropical Australia', *Australian Journal of Zoology*, 56:13–21.

DPE (Department of Planning and Environment) (2022) *Koala (Phascolarctos cinereus), Biodiversity Assessment Method survey guide*, Environment and Heritage Group, NSW Department of Planning and Environment, Parramatta.

Goldingay RL and Taylor BD (2009) 'Gliding performance and its relevance to gap crossing by the squirrel glider (*Petaurus norfolcensis*)', *Australian Journal of Zoology*, 57:99–104.

# Appendix B: BDAR and BCAR requirements for partial loss assessment

A BDAR or BCAR that includes partial loss as part of the assessment must include the information in Table 7.

**Table 7** BDAR and BCAR requirements for partial loss assessment

Component	Information required	Maps, tables or data
Avoid and minimise	Details of options to avoid, minimise and mitigate partial loss impacts on the subject land	Site map showing the areas of avoided and minimised partial loss impact
Partial loss assessment areas	Detailed maps of the partial loss impact assessment areas	Site map (including digital spatial data) showing the partial loss management zones and full loss management zones  Site map showing species polygon maps and areas that have been included for partial loss calculations
Partial loss calculations	Details of the current and future VI score for partial loss assessment areas and methods used for calculating partial loss of VI	Data used for partial loss calculations documented in a table BAM-C credit report included as a BDAR appendix
Partial loss justification	Details of the partial loss justification and reasoning  Details of any discussions and agreements on methods with the department’s BCS regional planning teams or the consent authority  How the predicted reduction in VI scores is proportional to the amount and degree of partial impact  How the predicted reduction in VI score relates to the future management actions that justify the calculation	Table identifying the clearing activity, attributes affected and attributes not affected, to support the justification (as per Table 1 of the BAM Operational Manual – Stage 2)  Table that details the predicted future VI scores for each vegetation or management zone alongside the evidence-based justification for each <b>compositional, structural, and functional</b> growth form attribute  Finalised BAM-C report with credit obligations for each partial loss impact area
Proposed ongoing management actions	Details of the proposed ongoing management actions and monitoring to maintain future predicted VI scores over the life of the project	Details as per Appendix C: Partial loss management plan in a short document to append to the CEMP, BMP or VMP

# Appendix C: Partial loss management plan

A partial loss management plan is to be included as part of the BDAR or BCAR if partial loss is being used in the assessment of the impacts, in accordance with Table 8. When drafting the plan it is important to consider the end-user, specifically ensuring those who will implement the plan understand the vegetation to be retained and the types of management actions required.

**Table 8**      **Content of a partial loss management plan**

Component	Information required
Objectives	<p>Define the purpose and overall objectives of the partial loss management plan</p> <p>Identify proposed land uses for areas subject to partial loss</p> <p>Identify potential planning mechanisms for the areas subject to the partial loss management plan</p>
Vegetation management actions	<p>Identify targets for composition, structure, function and VI scores to be maintained for each management zone</p> <p>Identify management actions for construction and operational phases of the proposed development footprint for each management zone and identify:</p> <ul style="list-style-type: none"> <li>• proposed timeframes for delivery</li> <li>• performance criteria</li> <li>• funding arrangements</li> <li>• roles and responsibilities</li> </ul> <p>Use language suitable to ensure implementers have a clear understanding of requirements to retain vegetation through construction and operation activities</p>
Monitoring program	<p>Collect and document data for a period pre-development and post-development to allow trends to be detected in areas subject to partial loss. First post-impact monitoring is to occur within 3 months. This will confirm management actions during construction have been implemented</p> <p>Identify monitoring objectives for construction and operational phases of the proposed development footprint for each management zone:</p> <ul style="list-style-type: none"> <li>• monitoring objectives and key activities</li> <li>• roles and responsibilities of key personnel</li> <li>• timeframes for data collection, reporting and other deliverables</li> <li>• mitigation measures and outcomes to support the monitoring objectives</li> <li>• residual risk levels for each impact to biodiversity</li> </ul>

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	<ul style="list-style-type: none"> <li>• data recording, storage and reporting frequencies</li> </ul>
Trigger Action Response Plan	Prepare a Trigger Action Response Plan table that indicates proposed triggers for adaptive management if performance criteria are not met
Reporting requirements	<p>Identify roles, responsibilities, and frequency of reporting</p> <p>Identify agencies that must be provided with reports or notified in the event of an adverse outcome</p>

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## Appendix D: Shortened forms

Term	Description
APZ	asset protection zone
BAM	Biodiversity Assessment Method
BAM-C	Biodiversity Assessment Method Calculator
BAR	Biodiversity Assessment Report (can refer to either a BDAR or BCAR)
BC Act	NSW <i>Biodiversity Conservation Act 2016</i>
BC Regulation	NSW Biodiversity Conservation Regulation 2017
BCAR	Biodiversity Certification Assessment Report
BDAR	Biodiversity Development Assessment Report
BMP	Biodiversity Management Plan
CEMP	Construction Environmental Management Plan
PCT	plant community type
SAII	serious and irreversible impacts
TBDC	Threatened Biodiversity Data Collection
TEC	threatened ecological community
the department	NSW Department of Climate Change, Energy, the Environment and Water
the guide	Assessing partial loss of biodiversity values BAM guide
the scheme	NSW Biodiversity Offsets Scheme
VI	vegetation integrity
VMP	Vegetation Management Plan