Field Data Sheets for

BioMetric (Version 3.1)

Clearing (development) proposal package

Updated September 2010

Refer to *BioMetric* Operational Manual for detailed data collection methodologies.

Includes:

- Clearing assessment data sheet (up to 10 zones)
- Offset assessment data sheet (up to 10 zones)
- Site Value (zones) - plot data sheet (up to 10 plots per clearing or offset zone)
- Site Value (reference sites) - plot data sheet (up to 10 plots per reference site)
- Step point transect tally tables – plot data sheet
- Crown Separation Ratio transect tables – plot data sheet
- Disturbance attributes and history record – plot data sheet
- *BioMetric* plot work sheet
- *BioMetric* and *Threatened Species Tool* scattered tree plot work sheet

Clearing & offset assessments
Field Data Sheets – Definitions and Descriptions*

Refer to* BioMetric *Operational Manual for more complete explanation and instructions.

Zones
The clearing and offset proposals must be divided into relatively homogenous or discrete zones for assessment. Each zone should represent a distinct vegetation type (according to the vegetation types provided in *BioMetric*) and broad condition state (note that vegetation in low condition must always form a separate zone to vegetation not in low condition). Zones within proposals do not need to be continuous (i.e. a single zone could occupy two or more discrete areas). Each zone must be >0.25ha in area (equivalent to 50mx50m). These zones should be digitized and labelled using the *NVAT Mapper*, and zone names and areas are autopopulated into *BioMetric*. Version 3.1 of *BioMetric* can deal with an unlimited number of zones.

Definitions for low condition vegetation
A. Native woody vegetation is in low condition if:

The over-storey per cent foliage cover is <25% of the lower value of the over-storey per cent foliage cover benchmark for that vegetation type, **and** <50% of vegetation in the ground layer is indigenous species, **or** >90% is ploughed or fallow, **or** ≥90% of the groundcover vegetation is regrowth but not protected regrowth.

B. Native grassland, shrubland, wetland or herbfield is in low condition if:

<50% of vegetation in the ground layer is indigenous species, **or** >90% is ploughed or fallow, **or** ≥90% of the groundcover vegetation is regrowth but not protected regrowth .[#]

Notes:

• Assessment of whether the over-storey foliage cover (%) meets the definition of low condition can be determined using the Paddock Tree Calculator (accessible via the *NVAT Mapper*).
• [#] Check the Native Vegetation Act and Regulations to determine whether this vegetation can be cleared without a PVP.

Landscape value assessment – conducted once only for clearing proposals, and once for offset proposals, regardless of the number of zones in each proposal.
(1) % native vegetation cover in the landscape (1.79km and 0.55km radii) – estimated in 10-precentile categories. In woody vegetation these estimates are based on the % cover of the over-storey relative to the approximate benchmark for that vegetation type (e.g. a completely vegetated circle with benchmark over-storey cover around the proposal would be assessed as >90-100% cover whether it is open woodland or closed forest. However, if the cover still occurred across the whole circle, but was around 2/3 of the benchmark over-storey cover for that vegetation (e.g. because of thinning) then the estimate of cover would be >60-70%). In non-woody vegetation (e.g. grassland) the assessment is based on the amount of vegetation in the landscape that is unlikely to meet the definition of low condition. These estimates can be made from the imagery and knowledge of the area. Any vegetation native to Australia can contribute to this measure (i.e. planted native species not indigenous to the area can contribute to this measure). **Note: where the development proposal is not entirely encompassed within a single 1000ha radius, undertake multiple assessments at this scale to fully encompass the proposal, then repeat this process for the 100ha scale assessment (see *BioMetric* Operational Manual for guidance).**

(2) Connectivity value
A **linkage** is defined as vegetation that forms links between pairs of vegetation remnants. A linkage is further defined as native vegetation that is ≤100m (or ≤30m in non-woody vegetation) from native vegetation that is not in low condition and ≥1ha in size. Note that where four remnants are connected via a common polygon, there are six linkages formed. The contribution of each linkage is assessed and a total Connectivity Value is calculated in the following 3-step process.

Step 1: Linkage Width Class
- The **Linkage Width Class (LWC)** is the average width of the area of vegetation that links the clearing or offset site with the adjoining vegetation. Linkage Width Classes are Very Narrow, Narrow, Moderate, Wide, and Very Wide.
- For each polygon in turn, determine the 'Current' and 'With Clearing' Linkage Width Class for each linkage using Table 1. Record in data sheet.

- Determine the number of linkage width class thresholds that are crossed (lost or gained) for each linkage.

Table 1. Linkage Width Classes and thresholds.

Linkage Width (m)				
0-5	>5-30	>30-100	>100-500	>500
Very Narrow	Narrow	Moderate	Wide	Very Wide

Step 2: Linkage Condition Class

- The **Linkage Condition Class (LCC)** is defined as the average vegetation condition within the linkage (of which the proposal polygon forms all or a part). The LCC is *not* the condition of the proposal area only, nor is the same as the Site Value. The LCC is the overall average vegetation condition of each linkage of which the proposal forms all or part. The condition states for each stratum are related to the benchmarks, based in part on the current 'low condition' definition. Linkage Condition Classes are Nil, Nil-Low, Low, Low-Mod, Moderate, Mod-High, High.
- For each polygon in turn, determine the 'Current' and 'With Clearing' Linkage Condition Class for each linkage using Table 2 (for woody vegetation) or Table 3 (for non-woody vegetation). After assessing the overall condition of a linkage, it is recommended that the assessor then take into account the existence of "hostile gaps" such as major highways or railways, water bodies etc. See Operational Manual for details.
- Determine the number of linkage condition class thresholds that are crossed (lost or gained) for each linkage. Record in data sheet.

Table 2. Woody vegetation Linkage Condition Classes and thresholds. For 'under-storey' condition use EITHER Mid-storey condition for vegetation types with shrubby under-storey >1m high, OR Ground stratum condition for vegetation types with grassy/low shrub/other under-storey <1m high. "fc" = foliage cover (%).

		Over-storey condition (= tallest stratum >1m)			
		No native Over-storey OR exotic vegetation with similar structure to the proposal	**fc <25% of lower benchmark OR exotic vegetation with similar structure to the proposal**	**fc ≥25% of lower benchmark to lower benchmark**	**fc within benchmark**
'Under-storey' condition (EITHER Mid-storey >1m OR Ground stratum <1m – see caption)	**No native 'under-storey' OR exotic vegetation with similar structure to the proposal**	**Nil**	**Nil-Low**	**Low**	**Low-Mod**
	fc <25% of lower benchmark OR exotic vegetation with similar structure to the proposal	**Nil-Low**	**Low**	**Low-Mod**	**Moderate**
	fc ≥25% of lower benchmark to lower benchmark OR exotic vegetation with similar structure to the proposal	**Low**	**Low-Mod**	**Moderate**	**Mod-High**
	'under-storey' fc within benchmark	**Low-Mod**	**Moderate**	**Mod-High**	**High**

Table 3. Non-woody vegetation Linkage Condition Classes and thresholds. "fc" = foliage cover (%).

Linkage Condition Class	Vegetation condition
High	Grass fc within benchmark in grassy vegetation types (or shrub/other for low shrub/other dominated vegetation types, e.g. low heath or sedgeland/rushland etc.).
Mod-high	n/a
Moderate	Grass fc ≥25% of lower benchmark to lower benchmark in grassy vegetation types (ditto above).
Low-mod	n/a
Low	Grass fc <25% of lower benchmark in grassy vegetation types (or shrub/other for low shrub dominated or other dominated vegetation types, e.g. low heath or sedgeland/rushland etc.). OR exotic vegetation with similar structure to the proposal.
Nil-Low	n/a
Nil	Meets none of the above definitions.

Step 3: Determine the Connectivity Value score.

- Where there is more than one linkage from the adjoining vegetation to the clearing or offset zone/s, the linkage which undergoes the greatest connectivity value score change is used to determine the connectivity value score.
- Determine which linkage (from all the polygons) has the greatest combined (LWC + LCC) score change, separately for clearing and offset proposals. Enter the LWC and LCC values ('Current' and 'With proposal') for that linkage into *BioMetric* for the relevant proposal.
- *BioMetric* automatically calculates the final connectivity value score using both the number of linkage width class thresholds and the number of linkage condition class thresholds that are crossed (see Table 4).

Table 4. Scores for loss/gain of connectivity value 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**
	1	**1**	**3**	**5**	**7**
	2	**2**	**4**	**6**	**8**
	3	**3**	**5**	**7**	**9**
	4	**4**	**6**	**8**	**10**
	5	**5**	**7**	**9**	**11**
	6	**6**	**8**	**10**	**12**

(3) Total adjacent remnant area – record the total remnant area of which the proposal is a part as one of five levels: extra large, very large, large, medium, or small. These five levels are defined differently according to the extent to which the Mitchell Landscape in which most of the proposal occurs has been cleared (Table 5). This figure can be obtained from the Vegetation tab in *BioMetric.* Digitising tools in the *NVAT Mapper* can be used to help estimate the area of the adjacent remnant if necessary.

Table 5. Criteria used for assessing total adjacent remnant area. Adjacent remnant area refers to the area (ha) of native vegetation that is not in low condition and is linked to (≤100m from, for woody vegetation; ≤30m from, for non-woody vegetation) the proposal area. The % of native vegetation cleared in the Mitchell Landscape in which most of the proposal occurs is calculated in Section 3.2.1.4 of the Operational Manual.

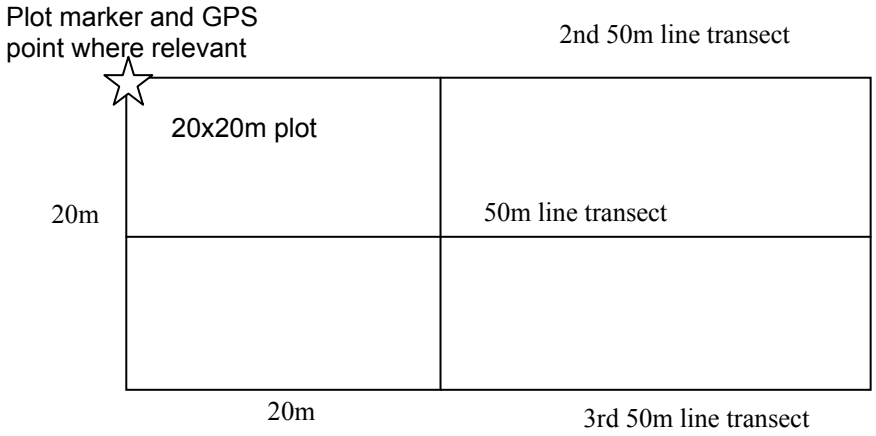
Level for total adjacent remnant area	% native vegetation cleared in the Mitchell Landscape in which most of proposal occurs			
	<30%	**30-70%**	**>70-90%**	**>90%**
Extra large	>1000	>200	>100	>50
Very large	>500-1000	>100-200	>50-100	>20-50
Large	>200-500	>50-100	>20-50	>10-20
Medium	>100-200	>20-50	>10-20	>21-10
Small	≤100	≤20	≤10	≤1

(4) % within riparian area – OFFSET ASSESSMENTS ONLY - offsets with >1% of their area within riparian areas (i.e. riparian zone plus buffer as defined in Appendix 6 of Operational Manual) receive an additional score. Record the proportion of offset area within riparian areas.

Site value assessment – conducted in each clearing and offset zone.
The current condition of each zone (including for those variables that can legally be removed, e.g. coarse woody debris) is assessed as per the methods described below. The future condition of each clearing and offset zone is predicted for each condition variable according to the guidelines provided in Appendix 4 of the Operational Manual.

Plots should be placed randomly with a minimum of one plot and a maximum of ten plots within a zone. See Site Value - plot data sheets for methodology prompts.

Suggested plot layout



Indigenous plant species richness (20mx20m plot): Indigenous plant species refers to vascular species local to the area and, if planted, which come from a local seed source. Systematically walk the plot counting the number of indigenous plant species for all vascular plants (i.e. the species do not have to be identified).

Native over-storey cover ((1) Crown Separation Ratio technique – transect of no set length; OR (2) at 10 points along each of the three 50m transects; OR (3) whole-of-zone method): Native over-storey is the tallest woody stratum present (including emergents) above 1m and includes all species native to New South Wales (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 <1m) may not have an over-storey stratum. Over-storey cover is estimated as FOLIAGE COVER (%), which is equivalent to the amount of shadow that would be cast on the ground if there were a light source directly overhead. Note, this is **not** the same as Crown Cover or Projective Foliage Cover (see Operational Manual Glossary). Foliage cover can be estimated using one of three methods:

(1) Using the Crown Separation Ratio (CSR) technique – see detailed methodology in Appendix 4 of Operational Manual. This is the preferred (most replicable) method; OR
(2) At 10 points (i.e. every 5m) along each of the three 50m transects (see Figure above) estimate FOLIAGE COVER (%) directly overhead using the images provided in Figure 2 of Appendix 4. Divide the total by the number of points (i.e. 30) measured along the transects (e.g. 50%, 0%, 0%, 40%,0% ,45%, 50%, 55%, 0%, 0%, 50%, 0%, 0%, 40%, 0%, 45%, 50%, 55%, 0%, 0%, 50%, 0%, 0%, 40%,0% ,45%, 50%, 55%, 0%, 0% = 720/30 =24% foliage cover, for guidance). NOTE: Multiple transects are required to sufficiently encompass over-storey heterogeneity; OR
(3) In proposals where the over-storey cover is very sparse (e.g. scattered or paddock trees), foliage cover can be estimated across the entire zone using the following steps: (a) calculate the average crown diameter of trees using the imagery in the *NVAT Mapper*, (b) determine the average foliage cover of individual trees (estimated by observing several trees in the field using diagrams in Figure 2 of Appendix 3); (c) count the number of trees in a known area within the zone using the imagery and *NVAT Mapper*; (d) enter these data in the *NVAT Paddock Tree Tool* (accessible via the *NVAT Mapper*) to arrive at the estimate for the entire zone. This figure must then be recorded as the over-storey cover estimate for each plot within the relevant zone.

Native mid-storey cover ((1) CSR technique – transect of no set length; OR (2) at 10 points along each of three 50m transects, OR (3) 20mx20m plot): The mid-storey contains all vegetation between the over-storey stratum and 1m in height (typically tall shrubs, under-storey trees and tree regeneration) and includes all species native to New South Wales (i.e. native species not local to the area can contribute to mid-storey structure). FOLIAGE COVER of the mid-storey is expressed as a % and can be measured using one of three methods:

(1) CSR technique – as for Native over-storey cover (see above). This is the preferred (most replicable) method; OR
(2) At 10 points (i.e. every 5m) along each of the three 50m transects – as for Native over-storey cover (see above). NOTE: Multiple transects are required to sufficiently encompass mid-storey heterogeneity; OR

(3) Visually estimate FOLIAGE COVER (%) in a 20mx20m plot. The precision of the estimate can be improved if the assessment is conducted separately in each of the four 10mx10m quarters that make up the 20mx20m plot. In a 10mx10m sub-plot 1m^2 of foliage cover is equal to 1% of foliage cover (in a 20mx20m plot 1% of foliage cover is equal to 4 m^2 of foliage cover). Tally the total m^2 of foliage cover for each of the four 10mx10m sub-plot and add them to estimate foliage cover (%) for the entire 20mx20m plot).

Native ground stratum cover (grasses, shrubs and other) ((1) 20mx20m plot, OR (2) at 50 points along each of three 50m transects): The ground stratum contains all native vegetation below 1m in height and includes all species native to New South Wales (i.e. is not confined to species indigenous to the area). The ground stratum (grasses) refers to native grasses (i.e. plants belonging to the family Poaceae). The ground stratum (shrubs) refers to native woody vegetation <1m. The ground stratum (other) refers to non-woody native vegetation (vascular plants only) <1m that is not grass (e.g. herbs, ferns). FOLIAGE COVER of the ground stratum (grasses, shrubs and other) is expressed as a % and can be measured using one of two methods:
(1) Visually estimate foliage cover (%) in a 20mx20m plot as described for native mid-storey cover above; OR
(2) At 50 points (i.e. every 1m) along each of the three 50m transects (see Figure above) record whether native grass intersects that point. Note, multiple 'hits' (i.e. multiple grasses) at a point count as ONE hit only. Divide the total of 'hits' by the number of points measured along the transects (i.e. 150). NOTE: Multiple transects are required to sufficiently encompass ground stratum cover heterogeneity.

Exotic plant cover ((1) 20mx20m plot, OR (2) at 50 points along each of three 50m transects): Exotic plants are vascular plants not native to Australia. Exotic plant cover is measured as total FOLIAGE COVER (%) of all exotics in all strata. If the exotics are in the over-storey then measure using the same method as native over-storey cover (see above), if exotics are in the mid-storey then measure using the same method as native mid-storey cover (see above) and if exotics are in the ground stratum then measure using the same method as described for native ground stratum cover (grasses) (see above). Note: abundance and invasiveness information are recorded in the "Disturbance attributes and history record" plot data sheet, to assist assessors in predicting future site condition (see Section 3.3.3.1 and Appendix 5 of *BioMetric* Operational Manual).

Number of trees with hollows ((1) 50mx20m plot; OR (2) whole-of-zone method): This is a count of the number of living and dead trees within a 50mx20m plot with at least one hollow (note that the hollows do not have to be within the plot). A hollow is only recorded if: (a) the entrance can be seen; (b) the minimum entrance width is at least 5cm across; (c) the hollow appears to have depth (i.e. you cannot see solid wood beyond the entrance); (d) the hollow is at least 1m above the ground (this omits hollows in cut stumps or at the base of trees); and (e) the centre of the tree is within the plot. Trees should be examined from all angles.

In proposals where trees occur in very low densities (e.g. paddock trees), the number of trees with hollows per 0.1ha (equivalent to the area of a 50x20m plot) can be estimated by: (a) identifying a representative area (in hectares) over which all trees will be examined using the imagery in the *NVAT Mapper*; (b) recording the number of trees with hollows within this area; and (c) entering these data in the Paddock Tree Calculator (accessible via the *NVAT Mapper*). This figure must then be recorded as number of trees with hollows in each plot within the relevant zone.

Regeneration (entire zone): Regeneration is measured as the proportion of over-storey species present at the site that is regenerating (i.e. with DBH $\leq$ 5cm). For example, if there are three tree species present at the site but only one of these species is regenerating, then the value is 0.33. The maximum value for this measure is 1.

Total length of fallen logs (50mx20m plot): This is the total length of logs at least 10cm diameter and at least 0.5m long. The diameter is estimated with a measuring tape (or callipers if available) held horizontally immediately above the log and the length is estimated to the nearest metre by measuring with a tape, or pacing, along the part of the log that is at least 10cm diameter. If estimating length by pacing then the actual length of a sample of logs should be measured regularly with a tape so the assessor can calibrate their own estimate derived from pacing. Only those parts of logs lying within the plot are measured.

Management actions – assessment conducted ONLY in offset zones.
For offsets, the assessor must also identify the management actions (1-10) proposed by the landholder to obtain improvements on the offset zone(s). Record in detail the proposed management actions for each offset zone, including intent, timing, methods, etc. Based on this information, the assessor must predict the future condition of the 10 condition variables in each zone, taking into consideration the current site condition, past and present disturbance factors impacting the site (including their age, frequency and severity – these can be recorded in the Disturbance attributes and history record plot data sheet for each zone), proposed management actions and hence the likely trajectory of site recovery.

Proposed management actions can advance the score for each variable by increments of 0.5, recognising that not all management actions will result in whole point score improvements. Predicted score improvements need to reflect the slow rate at which restoration occurs and the inherent risk associated with achieving biodiversity outcomes in the long-term. In most circumstances the score for a variable should only be advanced by 0.5 or 1, to reflect this uncertainty regarding the efficacy of many management actions, and the 'single human lifespan'

timeframe over which improvements to site condition are scored. Movements of scores by greater amounts (e.g. two increments) should be limited to selected variables and management actions that have a low risk of failure. Guidelines for scoring condition improvement as a result of management actions are provided in Appendix 5 of the *BioMetric* Operational Manual.

Clearing assessment

BioMetric

PVP Request No. (from *PADACS*)_____ **Date**_____

CMA _____ **Recorder/s**_____

VEGETATION TYPES (Use *NVAT Mapper* to determine Zone numbers and Mitchell Landscapes. 'Low condition' definition on reverse. Enter data into *BioMetric* Vegetation tab.)

Zone no.	Low condition?	Mitchell Landscape	Vegetation Formation	Vegetation Type	Listed Ecological Community?	Can PVP assessment proceed for zone?

REGIONAL VALUE (Use *NVAT Mapper* to determine Areas. Data autopopulates into *BioMetric* Vegetation Tab from *NVAT Mapper*.)

Zone no.	Area (ha)

Zone no.	Area (ha)

Zone no.	Area (ha)

Zone no.	Area (ha)

Zone no.	Area (ha)

Zone no.	Area (ha)

Zone no.	Area (ha)

Zone no.	Area (ha)

Zone no.	Area (ha)

Zone no.	Area (ha)

LANDSCAPE VALUE (To be assessed once per clearing proposal, using imagery in *NVAT Mapper*, or on the hard copy printouts. Definitions on reverse. Enter Connectivity Value results for linkage which undergoes greatest combined (LWC + LCC) change. See *BioMetric* Operational Manual for guidance. Enter data into *BioMetric* Clearing Landscape tab.)

Attribute	Current (circle one level per attribute)	With clearing (circle one level per attribute)
% cover within 1.79km radius (1000ha)	0 / >0-10 / >10-20 / >20-30 / >30-40 / >40-50 / >50-60 / >60-70 / >70-80 / >80-90 / >90-100%	0 / >0-10 / >10-20 / >20-30 / >30-40 / >40-50 / >50-60 / >60-70 / >70-80 / >80-90 / >90-100%
% cover within 0.55km radius (100ha)	0 / >0-10 / >10-20 / >20-30 / >30-40 / >40-50 / >50-60 / >60-70 / >70-80 / >80-90 / >90-100%	0 / >0-10 / >10-20 / >20-30 / >30-40 / >40-50 / >50-60 / >60-70 / >70-80 / >80-90 / >90-100%
Connectivity value - LWC	V. Narrow / Narrow / Moderate / Wide / V. Wide	V. Narrow / Narrow / Moderate / Wide / V. Wide
Connectivity value - LCC	Nil / Nil-Low / Low / Low-Mod / Mod / Mod-High / High	Nil / Nil-Low / Low / Low-Mod / Mod / Mod-High / High
Total adjacent remnant area	Small / Medium / Large / Very Large / Extra Large	

SITE VALUE (Record values for each zone using the Site Value - plot data sheet. See Site Value - plot data sheet for methodology prompts. Enter data into *BioMetric* Clearing Site tab.)

CLEARING ASSESSMENT FIELD DATA SHEET – DEFINITIONS AND DESCRIPTIONS*

Refer to* BioMetric *Operational Manual for more complete explanation and instructions.

Zones

The clearing proposal must be divided into relatively homogenous or discrete zones for assessment. Each zone should represent a distinct vegetation type (according to the vegetation types provided in *BioMetric*) and broad condition state (note that vegetation in low condition must always form a separate zone to vegetation not in low condition). Zones within proposals do not need to be continuous (i.e. a single zone could occupy two or more discrete areas). Each zone must be >0.25ha in area (equivalent to 50mx50m). These zones should be digitized and labelled using the *NVAT Mapper*, and the same zone labels entered into *BioMetric*. Version 3.1 of *BioMetric* can deal with an unlimited number of zones.

Definitions for low condition vegetation

A. Native woody vegetation is in low condition if:

The over-storey per cent foliage cover is <25% of the lower value of the over-storey per cent foliage cover benchmark for that vegetation type, **and** <50% of vegetation in the ground layer is indigenous species, **or** >90% is ploughed or fallow, **or** ≥90% of the groundcover vegetation is regrowth but not protected regrowth.

B. Native grassland, shrubland, wetland or herbfield is in low condition if:

<50% of vegetation in the ground layer is indigenous species, **or** >90% is ploughed or fallow, **or** ≥90% of the groundcover vegetation is regrowth but not protected regrowth .#

Notes:

• Assessment of whether the over-storey per cent foliage cover meets the definition of low condition can be determined using the Paddock Tree Calculator (accessible via the *NVAT Mapper*).
• # Check the Native Vegetation Act and Regulations to determine whether this vegetation can be cleared without a PVP.

Landscape value assessment – conducted once only, regardless of the number of clearing zones.

(1) % native vegetation cover in the landscape (1.79km and 0.55km radii) – estimated in 10-precentile categories. In woody vegetation these estimates are based on the % cover of the over-storey relative to the approximate benchmark for that vegetation type (e.g. a completely vegetated circle with benchmark over-storey cover around the proposal would be assessed as >90-100% cover whether it is open woodland or closed forest. However, if the cover still occurred across the whole circle, but was around 2/3 of the benchmark over-storey cover for that vegetation (e.g. because of thinning) then the estimate of cover would be >60-70%). In non-woody vegetation (e.g. grassland) the assessment is based on the amount of vegetation in the landscape that is unlikely to meet the definition of low condition. These estimates can be made from the imagery and knowledge of the area. Any vegetation native to Australia can contribute to this measure (i.e. planted native species not indigenous to the area can contribute to this measure). **Note: where the development proposal is not entirely encompassed within a single 1000ha radius, undertake multiple assessments at this scale to fully encompass the proposal, then repeat this process for the 100ha scale assessment (see *BioMetric* Operational Manual for guidance).**

(2) Connectivity value

A **linkage** is defined as vegetation that forms links between pairs of vegetation remnants. A linkage is further defined as native vegetation that is ≤100m (or ≤30m in non-woody vegetation) from native vegetation that is not in low condition and ≥1ha in size. Note that where four remnants are connected via a common polygon, there are six linkages formed. The contribution of each linkage is assessed and a total Connectivity Value is calculated in the following 3-step process. **Use the Connectivity Value plot data sheet to assess all linkages and determine which undergoes greatest connectivity change.**

Step 1: Linkage Width Class

- The **Linkage Width Class (LWC)** is the average width of the area of vegetation that links the clearing or offset site with the adjoining vegetation. Linkage Width Classes are Very Narrow, Narrow, Moderate, Wide, and Very Wide.
- For each polygon in turn, determine the 'Current' and 'With Clearing' Linkage Width Class for each linkage using Table 5 (Operational Manual).
- Determine the number of linkage width class thresholds that are crossed (lost or gained) for each linkage.

Step 2: Linkage Condition Class

- The **Linkage Condition Class (LCC)** is defined as the average vegetation condition within the linkage (of which the proposal polygon forms all or a part). The LCC is *not* the condition of the proposal area only, nor is the same as the Site Value. The LCC is the overall average vegetation condition of each linkage of which the proposal forms all or part. The condition states for each stratum are related to the benchmarks, based in part on the current 'low condition' definition. Linkage Condition Classes are Nil, Nil-Low, Low, Low-Mod, Moderate, Mod-High, High.
- For each polygon in turn, determine the 'Current' and 'With Clearing' Linkage Condition Class for each linkage using Table 6 of Operational Manual (for woody vegetation) or Table 7 of Operational Manual (for non-woody vegetation). After assessing the overall condition of a linkage, it is recommended that the assessor then take into account the existence of "hostile gaps" such as major highways or railways, water bodies etc. See Operational Manual for details.
- Determine the number of linkage condition class thresholds that are crossed (lost or gained) for each linkage.

Step 3: Determine the Connectivity Value score.

- Where there is more than one linkage from the adjoining vegetation to the clearing or offset zone/s, the linkage which undergoes the greatest connectivity value score change is used to determine the connectivity value score.
- Use the Connectivity Value plot data sheet to determine which linkage (from all the polygons) undergoes the greatest combined (LWC + LCC) score change.
- Enter the LWC and LCC values ('Current' and 'With proposal') for that linkage into *BioMetric* for the relevant proposal.
- *BioMetric* automatically calculates the final connectivity value score using both the number of linkage width class thresholds and the number of linkage condition class thresholds that are crossed.

(3) Total adjacent remnant area – record the total remnant area of which the proposal is a part as one of five levels: extra large, very large, large, medium, or small. These five levels are defined differently according to the extent to which the Mitchell Landscape in which most of the proposal occurs has been cleared (Table 2). This figure can be obtained from the Vegetation tab in *BioMetric.* Digitising tools in the *NVAT Mapper* can be used to help estimate the area of the adjacent remnant if necessary.

Table 2. Criteria used for assessing total adjacent remnant area. Adjacent remnant area refers to the area (ha) of native vegetation that is not in low condition and is linked to (≤100m from, for woody vegetation; ≤30m from, for non-woody vegetation) the proposal area. The % of native vegetation cleared in the Mitchell Landscape in which most of the proposal occurs is calculated in Section 3.2.1.4 of the Operational Manual.

Level for total adjacent remnant area	% native vegetation cleared in the Mitchell Landscape in which most of proposal occurs			
	<30%	**30-70%**	**>70-90%**	**>90%**
Extra large	>1000	>200	>100	>50
Very large	>500-1000	>100-200	>50-100	>20-50
Large	>200-500	>50-100	>20-50	>10-20
Medium	>100-200	>20-50	>10-20	>21-10
Small	≤100	≤20	≤10	≤1

Offset assessment

BioMetric

PVP Request No.
(from *PADACS*)_____ **Date**_____

CMA _____ **Recorder/s**_____

REGIONAL VALUE (Use *NVAT Mapper* to determine Zone numbers and Areas.)

Zone no.	Area (ha)	Vegetation Formation	Vegetation Type

LANDSCAPE VALUE (To be assessed once per offset proposal, using imagery in *NVAT Mapper*, or on the hard copy printouts. Definitions on reverse. Enter Connectivity Value results for linkage which undergoes greatest combined (LWC + LCC) change. See *BioMetric* Operational Manual for guidance.)

Attribute	**Current** (circle one level per attribute)	**With offsets** (circle one level per attribute)
% cover within 1.79km radius (1000ha)	0 / >0-10 / >10-20 / >20-30 / >30-40 / >40-50 / >50-60 / >60-70 / >70-80 / >80-90 / >90-100%	0 / >0-10 / >10-20 / >20-30 / >30-40 / >40-50 / >50-60 / >60-70 / >70-80 / >80-90 / >90-100%
% cover within 0.55km radius (100ha)	0 / >0-10 / >10-20 / >20-30 / >30-40 / >40-50 / >50-60 / >60-70 / >70-80 / >80-90 / >90-100%	0 / >0-10 / >10-20 / >20-30 / >30-40 / >40-50 / >50-60 / >60-70 / >70-80 / >80-90 / >90-100%
Connectivity value - LWC	V. Narrow / Narrow / Moderate / Wide / V. Wide	V. Narrow / Narrow / Moderate / Wide / V. Wide
Connectivity value - LCC	Nil / Nil-Low / Low / Low-Mod / Mod / Mod-High / High	Nil / Nil-Low / Low / Low-Mod / Mod / Mod-High / High
Total adjacent remnant area		Small / Medium / Large / Very Large / Extra Large
% within riparian area		<1% / 1-10% / >10-25% / >25%
Additional Site Value score		Calculated automatically

SITE VALUE (Record "Current score" values for each zone using the Site Value - plot data sheet. "Score with offset" values can only be completed following assessment of the current condition of each zone.)

MANAGEMENT ACTIONS (Tick relevant management actions for each zone, and record details. Predicted future condition of each condition variable must be scored by the assessor in *BioMetric* Offset Site tab, and management action details recorded in *BioMetric* Management Actions tab. See *BioMetric* Operational Manual for guidance.)

Zone No.	Grazing exclusion	Strategic grazing	Planting/ direct seeding	Weed control	Erosion control	Feral &/or over-abundant native herbivore control	Retain dead timber	Retain regrowth	Provide artificial hollows	Exclude fertilisers	Management action specifications (brief)

OFFSET ASSESSMENT FIELD DATA SHEET – DEFINITIONS AND DESCRIPTIONS*

Refer to* BioMetric *Operational Manual for more complete explanation and instructions.

Zones

The offset proposal must be divided into relatively homogenous or discrete zones for assessment. Each zone should represent a distinct vegetation type (according to the vegetation types provided in *BioMetric*) and broad condition state (note that vegetation in low condition must always form a separate zone to vegetation not in low condition). Zones within proposals do not need to be continuous (i.e. a single zone could occupy two or more discrete areas). Each zone must be >0.25ha in area (equivalent to 50mx50m). These zones should be digitized and labelled using the *NVAT Mapper*, and the same zone labels entered into *BioMetric*. Version 3.1 of *BioMetric* can deal with an unlimited number of zones.

Landscape value assessment – conducted once only, regardless of the number of offset zones.

(1) % native vegetation cover in the landscape (1.79km and 0.55km radii) – estimated in 10-precentile categories. In woody vegetation these estimates are based on the % cover of the over-storey relative to the approximate benchmark for that vegetation type (e.g. a completely vegetated circle with benchmark over-storey cover around the proposal would be assessed as >90-100% cover whether it is open woodland or closed forest. However, if the cover still occurred across the whole circle, but was around 2/3 of the benchmark over-storey cover for that vegetation (e.g. because of thinning) then the estimate of cover would be >60-70%). In non-woody vegetation (e.g. grassland) the assessment is based on the amount of vegetation in the landscape that is unlikely to meet the definition of low condition. These estimates can be made from the imagery and knowledge of the area. Any vegetation native to Australia can contribute to this measure (i.e. planted native species not indigenous to the area can contribute to this measure). **Note: where the development proposal is not entirely encompassed within a single 1000ha radius, undertake multiple assessments at this scale to fully encompass the proposal, then repeat this process for the 100ha scale assessment (see *BioMetric* Operational Manual for guidance).**

(2) Connectivity value

A **linkage** is defined as vegetation that forms links between pairs of vegetation remnants. A linkage is further defined as native vegetation that is ≤100m (or ≤30m in non-woody vegetation) from native vegetation that is not in low condition and ≥1ha in size. Note that where four remnants are connected via a common polygon, there are six linkages formed. The contribution of each linkage is assessed and a total Connectivity Value is calculated in the following 3-step process. **Use the Connectivity Value plot data sheet to assess all linkages and determine which undergoes greatest connectivity change.**

Step 1: Linkage Width Class

- The **Linkage Width Class (LWC)** is the average width of the area of vegetation that links the clearing or offset site with the adjoining vegetation. Linkage Width Classes are Very Narrow, Narrow, Moderate, Wide, and Very Wide.
- For each polygon in turn, determine the 'Current' and 'With Clearing' Linkage Width Class for each linkage using Table 5 (Operational Manual).
- Determine the number of linkage width class thresholds that are crossed (lost or gained) for each linkage.

Step 2: Linkage Condition Class

- The **Linkage Condition Class (LCC)** is defined as the average vegetation condition within the linkage (of which the proposal polygon forms all or a part). The LCC is *not* the condition of the proposal area only, nor is the same as the Site Value. The LCC is the overall average vegetation condition of each linkage of which the proposal forms all or part. The condition states for each stratum are related to the benchmarks, based in part on the current 'low condition' definition. Linkage Condition Classes are Nil, Nil-Low, Low, Low-Mod, Moderate, Mod-High, High.
- For each polygon in turn, determine the 'Current' and 'With Clearing' Linkage Condition Class for each linkage using Table 6 of Operational Manual (for woody vegetation) or Table 7 of Operational Manual (for non-woody vegetation). After assessing the overall condition of a linkage, it is recommended that the assessor then take into account the existence of "hostile gaps" such as major highways or railways, water bodies etc. See Operational Manual for details.
- Determine the number of linkage condition class thresholds that are crossed (lost or gained) for each linkage.

Step 3: Determine the Connectivity Value score.

- Where there is more than one linkage from the adjoining vegetation to the clearing or offset zone/s, the linkage which undergoes the greatest connectivity value score change is used to determine the connectivity value score.
- Use the Connectivity Value plot data sheet to determine which linkage (from all the polygons) undergoes the greatest combined (LWC + LCC) score change.
- Enter the LWC and LCC values ('Current' and 'With proposal') for that linkage into *BioMetric* for the relevant proposal.
- *BioMetric* automatically calculates the final connectivity value score using both the number of linkage width class thresholds and the number of linkage condition class thresholds that are crossed.

(3) Total adjacent remnant area – record the total remnant area of which the proposal is a part as one of five levels: extra large, very large, large, medium, or small. These five levels are defined differently according to the extent to which the Mitchell Landscape in which most of the proposal occurs has been cleared (Table 2). This figure can be obtained from the Vegetation tab in *BioMetric.* Digitising tools in the *NVAT Mapper* can be used to help estimate the area of the adjacent remnant if necessary.

Table 2. Criteria used for assessing total adjacent remnant area. Adjacent remnant area refers to the area (ha) of native vegetation that is not in low condition and is linked to (≤100m from, for woody vegetation; ≤30m from, for non-woody vegetation) the proposal area. The % of native vegetation cleared in the Mitchell Landscape in which most of the proposal occurs is calculated in Section 3.2.1.4 of the Operational Manual.

Level for total adjacent remnant area	% native vegetation cleared in the Mitchell Landscape in which most of proposal occurs			
	<30%	**30-70%**	**>70-90%**	**>90%**
Extra large	>1000	>200	>100	>50
Very large	>500-1000	>100-200	>50-100	>20-50
Large	>200-500	>50-100	>20-50	>10-20
Medium	>100-200	>20-50	>10-20	>21-10
Small	≤100	≤20	≤10	≤1

(4) % within riparian area - offsets with >1% of their area within riparian areas (i.e. riparian zone plus buffer as defined in Appendix 6 of Operational Manual) receive an additional score. Record proportion of offset within riparian areas.

Management actions

For offsets, the assessor must also identify the management actions (1-10) proposed by the landholder to obtain improvements on the offset zone(s). Record in detail the proposed management actions for each offset zone, including intent, timing, methods, etc. Based on this information, the assessor must predict the future condition of the 10 condition variables in each zone, taking into consideration the current site condition, past and present disturbance factors impacting the site (including their age, frequency and severity – these can be recorded in the "Disturbance attributes and history record plot data sheet" for each zone), proposed management actions and hence the likely trajectory of site recovery.

Proposed management actions can advance the score for each variable by increments of 0.5, recognising that not all management actions will result in whole point score improvements. Predicted score improvements need to reflect the slow rate at which restoration occurs and the inherent risk associated with achieving biodiversity outcomes in the long-term. In most circumstances the score for a variable should only be advanced by 0.5 or 1, to reflect this uncertainty regarding the efficacy of many management actions, and the 'single human lifespan' timeframe over which improvements to site condition are scored. Movements of scores by greater amounts (e.g. two increments) should be limited to selected variables and management actions that have a low risk of failure. Guidelines for scoring condition improvement as a result of management actions are provided in Appendix 5 of the *BioMetric* Operational Manual.

% native vegetation cover - data sheet

Use for Clearing, Offset and incentive assessments.

BioMetric

PVP Request No.: (from PADACS)

PROPOSAL TYPE: (circle one) Clearing & Offset / Incentive

CMA

Recorder/s

Date

Site location & description:

Vegetation Formation (as per Keith 2004)

Vegetation Class (as per Keith 2004)

Vegetation Type (*BioMetric)*

CLEARING ASSESSMENT

Current % native vegetation cover assessment (within each 1000ha circle, determine the 'Current' native vegetation cover (%) as per methods below. Use field verification to confirm assessments. Repeat for 100ha circles. (see also Operational Manual for details)).

	Circle no. 1	2	3	4	5	6	7	8	9	10	Total % cover	Total/ no. circles	Category
1000 ha assessment													
100 ha assessment													

'With clearing' % native vegetation cover assessment (repeat above, for 'with clearing' proposal).

	Circle no. 1	2	3	4	5	6	7	8	9	10	Total % cover	Total/ no. circles	Category
1000 ha assessment													
100 ha assessment													

OFFSET or INCENTIVE ASSESSMENT

Current % native vegetation cover assessment (repeat above, for current offset or incentive assessment).

	Circle no. 1	2	3	4	5	6	7	8	9	10	Total % cover	Total/ no. circles	Category
1000 ha assessment													
100 ha assessment													

'With clearing and offset'/'With proposal' % native vegetation cover assessment (repeat above, for 'with clearing and offset' proposal (i.e. minus the area to be cleared, plus any new area/s to be improved through management as an offset). For Incentive proposals, undertake 'With proposal' assessment).

	Circle no. 1	2	3	4	5	6	7	8	9	10	Total % cover	Total/ no. circles	Category
1000 ha assessment													
100 ha assessment													

Landscape Value – % native vegetation cover methodology details (As per *BioMetric* Operational Manual.)

a) Use the NVAT Mapper to place sufficient 1000ha circles over the development proposal areas to ensure complete coverage of the proposal;
b) Determine the 'Current' native vegetation cover (%) for each circle (see above), either visually or by digitisation, taking into consideration (i) the foliage cover (%) of each woody vegetation type relative to the approximate benchmark for that type; and (ii) for non-woody assessments, vegetation not in low condition. Use field verification to confirm assessments. Assess any circle overlap areas once only. (See Operational Manual for details)).
c) Calculate the Total % cover by summing the percent cover estimates for all circles;
d) Calculate the Total/no. circles, e.g. if 6 circles are used to cover the proposal, and the % cover estimates are 25, 34, 15, 67, 42 and 12; then the calculation is: (25+34+15+67+42+12)/6 = 195/6 = 32.5%;
e) Determine the corresponding category (in this example, >30-40%). Select this category from the drop down boxes for 'Current' percent vegetation cover at 1000ha in *BioMetric*;
f) Repeat (a) – (e) for 'With clearing' proposal. *BioMetric* will automatically calculate the loss in percent vegetation cover due to the development proposal, and corresponding scores;
g) Repeat for the 100ha scale assessment. Note, no new digitising will be necessary;
h) Repeat steps (a) – (g) for the offset proposal, remembering to assess the 'With Clearing and Offset' proposal (i.e. minus the area to be cleared, plus any new area/s to be improved through management as an offset) in order to assess the gain in percent vegetation cover. *BioMetric* will automatically calculate the gain in percent vegetation cover due to the offset proposal, and corresponding scores.

Total adjacent remnant area - data sheet

BioMetric

Use for Clearing, Offset and incentive assessments.

PVP Request No.: (from PADACS) | **PROPOSAL TYPE:** (circle one) Clearing & Offset / Incentive

CMA | **Recorder/s** | **Date**

Site location & description:

Vegetation Formation (as per Keith 2004)

Vegetation Class (as per Keith 2004)

Vegetation Type (*BioMetric*)

CLEARING and OFFSET ASSESSMENT (Determine the 'Current' total adjacent remnant area assessment only for the Development proposal, and the 'With clearing and offset' assessment for the Offset proposal. Categories are **Extra Large, Very Large, Large, Medium and Small**. Circle the polygon which undergoes the greatest change. (see Operational Manual for details).

No. clearing polygons ____ No. offset polygons _____	Polygon no.									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Current										
With clearing and offset										
	11	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
Current										
With clearing and offset										

INCENTIVE ASSESSMENT (Determine the 'Current' and 'With proposal' total adjacent remnant area assessments for the Incentive proposal. Categories are **Very Large, Large, Medium and Small.** Circle the polygon which undergoes the greatest change. (see Operational Manual for details).

No. polygons _____	Polygon no.									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Current										
With proposal										
	11	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
Current										
With proposal										

Landscape Value – total adjacent remnant area methodology details (As per *BioMetric* Operational Manual.)

- **Total adjacent remnant area** is the area (ha) of native vegetation that is not in low condition and is linked to (≤100m from; or ≤30m from, for non-woody vegetation) the proposal area. It includes the clearing or offset proposal. The adjacent remnant vegetation area may extend off-site to include adjoining areas of native vegetation;
- The aim of this measure is to encourage offsets to be established adjacent to, or as part of, remnants that are of equivalent size or larger than the remnant in which clearing is proposed to occur;
- Calculate total adjacent remnant area separately for each polygon;
- Record the number of zones and polygons comprising the clearing and offset (or incentive) proposals;
- For each polygon in turn, determine the 'Current' total adjacent remnant area of which the proposal is a part (i.e. this *includes* any area/s to be cleared). For clearing and offset proposals, total adjacent remnant area categories are: Extra large, Very large, Large, Medium, or Small. Note: the Extra Large category does not yet apply to incentive assessments. These categories are defined differently according to the extent to which the Mitchell Landscape in which most of the proposal occurs has been cleared (See Operational Manual). Digitising tools in the NVAT Mapper can be used to help estimate the area of the adjacent remnant if necessary;
- For each polygon, determine what the total adjacent remnant area will be **'With clearing and offset'** (i.e. minus the area to be cleared, plus any new area/s to be improved through management as an offset), or 'With proposal' for incentive proposals;
- Determine which polygon/s undergoes the greatest change (loss/gain) in total adjacent remnant area;
- Select corresponding categories from the 'Current' and 'With offset' drop-down menus in *BioMetric*, or the 'Current' and 'With proposal' categories for incentive proposals.

Table 4. Criteria used for assessing total adjacent remnant area. The percent of native vegetation cleared in the Mitchell Landscape in which most of the proposal occurs is recorded in the Vegetation tab in *BioMetric*. Note: 'Extra Large' category does not yet apply to Incentive assessments.

Level for total adjacent remnant area	**percent native vegetation cleared in the Mitchell Landscape in which most of proposal occurs**			
	<30%	**30-70%**	**>70-90%**	**>90%**
Extra large	>1000	>200	>100	>50
Very large	>500-1000	>100-200	>50-100	>20-50
Large	>200-500	>50-100	>20-50	>10-20
Medium	>100-200	>20-50	>10-20	>21-10
Small	≤100	≤20	≤10	≤1

Connectivity value - data sheet

Start a new sheet for each Clearing or Offset proposal

BioMetric

PVP Request No.: (from PADACS)

PROPOSAL TYPE: (circle one) Clearing / Offset

CMA

Recorder/s

Date

Site location & description:

Vegetation Formation (as per Keith 2004)

Vegetation Class (as per Keith 2004)

Vegetation Type (*BioMetric*)

	Zone __	Zone __	Zone __	Zone __	Zone __	Zone __	Zone __	Zone __	Zone __	Zone __
No. polygons in zone										

Veg Zone No. ___ Polygon No. ___ No. Linkages ___ (LWC categories are Very Narrow, Narrow, Moderate, Wide, Very Wide. LCC categories are Nil, Nil-Low, Low, Low-Mod, Moderate, Mod-High, High. Refer to methods in *BioMetric* Operational Manual.)

	Linkage No.:	**1**	**2**	**3**	**4**	**5**	**6**
Linkage Width Class (LWC)	Current						
	With proposal						
	LWC change = no. thresholds crossed (max. 4)						
Linkage Condition Class (LCC)	Current						
	With proposal						
	LCC change = no. thresholds crossed (max. 6)						
	Linkage connectivity change = LWC change + LCC change (max. 10)						

Veg Zone No. ___ Polygon No. ___ No. Linkages ___ (LWC categories are Very Narrow, Narrow, Moderate, Wide, Very Wide. LCC categories are Nil, Nil-Low, Low, Low-Mod, Moderate, Mod-High, High. Refer to methods in *BioMetric* Operational Manual.)

	Linkage No.:	**1**	**2**	**3**	**4**	**5**	**6**
Linkage Width Class (LWC)	Current						
	With proposal						
	LWC change = no. thresholds crossed (max. 4)						
Linkage Condition Class (LCC)	Current						
	With proposal						
	LCC change = no. thresholds crossed (max. 6)						

Veg Zone No. ___ Polygon No. ___ No. Linkages ___ (LWC categories are Very Narrow, Narrow, Moderate, Wide, Very Wide. LCC categories are Nil, Nil-Low, Low, Low-Mod, Moderate, Mod-High, High. Refer to methods in *BioMetric* Operational Manual.)

	Linkage No.:	**1**	**2**	**3**	**4**	**5**	**6**
Linkage Width Class (LWC)	Current						
	With proposal						
	LWC change = no. thresholds crossed (max. 4)						
Linkage Condition Class (LCC)	Current						
	With proposal						
	LCC change = no. thresholds crossed (max. 6)						

Veg Zone No. ___ Polygon No. ___ No. Linkages ___ (LWC categories are Very Narrow, Narrow, Moderate, Wide, Very Wide. LCC categories are Nil, Nil-Low, Low, Low-Mod, Moderate, Mod-High, High. Refer to methods in *BioMetric* Operational Manual.)

	Linkage No.:	**1**	**2**	**3**	**4**	**5**	**6**
Linkage Width Class (LWC)	Current						
	With proposal						
	LWC change = no. thresholds crossed (max. 4)						
Linkage Condition Class (LCC)	Current						
	With proposal						
	LCC change = no. thresholds crossed (max. 6)						
Linkage connectivity change = LWC change + LCC change (max. 10)							

Veg Zone No. ___ Polygon No. ___ No. Linkages ___ (LWC categories are Very Narrow, Narrow, Moderate, Wide, Very Wide. LCC categories are Nil, Nil-Low, Low, Low-Mod, Moderate, Mod-High, High. Refer to methods *BioMetric* Operational Manual.)

	Linkage No.:	**1**	**2**	**3**	**4**	**5**	**6**
Linkage Width Class (LWC)	Current						
	With proposal						
	LWC change = no. thresholds crossed (max. 4)						
Linkage Condition Class (LCC)	Current						
	With proposal						
	LCC change = no. thresholds crossed (max. 6)						

Landscape Value – Connectivity Value field methodology details (As per *BioMetric* Operational Manual.

- For each veg zone, record the number of polygons which comprise the zone.
- For each polygon in turn, record the number of linkages with other vegetation. A **linkage** is defined as vegetation that forms links between pairs of vegetation remnants. A linkage is further defined as native vegetation that is ≤100m (or ≤30m in non-woody vegetation) from native vegetation that is not in low condition and ≥1ha in size. Note that where four remnants are connected via a common polygon, there are six linkages formed. The contribution of each linkage is assessed and a total Connectivity Value is calculated in the following 3-step process.

Step 1: Linkage Width Class

- The **Linkage Width Class (LWC)** is the average width of the area of vegetation that links the clearing or offset site with the adjoining vegetation. Linkage Width Classes are Very Narrow, Narrow, Moderate, Wide, and Very Wide.
- Determine the 'Current' and 'With Clearing' Linkage Width Class for each linkage using Table 5 in *BioMetric* Operational Manual.
- Determine the number of linkage width class thresholds that are crossed (lost or gained) for each linkage.

Step 2: Linkage Condition Class

- The **Linkage Condition Class (LCC)** is defined as the average vegetation condition within the linkage (of which the proposal polygon forms all or a part). The LCC is *not* the condition of the proposal area only, nor is the same as the Site Value. The LCC is the overall average vegetation condition of each linkage of which the proposal forms all or part. The condition states for each stratum are related to the benchmarks, based in part on the current 'low condition' definition. Linkage Condition Classes are Nil, Nil-Low, Low, Low-Mod, Moderate, Mod-High, High.
- Determine the 'Current' and 'With Clearing' Linkage Condition Class for each linkage using Table 6a in *BioMetric* Operational Manual (for woody vegetation) or Table 6b (for non-woody vegetation). After assessing the overall condition of a linkage, it is recommended that the assessor then take into account the existence of "hostile gaps" such as major highways or railways, water bodies etc. See Operational Manual for details.
- Determine the number of linkage condition class thresholds that are crossed (lost or gained) for each linkage. **Note, each threshold between LC classes for non-woody vegetation count as TWO thresholds (e.g. a change from Moderate to Nil condition equates to a loss of four thresholds..**

Step 3: Determine the Connectivity Value score.

- Where there is more than one linkage from the adjoining vegetation to the clearing or offset site, the linkage which undergoes the greatest connectivity value score change is used to determine the connectivity value score.
- identify which linkage has the greatest combined (LWC + LCC) score change. Enter the LWC and LCC values ('Current' and 'With proposal') for that linkage into *BioMetric.*
- *BioMetric* automatically calculates the final connectivity value score using by considering both the number of linkage width class thresholds and the number of linkage condition class thresholds that are crossed (see Table 7, Operational Manual).

Site Value (zones) - plot data sheet

BioMetric

Start a new sheet for each zone (Clearing, Offset or Incentive proposals)

PLOT TYPE: (circle one) **Clearing zone / Offset zone / Incentive zone**

Linked zones (list type/s & nos.)

CMA

Recorder/s

Date

Site location & description:

PVP Request No. (from *PADACS*)

Veg Zone No. (from *NVAT Mapper*)

Vegetation Formation (as per Keith 2004)

Vegetation Class (as per Keith 2004)

Vegetation Type (*BioMetric*)

PLOT 1 Lat.	Long.
Orientation	**Photos**

PLOT 2 Lat.	Long.
Orientation	**Photos**

PLOT 3 Lat.	Long.
Orientation	**Photos**

PLOT 4 Lat.	Long.
Orientation	**Photos**

PLOT 5 Lat.	Long.
Orientation	**Photos**

PLOT 6 Lat.	Long.
Orientation	**Photos**

PLOT 7 Lat.	Long.
Orientation	**Photos**

PLOT 8 Lat.	Long.
Orientation	**Photos**

PLOT 9 Lat.	Long.
Orientation	**Photos**

Plot 10 Lat.	Long.
Orientation	**Photos**

20m x 20m plot (See also Step Point Transect or Crown Separation Ratio data sheets for assessing foliage cover (%). Note: CSR method is preferred for over-storey and mid-storey strata. 20x20m plot method is not considered reliable for the over-storey stratum. Refer to methods in Appendix 4 of *BioMetric* Operational Manual.)

Plot No.:	1	2	3	4	5	6	7	8	9	10
Number of native plant species										
Native mid-storey cover (%)										
Native ground stratum cover (%) - grasses										
Native ground stratum cover (%) - shrubs										
Native ground stratum cover (%) - other										
Exotic plant cover (%)										

Larger sampling area ([1]20m x 50m plot, or [2]whole of zone) (Refer to methods in Appendix 4 of *BioMetric* Operational Manual.)

[1]Number of trees with hollows – use Alternative method below if appropriate										
[2]Over-storey regeneration (proportion of over-storey spp)										
[1]Total length of fallen logs (m)										

Alternative methods for zones containing scattered trees (whole-of-zone methods) (Refer to methods in Appendix 4 of *BioMetric* Operational Manual. Use Paddock Tree Calculator, accessible via the *NVAT Mapper* for calculations.)

Native over-storey cover (%)	av. crown diameter (m)= av. foliage cover (%) = # trees= sample area (ha)=									
No. trees with hollows	sample area (ha)= no. trees with hollows =									

Notes – additional conservation values: e.g. riparian areas, special features, geology etc.

Site Value vegetation condition variables - field methodology details (As per Appendix 4 of *BioMetric* Operational Manual.
* indicates that an alternative method is provided where tree density is very low (e.g. scattered trees).

Plots should be placed randomly with a minimum of one plot and a maximum of ten plots within a zone.

Indigenous plant species richness (20mx20m plot): Indigenous plant species refers to vascular species local to the area and, if planted, which come from a local seed source. Systematically walk the plot counting the number of indigenous plant species for all vascular plants (i.e. the species do not have to be identified).

Native over-storey cover (Crown Separation Ratio (CSR) technique; OR at 10 points along each of three 50m transects; OR whole-of-zone method*): Native over-storey is the tallest woody stratum present (including emergents) above 1m and includes all species native to New South Wales (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 <1m) may not have an over-storey stratum. Over-storey cover is estimated as FOLIAGE COVER (%), which is equivalent to the amount of shadow that would be cast on the ground if there were a light source directly overhead. Note, this is **not** the same as Crown Cover or Projective Foliage Cover. Foliage cover can be estimated using one of three methods:

(1) Using the Crown Separation Ratio (CSR) technique. This is the preferred (most replicable) method. Use CSR transect tables – plot data sheet; OR
(2) At 10 points (i.e. every 5m) along each of the three 50m transects (see Figure 1, App. 4) estimate FOLIAGE COVER (%) directly overhead using the images provided in Figure 2 (App 4). Divide the total by the number of points (i.e. 30) measured along the transects (e.g. 50%, 0%, 0%, 40%,0%, 45%, 50%, 55%, 0%, 0%, 50%, 0%, 0%, 40%,0% ,45%, 50%, 55%, 0%, 0%, 50%, 0%, 0%, 40%,0%, 45%, 50%, 55%, 0%, 0% = 720/30 =24% foliage cover for guidance). NOTE: Multiple transects are required to sufficiently encompass over-storey heterogeneity. Use Step point transect tally tables – plot data sheet; OR
(3) In proposals where the over-storey cover is very sparse (e.g. scattered or paddock trees), foliage cover can be estimated across the entire zone using the *NVAT Paddock Tree Tool* (accessible via the *NVAT Mapper*).

Native mid-storey cover (CSR technique; OR at 10 points along each of three 50m transects, OR 20mx20m plot): The mid-storey contains all vegetation between the over-storey stratum and 1m in height (typically tall shrubs, under-storey trees and tree regeneration) and includes all species native to New South Wales (i.e. native species not local to the area can contribute to mid-storey structure). FOLIAGE COVER of the mid-storey is expressed as a % and can be measured using one of three methods:

(1) CSR technique – as for Native over-storey cover (see above); OR
(2) At 10 points (i.e. every 5m) along each of the three 50m transects – as for Native over-storey cover (see above). NOTE: Multiple transects are required to sufficiently encompass mid-storey heterogeneity; OR
(3) Visually estimate FOLIAGE COVER (%) in a 20mx20m plot. The precision of the estimate can be improved if the assessment is conducted separately in each of the four 10mx10m quarters that make up the 20mx20m plot. In a 10mx10m sub-plot 1m^2 of foliage cover is equal to 1% of foliage cover (in a 20mx20m plot 1% of foliage cover is equal to 4 m^2 of foliage cover). Tally the total m^2 of foliage cover for each of the four 10mx10m sub-plot and add them to estimate foliage cover (%) for the entire 20mx20m plot).

Native ground stratum cover (grasses, shrubs and other) (20mx20m plot; OR at 50 points along each of three 50m transects): The ground stratum contains all native vegetation below 1m in height and includes all species native to New South Wales (i.e. is not confined to species indigenous to the area). The ground stratum (**grasses**) refers to native grasses (i.e. plants belonging to the family Poaceae). The ground stratum (**shrubs**) refers to native woody vegetation <1m. The ground stratum (**other**) refers to non-woody native vegetation (vascular plants only) <1m that is not grass (e.g. herbs, ferns). FOLIAGE COVER (%) of the ground stratum (grasses) is expressed as a % and can be measured using one of two methods:

(1) Visually estimate per cent foliage cover in a 20mx20m plot as described for native mid-storey cover above; OR
(2) At 50 points (i.e. every 1m) along each of the three 50m transects (see Figure 1, App 4) record whether native grass intersects that point. Note, multiple 'hits' (i.e. multiple grasses) at a point count as ONE hit only. Divide the total of 'hits' by the number of points measured along the three transects (i.e. 150). NOTE: Multiple transects are required to sufficiently encompass ground stratum cover heterogeneity. Use Step point transect tally tables – plot data sheet.

Exotic plant cover (20mx20m plot; or at 50 points along each of three 50m transects): Exotic plants are vascular plants not native to Australia. Exotic plant cover is measured as total FOLIAGE COVER (%) of all exotics in all strata. If the exotics are in the over-storey then measure using the same method as native over-storey cover (see above), if exotics are in the mid-storey then measure using the same method as native mid-storey cover (see above) and if exotics are in the ground stratum then measure using the same method as described for native ground stratum cover (grasses) (see above). Note: abundance and invasiveness information are recorded in the Disturbance attributes and history record - plot data sheet for each zone, to assist assessors in predicting future site condition (see Section 3.3.3.1 and Appendix 5 of the *BioMetric* Operational Manual).

Number of trees with hollows (50mx20m plot; OR whole-of-zone method*): This is a count of the number of living and dead trees within a 50mx20m plot with at least one hollow (note that the hollows do not have to be within the plot). A hollow is only recorded if: (a) the entrance can be seen; (b) the minimum entrance width is at least 5cm across; (c) the hollow appears to have depth (i.e. you cannot see solid wood beyond the entrance); (d) the hollow is at least 1m above the ground (this omits hollows in cut stumps or at the base of trees); and (e) the centre of the tree is within the plot. Trees should be examined from all angles.

In proposals where trees occur in very low densities (e.g. paddock trees), the number of trees with hollows per 0.1ha (equivalent to the area of a 50x20m plot) can be estimated by: (a) identifying a representative area (in hectares) over which all trees will be examined using the imagery in the *NVAT Mapper*; (b) recording the number of trees with hollows within this area; and (c) entering these data in the Paddock Tree Calculator accessible via the *NVAT Mapper*. This figure must then be recorded as number of trees with hollows in each plot within the relevant zone.

Regeneration (entire zone): Regeneration is measured as the proportion of over-storey species present at the site that is regenerating (i.e. with DBH ≤ 5cm). For example if there are three tree species present at the site but only one of these species is regenerating, then the value is 0.33. The maximum value for this measure is 1.

Total length of fallen logs (50mx20m plot): This is the total length of logs at least 10cm diameter and at least 0.5m long. The diameter is estimated with a measuring tape (or callipers if available) held horizontally immediately above the log and the length is estimated to the nearest metre by measuring with a tape, or pacing, along the part of the log that is at least 10cm diameter. If estimating length by pacing then the actual length of a sample of logs should be measured regularly with a tape so the assessor can calibrate their own estimate derived from pacing. Only those parts of logs lying within the plot are measured.

Site Value (reference sites) - plot data sheet

Start a new sheet for each Reference site (see **Tips for selecting Reference sites & plots**…P.T.O.)

BioMetric

Ref site ID (assigned by assessor)		**CMA**		**Recorder/s**		**Date**	

Vegetation Formation (*sensu* Keith 2004)

Vegetation Class (*sensu* Keith 2004)

Vegetation Type (*BioMetric)*

Dominant species per stratum (P.T.O. for strata definitions)

Over-storey	Mid-storey	Ground stratum

PLOT 1 Lat.	Long.
Orientation	**Photos**

PLOT 2 Lat.	Long.
Orientation	**Photos**

PLOT 3 Lat.	Long.
Orientation	**Photos**

PLOT 4 Lat.	Long.
Orientation	**Photos**

PLOT 5 Lat.	Long.
Orientation	**Photos**

PLOT 6 Lat.	Long.
Orientation	**Photos**

PLOT 7 Lat.	Long.
Orientation	**Photos**

PLOT 8 Lat.	Long.
Orientation	**Photos**

PLOT 9 Lat.	Long.
Orientation	**Photos**

Plot 10 Lat.	Long.
Orientation	**Photos**

Disturbance attributes & history (Record Severity, Frequency, Evidence and Age codes for each plot, e.g. **L| Occ | Ob | R** . See over for details).

Plot No.	1	2	3	4	5	6	7	8	9	10
Canopy dieback	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Grazing and trampling	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Soil disturbance	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Timber harvesting	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Flood damage	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Storm damage	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Firewood collection & tidying up	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Dense regrowth post-disturbance	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Fertiliser addition	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Fire damage	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Feral herbivores										
Weeds	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Other - indicate type: _____	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |

20m x 20m plot (Refer to methods in Appendix 4 of *BioMetric* Operational Manual. Step Point Transect or Crown Separation Ratio methods can also be used to assess Foliage Cover. CSR method is preferred for over-storey and mid-storey strata. See over).

Number of native plant species										
Native mid-storey cover (%)										
Native ground stratum cover (%)- grasses										
Native ground stratum cover (%) - shrubs										
Native ground stratum cover (%) - other										

Larger sampling area (20m x 50m plot) (Refer to methods in Appendix 4 of *BioMetric* Operational Manual.)

Number of trees with hollows – use Alternative method below if appropriate										
Total length of fallen logs (m)										

Alternative (whole-of-zone) methods for zones containing scattered trees, such as sparsely wooded reference sites. (Refer to methods in Appendix 7 of *BioMetric* Operational Manual. Scattered Tree Calculator in *BioMetric* can be used for calculations.)

Native over-storey cover (%)	av. crown diameter (m)= av. foliage cover (%) = # trees= sample area (ha)=									
No. trees with hollows	sample area (ha)= no. trees with hollows =									

Please fax or email completed sheets to: Dani Murphy or James Crooks, Native Vegetation Science Unit, NSW DECCW.
Fax (02) 6229 7001. Email: biometric.tool@environment.nsw.gov.au. Thank you.

Disturbance attributes & history record - Scoring codes and Notes table

- Timber harvesting = stumps, coppicing, cut logs, ringbarking etc. (use Notes table below to record details)
- Grazing & trampling = grazing and trampling by introduced herbivores or over-abundant native herbivores (use Notes table below)
- Soil disturbance = ripping, cultivation, compaction, erosion (use Notes table below)
- Fire damage – indicate if high frequency, or if certain strata particularly affected (use Notes table below)
- Feral animals – indicate species (if known) and observed impacts (use Notes table below)

Severity codes	Frequency codes	Evidence codes	Age codes
N = Nil (no evidence)	A = Absent (i.e. n/a)	O = Observation	On = Ongoing
L = Light	Ra = Rare	W = Word of mouth (e.g. landholder)	R = Recent (<3 years)
M = Moderate	Occ = Occasional		NR = Not recent
S = Severe	F = Frequent		O = Old

Notes

Modification type	Plot #	Details

Site Value methodology prompts (for full details refer to Appendix 4 of *BioMetric* Operational Manual)

- Plots should be placed randomly with a minimum of one plot and a maximum of ten plots within a zone.
- Number of native plant species: COUNT of all indigenous vascular plant species.
- Strata definitions: Native over-storey refers to all native life-forms in the tallest dominant stratum (including emergents) present above 1m and includes all species native to Australia (i.e. native species not local to the area can contribute to over-storey structure). For example, in a woodland community the over-storey stratum is the tree layer, in a shrubland community the over-storey stratum is the tallest shrub layer above 1m; in a wetland or swamp the over-storey stratum may comprise sedges, rushes or bulrushes; and in a tall grassland there may be an over-storey stratum of grasses >1m high. Some vegetation types (e.g. low grasslands) may not have an over-storey stratum. The mid-storey contains all native life-forms between the over-storey stratum and 1m in height (typically tall shrubs, under-storey trees and regeneration of over-storey species) and includes all species native to Australia (i.e. native species not local to the area can contribute to mid-storey structure). Some vegetation types (e.g. grasslands) may not have a mid-storey stratum. The ground stratum contains all native life-forms below 1m in height and includes all species native to Australia (i.e. is not confined to species indigenous to the area). The ground stratum (grasses) refers to native grasses (i.e. plants belonging to the family Poaceae). Ground stratum (shrubs) refers to native woody vegetation <1m. Ground stratum (other) refers to non-woody native vegetation (vascular plants only) <1m that is not grass (e.g. forbs, herbs, ferns, lilies, rushes and sedges).
- Cover estimates (native over-storey, mid-storey, ground cover - grasses, shrubs and other): Foliage Cover (FC, %) – as defined in *BioMetric* Operational Manual. Use CSR transect tables – plot data sheet or Step point transect tally tables – plot data sheet, or tables below.
- No. trees with hollows: hollow entrance must be AT LEAST 5cm diameter; hollows must have depth, and be >1m above the ground.
- Over-storey regeneration: proportion of species in over-storey exhibiting regeneration (≤5cm DBH, no height limits).
- Step point transect tallies: hits recorded every 5m for over-storey and mid-storey cover, and every 1m for ground stratum cover variables. Use three transects for each plot. Record data in Step point transect tally tables – plot data sheet, or table below..

Selecting Reference sites for collecting vegetation condition benchmarks:

- See Appendix 1 in the Operational Manual for information on how to select reference sites for collecting vegetation condition benchmarks
- Stem density benchmarks can also be collected from Reference plots. The number of over-storey species stems need to be recorded for each DBH (diameter at breast height) class. Use "Site Value (stem density) – plot data sheet" to record stem density reference plot data.

Step point transect tally tables (for methodology details see above and refer to Appendix 4 of *BioMetric* Operational Manual.)

PLOT No. _____ TRANSECT No/s. _____	No. hits (tally)	%
Native over-storey cover (%)		
Native mid-storey cover (%)		
Native ground stratum cover (%) - grasses		
Native ground stratum cover (%) - shrubs		
Native ground stratum cover (%) - other		
Exotic plant cover (%)		
Litter cover (%) - optional		
Rock cover (%) - optional		
Bare ground cover (%) - optional		
Cryptogam cover (%) - optional		

Crown Separation Ratio transect tables (for methodology details refer to Appendix 4 of *BioMetric* Operational Manual. Record stratum (o/s, m/s, g/s(g), g/s(s) or g/s(o). Use consistent units within each plot, i.e. m OR cm. Use cm for ground stratum. Circle units used.)

PLOT No. _____ STRATUM _____	1	2	3	4	5	6	7	8	9	10	11	12	Mean
Crown width (m? OR cm?)													
Crown Separation/Gap (m? OR cm?)													
Crown type/ Degree of openness (%)													

Calculations:

CSR = mean Gap/mean Crown width = _____ m? or cm?

Crown Cover (CC) = 80.6/(1+CSR) = _____ %

Foliage Cover = CC (%) x mean Crown type (%)/100= _____ %. Enter this value into *BioMetric* for correct stratum within appropriate plot.

Step point transect tally tables - plot data sheet

BioMetric

Start a new sheet for each zone (Clearing, Offset or Incentive proposals) or Reference Site

PLOT TYPE: (circle one) **Clearing / Offset / Incentive /Reference**

Linked zones (list type/s & nos.)

CMA | **Recorder/s** | **Date**

Site location & description:

PVP Request No. (from *PADACS*)

Veg Zone No. (from *NVAT Mapper*)

Vegetation Type (*BioMetric*)

Step point transect tally tables (for methodology details see above and refer to Appendix 4 of *BioMetric* Operational Manual.)

PLOT No. _____ TRANSECT No/s. _____	No. hits (tally)	%
Native over-storey cover (%)		
Native mid-storey cover (%)		
Native ground stratum cover (%) - grasses		
Native ground stratum cover (%) - shrubs		
Native ground stratum cover (%) - other		
Exotic plant cover (%)		
Litter cover (%) - optional		
Rock cover (%) - optional		
Bare ground cover (%) - optional		
Cryptogam cover (%) - optional		

PLOT No. _____ TRANSECT No/s. _____	No. hits (tally)	%
Native over-storey cover (%)		
Native mid-storey cover (%)		
Native ground stratum cover (%) - grasses		
Native ground stratum cover (%) - shrubs		
Native ground stratum cover (%) - other		
Exotic plant cover (%)		
Litter cover (%) - optional		
Rock cover (%) - optional		
Bare ground cover (%) - optional		
Cryptogam cover (%) - optional		

PLOT No. _____ TRANSECT No/s. _____	No. hits (tally)	%
Native over-storey cover (%)		
Native mid-storey cover (%)		
Native ground stratum cover (%) - grasses		
Native ground stratum cover (%) - shrubs		
Native ground stratum cover (%) - other		
Exotic plant cover (%)		
Litter cover (%) - optional		
Rock cover (%) - optional		
Bare ground cover (%) - optional		
Cryptogam cover (%) - optional		

PLOT No. _____ TRANSECT No/s. _____	No. hits (tally)	%
Native over-storey cover (%)		
Native mid-storey cover (%)		
Native ground stratum cover (%) - grasses		
Native ground stratum cover (%) - shrubs		
Native ground stratum cover (%) - other		
Exotic plant cover (%)		
Litter cover (%) - optional		
Rock cover (%) - optional		
Bare ground cover (%) - optional		
Cryptogam cover (%) - optional		

PLOT No. _____ TRANSECT No/s. _____	No. hits (tally)	%
Native over-storey cover (%)		
Native mid-storey cover (%)		
Native ground stratum cover (%) - grasses		
Native ground stratum cover (%) - shrubs		
Native ground stratum cover (%) - other		
Exotic plant cover (%)		
Litter cover (%) - optional		
Rock cover (%) - optional		
Bare ground cover (%) - optional		
Cryptogam cover (%) - optional		

PLOT No. _____ TRANSECT No/s. _____	No. hits (tally)	%
Native over-storey cover (%)		
Native mid-storey cover (%)		
Native ground stratum cover (%) - grasses		
Native ground stratum cover (%) - shrubs		
Native ground stratum cover (%) - other		
Exotic plant cover (%)		
Litter cover (%) - optional		
Rock cover (%) - optional		
Bare ground cover (%) - optional		
Cryptogam cover (%) - optional		

PLOT No. _____ TRANSECT No/s. _____	No. hits (tally)	%
Native over-storey cover (%)		
Native mid-storey cover (%)		
Native ground stratum cover (%) - grasses		
Native ground stratum cover (%) - shrubs		
Native ground stratum cover (%) - other		
Exotic plant cover (%)		
Litter cover (%) - optional		
Rock cover (%) - optional		
Bare ground cover (%) - optional		
Cryptogam cover (%) - optional		

PLOT No. _____ TRANSECT No/s. _____	No. hits (tally)	%
Native over-storey cover (%)		
Native mid-storey cover (%)		
Native ground stratum cover (%) - grasses		
Native ground stratum cover (%) - shrubs		
Native ground stratum cover (%) - other		
Exotic plant cover (%)		
Litter cover (%) - optional		
Rock cover (%) - optional		
Bare ground cover (%) - optional		
Cryptogam cover (%) - optional		

Step point transect tally methodology details (As per Appendix 4 of *BioMetric* Operational Manual. * indicates that an alternative method is provided where tree density is very low (e.g. paddock trees)).

Native over-storey cover (*): FOLIAGE COVER of the over-storey is expressed as a % and can be measured using the step point transect method: at 10 points (i.e. every 5m) along each of the three 50m transects (see Figure 1, App. 4) estimate FOLIAGE COVER (%) directly overhead using the images provided in Figure 2 (App 4). Divide the total by the number of points (i.e. 30) measured along the transects (e.g. 50%, 0%, 0%, 40%,0%, 45%, 50%, 55%, 0%, 0%, 50%, 0%, 0%, 40%,0% ,45%, 50%, 55%, 0%, 0%, 50%, 0%, 0%, 40%,0%, 45%, 50%, 55%, 0%, 0% = 720/30 =24% foliage cover). NOTE: Multiple transects are required to sufficiently encompass over-storey heterogeneity.

Native mid-storey cover: Foliage cover of the mid-storey is expressed as a % and can be measured using the step point transect method: at 10 points (i.e. every 5m) along each of the three 50m transects estimate foliage cover (%) in the mid-storey. Divide the total by the number of points (i.e. 30) measured along the transect, as for native over-storey cover (above).

Native ground stratum cover (grasses, shrubs and other): Foliage cover of the ground stratum is expressed as a % and can be measured using the step point transect method: at 50 points (i.e. every 1m) along each of the three 50m transects record whether the appropriate life form (grass, shrub, other) intersects that point. Note, multiple 'hits' of any particular ground stratum type (e.g. multiple grasses) at a point count as ONE hit only for that type. Divide the total of 'hits' by the number of points measured along the three transects (i.e. 150). NOTE: Multiple transects are required to sufficiently encompass ground stratum cover heterogeneity.

Exotic plant cover: Exotic plant cover is measured as total FOLIAGE COVER (%) of all exotics in all strata. If the exotics are in the over-storey then measure using the same method as native over-storey cover (see above), if exotics are in the mid-storey then measure using the same method as native mid-storey cover (see above) and if exotics are in the ground stratum then measure using the same method as described for native ground stratum cover (grasses) (see above).

Other ground cover measures (litter, rock, bare ground, crypto cover): These variables are not needed for the *BioMetric* site condition assessment, however their inclusion in the field data sheets has been requested by some CMA officers. Cover of these attributes is expressed as a % and can be measured using the step point transect method: at 50 points (i.e. every 1m) along each of the three 50m transects record whether the appropriate attribute intersects that point. Divide the total of 'hits' by the number of points measured along the transects (i.e. 150).

Crown Separation Ratio transect tables - plot data sheet

Start a new sheet for each zone (Clearing, Offset or Incentive proposals) or Reference Site

BioMetric

PLOT TYPE: (circle one) **Clearing / Offset / Incentive /Reference**

Linked zones (list type/s & nos.)

CMA | **Recorder/s** | **Date**

Site location & description:

PVP Request No. (from *PADACS*)

Veg Zone No. (from *NVAT Mapper*)

Vegetation type (*BioMetric)*

Crown Separation Ratio transect tables (for methodology details see over and refer to Appendix 4 of *BioMetric* Operational Manual. Record stratum (o/s, m/s, g/s(g), g/s(s) or g/s(o). Use consistent units within each plot, i.e. m OR cm. Use cm for ground stratum. Circle units used.)

PLOT No. ______ STRATUM ________	1	2	3	4	5	6	7	8	9	10	11	12	Mean
Crown width (m? OR cm?)													
Crown Separation/Gap (m? OR cm?)													
Crown type/ Degree of openness (%)													

Calculations:
CSR = mean Gap/mean Crown width = _________ m? or cm?
Crown Cover (CC) = 80.6/(1+CSR) = _______ %
Foliage Cover = CC (%) x mean Crown type (%)/100= ________ %. Enter this value into *BioMetric* for correct stratum within appropriate plot.

PLOT No. ______ STRATUM ________	1	2	3	4	5	6	7	8	9	10	11	12	Mean
Crown width (m? OR cm?)													
Crown Separation/Gap (m? OR cm?)													
Crown type/ Degree of openness (%)													

Calculations:
CSR = mean Gap/mean Crown width = _________ m? or cm?
Crown Cover (CC) = 80.6/(1+CSR) = _______ %
Foliage Cover = CC (%) x mean Crown type (%)/100= ________ %. Enter this value into *BioMetric* for correct stratum within appropriate plot.

PLOT No. ______ STRATUM ________	1	2	3	4	5	6	7	8	9	10	11	12	Mean
Crown width (m? OR cm?)													
Crown Separation/Gap (m? OR cm?)													
Crown type/ Degree of openness (%)													

Calculations:
CSR = mean Gap/mean Crown width = _________ m? or cm?
Crown Cover (CC) = 80.6/(1+CSR) = _______ %
Foliage Cover = CC (%) x mean Crown type (%)/100= ________ %. Enter this value into *BioMetric* for correct stratum within appropriate plot.

PLOT No. ______ STRATUM ________	1	2	3	4	5	6	7	8	9	10	11	12	Mean
Crown width (m? OR cm?)													
Crown Separation/Gap (m? OR cm?)													
Crown type/ Degree of openness (%)													

Calculations:
CSR = mean Gap/mean Crown width = _________ m? or cm?
Crown Cover (CC) = 80.6/(1+CSR) = _______ %
Foliage Cover = CC (%) x mean Crown type (%)/100= ________ %. Enter this value into *BioMetric* for correct stratum within appropriate plot.

PLOT No. ______ STRATUM ________	1	2	3	4	5	6	7	8	9	10	11	12	Mean
Crown width (m? OR cm?)													
Crown Separation/Gap (m? OR cm?)													
Crown type/ Degree of openness (%)													

Calculations:
CSR = mean Gap/mean Crown width = _________ m? or cm?
Crown Cover (CC) = 80.6/(1+CSR) = _______ %
Foliage Cover = CC (%) x mean Crown type (%)/100= ________ %. Enter this value into *BioMetric* for correct stratum within appropriate plot.

PLOT No. ______ STRATUM ________	1	2	3	4	5	6	7	8	9	10	11	12	Mean
Crown width (m? OR cm?)													
Crown Separation/Gap (m? OR cm?)													
Crown type/ Degree of openness (%)													

Calculations:

CSR = mean Gap/mean Crown width = _________ m? or cm?
Crown Cover (CC) = 80.6/(1+CSR) = _______ %
Foliage Cover = CC (%) x mean Crown type (%)/100= ________ %. Enter this value into *BioMetric* for correct stratum within appropriate plot.

PLOT No. ______ STRATUM ________	1	2	3	4	5	6	7	8	9	10	11	12	Mean
Crown width (m? OR cm?)													
Crown Separation/Gap (m? OR cm?)													
Crown type/ Degree of openness (%)													

Calculations:

CSR = mean Gap/mean Crown width = _________ m? or cm?
Crown Cover (CC) = 80.6/(1+CSR) = _______ %
Foliage Cover = CC (%) x mean Crown type (%)/100= ________ %. Enter this value into *BioMetric* for correct stratum within appropriate plot.

PLOT No. ______ STRATUM ________	1	2	3	4	5	6	7	8	9	10	11	12	Mean
Crown width (m? OR cm?)													
Crown Separation/Gap (m? OR cm?)													
Crown type/ Degree of openness (%)													

Calculations:

CSR = mean Gap/mean Crown width = _________ m? or cm?
Crown Cover (CC) = 80.6/(1+CSR) = _______ %
Foliage Cover = CC (%) x mean Crown type (%)/100= ________ %. Enter this value into *BioMetric* for correct stratum within appropriate plot.

PLOT No. ______ STRATUM ________	1	2	3	4	5	6	7	8	9	10	11	12	Mean
Crown width (m? OR cm?)													
Crown Separation/Gap (m? OR cm?)													
Crown type/ Degree of openness (%)													

Calculations:

CSR = mean Gap/mean Crown width = _________ m? or cm?
Crown Cover (CC) = 80.6/(1+CSR) = _______ %
Foliage Cover = CC (%) x mean Crown type (%)/100= ________ %. Enter this value into *BioMetric* for correct stratum within appropriate plot.

PLOT No. ______ STRATUM ________	1	2	3	4	5	6	7	8	9	10	11	12	Mean
Crown width (m? OR cm?)													
Crown Separation/Gap (m? OR cm?)													
Crown type/ Degree of openness (%)													

Calculations:

CSR = mean Gap/mean Crown width = _________ m? or cm?
Crown Cover (CC) = 80.6/(1+CSR) = _______ %
Foliage Cover = CC (%) x mean Crown type (%)/100= ________ %. Enter this value into *BioMetric* for correct stratum within appropriate plot.

Crown Separation Ratio transect methodology details (As per Appendix 4 of *BioMetric* Operational Manual.)

Native over-storey cover, native mid-storey cover and native ground stratum cover are all estimated as FOLIAGE COVER (%), which is equivalent to the amount of shadow that would be cast on the ground if there were a light source directly overhead. The Crown Separation Ratio (CSR) method is the preferred (most replicable) method for assessing native over-storey cover and native mid-storey cover (%). It can also be used to assess native ground stratum cover (%). CSR is assessed separately for each stratum, as per method below.

1. Sample along a zig-zag transect as shown, following the 50m transect down the centre of the 50x20m plot (shown as PQ). Start at the crown closest to P (the transect beginning at the plot baseline) and select the next crown encountered going *towards* or *across* the transect line and in the direct P → Q.

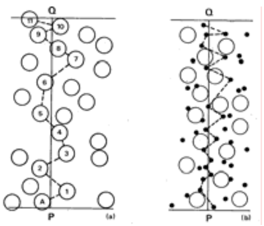


Figure. The zig-zag procedure is used for each stratum of layer, for example (a) for the over-storey and (b) for the mid-storey (Walker and Hopkins 1998).

2. For each stratum, and irrespective of species, measure:
    a. crown widths (m)
    b. crown gaps (m), and
    c. crown type (degree of openness, %), by matching the photographs in Figure 3 with the actual tree or shrub crowns.
    - In the field, a mean of 12 measurements (i.e. 12 widths and 12 gaps) is usually sufficient. Note, in more open vegetation types the transect PQ will be significantly longer than 50m.
    - Where crown overlap occurs, the crown gap has a negative value. The greater the overlap, the more negative the value. For example, for two crowns that overlap by 3m, the gap is -3.
3. Manually calculate CSR, Crown Cover (CC) and Foliage Cover (%) as per formulae provided.
4. Enter FC% into *BioMetric* for the appropriate zone and plot.

Disturbance attributes and history record – plot data sheet

BioMetric

Start a new sheet for each new Offset or Incentive proposal

PVP Request No. (from *PADACS*)_____ **Date**_____

CMA _____ **Recorder/s**_____

Disturbance attributes & history (Record Severity, Frequency, Evidence and Age codes for each plot, e.g. **L| Occ | Ob | R** . See over for details).

	Plot No.									
Zone No. ____	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Canopy dieback	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Grazing and trampling	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Soil disturbance	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Timber harvesting	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Flood damage	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Storm damage	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Firewood collection & tidying up	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Dense regrowth post-disturbance	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Fertiliser addition	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Fire damage	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Feral herbivores	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Weeds	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Other - indicate type: _____	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |

Notes (Record details of plot modification types – see over for examples).

Modification type	Plot #	Details

	Plot No.									
Zone No. ____	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Canopy dieback	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Grazing and trampling	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Soil disturbance	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Timber harvesting	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Flood damage	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Storm damage	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Firewood collection & tidying up	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Dense regrowth post-disturbance	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Fertiliser addition	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Fire damage	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Feral herbivores	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Weeds	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Other - indicate type: _____	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |

Notes (Record details of plot modification types – see over for examples).

Modification type	Plot #	Details

Plot No.										
Zone No. ____	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Canopy dieback	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Grazing and trampling	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Soil disturbance	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Timber harvesting	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Flood damage	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Storm damage	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Firewood collection & tidying up	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Dense regrowth post-disturbance	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Fertiliser addition	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Fire damage	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Feral herbivores	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Weeds	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Other - indicate type: _____	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |

Notes (Record details of plot modification types – see over for examples).

Modification type	Plot #	Details

Disturbance attributes & history record - Scoring codes and Notes table

Severity codes	Frequency codes	Evidence codes	Age codes
N = Nil (no evidence)	A = Absent (i.e. n/a)	O = Observation	On = Ongoing
L = Light	Ra = Rare	W = Word of mouth (e.g. landholder)	R = Recent (<3 years)
M = Moderate	Occ = Occasional		NR = Not recent
S = Severe	F = Frequent		O = Old

Notes tables Record details of modification type/s, e.g.

- Timber harvesting = stumps, coppicing, cut logs, ringbarking etc.
- Grazing & trampling = grazing and trampling by introduced herbivores or over-abundant native herbivores.
- Soil disturbance = ripping, cultivation, compaction, erosion.
- Fire damage – indicate if high frequency, or if certain strata particularly affected.
- Feral animals – indicate species (if known) and observed impacts.

Predicting future condition of offset and incentive zones - use of disturbance attributes and history information.
For each offset or incentive zone the assessor predicts the future condition of the ten site condition variables based on the proposed management action/s. Assessors will need to advise landholders of the technical feasibility of achieving the various desirable transitions from the starting state for each zone. This is where the basic information collected in the Disturbance attributes and history record tables for each zone will be useful. This summary of past and present disturbance pressures needs to be considered by the assessor in conjunction with the 'Current' zone condition for each variable, along with the proposed management actions for that zone. This combination of information will assist with best prediction of the likely trajectory of zone vegetation condition (hopefully, but not necessarily towards recovery). Ideally it will clarify which management actions are unlikely to produce the desired outcomes, and which are not, based on the suite of negative pressure/s impacting on the zone. Thus it will inform the prediction of potential future condition, determination of realistic restoration goals, timeframes and an adaptive management strategy for zones depending on their starting state.

Setting clear goals and objectives is fundamental to the achievement of improved vegetation condition and thus biodiversity. It requires a clear understanding of the Current state, the future Desired state and deciding how to make the transition from the former to the latter. It requires the recognition that not all management actions will help an area transition into an alternative and more desirable stable state.

The broad restoration goal for each zone should be established with reference to the ecological and technical feasibility of achieving the transitions required. Ecologically, desirable transitions maintain or improve the condition of a site in relation to benchmark condition, while non-desirable transitions are those that result in the degradation or loss of ecological condition.

Proposed management actions can advance the score for each variable by increments of 0.5, recognising that not all management actions will result in whole point score improvements. Predicted score improvements need to reflect the slow rate at which restoration occurs and the inherent risk associated with achieving biodiversity outcomes in the long-term. In most circumstances the score for a variable should only be advanced by 0.5 or 1, to reflect this uncertainty regarding the efficacy of many management actions, and the 'single human lifespan' timeframe over which improvements to site condition are scored (this timeframe was chosen based on the lack of ecological knowledge over restoration of native ecosystems over longer timeframes, and hence the need for a precautionary approach). Movements of scores by greater amounts (e.g. two increments) should be limited to selected variables and management actions that have a low risk of failure (see Appendix 5 of the *BioMetric* Operational Manual for details and conditions needed to obtain larger score increases).

***BioMetric* plot work sheets:** **Full species IDs are not required for *BioMetric*, but may be useful for identification of correct vegetation type & for monitoring purposes.**

Site type: Clearing zone / Offset zone / Incentive zone / Reference site **PVP Request No. & Zone No. OR Ref. site ID:**_____ **Date** _____ **Recorder/s** _____

Veg type: _____ **AMG (Zone/Easting Northing) OR Lat/Long (dec. degrees):** _____ **Photos:** _____

Native OVER_STOREY species list [20x20m plot]	**Regen (√) [zone]**	**Native MID-STOREY species list (>1m to <over-storey) [20x20m plot]**	**Native GROUND STRATUM COVER (GRASSES) species list (ground stratum <~1m) [20x20m plot]**	**Native GROUND STRATUM COVER (SHRUBS) species list (ground stratum <~1m) [20x20m plot]**	**Native GROUND STRATUM COVER (OTHER) species list* (ground stratum <~1m) [20x20m plot]**	**EXOTIC plants species list [20x20m plot]**	**FALLEN LOGS (min. 10cm diam x 50cm long [20x50m plot]**
Total no. species =							
Foliage Cover (FC, %) =							
Benchmark FC value (%) =							
av. crown diam. =							
av. Foliage Cover (%) =							
# trees =							
sample area =							
[whole of zone]							
# trees with HOLLOWS =							
sample area =		Total no. species =	Total no. species =	Total no. species =	Total no. species =	Total no. species =	
Benchmark value =		Foliage Cover (%) =	Foliage Cover (%) =	Foliage Cover (%) =	Foliage Cover (%) =	Foliage Cover (%) =	Total (m) =
[20x50m plot or whole zone]		Benchmark FC value (%) =	Benchmark FC value (%) =	Benchmark FC value (%) =	Benchmark FC value (%) =	Benchmark FC value (%) =	Benchmark (m) =

***** = **forbs, herbs, ferns, lilies, rushes, sedges etc.**

N.B. Plots should be placed randomly with a minimum of one plot and a maximum of ten plots within a zone.

Site & Other Notes:

***BioMetric* plot work sheets:** **Full species IDs are not required for *BioMetric*, but may be useful for identification of correct vegetation type & for monitoring purposes.**

Site type: Clearing zone / Offset zone / Incentive zone / Reference site **PVP Request No. & Zone No. OR Ref. site ID:**_____ **Date** _____ **Recorder/s** _____

Veg type: _____ **AMG (Zone/Easting Northing) OR Lat/Long (dec. degrees):** _____ **Photos:** _____

Native OVER_STOREY species list [20x20m plot]	**Regen (√) [zone]**	**Native MID-STOREY species list (>1m to <over-storey) [20x20m plot]**	**Native GROUND STRATUM COVER (GRASSES) species list (ground stratum <~1m) [20x20m plot]**	**Native GROUND STRATUM COVER (SHRUBS) species list (ground stratum <~1m) [20x20m plot]**	**Native GROUND STRATUM COVER (OTHER) species list* (ground stratum <~1m) [20x20m plot]**	**EXOTIC plants species list [20x20m plot]**	**FALLEN LOGS (min. 10cm diam x 50cm long [20x50m plot]**
Total no. species =							
Foliage Cover (FC, %) =							
Benchmark FC value (%) =							
av. crown diam. =							
av. Foliage Cover (%) =							
# trees =							
sample area =							
[whole of zone]							
# trees with HOLLOWS =							
sample area =		Total no. species =	Total no. species =	Total no. species =	Total no. species =	Total no. species =	
Benchmark value =		Foliage Cover (%) =	Foliage Cover (%) =	Foliage Cover (%) =	Foliage Cover (%) =	Foliage Cover (%) =	Total (m) =
[20x50m plot or whole zone]		Benchmark FC value (%) =	Benchmark FC value (%) =	Benchmark FC value (%) =	Benchmark FC value (%) =	Benchmark FC value (%) =	Benchmark (m) =

***** = **forbs, herbs, ferns, lilies, rushes, sedges etc.**

N.B. Plots should be placed randomly with a minimum of one plot and a maximum of ten plots within a zone.

Site & Other Notes:

***BioMetric* & Threatened Species Tool SCATTERED TREE plot work sheets:** **Full species IDs are not required for *BioMetric*, but may be useful for identification of correct vegetation type & for monitoring purposes.**

Site type: Clearing zone / Offset zone / Incentive zone / Reference site **PVP Request No. & Zone No. OR Ref. site ID:**_____

AMG (Zone/Easting Northing) OR Lat/Long (dec. degrees): _____ **Date** _____

Recorder/s _____ **Veg Type:** _____ **Photos:** _____

Tree No.	Species	DBHOB (cm)	Crown Diameter (m)	Foliage Cover (%)	Hollows (cm) size in 5cm increments	Mistletoe
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
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36						
37						
38						
39						
40						
41						
42						
43						
44						
45						
46						
47						
48						
49						
50						

No. trees: _____ **Av. Foliage Cover (%):** _____

No. trees with hollows: _____ **Av. no. hollow-bearing trees:** _____
(per 50x20m plot)

Sample area ID: _____ **Sample area (ha):** _____

Notes:

***BioMetric* & Threatened Species Tool SCATTERED TREE plot work sheets:** **Full species IDs are not required for *BioMetric*, but may be useful for identification of correct vegetation type & for monitoring purposes.**

Site type: Clearing zone / Offset zone / Incentive zone / Reference site **PVP Request No. & Zone No. OR Ref. site ID:**_____

AMG (Zone/Easting Northing) OR Lat/Long (dec. degrees): _____ **Date** _____

Recorder/s _____ **Veg Type:** _____ **Photos:** _____

Tree No.	Species	DBHOB (cm)	Crown Diameter (m)	Foliage Cover (%)	Hollows (cm) size in 5cm increments	Mistletoe
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
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40						
41						
42						
43						
44						
45						
46						
47						
48						
49						
50						

No. trees: _____ **Av. Foliage Cover (%):** _____

No. trees with hollows: _____ **Av. no. hollow-bearing trees:** _____
(per 50x20m plot)

Sample area ID: _____ **Sample area (ha):** _____

Notes

Field Data Sheets for

BioMetric (Version 3.1)

Thinning proposal package

Updated September 2010

Refer to *BioMetric* Operational Manual for detailed data collection methodologies.

Includes:

- Site Value (stem density) - plot data sheet (up to 10 plots per thinning zone or stem density reference site)
- Site Value (reference sites) - plot data sheet (up to 10 plots per reference site)
- Step point transect tally tables – plot data sheet
- Crown Separation Ratio transect tables – plot data sheet
- Disturbance attributes and history record – plot data sheet
- Plot work sheet
- Scattered tree plot work sheet

Thinning assessment
Field Data Sheet – Definitions and Descriptions*

Refer to* BioMetric *Operational Manual for more complete explanation and instructions.

Zones
The clearing proposal must be divided into relatively homogenous or discrete zones for assessment. Each zone should represent a distinct vegetation type (according to the vegetation types provided in *BioMetric*) and broad condition state (note that vegetation in low condition must always form a separate zone to vegetation not in low condition). Zones within proposals do not need to be continuous (i.e. a single zone could occupy two or more discrete areas). Each zone must be >0.25ha in area (equivalent to 50mx50m). These zones should be digitized and labelled using the *NVAT Mapper*, and zone names and areas are autopopulated into *BioMetric*. Version 3.1 of *BioMetric* can deal with an unlimited number of zones.

Environmental Outcomes Assessment Methodology
2010

5.4 Assessing thinning to benchmark stem densities
Thinning means ecological thinning, where:

- Individual trees or shrubs are removed to benchmark stem densities or greater, with no disturbance to native groundcover, soil and non-target plants (for example, chemical treatment of individual plants, ringbarking) or minimal disturbance to native groundcover, soil and non-target plants (for example, grubbing), and
- No more than 80% of the area of each vegetation zone is thinned, and
- Stems greater than 30cm diameter at breast height over bark (dbhob) are not removed.

Ecological thinning is the removal of individual trees or shrubs that are above benchmark stem densities. The purpose of ecological thinning is to reduce competition between the trees or shrubs to allow growth and maturation of the remaining trees and shrubs, and growth of groundcover. Ecological thinning also allows natural regeneration and growth of these and other native species (including native groundcover), thus improving or maintaining vegetation composition and structure.

For the purpose of this methodology:

- thinning means ecological thinning to improve or maintain environmental outcomes, and
- stem diameter classes are determined by measuring the dbhob. The stem diameter class of multi-stemmed trees or shrubs is the stem of the tree or shrub with the largest dbhob.

In coastal Catchment Management Authorities, this Chapter Section only applies to species of the genera listed in the coastal thinning genera database (below) in vegetation types in the following Vegetation Formations (Keith 2004):

- Wet Sclerophyll Forests (grassy subformation); and
- Wet Sclerophyll Forests (shrubby subformation); and
- Grassy Woodlands; and
- Dry Sclerophyll Forests (grassy subformation); and
- Dry Sclerophyll Forests (shrubby subformation).

Thinning in non-coastal Catchment Management Authorities is not restricted by genus.

Table 5.8 Coastal Thinning Genera Database.

Genus	Maximum dbhob that may be thinned
Eucalyptus	30
Corymbia	30
Angophora	30
Melaleuca	20
Casuarina	20
Allocasuarina	20
Callitris	20
Acacia	20

5.4.1 The improve or maintain test
Thinning improves or maintains environmental outcomes—and does not require offsets—if, and only if, in relation to each vegetation zone:

- The purpose of the thinning is for ecological reasons; and
- The area over which thinning takes place is no more than 80% of the area of the zone; and
- The number of stems to be retained in each stem diameter class for the vegetation type is greater than or equal to the benchmark stem density for the stem diameter class for the vegetation type; and
- Stems greater than 30cm DBHOB (stem diameter at breast height, i.e. at 1.3m above the ground, measured over bark) are not removed; and
- Thinning is undertaken by removing individual trees and shrubs with no or minimal disturbance to native groundcover, soil and non-target plants (e.g. by means such as chemical treatment of individual plants, ringbarking or grubbing); and
- Within riparian buffer distances (see *BioMetric* Operational Manual, Appendix 6) thinning is only undertaken by removing individual trees and shrubs with no disturbance to native groundcover, soil and non-target plants; and
- The number of stems retained for each diameter class are retained at that density on each one hectare of the proposal area; and
- Thinning is not undertaken in patches of less than one hectare in area that are not linked to adjoining vegetation.

The purpose of ecological thinning is to reduce competition between trees or shrubs to allow growth and maturation of the remaining trees and shrubs, and growth of groundcover. Ecological thinning aims to improve and subsequently maintain vegetation composition and structure, by returning vegetation towards benchmark condition for all vegetation condition attributes.

5.4.2 The Assessment
Thinning proposals are assessed as follows:

1. Different vegetation types must be assessed separately. If the area proposed to be thinned contains more than one vegetation type the proposal must be divided into vegetation zones each comprising a relatively homogenous vegetation type. Vegetation types with different stem density benchmarks, and vegetation with different starting stem densities (i.e. current broad condition states) must be assessed as separate zones. Each zone must be separately assessed.

2. Determine if riparian areas are present in the zone/s to be thinned. This is done by running the Water Quality Tool, buffers will be placed around the riparian areas and drawn onto the map that will be provided with the PVP. If riparian areas exist, tick the box. This will limit the type of thinning that may be undertaken in these areas – no disturbance to groundcover, soil and non-target plants.

3. Establish 50x20m (0.1ha) assessment plots randomly in each zone every two hectares, with a maximum of 10 plots per vegetation zone. Alternatively, plotless methods of assessing stem numbers in each stem diameter class, such as nearest neighbour techniques, can be used, however the *BioMetric* tool is not currently set up to accept data in this format and data collected must be converted to stems per 0.1ha.

In relation to each plot the stems must be classified into one of the following stem diameter classes: 0-10 cm, 11-20 cm, and 21-30 cm dbh.

4. Record the number of stems in each specified stem diameter (DBHOB) class and transcribed into the Plot tab for the corresponding zone. Methods for assessing stem numbers in the field are described in Appendix 4.

5. Record whether two or more stem diameter classes (≤30cm DBHOB) are in the same age cohort. If so, combined counts of stem numbers can be assessed in the assessment plots. Ideally, record counts separately for each DBHOB class in the field, and combine data (if relevant) within *BioMetric.*

6. Benchmark stem counts are also required. Reference sites must:

    - comprise the same vegetation community and be located in the same region as the vegetation zone being assessed;
    - contain vegetation in relatively unmodified condition; and
    - be measured as near in time to the vegetation zones being assessed so as to allow seasonal variation in condition to be taken into account.

Site Value (stem density) – plot data sheet

BioMetric

Start a new page for each zone (Thinning proposals) or Stem density Reference site

PLOT TYPE: (circle one) **Thinning zone / Stem density reference site**

CMA | **Recorder/s** | **Date**

PVP Request No. (from *PADACS*), **Zone No.** (from *NVAT Mapper*) **& Zone Area**	PVP Request No.	Veg. Zone No.	Area (ha)

OR

Ref site ID (assigned by assessor)

Vegetation Formation (*sensu* Keith 2004)

Vegetation Class (*sensu* Keith 2004)

Vegetation Type (*BioMetric*)

Dominant species in strata (See below for strata definitions)

Over-storey	Mid-storey	Ground stratum

PLOT 1 Lat.	Long.	PLOT 2 Lat.	Long.	PLOT 3 Lat.	Long.	PLOT 4 Lat.	Long.	PLOT 5 Lat.	Long.
Orientation	**Photos**	**Orientation**	**Photos**	**Orientation**	**Photos**	**Orientation**	**Photos**	**Orientation**	**Photos**

PLOT 6 Lat.	Long.	PLOT 7 Lat.	Long.	PLOT 8 Lat.	Long.	PLOT 9 Lat.	Long.	Plot 10 Lat.	Long.
Orientation	**Photos**	**Orientation**	**Photos**	**Orientation**	**Photos**	**Orientation**	**Photos**	**Orientation**	**Photos**

Plot No.	1	2	3	4	5	6	7	8	9	10
>0 to 10 (cm) DBHOB class:										
>10 to 20 (cm) DBHOB class:										
>20 to 30 (cm) DBHOB class:										
>30 (cm) DBHOB class - recommended:										

20m x 50m plot (Thinning assessments for PVPs do not have to be plot-based, but plots must be used on Reference Sites. DBHOB = diameter at breast height (1.3m above ground level), measured over bark. See below for methods.)

Strata definitions:

- Native over-storey refers to all native life-forms in the tallest dominant stratum (including emergents) present above 1m and includes all species native to Australia (i.e. native species not local to the area can contribute to over-storey structure). For example, in a woodland community the over-storey stratum is the tree layer, in a shrubland community the over-storey stratum is the tallest shrub layer above 1m; in a wetland or swamp the over-storey stratum may comprise sedges, rushes or bulrushes; and in a tall grassland there may be an over-storey stratum of grasses >1m high. Some vegetation types (e.g. low grasslands) may not have an over-storey stratum.
- The mid-storey contains all native life-forms between the over-storey stratum and 1m in height (typically tall shrubs, under-storey trees and regeneration of over-storey species) and includes all species native to Australia (i.e. native species not local to the area can contribute to mid-storey structure). Some vegetation types (e.g. grasslands) may not have a mid-storey stratum.
- The ground stratum contains all native life-forms below 1m in height and includes all species native to Australia (i.e. is not confined to species indigenous to the area). The ground stratum (grasses) refers to native grasses (i.e. plants belonging to the family Poaceae). Ground stratum (shrubs) refers to native woody vegetation <1m. Ground stratum (other) refers to non-woody native vegetation (vascular plants only) <1m that is not grass (e.g. forbs, herbs, ferns, lilies, rushes and sedges).

Site Value methodology prompt: (as per Appendix 4 of *BioMetric* Operational Manual)

- Number of stems in three specified DBHOB classes: COUNT of the number of stems of over-storey tree species in each DBHOB class. Record only those trees in which the centre of the stem is within the plot. Record only the largest stem for multi-stemmed trees. **N.B. stems >30cm DBHOB cannot be thinned.**
- Thinning assessments can be plot-based (as above) or may comprise visual comparison between assessment sites and benchmark densities and stem spacings (the latter are calculated by *BioMetric*).

Selecting Reference sites for collecting stem density benchmarks:

- See Appendix 1 in the *BioMetric* Operational Manual for information on how to select reference sites for collecting stem density (and vegetation condition) benchmarks. The number of over-storey species stems needs to be recorded for each DBHOB range. Record species information in *BioMetric* plot work sheets and/or *BioMetric* & Threatened Species Tool SCATTERED TREE plot work sheets. Record, species ids and the relative abundance of each species
- N.B. Use Site Value (reference sites) - plot data sheet to record plot disturbance attributes & history data.

Please fax or email completed Reference Site sheets to: Dani Murphy or James Crooks, Native Vegetation Science Unit, NSW DECCW. Fax (02) 6229 7001 Email: biometric.tool@environment.nsw.gov.au . Thank you.

Site Value (stem density) – plot data sheet

BioMetric

Start a new page for each zone (Thinning proposals) or Stem density Reference site

PLOT TYPE: (circle one) **Thinning zone / Stem density reference site**

CMA | **Recorder/s** | **Date**

PVP Request No. (from *PADACS*), **Zone No.** (from *NVAT Mapper*) **& Zone Area**	**PVP Request No.**	**Veg. Zone No.**	**Area (ha)**

OR **Ref site ID** (assigned by assessor)

Vegetation Formation (*sensu* Keith 2004)

Vegetation Class (*sensu* Keith 2004)

Vegetation Type (*BioMetric*)

Dominant species in strata (See below for strata definitions)

Over-storey	Mid-storey	Ground stratum

PLOT 1 Lat.	Long.
Orientation	**Photos**

PLOT 2 Lat.	Long.
Orientation	**Photos**

PLOT 3 Lat.	Long.
Orientation	**Photos**

PLOT 4 Lat.	Long.
Orientation	**Photos**

PLOT 5 Lat.	Long.
Orientation	**Photos**

PLOT 6 Lat.	Long.
Orientation	**Photos**

PLOT 7 Lat.	Long.
Orientation	**Photos**

PLOT 8 Lat.	Long.
Orientation	**Photos**

PLOT 9 Lat.	Long.
Orientation	**Photos**

Plot 10 Lat.	Long.
Orientation	**Photos**

Plot No.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
>0 to 10 (cm) DBHOB class:										
>10 to 20 (cm) DBHOB class:										
>20 to 30 (cm) DBHOB class:										
>30 (cm) DBHOB class - recommended:										

20m x 50m plot (Thinning assessments for PVPs do not have to be plot-based, but plots must be used on Reference Sites. DBHOB = diameter at breast height (1.3m above ground level), measured over bark. See below for methods.)

Strata definitions:

- Native over-storey refers to all native life-forms in the tallest dominant stratum (including emergents) present above 1m and includes all species native to Australia (i.e. native species not local to the area can contribute to over-storey structure). For example, in a woodland community the over-storey stratum is the tree layer, in a shrubland community the over-storey stratum is the tallest shrub layer above 1m; in a wetland or swamp the over-storey stratum may comprise sedges, rushes or bulrushes; and in a tall grassland there may be an over-storey stratum of grasses >1m high. Some vegetation types (e.g. low grasslands) may not have an over-storey stratum.
- The mid-storey contains all native life-forms between the over-storey stratum and 1m in height (typically tall shrubs, under-storey trees and regeneration of over-storey species) and includes all species native to Australia (i.e. native species not local to the area can contribute to mid-storey structure). Some vegetation types (e.g. grasslands) may not have a mid-storey stratum.
- The ground stratum contains all native life-forms below 1m in height and includes all species native to Australia (i.e. is not confined to species indigenous to the area). The ground stratum (grasses) refers to native grasses (i.e. plants belonging to the family Poaceae). Ground stratum (shrubs) refers to native woody vegetation <1m. Ground stratum (other) refers to non-woody native vegetation (vascular plants only) <1m that is not grass (e.g. forbs, herbs, ferns, lilies, rushes and sedges).

Site Value methodology prompt: (as per Appendix 4 of *BioMetric* Operational Manual)

- Number of stems in three specified DBHOB classes: COUNT of the number of stems of over-storey tree species in each DBHOB class. Record only those trees in which the centre of the stem is within the plot. Record only the largest stem for multi-stemmed trees. **N.B. stems >30cm DBHOB cannot be thinned.**
- Thinning assessments can be plot-based (as above) or may comprise visual comparison between assessment sites and benchmark densities and stem spacings (the latter are calculated by *BioMetric*).

Selecting Reference sites for collecting stem density benchmarks:

- See Appendix 1 in the *BioMetric* Operational Manual for information on how to select reference sites for collecting stem density (and vegetation condition) benchmarks. The number of over-storey species stems needs to be recorded for each DBHOB range. Record species information in *BioMetric* plot work sheets and/or *BioMetric* & Threatened Species Tool SCATTERED TREE plot work sheets. Record, species ids and the relative abundance of each species
- N.B. Use Site Value (reference sites) - plot data sheet to record plot disturbance attributes & history data.

Please fax or email completed Reference Site sheets to: Dani Murphy or James Crooks, Native Vegetation Science Unit, NSW DECCW. Fax (02) 6229 7001 Email: biometric.tool@environment.nsw.gov.au . Thank you.

Site Value (reference sites) - plot data sheet

Start a new sheet for each Reference site (see **Tips for selecting Reference sites & plots**…P.T.O.)

BioMetric

Ref site ID (assigned by assessor)		**CMA**		**Recorder/s**		**Date**	

Vegetation Formation (*sensu* Keith 2004)

Vegetation Class (*sensu* Keith 2004)

Vegetation Type (*BioMetric)*

Dominant species per stratum (P.T.O. for strata definitions)

Over-storey	Mid-storey	Ground stratum

PLOT 1 Lat.	Long.
Orientation	**Photos**

PLOT 2 Lat.	Long.
Orientation	**Photos**

PLOT 3 Lat.	Long.
Orientation	**Photos**

PLOT 4 Lat.	Long.
Orientation	**Photos**

PLOT 5 Lat.	Long.
Orientation	**Photos**

PLOT 6 Lat.	Long.
Orientation	**Photos**

PLOT 7 Lat.	Long.
Orientation	**Photos**

PLOT 8 Lat.	Long.
Orientation	**Photos**

PLOT 9 Lat.	Long.
Orientation	**Photos**

Plot 10 Lat.	Long.
Orientation	**Photos**

Disturbance attributes & history (Record Severity, Frequency, Evidence and Age codes for each plot, e.g. **L| Occ | Ob | R** . See over for details).

Plot No.	1	2	3	4	5	6	7	8	9	10
Canopy dieback	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Grazing and trampling	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Soil disturbance	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Timber harvesting	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Flood damage	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Storm damage	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Firewood collection & tidying up	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Dense regrowth post-disturbance	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Fertiliser addition	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Fire damage	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Feral herbivores										
Weeds	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Other - indicate type: _____	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |

20m x 20m plot (Refer to methods in Appendix 4 of *BioMetric* Operational Manual. Step Point Transect or Crown Separation Ratio methods can also be used to assess Foliage Cover. CSR method is preferred for over-storey and mid-storey strata. See over).

Number of native plant species										
Native mid-storey cover (%)										
Native ground stratum cover (%)- grasses										
Native ground stratum cover (%) - shrubs										
Native ground stratum cover (%) - other										

Larger sampling area (20m x 50m plot) (Refer to methods in Appendix 4 of *BioMetric* Operational Manual.)

Number of trees with hollows – use Alternative method below if appropriate										
Total length of fallen logs (m)										

Alternative (whole-of-zone) methods for zones containing scattered trees, such as sparsely wooded reference sites. (Refer to methods in Appendix 7 of *BioMetric* Operational Manual. Scattered Tree Calculator in *BioMetric* can be used for calculations.)

Native over-storey cover (%)	av. crown diameter (m)= av. foliage cover (%) = # trees= sample area (ha)=									
No. trees with hollows	sample area (ha)= no. trees with hollows =									

Please fax or email completed sheets to: Dani Murphy or James Crooks, Native Vegetation Science Unit, NSW DECCW.
Fax (02) 6229 7001. Email: biometric.tool@environment.nsw.gov.au. Thank you.

Disturbance attributes & history record - Scoring codes and Notes table

- Timber harvesting = stumps, coppicing, cut logs, ringbarking etc. (use Notes table below to record details)
- Grazing & trampling = grazing and trampling by introduced herbivores or over-abundant native herbivores (use Notes table below)
- Soil disturbance = ripping, cultivation, compaction, erosion (use Notes table below)
- Fire damage – indicate if high frequency, or if certain strata particularly affected (use Notes table below)
- Feral animals – indicate species (if known) and observed impacts (use Notes table below)

Severity codes	Frequency codes	Evidence codes	Age codes
N = Nil (no evidence)	A = Absent (i.e. n/a)	O = Observation	On = Ongoing
L = Light	Ra = Rare	W = Word of mouth (e.g. landholder)	R = Recent (<3 years)
M = Moderate	Occ = Occasional		NR = Not recent
S = Severe	F = Frequent		O = Old

Notes

Modification type	Plot #	Details

Site Value methodology prompts (for full details refer to Appendix 4 of *BioMetric* Operational Manual)

- Plots should be placed randomly with a minimum of one plot and a maximum of ten plots within a zone.
- Number of native plant species: COUNT of all indigenous vascular plant species.
- Strata definitions: Native over-storey refers to all native life-forms in the tallest dominant stratum (including emergents) present above 1m and includes all species native to Australia (i.e. native species not local to the area can contribute to over-storey structure). For example, in a woodland community the over-storey stratum is the tree layer, in a shrubland community the over-storey stratum is the tallest shrub layer above 1m; in a wetland or swamp the over-storey stratum may comprise sedges, rushes or bulrushes; and in a tall grassland there may be an over-storey stratum of grasses >1m high. Some vegetation types (e.g. low grasslands) may not have an over-storey stratum. The mid-storey contains all native life-forms between the over-storey stratum and 1m in height (typically tall shrubs, under-storey trees and regeneration of over-storey species) and includes all species native to Australia (i.e. native species not local to the area can contribute to mid-storey structure). Some vegetation types (e.g. grasslands) may not have a mid-storey stratum. The ground stratum contains all native life-forms below 1m in height and includes all species native to Australia (i.e. is not confined to species indigenous to the area). The ground stratum (grasses) refers to native grasses (i.e. plants belonging to the family Poaceae). Ground stratum (shrubs) refers to native woody vegetation <1m. Ground stratum (other) refers to non-woody native vegetation (vascular plants only) <1m that is not grass (e.g. forbs, herbs, ferns, lilies, rushes and sedges).
- Cover estimates (native over-storey, mid-storey, ground cover - grasses, shrubs and other): Foliage Cover (FC, %) – as defined in *BioMetric* Operational Manual
- No. trees with hollows: hollow entrance must be AT LEAST 5cm diameter; hollows must have depth, and be >1m above the ground.
- Over-storey regeneration: proportion of species in over-storey exhibiting regeneration (≤5cm DBH, no height limits).
- Step point transect tallies: hits recorded every 5m for over-storey and mid-storey cover, and every 1m for ground stratum cover variables. Use three transects for each plot.

Selecting Reference sites for collecting vegetation condition benchmarks:

- See Appendix 1 in the Operational Manual for information on how to select reference sites for collecting vegetation condition benchmarks
- Stem density benchmarks can also be collected from Reference plots. The number of over-storey species stems need to be recorded for each DBH (diameter at breast height) class. Use "Site Value (stem density) – plot data sheet" to record stem density reference plot data.

Step point transect tally tables (for methodology details see above and refer to Appendix 4 of *BioMetric* Operational Manual.)

PLOT No. _____ TRANSECT No/s. _____	No. hits (tally)	%
Native over-storey cover (%)		
Native mid-storey cover (%)		
Native ground stratum cover (%) - grasses		
Native ground stratum cover (%) - shrubs		
Native ground stratum cover (%) - other		
Exotic plant cover (%)		
Litter cover (%) - optional		
Rock cover (%) - optional		
Bare ground cover (%) - optional		
Cryptogam cover (%) - optional		

Crown Separation Ratio transect tables (for methodology details refer to Appendix 4 of *BioMetric* Operational Manual. Record stratum (o/s, m/s, g/s(g), g/s(s) or g/s(o). Use consistent units within each plot, i.e. m OR cm. Use cm for ground stratum. Circle units used.)

PLOT No. _____ STRATUM _____	1	2	3	4	5	6	7	8	9	10	11	12	Mean
Crown width (m? OR cm?)													
Crown Separation/Gap (m? OR cm?)													
Crown type/ Degree of openness (%)													

Calculations:

CSR = mean Gap/mean Crown width = _____ m? or cm?

Crown Cover (CC) = 80.6/(1+CSR) = _____ %

Foliage Cover = CC (%) x mean Crown type (%)/100= _____ %. Enter this value into *BioMetric* for correct stratum within appropriate plot.

Step point transect tally tables - plot data sheet

Start a new sheet for each zone (Clearing, Offset or Incentive proposals) or Reference Site

BioMetric

PLOT TYPE: (circle one) **Clearing / Offset / Incentive /Reference**

Linked zones (list type/s & nos.)

CMA | **Recorder/s** | **Date**

Site location & description:

PVP Request No. (from *PADACS*)

Veg Zone No. (from *NVAT Mapper*)

Vegetation Type (*BioMetric*)

Step point transect tally tables (for methodology details see above and refer to Appendix 4 of *BioMetric* Operational Manual.)

PLOT No. _____ TRANSECT No/s. _____	No. hits (tally)	%
Native over-storey cover (%)		
Native mid-storey cover (%)		
Native ground stratum cover (%) - grasses		
Native ground stratum cover (%) - shrubs		
Native ground stratum cover (%) - other		
Exotic plant cover (%)		
Litter cover (%) - optional		
Rock cover (%) - optional		
Bare ground cover (%) - optional		
Cryptogam cover (%) - optional		

PLOT No. _____ TRANSECT No/s. _____	No. hits (tally)	%
Native over-storey cover (%)		
Native mid-storey cover (%)		
Native ground stratum cover (%) - grasses		
Native ground stratum cover (%) - shrubs		
Native ground stratum cover (%) - other		
Exotic plant cover (%)		
Litter cover (%) - optional		
Rock cover (%) - optional		
Bare ground cover (%) - optional		
Cryptogam cover (%) - optional		

PLOT No. _____ TRANSECT No/s. _____	No. hits (tally)	%
Native over-storey cover (%)		
Native mid-storey cover (%)		
Native ground stratum cover (%) - grasses		
Native ground stratum cover (%) - shrubs		
Native ground stratum cover (%) - other		
Exotic plant cover (%)		
Litter cover (%) - optional		
Rock cover (%) - optional		
Bare ground cover (%) - optional		
Cryptogam cover (%) - optional		

PLOT No. _____ TRANSECT No/s. _____	No. hits (tally)	%
Native over-storey cover (%)		
Native mid-storey cover (%)		
Native ground stratum cover (%) - grasses		
Native ground stratum cover (%) - shrubs		
Native ground stratum cover (%) - other		
Exotic plant cover (%)		
Litter cover (%) - optional		
Rock cover (%) - optional		
Bare ground cover (%) - optional		
Cryptogam cover (%) - optional		

PLOT No. _____ TRANSECT No/s. _____	No. hits (tally)	%
Native over-storey cover (%)		
Native mid-storey cover (%)		
Native ground stratum cover (%) - grasses		
Native ground stratum cover (%) - shrubs		
Native ground stratum cover (%) - other		
Exotic plant cover (%)		
Litter cover (%) - optional		
Rock cover (%) - optional		
Bare ground cover (%) - optional		
Cryptogam cover (%) - optional		

PLOT No. _____ TRANSECT No/s. _____	No. hits (tally)	%
Native over-storey cover (%)		
Native mid-storey cover (%)		
Native ground stratum cover (%) - grasses		
Native ground stratum cover (%) - shrubs		
Native ground stratum cover (%) - other		
Exotic plant cover (%)		
Litter cover (%) - optional		
Rock cover (%) - optional		
Bare ground cover (%) - optional		
Cryptogam cover (%) - optional		

PLOT No. _____ TRANSECT No/s. _____	No. hits (tally)	%
Native over-storey cover (%)		
Native mid-storey cover (%)		
Native ground stratum cover (%) - grasses		
Native ground stratum cover (%) - shrubs		
Native ground stratum cover (%) - other		
Exotic plant cover (%)		
Litter cover (%) - optional		
Rock cover (%) - optional		
Bare ground cover (%) - optional		
Cryptogam cover (%) - optional		

PLOT No. _____ TRANSECT No/s. _____	No. hits (tally)	%
Native over-storey cover (%)		
Native mid-storey cover (%)		
Native ground stratum cover (%) - grasses		
Native ground stratum cover (%) - shrubs		
Native ground stratum cover (%) - other		
Exotic plant cover (%)		
Litter cover (%) - optional		
Rock cover (%) - optional		
Bare ground cover (%) - optional		
Cryptogam cover (%) - optional		

Step point transect tally methodology details (As per Appendix 4 of *BioMetric* Operational Manual. * indicates that an alternative method is provided where tree density is very low (e.g. paddock trees)).

Native over-storey cover (*): FOLIAGE COVER of the over-storey is expressed as a % and can be measured using the step point transect method: at 10 points (i.e. every 5m) along each of the three 50m transects (see Figure 1, App. 4) estimate FOLIAGE COVER (%) directly overhead using the images provided in Figure 2 (App 4). Divide the total by the number of points (i.e. 30) measured along the transects (e.g. 50%, 0%, 0%, 40%,0%, 45%, 50%, 55%, 0%, 0%, 50%, 0%, 0%, 40%,0% ,45%, 50%, 55%, 0%, 0%, 50%, 0%, 0%, 40%,0%, 45%, 50%, 55%, 0%, 0% = 720/30 =24% foliage cover). NOTE: Multiple transects are required to sufficiently encompass over-storey heterogeneity.

Native mid-storey cover: Foliage cover of the mid-storey is expressed as a % and can be measured using the step point transect method: at 10 points (i.e. every 5m) along each of the three 50m transects estimate foliage cover (%) in the mid-storey. Divide the total by the number of points (i.e. 30) measured along the transect, as for native over-storey cover (above).

Native ground stratum cover (grasses, shrubs and other): Foliage cover of the ground stratum is expressed as a % and can be measured using the step point transect method: at 50 points (i.e. every 1m) along each of the three 50m transects record whether the appropriate life form (grass, shrub, other) intersects that point. Note, multiple 'hits' of any particular ground stratum type (e.g. multiple grasses) at a point count as ONE hit only for that type. Divide the total of 'hits' by the number of points measured along the three transects (i.e. 150). NOTE: Multiple transects are required to sufficiently encompass ground stratum cover heterogeneity.

Exotic plant cover: Exotic plant cover is measured as total FOLIAGE COVER (%) of all exotics in all strata. If the exotics are in the over-storey then measure using the same method as native over-storey cover (see above), if exotics are in the mid-storey then measure using the same method as native mid-storey cover (see above) and if exotics are in the ground stratum then measure using the same method as described for native ground stratum cover (grasses) (see above).

Other ground cover measures (litter, rock, bare ground, crypto cover): These variables are not needed for the *BioMetric* site condition assessment, however their inclusion in the field data sheets has been requested by some CMA officers. Cover of these attributes is expressed as a % and can be measured using the step point transect method: at 50 points (i.e. every 1m) along each of the three 50m transects record whether the appropriate attribute intersects that point. Divide the total of 'hits' by the number of points measured along the transects (i.e. 150).

Crown Separation Ratio transect tables - plot data sheet

Start a new sheet for each zone (Clearing, Offset or Incentive proposals) or Reference Site

BioMetric

PLOT TYPE: (circle one) **Clearing / Offset / Incentive /Reference**

Linked zones (list type/s & nos.)

CMA **Recorder/s** **Date**

Site location & description:

PVP Request No. (from *PADACS*)

Veg Zone No. (from *NVAT Mapper*)

Vegetation type (*BioMetric*)

Crown Separation Ratio transect tables (for methodology details see over and refer to Appendix 4 of *BioMetric* Operational Manual. Record stratum (o/s, m/s, g/s(g), g/s(s) or g/s(o). Use consistent units within each plot, i.e. m OR cm. Use cm for ground stratum. Circle units used.)

PLOT No. ______ STRATUM ________	1	2	3	4	5	6	7	8	9	10	11	12	Mean
Crown width (m? OR cm?)													
Crown Separation/Gap (m? OR cm?)													
Crown type/ Degree of openness (%)													

Calculations:

CSR = mean Gap/mean Crown width = _________ m? or cm?
Crown Cover (CC) = 80.6/(1+CSR) = _______ %
Foliage Cover = CC (%) x mean Crown type (%)/100= ________ %. Enter this value into *BioMetric* for correct stratum within appropriate plot.

PLOT No. ______ STRATUM ________	1	2	3	4	5	6	7	8	9	10	11	12	Mean
Crown width (m? OR cm?)													
Crown Separation/Gap (m? OR cm?)													
Crown type/ Degree of openness (%)													

Calculations:

CSR = mean Gap/mean Crown width = _________ m? or cm?
Crown Cover (CC) = 80.6/(1+CSR) = _______ %
Foliage Cover = CC (%) x mean Crown type (%)/100= ________ %. Enter this value into *BioMetric* for correct stratum within appropriate plot.

PLOT No. ______ STRATUM ________	1	2	3	4	5	6	7	8	9	10	11	12	Mean
Crown width (m? OR cm?)													
Crown Separation/Gap (m? OR cm?)													
Crown type/ Degree of openness (%)													

Calculations:

CSR = mean Gap/mean Crown width = _________ m? or cm?
Crown Cover (CC) = 80.6/(1+CSR) = _______ %
Foliage Cover = CC (%) x mean Crown type (%)/100= ________ %. Enter this value into *BioMetric* for correct stratum within appropriate plot.

PLOT No. ______ STRATUM ________	1	2	3	4	5	6	7	8	9	10	11	12	Mean
Crown width (m? OR cm?)													
Crown Separation/Gap (m? OR cm?)													
Crown type/ Degree of openness (%)													

Calculations:

CSR = mean Gap/mean Crown width = _________ m? or cm?
Crown Cover (CC) = 80.6/(1+CSR) = _______ %
Foliage Cover = CC (%) x mean Crown type (%)/100= ________ %. Enter this value into *BioMetric* for correct stratum within appropriate plot.

PLOT No. ______ STRATUM ________	1	2	3	4	5	6	7	8	9	10	11	12	Mean
Crown width (m? OR cm?)													
Crown Separation/Gap (m? OR cm?)													
Crown type/ Degree of openness (%)													

Calculations:

CSR = mean Gap/mean Crown width = _________ m? or cm?
Crown Cover (CC) = 80.6/(1+CSR) = _______ %
Foliage Cover = CC (%) x mean Crown type (%)/100= ________ %. Enter this value into *BioMetric* for correct stratum within appropriate plot.

PLOT No. ______ STRATUM ________	1	2	3	4	5	6	7	8	9	10	11	12	Mean
Crown width (m? OR cm?)													
Crown Separation/Gap (m? OR cm?)													
Crown type/ Degree of openness (%)													

Calculations:

CSR = mean Gap/mean Crown width = _________ m? or cm?
Crown Cover (CC) = 80.6/(1+CSR) = _______ %
Foliage Cover = CC (%) x mean Crown type (%)/100= ________ %. Enter this value into *BioMetric* for correct stratum within appropriate plot.

PLOT No. ______ STRATUM ________	1	2	3	4	5	6	7	8	9	10	11	12	Mean
Crown width (m? OR cm?)													
Crown Separation/Gap (m? OR cm?)													
Crown type/ Degree of openness (%)													

Calculations:

CSR = mean Gap/mean Crown width = _________ m? or cm?
Crown Cover (CC) = 80.6/(1+CSR) = _______ %
Foliage Cover = CC (%) x mean Crown type (%)/100= ________ %. Enter this value into *BioMetric* for correct stratum within appropriate plot.

PLOT No. ______ STRATUM ________	1	2	3	4	5	6	7	8	9	10	11	12	Mean
Crown width (m? OR cm?)													
Crown Separation/Gap (m? OR cm?)													
Crown type/ Degree of openness (%)													

Calculations:

CSR = mean Gap/mean Crown width = _________ m? or cm?
Crown Cover (CC) = 80.6/(1+CSR) = _______ %
Foliage Cover = CC (%) x mean Crown type (%)/100= ________ %. Enter this value into *BioMetric* for correct stratum within appropriate plot.

PLOT No. ______ STRATUM ________	1	2	3	4	5	6	7	8	9	10	11	12	Mean
Crown width (m? OR cm?)													
Crown Separation/Gap (m? OR cm?)													
Crown type/ Degree of openness (%)													

Calculations:

CSR = mean Gap/mean Crown width = _________ m? or cm?
Crown Cover (CC) = 80.6/(1+CSR) = _______ %
Foliage Cover = CC (%) x mean Crown type (%)/100= ________ %. Enter this value into *BioMetric* for correct stratum within appropriate plot.

PLOT No. ______ STRATUM ________	1	2	3	4	5	6	7	8	9	10	11	12	Mean
Crown width (m? OR cm?)													
Crown Separation/Gap (m? OR cm?)													
Crown type/ Degree of openness (%)													

Calculations:

CSR = mean Gap/mean Crown width = _________ m? or cm?
Crown Cover (CC) = 80.6/(1+CSR) = _______ %
Foliage Cover = CC (%) x mean Crown type (%)/100= ________ %. Enter this value into *BioMetric* for correct stratum within appropriate plot.

Crown Separation Ratio transect methodology details (As per Appendix 4 of *BioMetric* Operational Manual.)

Native over-storey cover, native mid-storey cover and native ground stratum cover are all estimated as FOLIAGE COVER (%), which is equivalent to the amount of shadow that would be cast on the ground if there were a light source directly overhead. The Crown Separation Ratio (CSR) method is the preferred (most replicable) method for assessing native over-storey cover and native mid-storey cover (%). It can also be used to assess native ground stratum cover (%). CSR is assessed separately for each stratum, as per method below.

1. Sample along a zig-zag transect as shown, following the 50m transect down the centre of the 50x20m plot (shown as PQ). Start at the crown closest to P (the transect beginning at the plot baseline) and select the next crown encountered going *towards* or *across* the transect line and in the direct P → Q.

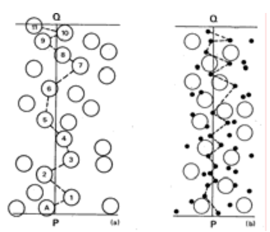

Figure. The zig-zag procedure is used for each stratum of layer, for example (a) for the over-storey and (b) for the mid-storey (Walker and Hopkins 1998).

2. For each stratum, and irrespective of species, measure:
   a. crown widths (m)
   b. crown gaps (m), and
   c. crown type (degree of openness, %), by matching the photographs in Figure 3 with the actual tree or shrub crowns.
- In the field, a mean of 12 measurements (i.e. 12 widths and 12 gaps) is usually sufficient. Note, in more open vegetation types the transect PQ will be significantly longer than 50m.
- Where crown overlap occurs, the crown gap has a negative value. The greater the overlap, the more negative the value. For example, for two crowns that overlap by 3m, the gap is -3.
3. Manually calculate CSR, Crown Cover (CC) and Foliage Cover (%) as per formulae provided.
4. Enter FC% into *BioMetric* for the appropriate zone and plot.

Disturbance attributes and history record – plot data sheet

BioMetric

Start a new sheet for each new Offset or Incentive proposal

PVP Request No. (from *PADACS*)_____ **Date**_____

CMA _____ **Recorder/s**_____

Disturbance attributes & history (Record Severity, Frequency, Evidence and Age codes for each plot, e.g. **L| Occ | Ob | R** . See over for details).

	Plot No.									
Zone No. _____	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Canopy dieback	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Grazing and trampling	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Soil disturbance	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Timber harvesting	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Flood damage	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Storm damage	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Firewood collection & tidying up	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Dense regrowth post-disturbance	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Fertiliser addition	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Fire damage	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Feral herbivores	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Weeds	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Other - indicate type: _____	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |

Notes (Record details of plot modification types – see over for examples).

Modification type	Plot #	Details

	Plot No.									
Zone No. _____	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Canopy dieback	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Grazing and trampling	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Soil disturbance	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Timber harvesting	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Flood damage	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Storm damage	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Firewood collection & tidying up	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Dense regrowth post-disturbance	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Fertiliser addition	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Fire damage	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Feral herbivores	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Weeds	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Other - indicate type: _____	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |

Notes (Record details of plot modification types – see over for examples).

Modification type	Plot #	Details

Plot No.										
Zone No. ____	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Canopy dieback	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Grazing and trampling	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Soil disturbance	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Timber harvesting	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Flood damage	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Storm damage	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Firewood collection & tidying up	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Dense regrowth post-disturbance	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Fertiliser addition	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Fire damage	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Feral herbivores	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Weeds	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Other - indicate type: _____	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |

Notes (Record details of plot modification types – see over for examples).

Modification type	Plot #	Details

Disturbance attributes & history record - Scoring codes and Notes table

Severity codes	Frequency codes	Evidence codes	Age codes
N = Nil (no evidence)	A = Absent (i.e. n/a)	O = Observation	On = Ongoing
L = Light	Ra = Rare	W = Word of mouth (e.g. landholder)	R = Recent (<3 years)
M = Moderate	Occ = Occasional		NR = Not recent
S = Severe	F = Frequent		O = Old

Notes tables Record details of modification type/s, e.g.

- Timber harvesting = stumps, coppicing, cut logs, ringbarking etc.
- Grazing & trampling = grazing and trampling by introduced herbivores or over-abundant native herbivores.
- Soil disturbance = ripping, cultivation, compaction, erosion.
- Fire damage – indicate if high frequency, or if certain strata particularly affected.
- Feral animals – indicate species (if known) and observed impacts.

Predicting future condition of offset and incentive zones - use of disturbance attributes and history information.

For each offset or incentive zone the assessor predicts the future condition of the ten site condition variables based on the proposed management action/s. Assessors will need to advise landholders of the technical feasibility of achieving the various desirable transitions from the starting state for each zone. This is where the basic information collected in the Disturbance attributes and history record tables for each zone will be useful. This summary of past and present disturbance pressures needs to be considered by the assessor in conjunction with the 'Current' zone condition for each variable, along with the proposed management actions for that zone. This combination of information will assist with best prediction of the likely trajectory of zone vegetation condition (hopefully, but not necessarily towards recovery). Ideally it will clarify which management actions are unlikely to produce the desired outcomes, and which are not, based on the suite of negative pressure/s impacting on the zone. Thus it will inform the prediction of potential future condition, determination of realistic restoration goals, timeframes and an adaptive management strategy for zones depending on their starting state.

Setting clear goals and objectives is fundamental to the achievement of improved vegetation condition and thus biodiversity. It requires a clear understanding of the Current state, the future Desired state and deciding how to make the transition from the former to the latter. It requires the recognition that not all management actions will help an area transition into an alternative and more desirable stable state.

The broad restoration goal for each zone should be established with reference to the ecological and technical feasibility of achieving the transitions required. Ecologically, desirable transitions maintain or improve the condition of a site in relation to benchmark condition, while non-desirable transitions are those that result in the degradation or loss of ecological condition.

Proposed management actions can advance the score for each variable by increments of 0.5, recognising that not all management actions will result in whole point score improvements. Predicted score improvements need to reflect the slow rate at which restoration occurs and the inherent risk associated with achieving biodiversity outcomes in the long-term. In most circumstances the score for a variable should only be advanced by 0.5 or 1, to reflect this uncertainty regarding the efficacy of many management actions, and the 'single human lifespan' timeframe over which improvements to site condition are scored (this timeframe was chosen based on the lack of ecological knowledge over restoration of native ecosystems over longer timeframes, and hence the need for a precautionary approach). Movements of scores by greater amounts (e.g. two increments) should be limited to selected variables and management actions that have a low risk of failure (see Appendix 5 of the *BioMetric* Operational Manual for details and conditions needed to obtain larger score increases).

***BioMetric* plot work sheets:** **Full species IDs are not required for *BioMetric*, but may be useful for identification of correct vegetation type & for monitoring purposes.**

Site type: Clearing zone / Offset zone / Incentive zone / Reference site **PVP Request No. & Zone No. OR Ref. site ID:**_____ **Date** _____ **Recorder/s** _____

Veg type: _____ **AMG (Zone/Easting Northing) OR Lat/Long (dec. degrees):** _____ **Photos:** _____

Native OVER_STOREY species list [20x20m plot]	**Regen (√) [zone]**	**Native MID-STOREY species list (>1m to <over-storey) [20x20m plot]**	**Native GROUND STRATUM COVER (GRASSES) species list (ground stratum <~1m) [20x20m plot]**	**Native GROUND STRATUM COVER (SHRUBS) species list (ground stratum <~1m) [20x20m plot]**	**Native GROUND STRATUM COVER (OTHER) species list* (ground stratum <~1m) [20x20m plot]**	**EXOTIC plants species list [20x20m plot]**	**FALLEN LOGS (min. 10cm diam x 50cm long [20x50m plot]**
Total no. species =							
Foliage Cover (FC, %) =							
Benchmark FC value (%) =							
av. crown diam. =							
av. Foliage Cover (%) =							
# trees =							
sample area =							
[whole of zone]							
# trees with HOLLOWS =							
sample area =		Total no. species =	Total no. species =	Total no. species =	Total no. species =	Total no. species =	
Benchmark value =		Foliage Cover (%) =	Foliage Cover (%) =	Foliage Cover (%) =	Foliage Cover (%) =	Foliage Cover (%) =	Total (m) =
[20x50m plot or whole zone]		Benchmark FC value (%) =	Benchmark FC value (%) =	Benchmark FC value (%) =	Benchmark FC value (%) =	Benchmark FC value (%) =	Benchmark (m) =

***** = **forbs, herbs, ferns, lilies, rushes, sedges etc.**

N.B. Plots should be placed randomly with a minimum of one plot and a maximum of ten plots within a zone.

Site & Other Notes:

***BioMetric* plot work sheets:** **Full species IDs are not required for *BioMetric*, but may be useful for identification of correct vegetation type & for monitoring purposes.**

Site type: Clearing zone / Offset zone / Incentive zone / Reference site **PVP Request No. & Zone No. OR Ref. site ID:**_____ **Date** _____ **Recorder/s** _____

Veg type: _____ **AMG (Zone/Easting Northing) OR Lat/Long (dec. degrees):** _____ **Photos:** _____

Native OVER_STOREY species list [20x20m plot]	**Regen (√) [zone]**	**Native MID-STOREY species list (>1m to <over-storey) [20x20m plot]**	**Native GROUND STRATUM COVER (GRASSES) species list (ground stratum <~1m) [20x20m plot]**	**Native GROUND STRATUM COVER (SHRUBS) species list (ground stratum <~1m) [20x20m plot]**	**Native GROUND STRATUM COVER (OTHER) species list* (ground stratum <~1m) [20x20m plot]**	**EXOTIC plants species list [20x20m plot]**	**FALLEN LOGS (min. 10cm diam x 50cm long [20x50m plot]**
Total no. species =							
Foliage Cover (FC, %) =							
Benchmark FC value (%) =							
av. crown diam. =							
av. Foliage Cover (%) =							
# trees =							
sample area =							
[whole of zone]							
# trees with HOLLOWS =							
sample area =		Total no. species =	Total no. species =	Total no. species =	Total no. species =	Total no. species =	
Benchmark value =		Foliage Cover (%) =	Foliage Cover (%) =	Foliage Cover (%) =	Foliage Cover (%) =	Foliage Cover (%) =	Total (m) =
[20x50m plot or whole zone]		Benchmark FC value (%) =	Benchmark FC value (%) =	Benchmark FC value (%) =	Benchmark FC value (%) =	Benchmark FC value (%) =	Benchmark (m) =

***** = **forbs, herbs, ferns, lilies, rushes, sedges etc.**

N.B. Plots should be placed randomly with a minimum of one plot and a maximum of ten plots within a zone.

Site & Other Notes:

***BioMetric* & Threatened Species Tool SCATTERED TREE plot work sheets:** **Full species IDs are not required for *BioMetric*, but may be useful for identification of correct vegetation type & for monitoring purposes.**

Site type: Clearing zone / Offset zone / Incentive zone / Reference site **PVP Request No. & Zone No. OR Ref. site ID:**_____

AMG (Zone/Easting Northing) OR Lat/Long (dec. degrees): _____ **Date** _____

Recorder/s _____ **Veg Type:** _____ **Photos:** _____

Tree No.	Species	DBHOB (cm)	Crown Diameter (m)	Foliage Cover (%)	Hollows (cm) size in 5cm increments	Mistletoe
1						
2						
3						
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42						
43						
44						
45						
46						
47						
48						
49						
50						

No. trees: _____ **Av. Foliage Cover (%):** _____

No. trees with hollows: _____ **Av. no. hollow-bearing trees:** _____
(per 50x20m plot)

Sample area ID: _____ **Sample area (ha):** _____

Notes:

***BioMetric* & Threatened Species Tool SCATTERED TREE plot work sheets:** **Full species IDs are not required for *BioMetric*, but may be useful for identification of correct vegetation type & for monitoring purposes.**

Site type: Clearing zone / Offset zone / Incentive zone / Reference site **PVP Request No. & Zone No. OR Ref. site ID:**_____

AMG (Zone/Easting Northing) OR Lat/Long (dec. degrees): _____ **Date** _____

Recorder/s _____ **Veg Type:** _____ **Photos:** _____

Tree No.	Species	DBHOB (cm)	Crown Diameter (m)	Foliage Cover (%)	Hollows (cm) size in 5cm increments	Mistletoe
1						
2						
3						
4						
5						
6						
7						
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43						
44						
45						
46						
47						
48						
49						
50						

No. trees: _____ **Av. Foliage Cover (%):** _____

No. trees with hollows: _____ **Av. no. hollow-bearing trees:** _____
(per 50x20m plot)

Sample area ID: _____ **Sample area (ha):** _____

Notes

Field Data Sheets for

BioMetric (Version 3.1)

Incentive proposal package

Updated September 2010

Refer to *BioMetric* Operational Manual for detailed data collection methodologies.

Includes:

- Incentive proposal data sheet (up to 10 zones)
- Site Value (zones) - plot data sheet (up to 10 plots per incentive zone)
- Site Value (reference sites) - plot data sheet (up to 10 plots per reference site)
- Step point transect tally tables – plot data sheet
- Crown Separation Ratio transect tables – plot data sheet
- Disturbance attributes and history record – plot data sheet
- *BioMetric* plot work sheet
- *BioMetric* and *Threatened Species Tool* scattered tree plot work sheet

Incentive proposal

Field Data Sheet – Definitions and Descriptions *

Refer to Operational Manual for more complete explanation and instructions.

Zones
The incentive proposal must be divided into relatively homogenous or discrete zones for assessment. Each zone should represent a distinct vegetation type (according to the vegetation types provided in *BioMetric*) and broad condition state (note that vegetation in low condition must always form a separate zone to vegetation not in low condition). Zones within proposals do not need to be continuous (i.e. a single zone could occupy two or more discrete areas). Each zone must be >0.25ha in area (equivalent to 50mx50m). These zones should be digitized and labelled using the *NVAT Mapper*, and zone names and areas are autopopulated into *BioMetric*. Version 3.1 of *BioMetric* can deal with an unlimited number of zones.

Duration of management commitment
Management actions that last longer receive higher scores. Management actions in perpetuity result in the highest scores. Choose the appropriate duration of commitment after discussing with the landholder.

Threatened species score
A score for threatened species that must be transcribed from the *Threatened Species Tool*.

Landscape value assessment – conducted once only, regardless of the number of incentive zones.
(1) % native vegetation cover in the landscape (1.79km, 0.55km and 0.2km radii) – estimated in categories (0-10%, 11-30%, 31-70%, or >70% cover). In woody vegetation these estimates are based on the % cover of the over-storey relative to the approximate benchmark for that vegetation type (e.g. a completely vegetated circle with benchmark over-storey cover around the proposal would be assessed as >70% cover whether it is open woodland or closed forest. However, if the cover still occurred across the whole circle, but was around 30-70% of the benchmark over-storey cover for that vegetation (e.g. because of thinning) then the estimate of cover would be 30-70%). In non-woody vegetation (e.g. grassland) the assessment is based on the amount of vegetation in the landscape that is unlikely to meet the definition of low condition. These estimates can be made from the imagery and knowledge of the area. Any vegetation native to Australia can contribute to this measure (i.e. planted native species not indigenous to the area can contribute to this measure). In certain instances non-native vegetation can also contribute to this measure (see p. 22 of the *BioMetric* Operational Manual). **Note: each circle should be centred so it captures the maximum area of the proposal (see *BioMetric* Operational Manual for guidance).**

(2) Connectivity value – assessed as one of four levels (high, moderate, low and nil) using the criteria in Table 1. Estimated as "current", and then "with development" (i.e. as though the clearing had occurred). This measure aims to assess the impact of the proposal on connectivity between surrounding vegetation. See *BioMetric* Operational Manual for guidance, including examples.

Table 1. Criteria for assessing connectivity value. Where the proposal includes multiple types of vegetation, choose the highest connectivity value that pertains to vegetation within the proposal. Vegetation is linked to surrounding native vegetation if it is ≤100m from native vegetation that is, in turn, linked to native vegetation not in low condition and ≥1ha. Any gap >100m within a proposal means that the vegetation is not linked. Low condition is as defined above.

Connectivity value	Current	With proposal
High	The proposal includes vegetation that: • is **not** in low condition • has an average width >100m, and • links to surrounding native vegetation on more than one compass quarter of the proposal.	At least one high connectivity value vegetation link is maintained (following clearing) or created (by the offset or incentive proposal) between surrounding native vegetation on more than one compass quarter.
Moderate	The proposal includes vegetation that: • is **not** in low condition • has an average width of >30-100m, and • links to surrounding native vegetation on more than one compass quarter of the proposal.	At least one moderate connectivity value vegetation link is maintained (following clearing) or created (by the offset or incentive proposal) between surrounding native vegetation on more than one compass quarter.

Connectivity value	Current	With proposal
Low	The proposal includes vegetation that: • is in low condition, • has an average width >100m, and • links to surrounding native vegetation on more than one compass quarter of the proposal; OR The proposal includes vegetation that: • is **not** in low condition • has an average width ≥5-30m, and • links to surrounding native vegetation on more than one compass quarter of the proposal; OR The proposal includes vegetation that: • links to surrounding native vegetation via exotic vegetation with similar structure to the proposal on more than one compass quarter.	At least one low connectivity value vegetation link is maintained (following clearing) or created (by the offset or incentive proposal) between surrounding native vegetation on more than one compass quarter.
Nil	The proposal includes vegetation that meets none of the above definitions.	No links between vegetation surrounding the proposal that meet any of the above criteria will be maintained (following clearing) or created (by the offset or incentive proposal).

(3) Total adjacent remnant area – record the total remnant area of which the proposal is a part as one of four levels: very large, large, medium, or small. These four levels are defined differently according to the extent to which the Mitchell Landscape in which most of the proposal occurs has been cleared (Table 2). This figure can be obtained from Step 2 in *BioMetric.* Digitising tools in the *NVAT Mapper* can be used to help estimate the area of the adjacent remnant if necessary.

Table 2. Criteria used for assessing total adjacent remnant area. Adjacent remnant area refers to the area (ha) of native vegetation that is not in low condition and is linked to (≤100m from) the proposal area. The % of native vegetation cleared in the Mitchell Landscape in which most of the proposal occurs is calculated in Step 2.

Level for total adjacent remnant area	% native vegetation cleared in the Mitchell Landscape in which most of proposal occurs			
	<30%	**30-70%**	**71-90%**	**>90%**
Very large	>500	>100	>50	>20
Large	201-500	51-100	21-50	11-20
Medium	101-200	21-50	11-20	1-10
Small	<100	<20	<10	<1

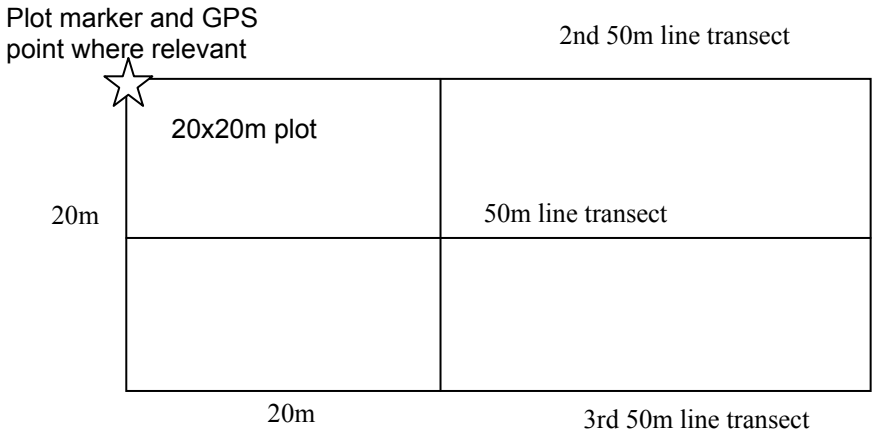
(4) % within riparian area - offsets with >25% of their area within riparian areas (i.e. riparian zone plus buffer as defined in Appendix 5 of Operational Manual) receive an additional score.

Site value assessment – conducted in each clearing and offset zone.

Site Value is assessed as for clearing proposals with two crucial differences: (1) the score for incentives factors current condition of the incentive proposal site into the score. This both rewards landholders who manage their land well for biodiversity and allocates priority to proposal sites in reasonable condition that are more likely to recover with management, and (2) the Site Value is calculated as the product of the current Site Value and the difference between the predicted Site Value with management and the predicted Site Value without management, as guided by the minimum standards for managing native vegetation in the NV Act (2003). Current management actions that enhance condition and which the landholder continues are taken into account when increases in condition with management actions are scored for incentives.

Plots should be placed randomly with a minimum of one plot and a maximum of ten plots within a zone.

Suggested plot layout



Indigenous plant species richness (20mx20m plot): Indigenous plant species refers to vascular species local to the area and, if planted, which come from a local seed source. Systematically walk the plot counting the number of indigenous plant species for all vascular plants (i.e. the species do not have to be identified).

Native over-storey cover ((1) Crown Separation Ratio technique – transect of no set length; (2) OR At 10 points along each of three 50m transects; OR (3) Whole-of-zone method): Native over-storey is the tallest woody stratum present (including emergents) above 1m and includes all species native to New South Wales (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 <1m) may not have an over-storey stratum. Over-storey cover is estimated as FOLIAGE COVER (%), which is equivalent to the amount of shadow that would be cast on the ground if there were a light source directly overhead. Note, this is **not** the same as Crown Cover or Projective Foliage Cover (see Operational Manual Glossary). Foliage cover can be estimated using one of three methods:

(1) Using the Crown Separation Ratio (CSR) technique – see detailed methodology in Appendix 4 of Operational Manual. This is the preferred (most replicable) method; OR
(2) At 10 points (i.e. every 5m) along each of the three 50m transects (see Figure above) estimate FOLIAGE COVER (%) directly overhead using the images provided in Figure 2 of Appendix 4. Divide the total by the number of points (i.e. 30) measured along the transects (e.g. 50%, 0%, 0%, 40%,0% ,45%, 50%, 55%, 0%, 0%, 50%, 0%, 0%, 40%,0% ,45%, 50%, 55%, 0%, 0%, 50%, 0%, 0%, 40%,0% ,45%, 50%, 55%, 0%, 0% = 720/30 =24% foliage cover, for guidance). NOTE: Multiple transects are required to sufficiently encompass over-storey heterogeneity; OR
(3) In proposals where the over-storey cover is very sparse (e.g. scattered or paddock trees), foliage cover can be estimated across the entire zone using the following steps: (a) calculate the average crown diameter of trees using the imagery in the *NVAT Mapper*, (b) determine the average foliage cover of individual trees (estimated by observing several trees in the field using diagrams in Figure 2 of Appendix 3); (c) count the number of trees in a known area within the zone using the imagery and *NVAT Mapper*; (d) enter these data in the *NVAT Paddock Tree Tool* (accessible via the *NVAT Mapper*) to arrive at the estimate for the entire zone. This figure must then be recorded as the over-storey cover estimate for each plot within the relevant zone.

Native mid-storey cover ((1) CSR technique – transect of no set length; OR (2) At 10 points along each of three 50m transects, or (3) 20mx20m plot): The mid-storey contains all vegetation between the over-storey stratum and 1m in height (typically tall shrubs, under-storey trees and tree regeneration) and includes all species native to New South Wales (i.e. native species not local to the area can contribute to mid-storey structure). FOLIAGE COVER of the mid-storey is expressed as a % and can be measured using one of three methods:

(1) CSR technique – as for Native over-storey cover (see above). This is the preferred (most replicable) method; OR
(2) At 10 points (i.e. every 5m) along each of the three 50m transects – as for Native over-storey cover (see above). NOTE: Multiple transects are required to sufficiently encompass mid-storey heterogeneity; OR
(3) Visually estimate FOLIAGE COVER (%) in a 20mx20m plot. The precision of the estimate can be improved if the assessment is conducted separately in each of the four 10mx10m quarters that make up the 20mx20m plot. In a 10mx10m sub-plot 1m^2 of foliage cover is equal to 1% of foliage cover (in a 20mx20m plot 1% of foliage cover is equal to 4 m^2 of foliage cover). Tally the total m^2 of foliage cover for each of the four 10mx10m sub-plot and add them to estimate foliage cover (%) for the entire 20mx20m plot).

Native ground stratum cover (grasses, shrubs and other) ((1) 20mx20m plot, OR (2) At 50 points along each of three 50m transects): The ground stratum contains all native vegetation below 1m in height and includes all species native to New South Wales (i.e. is not confined to species indigenous to the area). The ground stratum (grasses) refers to native grasses (i.e. plants belonging to the family Poaceae). The ground stratum (shrubs)

refers to native woody vegetation <1m. The ground stratum (other) refers to non-woody native vegetation (vascular plants only) <1m that is not grass (e.g. herbs, ferns). FOLIAGE COVER of the ground stratum (grasses, shrubs and other) is expressed as a % and can be measured using one of two methods:

(1) Visually estimate foliage cover (%) in a 20mx20m plot as described for native mid-storey cover above; OR
(2) At 50 points (i.e. every 1m) along each of the three 50m transects (see Figure above) record whether native grass intersects that point. Note, multiple 'hits' (i.e. multiple grasses) at a point count as ONE hit only. Divide the total of 'hits' by the number of points measured along the transects (i.e. 150). NOTE: Multiple transects are required to sufficiently encompass ground stratum cover heterogeneity.

Exotic plant cover (20mx20m plot, or at 50 points along a 50m transect): Exotic plants are vascular plants not native to Australia. Exotic plant cover is measured as total per cent foliage cover of all exotics in all strata. If the exotics are in the over-storey then measure using the same method as native over-storey cover, if exotics are in the mid-storey then measure using the same method as native mid-storey cover and if exotics are in the ground stratum then measure using the same method as described for native ground cover (see above).

Exotic plant cover ((1) 20mx20m plot, OR (2) At 50 points along each of three 50m transects): Exotic plants are vascular plants not native to Australia. Exotic plant cover is measured as total FOLIAGE COVER (%) of all exotics in all strata. If the exotics are in the over-storey then measure using the same method as native over-storey cover (see above), if exotics are in the mid-storey then measure using the same method as native mid-storey cover (see above) and if exotics are in the ground stratum then measure using the same method as described for native ground stratum cover (grasses) (see above). Note: abundance and invasiveness information are recorded in the "Disturbance attributes and history record" plot data sheet, to assist assessors in predicting future site condition (see Section 3.3.3.1 and Appendix 5 of *BioMetric* Operational Manual).

Number of trees with hollows ((1) 50mx20m plot; OR (2) Whole-of-zone method): This is a count of the number of living and dead trees within a 50mx20m plot with at least one hollow (note that the hollows do not have to be within the plot). A hollow is only recorded if: (a) the entrance can be seen; (b) the minimum entrance width is at least 5cm across; (c) the hollow appears to have depth (i.e. you cannot see solid wood beyond the entrance); (d) the hollow is at least 1m above the ground (this omits hollows in cut stumps or at the base of trees); and (e) the centre of the tree is within the plot. Trees should be examined from all angles.

In proposals where trees occur in very low densities (e.g. paddock trees), the number of trees with hollows per 0.1ha (equivalent to the area of a 50x20m plot) can be estimated by: (a) identifying a representative area (in hectares) over which all trees will be examined using the imagery in the *NVAT Mapper*; (b) recording the number of trees with hollows within this area; and (c) entering these data in the Paddock Tree Calculator (accessible via the *NVAT Mapper*). This figure must then be recorded as number of trees with hollows in each plot within the relevant zone.

Regeneration (Entire zone): Regeneration is measured as the proportion of over-storey species present at the site that is regenerating (i.e. with DBH $\leq$ 5cm). For example, if there are three tree species present at the site but only one of these species is regenerating, then the value is 0.33. The maximum value for this measure is 1.

Total length of fallen logs (50mx20m plot): This is the total length of logs at least 10cm diameter and at least 0.5m long. The diameter is estimated with a measuring tape (or callipers if available) held horizontally immediately above the log and the length is estimated to the nearest metre by measuring with a tape, or pacing, along the part of the log that is at least 10cm diameter. If estimating length by pacing then the actual length of a sample of logs should be measured regularly with a tape so the assessor can calibrate their estimate derived from pacing. Only those parts of logs lying within the plot are measured.

Management actions - conducted in each incentive zone

For incentive proposals, the assessor must also identify the management actions (1-10) proposed by the landholder to obtain improvements on each zone. Record in detail the proposed management actions for each offset zone, including intent, timing, methods, etc. Based on this information, the assessor must predict the future condition of the 10 condition variables in each zone, taking into consideration the current site condition, past and present disturbance factors impacting the site (including their age, frequency and severity – these can be recorded in the Disturbance attributes and history record plot data sheet for each zone), proposed management actions and hence the likely trajectory of site recovery.

Proposed management actions can advance the score for each variable by increments of 0.5, recognising that not all management actions will result in whole point score improvements. Predicted score improvements need to reflect the slow rate at which restoration occurs and the inherent risk associated with achieving biodiversity outcomes in the long-term. In most circumstances the score for a variable should only be advanced by 0.5 or 1, to reflect this uncertainty regarding the efficacy of many management actions, and the 'single human lifespan' timeframe over which improvements to site condition are scored. Movements of scores by greater amounts (e.g. two increments) should be limited to selected variables and management actions that have a low risk of failure. Guidelines for scoring condition improvement as a result of management actions are provided in Appendix 5 of the *BioMetric* Operational Manual.

Incentive proposal

BioMetric

PVP Request No. (from *PADACS*)_____ **Date**_____

CMA _____ **Recorder/s**_____

Duration of commitment
(circle one): 5 years / 10 years / 15 years / In perpetuity

Threatened Species score
(from Threatened species tool):
_____

REGIONAL VALUE (Use *NVAT Mapper* to determine Zone numbers and Areas.)

Zone no.	Area (ha)	Vegetation Formation	Vegetation Type

LANDSCAPE VALUE (To be assessed once per incentive proposal, using imagery in *NVAT Mapper*, or on the hard copy printouts. Definitions on reverse. See *BioMetric* Operational Manual for guidance.)

Attribute	**With proposal** (circle one level per attribute)
% cover within 1.79km radius (1000ha)	0-10% / 11-30% / 31-70% / >70%
% cover within 0.55km radius (100ha)	0-10% / 11-30% / 31-70% / >70%
% cover within 0.2km radius (10ha)	0-10% / 11-30% / 31-70% / >70%
Connectivity value	High / Moderate / Low / Nil
Total adjacent remnant area	Very large / Large / Medium / Small
% within riparian area	0-25% / 26-50% / 51-75% / >75%

SITE VALUE (Record "Current score" values for each zone using the Site value - plot data sheet. "Score with proposal" values can only be completed following assessment of the current condition of each zone.)

MANAGEMENT ACTIONS (Tick relevant management actions for each zone, and record details. Predicted future condition of each condition variable must be scored by the assessor in *BioMetric* Step 5, and management action details recorded in Step 6. See *BioMetric* Operational Manual for guidance.)

Zone No.	Grazing exclusion	Strategic grazing	Planting/ direct seeding	Weed control	Erosion control	Feral &/or over-abundant native herbivore control	Retain dead timber	Retain regrowth	Provide artificial hollows	Exclude fertilisers	Management action specifications (brief)

INCENTIVE PROPOSAL FIELD DATA SHEET – DEFINITIONS AND DESCRIPTIONS*

Refer to Operational Manual for more complete explanation and instructions.

Zones
The clearing proposal must be divided into relatively homogenous or discrete zones for assessment. Each zone should represent a distinct vegetation type (according to the vegetation types provided in *BioMetric*) and broad condition state (note that vegetation in low condition must always form a separate zone to vegetation not in low condition). Zones within proposals do not need to be continuous (i.e. a single zone could occupy two or more discrete areas). Each zone must be >0.25ha in area (equivalent to 50mx50m). These zones should be digitized and labelled using the *PVP Mapper*, and the same zone labels entered into *BioMetric*. Version 1.9 of *BioMetric* can deal with up to 10 zones.

Duration of management commitment
Management actions that last longer receive higher scores. Management actions in perpetuity result in the highest scores. Choose the appropriate duration of commitment after discussing with the landholder.

Threatened species score
A score for threatened species that must be transcribed from the *Threatened Species Tool*.

Landscape value assessment – conducted once only, regardless of the number of incentive zones.
(1) % native vegetation cover in the landscape (1.75km, 0.55km and 0.2km radii) – estimated in categories (0-10%, 11-30%, 31-70%, or >70% cover). In woody vegetation these estimates are based on the % cover of the over-storey relative to the approximate benchmark for that vegetation type (e.g. a completely vegetated circle with benchmark over-storey cover around the proposal would be assessed as >70% cover whether it is open woodland or closed forest. However, if the cover still occurred across the whole circle, but was around 30-70% of the benchmark over-storey cover for that vegetation (e.g. because of thinning) then the estimate of cover would be 30-70%). In non-woody vegetation (e.g. grassland) the assessment is based on the amount of vegetation in the landscape that is unlikely to meet the definition of low condition. These estimates can be made from the imagery and knowledge of the area. Any vegetation native to Australia can contribute to this measure (i.e. planted native species not indigenous to the area can contribute to this measure). In certain instances non-native vegetation can also contribute to this measure. **Note: each circle should be centred so it captures the maximum area of the proposal (see *BioMetric* Operational Manual for guidance).**

(2) Connectivity value – assessed as one of four levels (high, moderate, low and nil) using the criteria in Table 1. Estimated as "current", and then "with development" (i.e. as though the clearing had occurred). This measure aims to assess the impact of the proposal on connectivity between surrounding vegetation. See *BioMetric* Operational Manual for guidance, including examples.

Table 1. Criteria for assessing connectivity value. Where the proposal includes multiple types of vegetation, choose the highest connectivity value that pertains to vegetation within the proposal. Vegetation is linked to surrounding native vegetation if it is ≤100m from native vegetation that is, in turn, linked to native vegetation not in low condition and ≥1ha. Any gap >100m within a proposal means that the vegetation is not linked. Low condition is as defined above.

Connectivity value	Current	With proposal
High	The proposal includes vegetation that: • is **not** in low condition • has an average width >100m, and • links to surrounding native vegetation on more than one compass quarter of the proposal.	At least one high connectivity value vegetation link is maintained (following clearing) or created (by the offset or incentive proposal) between surrounding native vegetation on more than one compass quarter.
Moderate	The proposal includes vegetation that: • is **not** in low condition • has an average width of >30-100m, and • links to surrounding native vegetation on more than one compass quarter of the proposal.	At least one moderate connectivity value vegetation link is maintained (following clearing) or created (by the offset or incentive proposal) between surrounding native vegetation on more than one compass quarter.
Low	The proposal includes vegetation that: • is in low condition, • has an average width >100m, and • links to surrounding native vegetation on more than one compass quarter of the proposal; OR The proposal includes vegetation that: • is **not** in low condition • has an average width ≥5-30m, and • links to surrounding native vegetation on more than one compass quarter of the proposal; OR The proposal includes vegetation that: • links to surrounding native vegetation via exotic vegetation with similar structure to the proposal on more than one compass quarter.	At least one low connectivity value vegetation link is maintained (following clearing) or created (by the offset or incentive proposal) between surrounding native vegetation on more than one compass quarter.
Nil	The proposal includes vegetation that meets none of the above definitions.	No links between vegetation surrounding the proposal that meet any of the above criteria will be maintained (following clearing) or created (by the offset or incentive proposal).

(3) Total adjacent remnant area – record the total remnant area of which the proposal is a part as one of four levels: very large, large, medium, or small. These four levels are defined differently according to the extent to which the Mitchell Landscape in which most of the proposal occurs has been cleared (Table 2). This figure can be obtained from Step 2 in *BioMetric.* Digitising tools in the *PVP Mapper* can be used to help estimate the area of the adjacent remnant if necessary.

Table 2. Criteria used for assessing total adjacent remnant area. Adjacent remnant area refers to the area (ha) of native vegetation that is not in low condition and is linked to (≤100m from) the proposal area. The % of native vegetation cleared in the Mitchell Landscape in which most of the proposal occurs is calculated in Step 2.

Level for total adjacent remnant area	% native vegetation cleared in the Mitchell Landscape in which most of proposal occurs			
	<30%	**30-70%**	**71-90%**	**>90%**
Very large	>500	>100	>50	>20
Large	201-500	51-100	21-50	11-20
Medium	101-200	21-50	11-20	1-10
Small	<100	<20	<10	<1

(4) % within riparian area - offsets with >25% of their area within riparian areas (i.e. riparian zone plus buffer as defined in Appendix 5 of Operational Manual) receive an additional score.

Site Value variables
Site Value is assessed as for clearing proposals with two crucial differences: (1) the score for incentives factors current condition of the incentive proposal site into the score. This both rewards landholders who manage their land well for biodiversity and allocates priority to proposal sites in reasonable condition that are more likely to recover with management, and (2) the Site Value is calculated as the product of the current Site Value and the difference between the predicted Site Value with management and the predicted Site Value without management, as guided by the minimum standards for managing native vegetation in the NV Act (2003). Current management actions that enhance condition and which the landholder continues are taken into account when increases in condition with management actions are scored for incentives. The biodiversity value of management actions proposed by the landholder is predicted in the same way as for Offsets. See Site Value - plot data sheets for methodology prompts.

Site Value (zones) - plot data sheet

Start a new sheet for each zone (Clearing, Offset or Incentive proposals)

BioMetric

PLOT TYPE: (circle one) **Clearing zone / Offset zone / Incentive zone**

Linked zones (list type/s & nos.)

CMA | **Recorder/s** | **Date**

Site location & description:

PVP Request No. (from *PADACS*)

Veg Zone No. (from *NVAT Mapper*)

Vegetation Formation (as per Keith 2004)

Vegetation Class (as per Keith 2004)

Vegetation Type (*BioMetric*)

PLOT 1 Lat.	Long.
Orientation	**Photos**

PLOT 2 Lat.	Long.
Orientation	**Photos**

PLOT 3 Lat.	Long.
Orientation	**Photos**

PLOT 4 Lat.	Long.
Orientation	**Photos**

PLOT 5 Lat.	Long.
Orientation	**Photos**

PLOT 6 Lat.	Long.
Orientation	**Photos**

PLOT 7 Lat.	Long.
Orientation	**Photos**

PLOT 8 Lat.	Long.
Orientation	**Photos**

PLOT 9 Lat.	Long.
Orientation	**Photos**

Plot 10 Lat.	Long.
Orientation	**Photos**

20m x 20m plot (See also Step Point Transect or Crown Separation Ratio data sheets for assessing foliage cover (%). Note: CSR method is preferred for over-storey and mid-storey strata. 20x20m plot method is not considered reliable for the over-storey stratum. Refer to methods in Appendix 4 of *BioMetric* Operational Manual.)

Plot No.:	1	2	3	4	5	6	7	8	9	10
Number of native plant species										
Native mid-storey cover (%)										
Native ground stratum cover (%) - grasses										
Native ground stratum cover (%) - shrubs										
Native ground stratum cover (%) - other										
Exotic plant cover (%)										

Larger sampling area ([1]20m x 50m plot, or [2]whole of zone) (Refer to methods in Appendix 4 of *BioMetric* Operational Manual.)

[1]Number of trees with hollows – use Alternative method below if appropriate										
[2]Over-storey regeneration (proportion of over-storey spp)										
[1]Total length of fallen logs (m)										

Alternative methods for zones containing scattered trees (whole-of-zone methods) (Refer to methods in Appendix 4 of *BioMetric* Operational Manual. Use Paddock Tree Calculator, accessible via the *NVAT Mapper* for calculations.)

Native over-storey cover (%)	av. crown diameter (m)= av. foliage cover (%) = # trees= sample area (ha)=									
No. trees with hollows	sample area (ha)= no. trees with hollows =									

Notes – additional conservation values: e.g. riparian areas, special features, geology etc.

Site Value vegetation condition variables - field methodology details (As per Appendix 4 of *BioMetric* Operational Manual.
* indicates that an alternative method is provided where tree density is very low (e.g. scattered trees).

Plots should be placed randomly with a minimum of one plot and a maximum of ten plots within a zone.

Indigenous plant species richness (20mx20m plot): Indigenous plant species refers to vascular species local to the area and, if planted, which come from a local seed source. Systematically walk the plot counting the number of indigenous plant species for all vascular plants (i.e. the species do not have to be identified).

Native over-storey cover (Crown Separation Ratio (CSR) technique; OR at 10 points along each of three 50m transects; OR whole-of-zone method*): Native over-storey is the tallest woody stratum present (including emergents) above 1m and includes all species native to New South Wales (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 <1m) may not have an over-storey stratum. Over-storey cover is estimated as FOLIAGE COVER (%), which is equivalent to the amount of shadow that would be cast on the ground if there were a light source directly overhead. Note, this is **not** the same as Crown Cover or Projective Foliage Cover. Foliage cover can be estimated using one of three methods:

(1) Using the Crown Separation Ratio (CSR) technique. This is the preferred (most replicable) method. Use CSR transect tables – plot data sheet; OR
(2) At 10 points (i.e. every 5m) along each of the three 50m transects (see Figure 1, App. 4) estimate FOLIAGE COVER (%) directly overhead using the images provided in Figure 2 (App 4). Divide the total by the number of points (i.e. 30) measured along the transects (e.g. 50%, 0%, 0%, 40%,0%, 45%, 50%, 55%, 0%, 0%, 50%, 0%, 0%, 40%,0% ,45%, 50%, 55%, 0%, 0%, 50%, 0%, 0%, 40%,0%, 45%, 50%, 55%, 0%, 0% = 720/30 =24% foliage cover for guidance). NOTE: Multiple transects are required to sufficiently encompass over-storey heterogeneity. Use Step point transect tally tables – plot data sheet; OR
(3) In proposals where the over-storey cover is very sparse (e.g. scattered or paddock trees), foliage cover can be estimated across the entire zone using the *NVAT Paddock Tree Tool* (accessible via the *NVAT Mapper*).

Native mid-storey cover (CSR technique; OR at 10 points along each of three 50m transects, OR 20mx20m plot): The mid-storey contains all vegetation between the over-storey stratum and 1m in height (typically tall shrubs, under-storey trees and tree regeneration) and includes all species native to New South Wales (i.e. native species not local to the area can contribute to mid-storey structure). FOLIAGE COVER of the mid-storey is expressed as a % and can be measured using one of three methods:

(1) CSR technique – as for Native over-storey cover (see above); OR
(2) At 10 points (i.e. every 5m) along each of the three 50m transects – as for Native over-storey cover (see above). NOTE: Multiple transects are required to sufficiently encompass mid-storey heterogeneity; OR
(3) Visually estimate FOLIAGE COVER (%) in a 20mx20m plot. The precision of the estimate can be improved if the assessment is conducted separately in each of the four 10mx10m quarters that make up the 20mx20m plot. In a 10mx10m sub-plot 1m^2 of foliage cover is equal to 1% of foliage cover (in a 20mx20m plot 1% of foliage cover is equal to 4 m^2 of foliage cover). Tally the total m^2 of foliage cover for each of the four 10mx10m sub-plot and add them to estimate foliage cover (%) for the entire 20mx20m plot).

Native ground stratum cover (grasses, shrubs and other) (20mx20m plot; OR at 50 points along each of three 50m transects): The ground stratum contains all native vegetation below 1m in height and includes all species native to New South Wales (i.e. is not confined to species indigenous to the area). The ground stratum (**grasses**) refers to native grasses (i.e. plants belonging to the family Poaceae). The ground stratum (**shrubs**) refers to native woody vegetation <1m. The ground stratum (**other**) refers to non-woody native vegetation (vascular plants only) <1m that is not grass (e.g. herbs, ferns). FOLIAGE COVER (%) of the ground stratum (grasses) is expressed as a % and can be measured using one of two methods:

(1) Visually estimate per cent foliage cover in a 20mx20m plot as described for native mid-storey cover above; OR
(2) At 50 points (i.e. every 1m) along each of the three 50m transects (see Figure 1, App 4) record whether native grass intersects that point. Note, multiple 'hits' (i.e. multiple grasses) at a point count as ONE hit only. Divide the total of 'hits' by the number of points measured along the three transects (i.e. 150). NOTE: Multiple transects are required to sufficiently encompass ground stratum cover heterogeneity. Use Step point transect tally tables – plot data sheet.

Exotic plant cover (20mx20m plot; or at 50 points along each of three 50m transects): Exotic plants are vascular plants not native to Australia. Exotic plant cover is measured as total FOLIAGE COVER (%) of all exotics in all strata. If the exotics are in the over-storey then measure using the same method as native over-storey cover (see above), if exotics are in the mid-storey then measure using the same method as native mid-storey cover (see above) and if exotics are in the ground stratum then measure using the same method as described for native ground stratum cover (grasses) (see above). Note: abundance and invasiveness information are recorded in the Disturbance attributes and history record - plot data sheet for each zone, to assist assessors in predicting future site condition (see Section 3.3.3.1 and Appendix 5 of the *BioMetric* Operational Manual).

Number of trees with hollows (50mx20m plot; OR whole-of-zone method*): This is a count of the number of living and dead trees within a 50mx20m plot with at least one hollow (note that the hollows do not have to be within the plot). A hollow is only recorded if: (a) the entrance can be seen; (b) the minimum entrance width is at least 5cm across; (c) the hollow appears to have depth (i.e. you cannot see solid wood beyond the entrance); (d) the hollow is at least 1m above the ground (this omits hollows in cut stumps or at the base of trees); and (e) the centre of the tree is within the plot. Trees should be examined from all angles.

In proposals where trees occur in very low densities (e.g. paddock trees), the number of trees with hollows per 0.1ha (equivalent to the area of a 50x20m plot) can be estimated by: (a) identifying a representative area (in hectares) over which all trees will be examined using the imagery in the *NVAT Mapper*; (b) recording the number of trees with hollows within this area; and (c) entering these data in the Paddock Tree Calculator accessible via the *NVAT Mapper*. This figure must then be recorded as number of trees with hollows in each plot within the relevant zone.

Regeneration (entire zone): Regeneration is measured as the proportion of over-storey species present at the site that is regenerating (i.e. with DBH ≤ 5cm). For example if there are three tree species present at the site but only one of these species is regenerating, then the value is 0.33. The maximum value for this measure is 1.

Total length of fallen logs (50mx20m plot): This is the total length of logs at least 10cm diameter and at least 0.5m long. The diameter is estimated with a measuring tape (or callipers if available) held horizontally immediately above the log and the length is estimated to the nearest metre by measuring with a tape, or pacing, along the part of the log that is at least 10cm diameter. If estimating length by pacing then the actual length of a sample of logs should be measured regularly with a tape so the assessor can calibrate their own estimate derived from pacing. Only those parts of logs lying within the plot are measured.

Site Value (reference sites) - plot data sheet

Start a new sheet for each Reference site (see **Tips for selecting Reference sites & plots**…P.T.O.)

BioMetric

Ref site ID (assigned by assessor)		**CMA**		**Recorder/s**		**Date**	

Vegetation Formation (*sensu* Keith 2004)

Vegetation Class (*sensu* Keith 2004)

Vegetation Type (*BioMetric)*

Dominant species per stratum (P.T.O. for strata definitions)

Over-storey	Mid-storey	Ground stratum

PLOT 1 Lat.	Long.
Orientation	**Photos**

PLOT 2 Lat.	Long.
Orientation	**Photos**

PLOT 3 Lat.	Long.
Orientation	**Photos**

PLOT 4 Lat.	Long.
Orientation	**Photos**

PLOT 5 Lat.	Long.
Orientation	**Photos**

PLOT 6 Lat.	Long.
Orientation	**Photos**

PLOT 7 Lat.	Long.
Orientation	**Photos**

PLOT 8 Lat.	Long.
Orientation	**Photos**

PLOT 9 Lat.	Long.
Orientation	**Photos**

Plot 10 Lat.	Long.
Orientation	**Photos**

Disturbance attributes & history (Record Severity, Frequency, Evidence and Age codes for each plot, e.g. **L| Occ | Ob | R** . See over for details).

Plot No.	1	2	3	4	5	6	7	8	9	10
Canopy dieback	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Grazing and trampling	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Soil disturbance	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Timber harvesting	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Flood damage	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Storm damage	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Firewood collection & tidying up	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Dense regrowth post-disturbance	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Fertiliser addition	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Fire damage	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Feral herbivores										
Weeds	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Other - indicate type: _____	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |

20m x 20m plot (Refer to methods in Appendix 4 of *BioMetric* Operational Manual. Step Point Transect or Crown Separation Ratio methods can also be used to assess Foliage Cover. CSR method is preferred for over-storey and mid-storey strata. See over).

Number of native plant species										
Native mid-storey cover (%)										
Native ground stratum cover (%)- grasses										
Native ground stratum cover (%) - shrubs										
Native ground stratum cover (%) - other										

Larger sampling area (20m x 50m plot) (Refer to methods in Appendix 4 of *BioMetric* Operational Manual.)

Number of trees with hollows – use Alternative method below if appropriate										
Total length of fallen logs (m)										

Alternative (whole-of-zone) methods for zones containing scattered trees, such as sparsely wooded reference sites. (Refer to methods in Appendix 7 of *BioMetric* Operational Manual. Scattered Tree Calculator in *BioMetric* can be used for calculations.)

Native over-storey cover (%)	av. crown diameter (m)= av. foliage cover (%) = # trees= sample area (ha)=									
No. trees with hollows	sample area (ha)= no. trees with hollows =									

Please fax or email completed sheets to: Dani Murphy or James Crooks, Native Vegetation Science Unit, NSW DECCW.
Fax (02) 6229 7001. Email: biometric.tool@environment.nsw.gov.au. Thank you.

Disturbance attributes & history record - Scoring codes and Notes table

- Timber harvesting = stumps, coppicing, cut logs, ringbarking etc. (use Notes table below to record details)
- Grazing & trampling = grazing and trampling by introduced herbivores or over-abundant native herbivores (use Notes table below)
- Soil disturbance = ripping, cultivation, compaction, erosion (use Notes table below)
- Fire damage – indicate if high frequency, or if certain strata particularly affected (use Notes table below)
- Feral animals – indicate species (if known) and observed impacts (use Notes table below)

Severity codes	Frequency codes	Evidence codes	Age codes
N = Nil (no evidence)	A = Absent (i.e. n/a)	O = Observation	On = Ongoing
L = Light	Ra = Rare	W = Word of mouth (e.g. landholder)	R = Recent (<3 years)
M = Moderate	Occ = Occasional		NR = Not recent
S = Severe	F = Frequent		O = Old

Notes

Modification type	Plot #	Details

Site Value methodology prompts (for full details refer to Appendix 4 of *BioMetric* Operational Manual)

- Plots should be placed randomly with a minimum of one plot and a maximum of ten plots within a zone.
- Number of native plant species: COUNT of all indigenous vascular plant species.
- Strata definitions: Native over-storey refers to all native life-forms in the tallest dominant stratum (including emergents) present above 1m and includes all species native to Australia (i.e. native species not local to the area can contribute to over-storey structure). For example, in a woodland community the over-storey stratum is the tree layer, in a shrubland community the over-storey stratum is the tallest shrub layer above 1m; in a wetland or swamp the over-storey stratum may comprise sedges, rushes or bulrushes; and in a tall grassland there may be an over-storey stratum of grasses >1m high. Some vegetation types (e.g. low grasslands) may not have an over-storey stratum. The mid-storey contains all native life-forms between the over-storey stratum and 1m in height (typically tall shrubs, under-storey trees and regeneration of over-storey species) and includes all species native to Australia (i.e. native species not local to the area can contribute to mid-storey structure). Some vegetation types (e.g. grasslands) may not have a mid-storey stratum. The ground stratum contains all native life-forms below 1m in height and includes all species native to Australia (i.e. is not confined to species indigenous to the area). The ground stratum (grasses) refers to native grasses (i.e. plants belonging to the family Poaceae). Ground stratum (shrubs) refers to native woody vegetation <1m. Ground stratum (other) refers to non-woody native vegetation (vascular plants only) <1m that is not grass (e.g. forbs, herbs, ferns, lilies, rushes and sedges).
- Cover estimates (native over-storey, mid-storey, ground cover - grasses, shrubs and other): Foliage Cover (FC, %) – as defined in *BioMetric* Operational Manual. Use CSR transect tables – plot data sheet or Step point transect tally tables – plot data sheet, or tables below.
- No. trees with hollows: hollow entrance must be AT LEAST 5cm diameter; hollows must have depth, and be >1m above the ground.
- Over-storey regeneration: proportion of species in over-storey exhibiting regeneration (≤5cm DBH, no height limits).
- Step point transect tallies: hits recorded every 5m for over-storey and mid-storey cover, and every 1m for ground stratum cover variables. Use three transects for each plot. Record data in Step point transect tally tables – plot data sheet, or table below..

Selecting Reference sites for collecting vegetation condition benchmarks:

- See Appendix 1 in the Operational Manual for information on how to select reference sites for collecting vegetation condition benchmarks
- Stem density benchmarks can also be collected from Reference plots. The number of over-storey species stems need to be recorded for each DBH (diameter at breast height) class. Use "Site Value (stem density) – plot data sheet" to record stem density reference plot data.

Step point transect tally tables (for methodology details see above and refer to Appendix 4 of *BioMetric* Operational Manual.)

PLOT No. _____ TRANSECT No/s. _____	No. hits (tally)	%
Native over-storey cover (%)		
Native mid-storey cover (%)		
Native ground stratum cover (%) - grasses		
Native ground stratum cover (%) - shrubs		
Native ground stratum cover (%) - other		
Exotic plant cover (%)		
Litter cover (%) - optional		
Rock cover (%) - optional		
Bare ground cover (%) - optional		
Cryptogam cover (%) - optional		

Crown Separation Ratio transect tables (for methodology details refer to Appendix 4 of *BioMetric* Operational Manual. Record stratum (o/s, m/s, g/s(g), g/s(s) or g/s(o). Use consistent units within each plot, i.e. m OR cm. Use cm for ground stratum. Circle units used.)

PLOT No. _____ STRATUM _____	1	2	3	4	5	6	7	8	9	10	11	12	Mean
Crown width (m? OR cm?)													
Crown Separation/Gap (m? OR cm?)													
Crown type/ Degree of openness (%)													

Calculations:

CSR = mean Gap/mean Crown width = _____ m? or cm?

Crown Cover (CC) = 80.6/(1+CSR) = _____ %

Foliage Cover = CC (%) x mean Crown type (%)/100= _____ %. Enter this value into *BioMetric* for correct stratum within appropriate plot.

Step point transect tally tables - plot data sheet

Start a new sheet for each zone (Clearing, Offset or Incentive proposals) or Reference Site

BioMetric

PLOT TYPE: (circle one) **Clearing / Offset / Incentive /Reference**

Linked zones (list type/s & nos.)

CMA **Recorder/s** **Date**

Site location & description:

PVP Request No. (from *PADACS*)

Veg Zone No. (from *NVAT Mapper*)

Vegetation Type (*BioMetric*)

Step point transect tally tables (for methodology details see above and refer to Appendix 4 of *BioMetric* Operational Manual.)

PLOT No. _____ TRANSECT No/s. _____	No. hits (tally)	%
Native over-storey cover (%)		
Native mid-storey cover (%)		
Native ground stratum cover (%) - grasses		
Native ground stratum cover (%) - shrubs		
Native ground stratum cover (%) - other		
Exotic plant cover (%)		
Litter cover (%) - optional		
Rock cover (%) - optional		
Bare ground cover (%) - optional		
Cryptogam cover (%) - optional		

PLOT No. _____ TRANSECT No/s. _____	No. hits (tally)	%
Native over-storey cover (%)		
Native mid-storey cover (%)		
Native ground stratum cover (%) - grasses		
Native ground stratum cover (%) - shrubs		
Native ground stratum cover (%) - other		
Exotic plant cover (%)		
Litter cover (%) - optional		
Rock cover (%) - optional		
Bare ground cover (%) - optional		
Cryptogam cover (%) - optional		

PLOT No. _____ TRANSECT No/s. _____	No. hits (tally)	%
Native over-storey cover (%)		
Native mid-storey cover (%)		
Native ground stratum cover (%) - grasses		
Native ground stratum cover (%) - shrubs		
Native ground stratum cover (%) - other		
Exotic plant cover (%)		
Litter cover (%) - optional		
Rock cover (%) - optional		
Bare ground cover (%) - optional		
Cryptogam cover (%) - optional		

PLOT No. _____ TRANSECT No/s. _____	No. hits (tally)	%
Native over-storey cover (%)		
Native mid-storey cover (%)		
Native ground stratum cover (%) - grasses		
Native ground stratum cover (%) - shrubs		
Native ground stratum cover (%) - other		
Exotic plant cover (%)		
Litter cover (%) - optional		
Rock cover (%) - optional		
Bare ground cover (%) - optional		
Cryptogam cover (%) - optional		

PLOT No. _____ TRANSECT No/s. _____	No. hits (tally)	%
Native over-storey cover (%)		
Native mid-storey cover (%)		
Native ground stratum cover (%) - grasses		
Native ground stratum cover (%) - shrubs		
Native ground stratum cover (%) - other		
Exotic plant cover (%)		
Litter cover (%) - optional		
Rock cover (%) - optional		
Bare ground cover (%) - optional		
Cryptogam cover (%) - optional		

PLOT No. _____ TRANSECT No/s. _____	No. hits (tally)	%
Native over-storey cover (%)		
Native mid-storey cover (%)		
Native ground stratum cover (%) - grasses		
Native ground stratum cover (%) - shrubs		
Native ground stratum cover (%) - other		
Exotic plant cover (%)		
Litter cover (%) - optional		
Rock cover (%) - optional		
Bare ground cover (%) - optional		
Cryptogam cover (%) - optional		

PLOT No. _____ TRANSECT No/s. _____	No. hits (tally)	%
Native over-storey cover (%)		
Native mid-storey cover (%)		
Native ground stratum cover (%) - grasses		
Native ground stratum cover (%) - shrubs		
Native ground stratum cover (%) - other		
Exotic plant cover (%)		
Litter cover (%) - optional		
Rock cover (%) - optional		
Bare ground cover (%) - optional		
Cryptogam cover (%) - optional		

PLOT No. _____ TRANSECT No/s. _____	No. hits (tally)	%
Native over-storey cover (%)		
Native mid-storey cover (%)		
Native ground stratum cover (%) - grasses		
Native ground stratum cover (%) - shrubs		
Native ground stratum cover (%) - other		
Exotic plant cover (%)		
Litter cover (%) - optional		
Rock cover (%) - optional		
Bare ground cover (%) - optional		
Cryptogam cover (%) - optional		

Step point transect tally methodology details (As per Appendix 4 of *BioMetric* Operational Manual. * indicates that an alternative method is provided where tree density is very low (e.g. paddock trees)).

Native over-storey cover (*): FOLIAGE COVER of the over-storey is expressed as a % and can be measured using the step point transect method: at 10 points (i.e. every 5m) along each of the three 50m transects (see Figure 1, App. 4) estimate FOLIAGE COVER (%) directly overhead using the images provided in Figure 2 (App 4). Divide the total by the number of points (i.e. 30) measured along the transects (e.g. 50%, 0%, 0%, 40%,0%, 45%, 50%, 55%, 0%, 0%, 50%, 0%, 0%, 40%,0% ,45%, 50%, 55%, 0%, 0%, 50%, 0%, 0%, 40%,0%, 45%, 50%, 55%, 0%, 0% = 720/30 =24% foliage cover). NOTE: Multiple transects are required to sufficiently encompass over-storey heterogeneity.

Native mid-storey cover: Foliage cover of the mid-storey is expressed as a % and can be measured using the step point transect method: at 10 points (i.e. every 5m) along each of the three 50m transects estimate foliage cover (%) in the mid-storey. Divide the total by the number of points (i.e. 30) measured along the transect, as for native over-storey cover (above).

Native ground stratum cover (grasses, shrubs and other): Foliage cover of the ground stratum is expressed as a % and can be measured using the step point transect method: at 50 points (i.e. every 1m) along each of the three 50m transects record whether the appropriate life form (grass, shrub, other) intersects that point. Note, multiple 'hits' of any particular ground stratum type (e.g. multiple grasses) at a point count as ONE hit only for that type. Divide the total of 'hits' by the number of points measured along the three transects (i.e. 150). NOTE: Multiple transects are required to sufficiently encompass ground stratum cover heterogeneity.

Exotic plant cover: Exotic plant cover is measured as total FOLIAGE COVER (%) of all exotics in all strata. If the exotics are in the over-storey then measure using the same method as native over-storey cover (see above), if exotics are in the mid-storey then measure using the same method as native mid-storey cover (see above) and if exotics are in the ground stratum then measure using the same method as described for native ground stratum cover (grasses) (see above).

Other ground cover measures (litter, rock, bare ground, crypto cover): These variables are not needed for the *BioMetric* site condition assessment, however their inclusion in the field data sheets has been requested by some CMA officers. Cover of these attributes is expressed as a % and can be measured using the step point transect method: at 50 points (i.e. every 1m) along each of the three 50m transects record whether the appropriate attribute intersects that point. Divide the total of 'hits' by the number of points measured along the transects (i.e. 150).

Crown Separation Ratio transect tables - plot data sheet

Start a new sheet for each zone (Clearing, Offset or Incentive proposals) or Reference Site

BioMetric

PLOT TYPE: (circle one) **Clearing / Offset / Incentive /Reference**

Linked zones (list type/s & nos.)

CMA **Recorder/s** **Date**

Site location & description:

PVP Request No. (from *PADACS*)

Veg Zone No. (from *NVAT Mapper*)

Vegetation type (*BioMetric*)

Crown Separation Ratio transect tables (for methodology details see over and refer to Appendix 4 of *BioMetric* Operational Manual. Record stratum (o/s, m/s, g/s(g), g/s(s) or g/s(o). Use consistent units within each plot, i.e. m OR cm. Use cm for ground stratum. Circle units used.)

PLOT No. ______ STRATUM ________	1	2	3	4	5	6	7	8	9	10	11	12	Mean
Crown width (m? OR cm?)													
Crown Separation/Gap (m? OR cm?)													
Crown type/ Degree of openness (%)													

Calculations:
CSR = mean Gap/mean Crown width = _________ m? or cm?
Crown Cover (CC) = 80.6/(1+CSR) = _______ %
Foliage Cover = CC (%) x mean Crown type (%)/100= ________ %. Enter this value into *BioMetric* for correct stratum within appropriate plot.

PLOT No. ______ STRATUM ________	1	2	3	4	5	6	7	8	9	10	11	12	Mean
Crown width (m? OR cm?)													
Crown Separation/Gap (m? OR cm?)													
Crown type/ Degree of openness (%)													

Calculations:
CSR = mean Gap/mean Crown width = _________ m? or cm?
Crown Cover (CC) = 80.6/(1+CSR) = _______ %
Foliage Cover = CC (%) x mean Crown type (%)/100= ________ %. Enter this value into *BioMetric* for correct stratum within appropriate plot.

PLOT No. ______ STRATUM ________	1	2	3	4	5	6	7	8	9	10	11	12	Mean
Crown width (m? OR cm?)													
Crown Separation/Gap (m? OR cm?)													
Crown type/ Degree of openness (%)													

Calculations:
CSR = mean Gap/mean Crown width = _________ m? or cm?
Crown Cover (CC) = 80.6/(1+CSR) = _______ %
Foliage Cover = CC (%) x mean Crown type (%)/100= ________ %. Enter this value into *BioMetric* for correct stratum within appropriate plot.

PLOT No. ______ STRATUM ________	1	2	3	4	5	6	7	8	9	10	11	12	Mean
Crown width (m? OR cm?)													
Crown Separation/Gap (m? OR cm?)													
Crown type/ Degree of openness (%)													

Calculations:
CSR = mean Gap/mean Crown width = _________ m? or cm?
Crown Cover (CC) = 80.6/(1+CSR) = _______ %
Foliage Cover = CC (%) x mean Crown type (%)/100= ________ %. Enter this value into *BioMetric* for correct stratum within appropriate plot.

PLOT No. ______ STRATUM ________	1	2	3	4	5	6	7	8	9	10	11	12	Mean
Crown width (m? OR cm?)													
Crown Separation/Gap (m? OR cm?)													
Crown type/ Degree of openness (%)													

Calculations:
CSR = mean Gap/mean Crown width = _________ m? or cm?
Crown Cover (CC) = 80.6/(1+CSR) = _______ %
Foliage Cover = CC (%) x mean Crown type (%)/100= ________ %. Enter this value into *BioMetric* for correct stratum within appropriate plot.

PLOT No. ______ STRATUM ________	1	2	3	4	5	6	7	8	9	10	11	12	Mean
Crown width (m? OR cm?)													
Crown Separation/Gap (m? OR cm?)													
Crown type/ Degree of openness (%)													

Calculations:
CSR = mean Gap/mean Crown width = _________ m? or cm?
Crown Cover (CC) = 80.6/(1+CSR) = _______ %
Foliage Cover = CC (%) x mean Crown type (%)/100= ________ %. Enter this value into *BioMetric* for correct stratum within appropriate plot.

PLOT No. ______ STRATUM ________	1	2	3	4	5	6	7	8	9	10	11	12	Mean
Crown width (m? OR cm?)													
Crown Separation/Gap (m? OR cm?)													
Crown type/ Degree of openness (%)													

Calculations:
CSR = mean Gap/mean Crown width = _________ m? or cm?
Crown Cover (CC) = 80.6/(1+CSR) = _______ %
Foliage Cover = CC (%) x mean Crown type (%)/100= ________ %. Enter this value into *BioMetric* for correct stratum within appropriate plot.

PLOT No. ______ STRATUM ________	1	2	3	4	5	6	7	8	9	10	11	12	Mean
Crown width (m? OR cm?)													
Crown Separation/Gap (m? OR cm?)													
Crown type/ Degree of openness (%)													

Calculations:
CSR = mean Gap/mean Crown width = _________ m? or cm?
Crown Cover (CC) = 80.6/(1+CSR) = _______ %
Foliage Cover = CC (%) x mean Crown type (%)/100= ________ %. Enter this value into *BioMetric* for correct stratum within appropriate plot.

PLOT No. ______ STRATUM ________	1	2	3	4	5	6	7	8	9	10	11	12	Mean
Crown width (m? OR cm?)													
Crown Separation/Gap (m? OR cm?)													
Crown type/ Degree of openness (%)													

Calculations:
CSR = mean Gap/mean Crown width = _________ m? or cm?
Crown Cover (CC) = 80.6/(1+CSR) = _______ %
Foliage Cover = CC (%) x mean Crown type (%)/100= ________ %. Enter this value into *BioMetric* for correct stratum within appropriate plot.

PLOT No. ______ STRATUM ________	1	2	3	4	5	6	7	8	9	10	11	12	Mean
Crown width (m? OR cm?)													
Crown Separation/Gap (m? OR cm?)													
Crown type/ Degree of openness (%)													

Calculations:
CSR = mean Gap/mean Crown width = _________ m? or cm?
Crown Cover (CC) = 80.6/(1+CSR) = _______ %
Foliage Cover = CC (%) x mean Crown type (%)/100= ________ %. Enter this value into *BioMetric* for correct stratum within appropriate plot.

Crown Separation Ratio transect methodology details (As per Appendix 4 of *BioMetric* Operational Manual.)

Native over-storey cover, native mid-storey cover and native ground stratum cover are all estimated as FOLIAGE COVER (%), which is equivalent to the amount of shadow that would be cast on the ground if there were a light source directly overhead. The Crown Separation Ratio (CSR) method is the preferred (most replicable) method for assessing native over-storey cover and native mid-storey cover (%). It can also be used to assess native ground stratum cover (%). CSR is assessed separately for each stratum, as per method below.

1. Sample along a zig-zag transect as shown, following the 50m transect down the centre of the 50x20m plot (shown as PQ). Start at the crown closest to P (the transect beginning at the plot baseline) and select the next crown encountered going *towards* or *across* the transect line and in the direct P → Q.

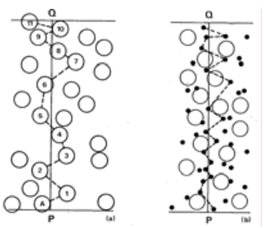


Figure. The zig-zag procedure is used for each stratum of layer, for example (a) for the over-storey and (b) for the mid-storey (Walker and Hopkins 1998).

2. For each stratum, and irrespective of species, measure:
    a. crown widths (m)
    b. crown gaps (m), and
    c. crown type (degree of openness, %), by matching the photographs in Figure 3 with the actual tree or shrub crowns.
   - In the field, a mean of 12 measurements (i.e. 12 widths and 12 gaps) is usually sufficient. Note, in more open vegetation types the transect PQ will be significantly longer than 50m.
   - Where crown overlap occurs, the crown gap has a negative value. The greater the overlap, the more negative the value. For example, for two crowns that overlap by 3m, the gap is -3.
3. Manually calculate CSR, Crown Cover (CC) and Foliage Cover (%) as per formulae provided.
4. Enter FC% into *BioMetric* for the appropriate zone and plot.

Disturbance attributes and history record – plot data sheet

BioMetric

Start a new sheet for each new Offset or Incentive proposal

PVP Request No. (from *PADACS*)_____ **Date**_____

CMA _____ **Recorder/s**_____

Disturbance attributes & history (Record Severity, Frequency, Evidence and Age codes for each plot, e.g. **L| Occ | Ob | R** . See over for details).

	Plot No.									
Zone No. ____	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Canopy dieback	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Grazing and trampling	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Soil disturbance	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Timber harvesting	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Flood damage	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Storm damage	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Firewood collection & tidying up	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Dense regrowth post-disturbance	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Fertiliser addition	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Fire damage	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Feral herbivores	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Weeds	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Other - indicate type: _____	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |

Notes (Record details of plot modification types – see over for examples).

Modification type	Plot #	Details

	Plot No.									
Zone No. ____	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Canopy dieback	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Grazing and trampling	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Soil disturbance	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Timber harvesting	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Flood damage	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Storm damage	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Firewood collection & tidying up	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Dense regrowth post-disturbance	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Fertiliser addition	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Fire damage	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Feral herbivores	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Weeds	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Other - indicate type: _____	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |

Notes (Record details of plot modification types – see over for examples).

Modification type	Plot #	Details

Plot No.										
Zone No. ____	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Canopy dieback	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Grazing and trampling	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Soil disturbance	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Timber harvesting	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Flood damage	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Storm damage	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Firewood collection & tidying up	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Dense regrowth post-disturbance	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Fertiliser addition	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Fire damage	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Feral herbivores	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Weeds	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Other - indicate type: _____	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |

Notes (Record details of plot modification types – see over for examples).

Modification type	Plot #	Details

Disturbance attributes & history record - Scoring codes and Notes table

Severity codes	Frequency codes	Evidence codes	Age codes
N = Nil (no evidence)	A = Absent (i.e. n/a)	O = Observation	On = Ongoing
L = Light	Ra = Rare	W = Word of mouth (e.g. landholder)	R = Recent (<3 years)
M = Moderate	Occ = Occasional		NR = Not recent
S = Severe	F = Frequent		O = Old

Notes tables Record details of modification type/s, e.g.

- Timber harvesting = stumps, coppicing, cut logs, ringbarking etc.
- Grazing & trampling = grazing and trampling by introduced herbivores or over-abundant native herbivores.
- Soil disturbance = ripping, cultivation, compaction, erosion.
- Fire damage – indicate if high frequency, or if certain strata particularly affected.
- Feral animals – indicate species (if known) and observed impacts.

Predicting future condition of offset and incentive zones - use of disturbance attributes and history information.
For each offset or incentive zone the assessor predicts the future condition of the ten site condition variables based on the proposed management action/s. Assessors will need to advise landholders of the technical feasibility of achieving the various desirable transitions from the starting state for each zone. This is where the basic information collected in the Disturbance attributes and history record tables for each zone will be useful. This summary of past and present disturbance pressures needs to be considered by the assessor in conjunction with the 'Current' zone condition for each variable, along with the proposed management actions for that zone. This combination of information will assist with best prediction of the likely trajectory of zone vegetation condition (hopefully, but not necessarily towards recovery). Ideally it will clarify which management actions are unlikely to produce the desired outcomes, and which are not, based on the suite of negative pressure/s impacting on the zone. Thus it will inform the prediction of potential future condition, determination of realistic restoration goals, timeframes and an adaptive management strategy for zones depending on their starting state.

Setting clear goals and objectives is fundamental to the achievement of improved vegetation condition and thus biodiversity. It requires a clear understanding of the Current state, the future Desired state and deciding how to make the transition from the former to the latter. It requires the recognition that not all management actions will help an area transition into an alternative and more desirable stable state.

The broad restoration goal for each zone should be established with reference to the ecological and technical feasibility of achieving the transitions required. Ecologically, desirable transitions maintain or improve the condition of a site in relation to benchmark condition, while non-desirable transitions are those that result in the degradation or loss of ecological condition.

Proposed management actions can advance the score for each variable by increments of 0.5, recognising that not all management actions will result in whole point score improvements. Predicted score improvements need to reflect the slow rate at which restoration occurs and the inherent risk associated with achieving biodiversity outcomes in the long-term. In most circumstances the score for a variable should only be advanced by 0.5 or 1, to reflect this uncertainty regarding the efficacy of many management actions, and the 'single human lifespan' timeframe over which improvements to site condition are scored (this timeframe was chosen based on the lack of ecological knowledge over restoration of native ecosystems over longer timeframes, and hence the need for a precautionary approach). Movements of scores by greater amounts (e.g. two increments) should be limited to selected variables and management actions that have a low risk of failure (see Appendix 5 of the *BioMetric* Operational Manual for details and conditions needed to obtain larger score increases).

***BioMetric* plot work sheets:** **Full species IDs are not required for *BioMetric*, but may be useful for identification of correct vegetation type & for monitoring purposes.**

Site type: Clearing zone / Offset zone / Incentive zone / Reference site **PVP Request No. & Zone No. OR Ref. site ID:**_____ **Date** _____ **Recorder/s** _____

Veg type: _____ **AMG (Zone/Easting Northing) OR Lat/Long (dec. degrees):** _____ **Photos:** _____

Native OVER_STOREY species list [20x20m plot]	**Regen (√) [zone]**	**Native MID-STOREY species list (>1m to <over-storey) [20x20m plot]**	**Native GROUND STRATUM COVER (GRASSES) species list (ground stratum <~1m) [20x20m plot]**	**Native GROUND STRATUM COVER (SHRUBS) species list (ground stratum <~1m) [20x20m plot]**	**Native GROUND STRATUM COVER (OTHER) species list* (ground stratum <~1m) [20x20m plot]**	**EXOTIC plants species list [20x20m plot]**	**FALLEN LOGS (min. 10cm diam x 50cm long [20x50m plot]**
Total no. species =							
Foliage Cover (FC, %) =							
Benchmark FC value (%) =							
av. crown diam. =							
av. Foliage Cover (%) =							
# trees =							
sample area =							
[whole of zone]							
# trees with HOLLOWS =							
sample area =		Total no. species =	Total no. species =	Total no. species =	Total no. species =	Total no. species =	
Benchmark value =		Foliage Cover (%) =	Foliage Cover (%) =	Foliage Cover (%) =	Foliage Cover (%) =	Foliage Cover (%) =	Total (m) =
[20x50m plot or whole zone]		Benchmark FC value (%) =	Benchmark FC value (%) =	Benchmark FC value (%) =	Benchmark FC value (%) =	Benchmark FC value (%) =	Benchmark (m) =

***** = **forbs, herbs, ferns, lilies, rushes, sedges etc.**

N.B. Plots should be placed randomly with a minimum of one plot and a maximum of ten plots within a zone.

Site & Other Notes:

***BioMetric* plot work sheets:** **Full species IDs are not required for *BioMetric*, but may be useful for identification of correct vegetation type & for monitoring purposes.**

Site type: Clearing zone / Offset zone / Incentive zone / Reference site **PVP Request No. & Zone No. OR Ref. site ID:**_____ **Date** _____ **Recorder/s** _____

Veg type: _____ **AMG (Zone/Easting Northing) OR Lat/Long (dec. degrees):** _____ **Photos:** _____

Native OVER_STOREY species list [20x20m plot]	**Regen (√) [zone]**	**Native MID-STOREY species list (>1m to <over-storey) [20x20m plot]**	**Native GROUND STRATUM COVER (GRASSES) species list (ground stratum <~1m) [20x20m plot]**	**Native GROUND STRATUM COVER (SHRUBS) species list (ground stratum <~1m) [20x20m plot]**	**Native GROUND STRATUM COVER (OTHER) species list* (ground stratum <~1m) [20x20m plot]**	**EXOTIC plants species list [20x20m plot]**	**FALLEN LOGS (min. 10cm diam x 50cm long [20x50m plot]**
Total no. species =							
Foliage Cover (FC, %) =							
Benchmark FC value (%) =							
av. crown diam. =							
av. Foliage Cover (%) =							
# trees =							
sample area =							
[whole of zone]							
# trees with HOLLOWS =							
sample area =		Total no. species =	Total no. species =	Total no. species =	Total no. species =	Total no. species =	
Benchmark value =		Foliage Cover (%) =	Foliage Cover (%) =	Foliage Cover (%) =	Foliage Cover (%) =	Foliage Cover (%) =	Total (m) =
[20x50m plot or whole zone]		Benchmark FC value (%) =	Benchmark FC value (%) =	Benchmark FC value (%) =	Benchmark FC value (%) =	Benchmark FC value (%) =	Benchmark (m) =

***** = **forbs, herbs, ferns, lilies, rushes, sedges etc.**

N.B. Plots should be placed randomly with a minimum of one plot and a maximum of ten plots within a zone.

Site & Other Notes:

***BioMetric* & Threatened Species Tool SCATTERED TREE plot work sheets:** **Full species IDs are not required for *BioMetric*, but may be useful for identification of correct vegetation type & for monitoring purposes.**

Site type: Clearing zone / Offset zone / Incentive zone / Reference site **PVP Request No. & Zone No. OR Ref. site ID:**_____

AMG (Zone/Easting Northing) OR Lat/Long (dec. degrees): _____ **Date** _____

Recorder/s _____ **Veg Type:** _____ **Photos:** _____

Tree No.	Species	DBHOB (cm)	Crown Diameter (m)	Foliage Cover (%)	Hollows (cm) size in 5cm increments	Mistletoe
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
26						
27						
28						
29						
30						
31						
32						
33						
34						
35						
36						
37						
38						
39						
40						
41						
42						
43						
44						
45						
46						
47						
48						
49						
50						

No. trees: _____ **Av. Foliage Cover (%):** _____

No. trees with hollows: _____ **Av. no. hollow-bearing trees:** _____
(per 50x20m plot)

Sample area ID: _____ **Sample area (ha):** _____

Notes:

***BioMetric* & Threatened Species Tool SCATTERED TREE plot work sheets:** **Full species IDs are not required for *BioMetric*, but may be useful for identification of correct vegetation type & for monitoring purposes.**

Site type: Clearing zone / Offset zone / Incentive zone / Reference site **PVP Request No. & Zone No. OR Ref. site ID:**_____

AMG (Zone/Easting Northing) OR Lat/Long (dec. degrees): _____ **Date** _____

Recorder/s _____ **Veg Type:** _____ **Photos:** _____

Tree No.	Species	DBHOB (cm)	Crown Diameter (m)	Foliage Cover (%)	Hollows (cm) size in 5cm increments	Mistletoe
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
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37						
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40						
41						
42						
43						
44						
45						
46						
47						
48						
49						
50						

No. trees: _____ **Av. Foliage Cover (%):** _____

No. trees with hollows: _____ **Av. no. hollow-bearing trees:** _____
(per 50x20m plot)

Sample area ID: _____ **Sample area (ha):** _____

Notes

Field Data Sheets for

BioMetric (Version 3.1)

Reference site package

Updated September 2010

Refer to *BioMetric* Operational Manual for detailed data collection methodologies.

Includes:

- Site Value (reference sites) - plot data sheet (up to 10 plots per reference site)
- Step point transect tally tables – plot data sheet
- Crown Separation Ratio transect tables – plot data sheet
- Disturbance attributes and history record – plot data sheet
- Site Value (stem density) - plot data sheet (up to 10 plots per stem density reference site)
- Plot work sheet
- Scattered tree plot work sheet

Site Value (reference sites) - plot data sheet

Start a new sheet for each Reference site (see **Tips for selecting Reference sites & plots**…P.T.O.)

BioMetric

Ref site ID (assigned by assessor)		**CMA**		**Recorder/s**		**Date**	

Vegetation Formation (*sensu* Keith 2004)

Vegetation Class (*sensu* Keith 2004)

Vegetation Type (*BioMetric)*

Dominant species per stratum (P.T.O. for strata definitions)

Over-storey	Mid-storey	Ground stratum

PLOT 1 Lat.	Long.
Orientation	**Photos**

PLOT 2 Lat.	Long.
Orientation	**Photos**

PLOT 3 Lat.	Long.
Orientation	**Photos**

PLOT 4 Lat.	Long.
Orientation	**Photos**

PLOT 5 Lat.	Long.
Orientation	**Photos**

PLOT 6 Lat.	Long.
Orientation	**Photos**

PLOT 7 Lat.	Long.
Orientation	**Photos**

PLOT 8 Lat.	Long.
Orientation	**Photos**

PLOT 9 Lat.	Long.
Orientation	**Photos**

Plot 10 Lat.	Long.
Orientation	**Photos**

Disturbance attributes & history (Record Severity, Frequency, Evidence and Age codes for each plot, e.g. **L| Occ | Ob | R** . See over for details).

Plot No.	1	2	3	4	5	6	7	8	9	10
Canopy dieback	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Grazing and trampling	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Soil disturbance	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Timber harvesting	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Flood damage	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Storm damage	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Firewood collection & tidying up	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Dense regrowth post-disturbance	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Fertiliser addition	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Fire damage	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Feral herbivores										
Weeds	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Other - indicate type: _____	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |

20m x 20m plot (Refer to methods in Appendix 4 of *BioMetric* Operational Manual. Step Point Transect or Crown Separation Ratio methods can also be used to assess Foliage Cover. CSR method is preferred for over-storey and mid-storey strata. See over).

Number of native plant species										
Native mid-storey cover (%)										
Native ground stratum cover (%)- grasses										
Native ground stratum cover (%) - shrubs										
Native ground stratum cover (%) - other										

Larger sampling area (20m x 50m plot) (Refer to methods in Appendix 4 of *BioMetric* Operational Manual.)

Number of trees with hollows – use Alternative method below if appropriate										
Total length of fallen logs (m)										

Alternative (whole-of-zone) methods for zones containing scattered trees, such as sparsely wooded reference sites. (Refer to methods in Appendix 7 of *BioMetric* Operational Manual. Scattered Tree Calculator in *BioMetric* can be used for calculations.)

Native over-storey cover (%)	av. crown diameter (m)= av. foliage cover (%) = # trees= sample area (ha)=									
No. trees with hollows	sample area (ha)= no. trees with hollows =									

Please fax or email completed sheets to: Dani Murphy or James Crooks, Native Vegetation Science Unit, NSW DECCW.
Fax (02) 6229 7001. Email: biometric.tool@environment.nsw.gov.au. Thank you.

Disturbance attributes & history record - Scoring codes and Notes table

- Timber harvesting = stumps, coppicing, cut logs, ringbarking etc. (use Notes table below to record details)
- Grazing & trampling = grazing and trampling by introduced herbivores or over-abundant native herbivores (use Notes table below)
- Soil disturbance = ripping, cultivation, compaction, erosion (use Notes table below)
- Fire damage – indicate if high frequency, or if certain strata particularly affected (use Notes table below)
- Feral animals – indicate species (if known) and observed impacts (use Notes table below)

Severity codes	Frequency codes	Evidence codes	Age codes
N = Nil (no evidence)	A = Absent (i.e. n/a)	O = Observation	On = Ongoing
L = Light	Ra = Rare	W = Word of mouth (e.g. landholder)	R = Recent (<3 years)
M = Moderate	Occ = Occasional		NR = Not recent
S = Severe	F = Frequent		O = Old

Notes

Modification type	Plot #	Details

Site Value methodology prompts (for full details refer to Appendix 4 of *BioMetric* Operational Manual)

- Plots should be placed randomly with a minimum of one plot and a maximum of ten plots within a zone.
- Number of native plant species: COUNT of all indigenous vascular plant species.
- Strata definitions: Native over-storey refers to all native life-forms in the tallest dominant stratum (including emergents) present above 1m and includes all species native to Australia (i.e. native species not local to the area can contribute to over-storey structure). For example, in a woodland community the over-storey stratum is the tree layer, in a shrubland community the over-storey stratum is the tallest shrub layer above 1m; in a wetland or swamp the over-storey stratum may comprise sedges, rushes or bulrushes; and in a tall grassland there may be an over-storey stratum of grasses >1m high. Some vegetation types (e.g. low grasslands) may not have an over-storey stratum. The mid-storey contains all native life-forms between the over-storey stratum and 1m in height (typically tall shrubs, under-storey trees and regeneration of over-storey species) and includes all species native to Australia (i.e. native species not local to the area can contribute to mid-storey structure). Some vegetation types (e.g. grasslands) may not have a mid-storey stratum. The ground stratum contains all native life-forms below 1m in height and includes all species native to Australia (i.e. is not confined to species indigenous to the area). The ground stratum (grasses) refers to native grasses (i.e. plants belonging to the family Poaceae). Ground stratum (shrubs) refers to native woody vegetation <1m. Ground stratum (other) refers to non-woody native vegetation (vascular plants only) <1m that is not grass (e.g. forbs, herbs, ferns, lilies, rushes and sedges).
- Cover estimates (native over-storey, mid-storey, ground cover - grasses, shrubs and other): Foliage Cover (FC, %) – as defined in *BioMetric* Operational Manual. Use CSR transect tables – plot data sheet or Step point transect tally tables – plot data sheet, or tables below.
- No. trees with hollows: hollow entrance must be AT LEAST 5cm diameter; hollows must have depth, and be >1m above the ground.
- Over-storey regeneration: proportion of species in over-storey exhibiting regeneration (≤5cm DBH, no height limits).
- Step point transect tallies: hits recorded every 5m for over-storey and mid-storey cover, and every 1m for ground stratum cover variables. Use three transects for each plot. Record data in Step point transect tally tables – plot data sheet, or table below..

Selecting Reference sites for collecting vegetation condition benchmarks:

- See Appendix 1 in the Operational Manual for information on how to select reference sites for collecting vegetation condition benchmarks
- Stem density benchmarks can also be collected from Reference plots. The number of over-storey species stems need to be recorded for each DBH (diameter at breast height) class. Use "Site Value (stem density) – plot data sheet" to record stem density reference plot data.

Step point transect tally tables (for methodology details see above and refer to Appendix 4 of *BioMetric* Operational Manual.)

PLOT No. _____ TRANSECT No/s. _____	No. hits (tally)	%
Native over-storey cover (%)		
Native mid-storey cover (%)		
Native ground stratum cover (%) - grasses		
Native ground stratum cover (%) - shrubs		
Native ground stratum cover (%) - other		
Exotic plant cover (%)		
Litter cover (%) - optional		
Rock cover (%) - optional		
Bare ground cover (%) - optional		
Cryptogam cover (%) - optional		

Crown Separation Ratio transect tables (for methodology details refer to Appendix 4 of *BioMetric* Operational Manual. Record stratum (o/s, m/s, g/s(g), g/s(s) or g/s(o). Use consistent units within each plot, i.e. m OR cm. Use cm for ground stratum. Circle units used.)

PLOT No. _____ STRATUM _____	1	2	3	4	5	6	7	8	9	10	11	12	Mean
Crown width (m? OR cm?)													
Crown Separation/Gap (m? OR cm?)													
Crown type/ Degree of openness (%)													

Calculations:

CSR = mean Gap/mean Crown width = _____ m? or cm?

Crown Cover (CC) = 80.6/(1+CSR) = _____ %

Foliage Cover = CC (%) x mean Crown type (%)/100= _____ %. Enter this value into *BioMetric* for correct stratum within appropriate plot.

Step point transect tally tables - plot data sheet

Start a new sheet for each zone (Clearing, Offset or Incentive proposals) or Reference Site

BioMetric

PLOT TYPE: (circle one) **Clearing / Offset / Incentive /Reference**

Linked zones (list type/s & nos.)

CMA 　 **Recorder/s** 　 **Date**

Site location & description:

PVP Request No. (from *PADACS*) 　 **Veg Zone No.** (from *NVAT Mapper*)

Vegetation Type (*BioMetric*)

Step point transect tally tables (for methodology details see above and refer to Appendix 4 of *BioMetric* Operational Manual.)

PLOT No. _____ TRANSECT No/s. _____	No. hits (tally)	%
Native over-storey cover (%)		
Native mid-storey cover (%)		
Native ground stratum cover (%) - grasses		
Native ground stratum cover (%) - shrubs		
Native ground stratum cover (%) - other		
Exotic plant cover (%)		
Litter cover (%) - optional		
Rock cover (%) - optional		
Bare ground cover (%) - optional		
Cryptogam cover (%) - optional		

PLOT No. _____ TRANSECT No/s. _____	No. hits (tally)	%
Native over-storey cover (%)		
Native mid-storey cover (%)		
Native ground stratum cover (%) - grasses		
Native ground stratum cover (%) - shrubs		
Native ground stratum cover (%) - other		
Exotic plant cover (%)		
Litter cover (%) - optional		
Rock cover (%) - optional		
Bare ground cover (%) - optional		
Cryptogam cover (%) - optional		

PLOT No. _____ TRANSECT No/s. _____	No. hits (tally)	%
Native over-storey cover (%)		
Native mid-storey cover (%)		
Native ground stratum cover (%) - grasses		
Native ground stratum cover (%) - shrubs		
Native ground stratum cover (%) - other		
Exotic plant cover (%)		
Litter cover (%) - optional		
Rock cover (%) - optional		
Bare ground cover (%) - optional		
Cryptogam cover (%) - optional		

PLOT No. _____ TRANSECT No/s. _____	No. hits (tally)	%
Native over-storey cover (%)		
Native mid-storey cover (%)		
Native ground stratum cover (%) - grasses		
Native ground stratum cover (%) - shrubs		
Native ground stratum cover (%) - other		
Exotic plant cover (%)		
Litter cover (%) - optional		
Rock cover (%) - optional		
Bare ground cover (%) - optional		
Cryptogam cover (%) - optional		

PLOT No. _____ TRANSECT No/s. _____	No. hits (tally)	%
Native over-storey cover (%)		
Native mid-storey cover (%)		
Native ground stratum cover (%) - grasses		
Native ground stratum cover (%) - shrubs		
Native ground stratum cover (%) - other		
Exotic plant cover (%)		
Litter cover (%) - optional		
Rock cover (%) - optional		
Bare ground cover (%) - optional		
Cryptogam cover (%) - optional		

PLOT No. _____ TRANSECT No/s. _____	No. hits (tally)	%
Native over-storey cover (%)		
Native mid-storey cover (%)		
Native ground stratum cover (%) - grasses		
Native ground stratum cover (%) - shrubs		
Native ground stratum cover (%) - other		
Exotic plant cover (%)		
Litter cover (%) - optional		
Rock cover (%) - optional		
Bare ground cover (%) - optional		
Cryptogam cover (%) - optional		

PLOT No. _____ TRANSECT No/s. _____	No. hits (tally)	%
Native over-storey cover (%)		
Native mid-storey cover (%)		
Native ground stratum cover (%) - grasses		
Native ground stratum cover (%) - shrubs		
Native ground stratum cover (%) - other		
Exotic plant cover (%)		
Litter cover (%) - optional		
Rock cover (%) - optional		
Bare ground cover (%) - optional		
Cryptogam cover (%) - optional		

PLOT No. _____ TRANSECT No/s. _____	No. hits (tally)	%
Native over-storey cover (%)		
Native mid-storey cover (%)		
Native ground stratum cover (%) - grasses		
Native ground stratum cover (%) - shrubs		
Native ground stratum cover (%) - other		
Exotic plant cover (%)		
Litter cover (%) - optional		
Rock cover (%) - optional		
Bare ground cover (%) - optional		
Cryptogam cover (%) - optional		

Step point transect tally methodology details (As per Appendix 4 of *BioMetric* Operational Manual. * indicates that an alternative method is provided where tree density is very low (e.g. paddock trees)).

Native over-storey cover (*): FOLIAGE COVER of the over-storey is expressed as a % and can be measured using the step point transect method: at 10 points (i.e. every 5m) along each of the three 50m transects (see Figure 1, App. 4) estimate FOLIAGE COVER (%) directly overhead using the images provided in Figure 2 (App 4). Divide the total by the number of points (i.e. 30) measured along the transects (e.g. 50%, 0%, 0%, 40%,0%, 45%, 50%, 55%, 0%, 0%, 50%, 0%, 0%, 40%,0% ,45%, 50%, 55%, 0%, 0%, 50%, 0%, 0%, 40%,0%, 45%, 50%, 55%, 0%, 0% = 720/30 =24% foliage cover). NOTE: Multiple transects are required to sufficiently encompass over-storey heterogeneity.

Native mid-storey cover: Foliage cover of the mid-storey is expressed as a % and can be measured using the step point transect method: at 10 points (i.e. every 5m) along each of the three 50m transects estimate foliage cover (%) in the mid-storey. Divide the total by the number of points (i.e. 30) measured along the transect, as for native over-storey cover (above).

Native ground stratum cover (grasses, shrubs and other): Foliage cover of the ground stratum is expressed as a % and can be measured using the step point transect method: at 50 points (i.e. every 1m) along each of the three 50m transects record whether the appropriate life form (grass, shrub, other) intersects that point. Note, multiple 'hits' of any particular ground stratum type (e.g. multiple grasses) at a point count as ONE hit only for that type. Divide the total of 'hits' by the number of points measured along the three transects (i.e. 150). NOTE: Multiple transects are required to sufficiently encompass ground stratum cover heterogeneity.

Exotic plant cover: Exotic plant cover is measured as total FOLIAGE COVER (%) of all exotics in all strata. If the exotics are in the over-storey then measure using the same method as native over-storey cover (see above), if exotics are in the mid-storey then measure using the same method as native mid-storey cover (see above) and if exotics are in the ground stratum then measure using the same method as described for native ground stratum cover (grasses) (see above).

Other ground cover measures (litter, rock, bare ground, crypto cover): These variables are not needed for the *BioMetric* site condition assessment, however their inclusion in the field data sheets has been requested by some CMA officers. Cover of these attributes is expressed as a % and can be measured using the step point transect method: at 50 points (i.e. every 1m) along each of the three 50m transects record whether the appropriate attribute intersects that point. Divide the total of 'hits' by the number of points measured along the transects (i.e. 150).

Crown Separation Ratio transect tables - plot data sheet

Start a new sheet for each zone (Clearing, Offset or Incentive proposals) or Reference Site

BioMetric

PLOT TYPE: (circle one) **Clearing / Offset / Incentive /Reference**

Linked zones (list type/s & nos.)

CMA | **Recorder/s** | **Date**

Site location & description:

PVP Request No. (from *PADACS*)

Veg Zone No. (from *NVAT Mapper*)

Vegetation type (*BioMetric*)

Crown Separation Ratio transect tables (for methodology details see over and refer to Appendix 4 of *BioMetric* Operational Manual. Record stratum (o/s, m/s, g/s(g), g/s(s) or g/s(o). Use consistent units within each plot, i.e. m OR cm. Use cm for ground stratum. Circle units used.)

PLOT No. ______ STRATUM ________	1	2	3	4	5	6	7	8	9	10	11	12	Mean
Crown width (m? OR cm?)													
Crown Separation/Gap (m? OR cm?)													
Crown type/ Degree of openness (%)													

Calculations:
CSR = mean Gap/mean Crown width = _________ m? or cm?
Crown Cover (CC) = 80.6/(1+CSR) = _______ %
Foliage Cover = CC (%) x mean Crown type (%)/100= ________ %. Enter this value into *BioMetric* for correct stratum within appropriate plot.

PLOT No. ______ STRATUM ________	1	2	3	4	5	6	7	8	9	10	11	12	Mean
Crown width (m? OR cm?)													
Crown Separation/Gap (m? OR cm?)													
Crown type/ Degree of openness (%)													

Calculations:
CSR = mean Gap/mean Crown width = _________ m? or cm?
Crown Cover (CC) = 80.6/(1+CSR) = _______ %
Foliage Cover = CC (%) x mean Crown type (%)/100= ________ %. Enter this value into *BioMetric* for correct stratum within appropriate plot.

PLOT No. ______ STRATUM ________	1	2	3	4	5	6	7	8	9	10	11	12	Mean
Crown width (m? OR cm?)													
Crown Separation/Gap (m? OR cm?)													
Crown type/ Degree of openness (%)													

Calculations:
CSR = mean Gap/mean Crown width = _________ m? or cm?
Crown Cover (CC) = 80.6/(1+CSR) = _______ %
Foliage Cover = CC (%) x mean Crown type (%)/100= ________ %. Enter this value into *BioMetric* for correct stratum within appropriate plot.

PLOT No. ______ STRATUM ________	1	2	3	4	5	6	7	8	9	10	11	12	Mean
Crown width (m? OR cm?)													
Crown Separation/Gap (m? OR cm?)													
Crown type/ Degree of openness (%)													

Calculations:
CSR = mean Gap/mean Crown width = _________ m? or cm?
Crown Cover (CC) = 80.6/(1+CSR) = _______ %
Foliage Cover = CC (%) x mean Crown type (%)/100= ________ %. Enter this value into *BioMetric* for correct stratum within appropriate plot.

PLOT No. ______ STRATUM ________	1	2	3	4	5	6	7	8	9	10	11	12	Mean
Crown width (m? OR cm?)													
Crown Separation/Gap (m? OR cm?)													
Crown type/ Degree of openness (%)													

Calculations:
CSR = mean Gap/mean Crown width = _________ m? or cm?
Crown Cover (CC) = 80.6/(1+CSR) = _______ %
Foliage Cover = CC (%) x mean Crown type (%)/100= ________ %. Enter this value into *BioMetric* for correct stratum within appropriate plot.

PLOT No. ______ STRATUM ________	1	2	3	4	5	6	7	8	9	10	11	12	Mean
Crown width (m? OR cm?)													
Crown Separation/Gap (m? OR cm?)													
Crown type/ Degree of openness (%)													

Calculations:

CSR = mean Gap/mean Crown width = _________ m? or cm?
Crown Cover (CC) = 80.6/(1+CSR) = _______ %
Foliage Cover = CC (%) x mean Crown type (%)/100= ________ %. Enter this value into *BioMetric* for correct stratum within appropriate plot.

PLOT No. ______ STRATUM ________	1	2	3	4	5	6	7	8	9	10	11	12	Mean
Crown width (m? OR cm?)													
Crown Separation/Gap (m? OR cm?)													
Crown type/ Degree of openness (%)													

Calculations:

CSR = mean Gap/mean Crown width = _________ m? or cm?
Crown Cover (CC) = 80.6/(1+CSR) = _______ %
Foliage Cover = CC (%) x mean Crown type (%)/100= ________ %. Enter this value into *BioMetric* for correct stratum within appropriate plot.

PLOT No. ______ STRATUM ________	1	2	3	4	5	6	7	8	9	10	11	12	Mean
Crown width (m? OR cm?)													
Crown Separation/Gap (m? OR cm?)													
Crown type/ Degree of openness (%)													

Calculations:

CSR = mean Gap/mean Crown width = _________ m? or cm?
Crown Cover (CC) = 80.6/(1+CSR) = _______ %
Foliage Cover = CC (%) x mean Crown type (%)/100= ________ %. Enter this value into *BioMetric* for correct stratum within appropriate plot.

PLOT No. ______ STRATUM ________	1	2	3	4	5	6	7	8	9	10	11	12	Mean
Crown width (m? OR cm?)													
Crown Separation/Gap (m? OR cm?)													
Crown type/ Degree of openness (%)													

Calculations:

CSR = mean Gap/mean Crown width = _________ m? or cm?
Crown Cover (CC) = 80.6/(1+CSR) = _______ %
Foliage Cover = CC (%) x mean Crown type (%)/100= ________ %. Enter this value into *BioMetric* for correct stratum within appropriate plot.

PLOT No. ______ STRATUM ________	1	2	3	4	5	6	7	8	9	10	11	12	Mean
Crown width (m? OR cm?)													
Crown Separation/Gap (m? OR cm?)													
Crown type/ Degree of openness (%)													

Calculations:

CSR = mean Gap/mean Crown width = _________ m? or cm?
Crown Cover (CC) = 80.6/(1+CSR) = _______ %
Foliage Cover = CC (%) x mean Crown type (%)/100= ________ %. Enter this value into *BioMetric* for correct stratum within appropriate plot.

Crown Separation Ratio transect methodology details (As per Appendix 4 of *BioMetric* Operational Manual.)

Native over-storey cover, native mid-storey cover and native ground stratum cover are all estimated as FOLIAGE COVER (%), which is equivalent to the amount of shadow that would be cast on the ground if there were a light source directly overhead. The Crown Separation Ratio (CSR) method is the preferred (most replicable) method for assessing native over-storey cover and native mid-storey cover (%). It can also be used to assess native ground stratum cover (%). CSR is assessed separately for each stratum, as per method below.

1. Sample along a zig-zag transect as shown, following the 50m transect down the centre of the 50x20m plot (shown as PQ). Start at the crown closest to P (the transect beginning at the plot baseline) and select the next crown encountered going *towards* or *across* the transect line and in the direct P → Q.

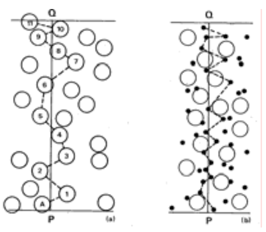

Figure. The zig-zag procedure is used for each stratum of layer, for example (a) for the over-storey and (b) for the mid-storey (Walker and Hopkins 1998).

2. For each stratum, and irrespective of species, measure:
    a. crown widths (m)
    b. crown gaps (m), and
    c. crown type (degree of openness, %), by matching the photographs in Figure 3 with the actual tree or shrub crowns.
    - In the field, a mean of 12 measurements (i.e. 12 widths and 12 gaps) is usually sufficient. Note, in more open vegetation types the transect PQ will be significantly longer than 50m.
    - Where crown overlap occurs, the crown gap has a negative value. The greater the overlap, the more negative the value. For example, for two crowns that overlap by 3m, the gap is -3.
3. Manually calculate CSR, Crown Cover (CC) and Foliage Cover (%) as per formulae provided.
4. Enter FC% into *BioMetric* for the appropriate zone and plot.

Disturbance attributes and history record – plot data sheet

BioMetric

Start a new sheet for each new Offset or Incentive proposal

PVP Request No. (from *PADACS*)_____ **Date**_____

CMA _____ **Recorder/s**_____

Disturbance attributes & history (Record Severity, Frequency, Evidence and Age codes for each plot, e.g. **L| Occ | Ob | R** . See over for details).

	Plot No.									
Zone No. ____	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Canopy dieback	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Grazing and trampling	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Soil disturbance	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Timber harvesting	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Flood damage	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Storm damage	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Firewood collection & tidying up	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Dense regrowth post-disturbance	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Fertiliser addition	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Fire damage	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Feral herbivores	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Weeds	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Other - indicate type: _____	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |

Notes (Record details of plot modification types – see over for examples).

Modification type	Plot #	Details

	Plot No.									
Zone No. ____	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Canopy dieback	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Grazing and trampling	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Soil disturbance	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Timber harvesting	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Flood damage	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Storm damage	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Firewood collection & tidying up	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Dense regrowth post-disturbance	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Fertiliser addition	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Fire damage	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Feral herbivores	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Weeds	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Other - indicate type: _____	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |

Notes (Record details of plot modification types – see over for examples).

Modification type	Plot #	Details

Plot No.										
Zone No. ____	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Canopy dieback	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Grazing and trampling	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Soil disturbance	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Timber harvesting	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Flood damage	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Storm damage	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Firewood collection & tidying up	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Dense regrowth post-disturbance	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Fertiliser addition	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Fire damage	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Feral herbivores	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Weeds	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |
Other - indicate type: _____	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |	| | |

Notes (Record details of plot modification types – see over for examples).

Modification type	Plot #	Details

Disturbance attributes & history record - Scoring codes and Notes table

Severity codes	Frequency codes	Evidence codes	Age codes
N = Nil (no evidence)	A = Absent (i.e. n/a)	O = Observation	On = Ongoing
L = Light	Ra = Rare	W = Word of mouth (e.g. landholder)	R = Recent (<3 years)
M = Moderate	Occ = Occasional		NR = Not recent
S = Severe	F = Frequent		O = Old

Notes tables Record details of modification type/s, e.g.

- Timber harvesting = stumps, coppicing, cut logs, ringbarking etc.
- Grazing & trampling = grazing and trampling by introduced herbivores or over-abundant native herbivores.
- Soil disturbance = ripping, cultivation, compaction, erosion.
- Fire damage – indicate if high frequency, or if certain strata particularly affected.
- Feral animals – indicate species (if known) and observed impacts.

Predicting future condition of offset and incentive zones - use of disturbance attributes and history information.

For each offset or incentive zone the assessor predicts the future condition of the ten site condition variables based on the proposed management action/s. Assessors will need to advise landholders of the technical feasibility of achieving the various desirable transitions from the starting state for each zone. This is where the basic information collected in the Disturbance attributes and history record tables for each zone will be useful. This summary of past and present disturbance pressures needs to be considered by the assessor in conjunction with the 'Current' zone condition for each variable, along with the proposed management actions for that zone. This combination of information will assist with best prediction of the likely trajectory of zone vegetation condition (hopefully, but not necessarily towards recovery). Ideally it will clarify which management actions are unlikely to produce the desired outcomes, and which are not, based on the suite of negative pressure/s impacting on the zone. Thus it will inform the prediction of potential future condition, determination of realistic restoration goals, timeframes and an adaptive management strategy for zones depending on their starting state.

Setting clear goals and objectives is fundamental to the achievement of improved vegetation condition and thus biodiversity. It requires a clear understanding of the Current state, the future Desired state and deciding how to make the transition from the former to the latter. It requires the recognition that <u>not all management actions will help an area transition into an alternative and more desirable stable state</u>.

The broad restoration goal for each zone should be established with reference to the ecological and technical feasibility of achieving the transitions required. Ecologically, desirable transitions maintain or improve the condition of a site in relation to benchmark condition, while non-desirable transitions are those that result in the degradation or loss of ecological condition.

Proposed management actions can advance the score for each variable by increments of 0.5, recognising that not all management actions will result in whole point score improvements. Predicted score improvements need to reflect the slow rate at which restoration occurs and the inherent risk associated with achieving biodiversity outcomes in the long-term. In most circumstances the score for a variable should only be advanced by 0.5 or 1, to reflect this uncertainty regarding the efficacy of many management actions, and the 'single human lifespan' timeframe over which improvements to site condition are scored (this timeframe was chosen based on the lack of ecological knowledge over restoration of native ecosystems over longer timeframes, and hence the need for a precautionary approach). Movements of scores by greater amounts (e.g. two increments) should be limited to selected variables and management actions that have a low risk of failure (see Appendix 5 of the *BioMetric* Operational Manual for details and conditions needed to obtain larger score increases).

Site Value (stem density) – plot data sheet

BioMetric

Start a new page for each zone (Thinning proposals) or Stem density Reference site

PLOT TYPE: (circle one) **Thinning zone / Stem density reference site**

CMA | **Recorder/s** | **Date**

PVP Request No.	**Veg. Zone No.**	**Area (ha)**

PVP Request No. (from *PADACS*), **Zone No.** (from *NVAT Mapper*) **& Zone Area**

OR

Ref site ID (assigned by assessor)

Vegetation Formation (*sensu* Keith 2004)

Vegetation Class (*sensu* Keith 2004)

Vegetation Type (*BioMetric)*

Dominant species in strata
(See below for strata definitions)

Over-storey	**Mid-storey**	**Ground stratum**

PLOT 1 Lat.	**Long.**
Orientation	**Photos**

PLOT 2 Lat.	**Long.**
Orientation	**Photos**

PLOT 3 Lat.	**Long.**
Orientation	**Photos**

PLOT 4 Lat.	**Long.**
Orientation	**Photos**

PLOT 5 Lat.	**Long.**
Orientation	**Photos**

PLOT 6 Lat.	**Long.**
Orientation	**Photos**

PLOT 7 Lat.	**Long.**
Orientation	**Photos**

PLOT 8 Lat.	**Long.**
Orientation	**Photos**

PLOT 9 Lat.	**Long.**
Orientation	**Photos**

Plot 10 Lat.	**Long.**
Orientation	**Photos**

Plot No. 1 2 3 4 5 6 7 8 9 10

20m x 50m plot (Thinning assessments for PVPs do not have to be plot-based, but plots must be used on Reference Sites. DBHOB = diameter at breast height (1.3m above ground level), measured over bark. See below for methods.)

>0 to 10 (cm) DBHOB class:										
>10 to 20 (cm) DBHOB class:										
>20 to 30 (cm) DBHOB class:										
>30 (cm) DBHOB class - recommended:										

Strata definitions:

- Native over-storey refers to all native life-forms in the tallest dominant stratum (including emergents) present above 1m and includes all species native to Australia (i.e. native species not local to the area can contribute to over-storey structure). For example, in a woodland community the over-storey stratum is the tree layer, in a shrubland community the over-storey stratum is the tallest shrub layer above 1m; in a wetland or swamp the over-storey stratum may comprise sedges, rushes or bulrushes; and in a tall grassland there may be an over-storey stratum of grasses >1m high. Some vegetation types (e.g. low grasslands) may not have an over-storey stratum.
- The mid-storey contains all native life-forms between the over-storey stratum and 1m in height (typically tall shrubs, under-storey trees and regeneration of over-storey species) and includes all species native to Australia (i.e. native species not local to the area can contribute to mid-storey structure). Some vegetation types (e.g. grasslands) may not have a mid-storey stratum.
- The ground stratum contains all native life-forms below 1m in height and includes all species native to Australia (i.e. is not confined to species indigenous to the area). The ground stratum (grasses) refers to native grasses (i.e. plants belonging to the family Poaceae). Ground stratum (shrubs) refers to native woody vegetation <1m. Ground stratum (other) refers to non-woody native vegetation (vascular plants only) <1m that is not grass (e.g. forbs, herbs, ferns, lilies, rushes and sedges).

Site Value methodology prompt: (as per Appendix 4 of *BioMetric* Operational Manual)

- Number of stems in three specified DBHOB classes: COUNT of the number of stems of over-storey tree species in each DBHOB class. Record only those trees in which the centre of the stem is within the plot. Record only the largest stem for multi-stemmed trees. **N.B. stems >30cm DBHOB cannot be thinned.**
- Thinning assessments can be plot-based (as above) or may comprise visual comparison between assessment sites and benchmark densities and stem spacings (the latter are calculated by *BioMetric*).

Selecting Reference sites for collecting stem density benchmarks:

- See Appendix 1 in the *BioMetric* Operational Manual for information on how to select reference sites for collecting stem density (and vegetation condition) benchmarks. The number of over-storey species stems needs to be recorded for each DBHOB range. Record species information in *BioMetric* plot work sheets and/or *BioMetric* & Threatened Species Tool SCATTERED TREE plot work sheets. Record, species ids and the relative abundance of each species
- N.B. Use Site Value (reference sites) - plot data sheet to record plot disturbance attributes & history data.

Please fax or email completed Reference Site sheets to: Dani Murphy or James Crooks, Native Vegetation Science Unit, NSW DECCW. Fax (02) 6229 7001 Email: biometric.tool@environment.nsw.gov.au . Thank you.

Site Value (stem density) – plot data sheet

BioMetric

Start a new page for each zone (Thinning proposals) or Stem density Reference site

PLOT TYPE: (circle one) **Thinning zone / Stem density reference site**

CMA | **Recorder/s** | **Date**

PVP Request No.	**Veg. Zone No.**	**Area (ha)**

PVP Request No. (from *PADACS*), **Zone No.** (from *NVAT Mapper*) **& Zone Area**

OR

Ref site ID (assigned by assessor)

Vegetation Formation (*sensu* Keith 2004)

Vegetation Class (*sensu* Keith 2004)

Vegetation Type (*BioMetric)*

Dominant species in strata
(See below for strata definitions)

Over-storey	**Mid-storey**	**Ground stratum**

PLOT 1 Lat.	**Long.**
Orientation	**Photos**

PLOT 2 Lat.	**Long.**
Orientation	**Photos**

PLOT 3 Lat.	**Long.**
Orientation	**Photos**

PLOT 4 Lat.	**Long.**
Orientation	**Photos**

PLOT 5 Lat.	**Long.**
Orientation	**Photos**

PLOT 6 Lat.	**Long.**
Orientation	**Photos**

PLOT 7 Lat.	**Long.**
Orientation	**Photos**

PLOT 8 Lat.	**Long.**
Orientation	**Photos**

PLOT 9 Lat.	**Long.**
Orientation	**Photos**

Plot 10 Lat.	**Long.**
Orientation	**Photos**

Plot No. 1 2 3 4 5 6 7 8 9 10

20m x 50m plot (Thinning assessments for PVPs do not have to be plot-based, but plots must be used on Reference Sites. DBHOB = diameter at breast height (1.3m above ground level), measured over bark. See below for methods.)

>0 to 10 (cm) DBHOB class:										
>10 to 20 (cm) DBHOB class:										
>20 to 30 (cm) DBHOB class:										
>30 (cm) DBHOB class - recommended:										

Strata definitions:

- Native over-storey refers to all native life-forms in the tallest dominant stratum (including emergents) present above 1m and includes all species native to Australia (i.e. native species not local to the area can contribute to over-storey structure). For example, in a woodland community the over-storey stratum is the tree layer, in a shrubland community the over-storey stratum is the tallest shrub layer above 1m; in a wetland or swamp the over-storey stratum may comprise sedges, rushes or bulrushes; and in a tall grassland there may be an over-storey stratum of grasses >1m high. Some vegetation types (e.g. low grasslands) may not have an over-storey stratum.
- The mid-storey contains all native life-forms between the over-storey stratum and 1m in height (typically tall shrubs, under-storey trees and regeneration of over-storey species) and includes all species native to Australia (i.e. native species not local to the area can contribute to mid-storey structure). Some vegetation types (e.g. grasslands) may not have a mid-storey stratum.
- The ground stratum contains all native life-forms below 1m in height and includes all species native to Australia (i.e. is not confined to species indigenous to the area). The ground stratum (grasses) refers to native grasses (i.e. plants belonging to the family Poaceae). Ground stratum (shrubs) refers to native woody vegetation <1m. Ground stratum (other) refers to non-woody native vegetation (vascular plants only) <1m that is not grass (e.g. forbs, herbs, ferns, lilies, rushes and sedges).

Site Value methodology prompt: (as per Appendix 4 of *BioMetric* Operational Manual)

- Number of stems in three specified DBHOB classes: COUNT of the number of stems of over-storey tree species in each DBHOB class. Record only those trees in which the centre of the stem is within the plot. Record only the largest stem for multi-stemmed trees. **N.B. stems >30cm DBHOB cannot be thinned.**
- Thinning assessments can be plot-based (as above) or may comprise visual comparison between assessment sites and benchmark densities and stem spacings (the latter are calculated by *BioMetric*).

Selecting Reference sites for collecting stem density benchmarks:

- See Appendix 1 in the *BioMetric* Operational Manual for information on how to select reference sites for collecting stem density (and vegetation condition) benchmarks. The number of over-storey species stems needs to be recorded for each DBHOB range. Record species information in *BioMetric* plot work sheets and/or *BioMetric* & Threatened Species Tool SCATTERED TREE plot work sheets. Record, species ids and the relative abundance of each species
- N.B. Use Site Value (reference sites) - plot data sheet to record plot disturbance attributes & history data.

Please fax or email completed Reference Site sheets to: Dani Murphy or James Crooks, Native Vegetation Science Unit, NSW DECCW. Fax (02) 6229 7001 Email: biometric.tool@environment.nsw.gov.au . Thank you.

***BioMetric* plot work sheets:** **Full species IDs are not required for *BioMetric*, but may be useful for identification of correct vegetation type & for monitoring purposes.**

Site type: Clearing zone / Offset zone / Incentive zone / Reference site **PVP Request No. & Zone No. OR Ref. site ID:**_____ **Date** _____ **Recorder/s** _____

Veg type: _____ **AMG (Zone/Easting Northing) OR Lat/Long (dec. degrees):** _____ **Photos:** _____

Native OVER_STOREY species list [20x20m plot]	**Regen (√) [zone]**	**Native MID-STOREY species list (>1m to <over-storey) [20x20m plot]**	**Native GROUND STRATUM COVER (GRASSES) species list (ground stratum <~1m) [20x20m plot]**	**Native GROUND STRATUM COVER (SHRUBS) species list (ground stratum <~1m) [20x20m plot]**	**Native GROUND STRATUM COVER (OTHER) species list* (ground stratum <~1m) [20x20m plot]**	**EXOTIC plants species list [20x20m plot]**	**FALLEN LOGS (min. 10cm diam x 50cm long [20x50m plot]**
Total no. species =							
Foliage Cover (FC, %) =							
Benchmark FC value (%) =							
av. crown diam. =							
av. Foliage Cover (%) =							
# trees =							
sample area =							
[whole of zone]							
# trees with HOLLOWS =							
sample area =		Total no. species =	Total no. species =	Total no. species =	Total no. species =	Total no. species =	
Benchmark value =		Foliage Cover (%) =	Foliage Cover (%) =	Foliage Cover (%) =	Foliage Cover (%) =	Foliage Cover (%) =	Total (m) =
[20x50m plot or whole zone]		Benchmark FC value (%) =	Benchmark FC value (%) =	Benchmark FC value (%) =	Benchmark FC value (%) =	Benchmark FC value (%) =	Benchmark (m) =

***** = **forbs, herbs, ferns, lilies, rushes, sedges etc.**

N.B. Plots should be placed randomly with a minimum of one plot and a maximum of ten plots within a zone.

Site & Other Notes:

***BioMetric* plot work sheets:** **Full species IDs are not required for *BioMetric*, but may be useful for identification of correct vegetation type & for monitoring purposes.**

Site type: Clearing zone / Offset zone / Incentive zone / Reference site **PVP Request No. & Zone No. OR Ref. site ID:**_____ **Date** _____ **Recorder/s** _____

Veg type: _____ **AMG (Zone/Easting Northing) OR Lat/Long (dec. degrees):** _____ **Photos:** _____

Native OVER_STOREY species list [20x20m plot]	**Regen (√) [zone]**	**Native MID-STOREY species list (>1m to <over-storey) [20x20m plot]**	**Native GROUND STRATUM COVER (GRASSES) species list (ground stratum <~1m) [20x20m plot]**	**Native GROUND STRATUM COVER (SHRUBS) species list (ground stratum <~1m) [20x20m plot]**	**Native GROUND STRATUM COVER (OTHER) species list* (ground stratum <~1m) [20x20m plot]**	**EXOTIC plants species list [20x20m plot]**	**FALLEN LOGS (min. 10cm diam x 50cm long [20x50m plot]**
Total no. species =							
Foliage Cover (FC, %) =							
Benchmark FC value (%) =							
av. crown diam. =							
av. Foliage Cover (%) =							
# trees =							
sample area =							
[whole of zone]							
# trees with HOLLOWS =							
sample area =		Total no. species =	Total no. species =	Total no. species =	Total no. species =	Total no. species =	
Benchmark value =		Foliage Cover (%) =	Foliage Cover (%) =	Foliage Cover (%) =	Foliage Cover (%) =	Foliage Cover (%) =	Total (m) =
[20x50m plot or whole zone]		Benchmark FC value (%) =	Benchmark FC value (%) =	Benchmark FC value (%) =	Benchmark FC value (%) =	Benchmark FC value (%) =	Benchmark (m) =

***** = **forbs, herbs, ferns, lilies, rushes, sedges etc.**

N.B. Plots should be placed randomly with a minimum of one plot and a maximum of ten plots within a zone.

Site & Other Notes:

***BioMetric* & Threatened Species Tool SCATTERED TREE plot work sheets:** **Full species IDs are not required for *BioMetric*, but may be useful for identification of correct vegetation type & for monitoring purposes.**

Site type: Clearing zone / Offset zone / Incentive zone / Reference site **PVP Request No. & Zone No. OR Ref. site ID:**_____

AMG (Zone/Easting Northing) OR Lat/Long (dec. degrees): _____ **Date** _____

Recorder/s _____ **Veg Type:** _____ **Photos:** _____

Tree No.	Species	DBHOB (cm)	Crown Diameter (m)	Foliage Cover (%)	Hollows (cm) size in 5cm increments	Mistletoe
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
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38						
39						
40						
41						
42						
43						
44						
45						
46						
47						
48						
49						
50						

No. trees: _____ **Av. Foliage Cover (%):** _____

No. trees with hollows: _____ **Av. no. hollow-bearing trees:** _____
(per 50x20m plot)

Sample area ID: _____ **Sample area (ha):** _____

Notes:

***BioMetric* & Threatened Species Tool SCATTERED TREE plot work sheets:** **Full species IDs are not required for *BioMetric*, but may be useful for identification of correct vegetation type & for monitoring purposes.**

Site type: Clearing zone / Offset zone / Incentive zone / Reference site **PVP Request No. & Zone No. OR Ref. site ID:**_____

AMG (Zone/Easting Northing) OR Lat/Long (dec. degrees): _____ **Date** _____

Recorder/s _____ **Veg Type:** _____ **Photos:** _____

Tree No.	Species	DBHOB (cm)	Crown Diameter (m)	Foliage Cover (%)	Hollows (cm) size in 5cm increments	Mistletoe
1						
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11						
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48						
49						
50						

No. trees: _____ **Av. Foliage Cover (%):** _____

No. trees with hollows: _____ **Av. no. hollow-bearing trees:** _____
(per 50x20m plot)

Sample area ID: _____ **Sample area (ha):** _____

Notes