CFI Methodology

for Native Forest Protection Projects

Version 1.3

Prepared by Redd Forests Pty Ltd and GreenCollar Pty Ltd

Table of Contents

Section 1: Applicant Details

Name:	s47F
Company:	Redd Forests Pty Ltd
Position:	s47F
Telephone:	
Email:	
Address:	
Postal address (if different to above):	As above

Name:	s47F
Company:	GreenCollar Climate Solutions Pty Ltd
Position:	s47F
Telephone:	
Email:	
Address:	
Postal address (if different to above):	As above

Section 2: Expert Consultation

N/A

Section 3: Existing Methodologies

3.1 Has a similar methodology already been approved for use under the CFI? If yes, outline how the new methodology proposal is different.
No

3.2 Is the draft methodology an adaptation of an existing methodology that has been approved under an international offsets scheme or an offsets scheme in another Australian jurisdiction? If yes, provide a reference for the existing methodology and describe any major differences between the draft methodology and the existing methodology.
Yes. This methodology is based on VM0010 Methodology for Improved Forest Management: Conversion from Logged to Protected Forest. The methodology was developed by GreenCollar Climate Solutions and approved by the Verified Carbon Standard on 11 February 2011. It is available through the VCS website at http://www.v-c-s.org/sites/v-c-s.org/files/VM0010%20Methodology%20for%20IFM%20LtPF%20v1.0%2C%2018MAR2011.pdf.

The Redd Forests IFM methodology has been adapted from the existing methodology in the following ways:

- The definitions and terminology are based on the Carbon Credits (Carbon Farming Initiative) Bill, No ###, 2011.
- The equations have been modified to remove the parameter 'land parcel', *p*. This was considered unnecessary when the equations already contain the parameter 'stratum', *i*.
- The equations have been modified to calculate annualised emission reductions. This figure is multiplied by the number of years in the reporting period to determine the number of CFI credits that the proponent can claim.
- The mechanism for calculating carbon sequestration through forest growth has been revised to utilise FullCAM to, a model developed for the National Carbon Accounting System (NCAS), a constantly evolving 'best practice' approach. FullCAM provides temporally and spatially explicit monitoring and modelling capabilities for land-based emissions and sinks. It is part of a Tier 3 accounting framework and industry best practice in Australia[1], and therefore preferable to the more limited tools available to an internationally applicable methodology.
- The equations and monitoring parameters accounting for loss of carbon stocks through illegal logging have been removed. Illegal logging is not considered a threat in Australia due to widespread recognition of private property, and strong enforcement of commercial forest harvesting regulation.
- The equations accounting for leakage will be revised, in accordance with the standardised leakage assessment for CFI projects.
- The equations accounting for uncertainty have been removed. The key source of uncertainty, sampling error, has been identified and addressed during the stratification of the project area.
- The equations accounting for risk have been removed. Instead, the risk of reversal buffer has been set at 5% in accordance with the Carbon Credits (Carbon Farming Initiative) Bill This replaces the use of the (recently superseded) VCS Tool for AFOLU Non-Permanence Risk Analysis and Buffer Determination.

This methodology also draws on:

- VCS Program Guide 2011[2]
- VCS Tool for AFOLU Methodological Issues[3]
- VCS Tool for the Demonstration and Assessment of Additionality in VCS Agriculture, Forestry and Other Land Use (AFOLU) Project Activities[4]
- Tool for Calculation of the Number of Sample Plots for Measurements within A/R CDM Project Activities[5]

---

[1] Richards, GP (2001) The FullCAM Carbon Accounting Model: Development, Calibration and Implementation, Australian Greenhouse Office, Canberra. Presented at the IEA Bioenergy Task 38: Workshop, 'Carbon Accounting and Emissions Trading Related to Bioenergy, Wood Products and Carbon Sequestration'. Available at < http://www.ieabioenergy-task38.org/workshops/canberra01/cansession1.pdf> [accessed 19/07/2011]

[2] http://v-c-s.org/sites/v-c-s.org/files/VCS%20Program%20Guide,%20v3.0_2.pdf

[3] http://www.v-c-s.org/sites/v-c-s.org/files/Tool%20for%20AFOLU%20Methodological%20Issues.pdf

[4] http://www.v-c-s.org/methodologies/VT0001

[5] http://cdm.unfccc.int/methodologies/ARmethodologies/tools/ar-am-tool-03-v1.pdf

Section 4: Methodology Glossary

Provide a glossary of terms that are specific to the draft methodology.	
|BSL	The suffix featured to indicate physical quantities referring to the **baseline scenario**
|NFPP	The suffix featured to indicate physical quantities referring to the **native forest protection project**
|PRJ	The suffix featured to indicate physical quantities referring to the **project scenario**
Aboveground biomass	Living biomass above the soil, including the stem, stump, branches, bark, seeds and foliage
BCEF	Biomass conversion and expansion factor
Carbon pool	A reservoir of carbon that has the potential to accumulate (or lose) carbon over time. For LULUCF projects, this encompasses aboveground biomass, belowground biomass, litter, dead wood and soil
Carbon stock	The quantity of carbon held within a pool, measured in tonnes of CO2
Commercial timber harvest	Removal of merchantable trees from a forest to obtain income from the wood products. For the purpose of this methodology, a commercial timber harvest must be planned and legally permitted
DBH	Diameter at breast height
Forest inventory	A system for measuring the extent, quantity, and condition of a forest by sampling through: a) a set of objective sampling methods designed to quantify the spatial distribution, composition, and rates of change of forest parameters within specified levels of precision for the purpose of management; b) the listing of data from such a survey.
Project area	The area of land within the property available for logging and timber extraction operations as defined in the timber harvest plan. This excludes all non-forested area and any forested area protected under other mechanisms (streamside reserves, roadside buffers, conservation covenants, etc).
Timber harvest plan	Description of the methods and operations needed to harvest timber from a forest under a given set of legal conditions for harvest. This includes: a) demarcation of non-harvest areas within the forest, b) division of the harvestable forest into annual operating areas presented as descriptions and maps, c) the design and presentation of the transport system for the removal of harvested timber products, d) a description of the harvest and transport machinery used for timber harvest.
Wood products	Products derived from wood harvested from a forest, including fuelwood and logs and the products derived from them such as sawn timber, plywood, wood pulp, paper

Section 5: Methodology (or Activity) Scope

5.1 Describe the specific abatement activities, technologies or management practices to which the methodology applies. Explain how the abatement activities, technologies or management practices will reduce or avoid emissions or remove and sequester greenhouse gases from the atmosphere.

This methodology calculates the abatement of emissions from a native forest protection project, specifically the prevention of clearing and clear-felling of native forests.

Native forests across Australia have historically been logged for wood products, varying from low-value wood chips to high-value sawnwood. This has traditionally been one of the only means to generate income from forestry. There has also been widespread conversion of native forests to other land uses. However, the consequences of ongoing logging and/or conversion are substantial emissions from the logging process, and the steady degradation or loss of carbon stocks in native forest.

The establishment of native forest protection projects is intended to prevent the emissions generated through business-as-usual logging practices, and to maintain and enhance the carbon stocks in native forests. Such projects have the additional benefits of enhancing local biodiversity, diversifying landowners' income and maintaining the aesthetic and recreational values of the forest landscape.

The number of greenhouse gas emissions prevented by the project is determined by the difference between the baseline and project scenarios, and after taking leakage into account. Calculation of greenhouse gas emissions requires the application of equations presented in Section 9. Baseline scenario projections are calculated *ex ante* and are not adjusted throughout the project lifetime. Project scenario projections are calculated *ex ante*, and adjusted *ex post* based on monitoring data collected during the crediting period.

The baseline net greenhouse gas emissions are determined from calculation of deadwood generated in the process of timber harvest, the emissions resulting from production and subsequent retirement of wood products derived from the timber harvesting, minus the rates of forest regrowth after timber harvest. Baseline commercial timber volumes must be derived for development of the timber harvest plan and for *ex post* accounting of emissions resulting from natural forest disturbance.

Net greenhouse gas emissions in the project scenario will be equal to carbon sequestration through ongoing forest growth minus any emissions resulting from natural disturbance. *Ex ante* estimations of natural disturbance for the project scenario shall be based on historical incidence of fire and natural disturbance on the project site; the data may be from the project region if site-specific data is not available. For all offsets reports, data collected for monitored parameters for natural disturbance must be included using the equations given in Section 9.

5.2 List the circumstances or conditions under which the activities, technologies or management practices are to be implemented. If they can be implemented under different circumstances or conditions (for example, climatic conditions, soil types and other regionally specific conditions), specify any differences in implementation for each of the different circumstances or conditions.

Specific conditions under which this methodology is applicable are:

- The project area must contain native forests, as defined under Section 5 of the Carbon Credits (Carbon Farming Initiative) Bill.
- Forest management, harvesting and carbon rights must be demonstrated by documentary proof of legal ownership of the land, a legal lease on the forest or any contracts associated with forest use.
- Forest management in the baseline scenario must be planned timber harvest or clearfell for land use conversion.
- A legal right to harvest, issued by the relevant government body, must pre-exist the implementation of the project. The legality of the planned timber harvest or conversion must be demonstrated by valid harvesting permits; by recent harvesting permits combined with evidence that forest management laws have not changed; or by evidence that the project site is representative of other harvested forestlands and within commercially viable distance of transport networks and processing options.
- Project proponents must demonstrate intent to harvest the area prior to any evidence of intended carbon-financed forest protection. Projects shall provide any of the following documented evidence:
    - A history of timber harvest on the project area
    - A history of timber harvest by the landowner
    - A valid harvesting permit on the property
- In the project scenario, forest use is limited to activities that do not result in commercial timber harvest or forest degradation.
- Planned timber harvest must be estimated using forest inventory methods that determine allowable offtake as volume of timber (m^3/ha).
- The boundaries of the forest land must be clearly defined and documented.
- Baseline scenario, project scenario and project case cannot include wetland or peatland.

5.3. (Optional) Provide background information about the abatement activities, technologies or management practices. This could include case studies that demonstrate the successful implementation of the abatement activities, technologies or management practices.

Redd Forests has implemented three native forest protection projects in Tasmania in accordance with 'VM0010 Methodology for Improved Forest Management: Conversion from Logged to Protected Forest' (on which this methodology is based). These projects have been validated and verified under the Verified Carbon Standard, and the credits from the first year of the abatement activities have been registered, issued and sold.

The Project Descriptions for these case studies are available from the VCS project registry:

- Protection of a Tasmanian native forest (Redd Forests' pilot). Implemented on 890 hectares and generating 4,965 VCUs per annum. Available from <https://vcsprojectdatabase1.apx.com/myModule/Interactive.asp?Tab=Projects&p=605&lat=%2D41%2E823394&lon=146%2E971044>.
- Protection of a Tasmanian native forest (Project 3 – Peter Downie). Implemented on 7,666 hectares and generating 55,549 VCUs per annum. Available from < https://vcsprojectdatabase1.apx.com/myModule/Interactive.asp?Tab=Projects&p=587&lat=%2D42%2E49114&lon=147%2E09407>.

- Protection of a Tasmanian native forest (Project 4 – Grouped Project). Implemented on XXXX hectares to date, but permits the addition of individual proponents and project activity instances within the Grouped Project. Available from <https://vcsprojectdatabase1.apx.com/myModule/ProjectDoc/Project_ViewFile.asp?FileID=6927&IDKEY=f98klasmf8jflkasf8098afnasfkj98f0a9sfsakjflsakjf8d09552333>.

Section 6: Identifying the Baseline

6.1 Specify the process for identifying the project baseline.

Project proponents must identify realistic, legal and credible land use scenarios that could have occurred on the land within the proposed project boundary in the absence of the native forest protection project. The baseline scenarios can be based on historical practice, common practice or projected baselines.

As per the applicability conditions, the project must demonstrate a baseline scenario of planned land use change (timber harvest or conversion).

The baseline scenario must be tested using an investment analysis. This analysis is developed from the VCS Tool for the Demonstration and Assessment of Additionality in VCS Agriculture, Forestry and Other Land Use (AFOLU) Project Activities**.** The proposed native forest protection project, without the revenue from the sale of GHG credits, should be economically or financially less attractive than at least one of the other land use scenarios.

- If the project activity generates no financial benefits other than carbon-related income, this is considered an adequate demonstration of the baseline scenario's credibility and feasibility.
- If the project activity generates additional sources of income to carbon finance, the revenue from these additional sources must be compared to the revenue generated in the baseline scenario. Identify appropriate financial indicators (IRR, NPV, cost-benefit ratio, required rate of return, etc) for the project type and decision context. Calculate the selected financial indicator(s) for the proposed CFI project *without* carbon finance and for the baseline scenario(s). Include all relevant costs and revenues, and present the investment analysis in a transparent manner. If the CFI project is to be implemented, it should be clearly demonstrated that carbon finance is required to make the project financially or economically as attractive as at least one of the identified baseline scenarios.

Once the baseline scenario of planned timber harvest is demonstrated, project proponents must prepare a timber harvest plan for the baseline scenario. A Historical Baseline Scenario must be used where data is available, otherwise a Common Practice Baseline Scenario shall be used.

A Historical Baseline Scenario, and a timber harvest plan derived from the historical practices on the property or by the proponent, can be modelled as the project baseline if appropriate documentation exists (identified in Section 11.2.1).

All other cases must model baseline harvest based on common practice. Common practice will be planned timber harvest under the legal requirements for forest management and will be determined from a timber harvest plan developed from scenario modelling of the project area. This can be based on advice from qualified forestry agents or experts, and/or comparison with a reference area (or multiple reference areas) already under timber harvest management that complies with legal requirements for forest management and selected to be representative of local common practice for timber harvest.

Common practice cannot contradict management of the baseline agent except where common practice represents a lower harvest intensity (in m^3/ha) than management by the baseline agent.

Where there is limited capacity to generate the baseline scenario using a reference site in the region of the project area, multiple reference areas may be selected to cover a country so long as the reference areas are in the same region as the project area, with comparable forest types, climate and elevation (±20%).

6.1.2 A Timber Harvest Plan

The description of harvesting in the form of a timber harvest plan forms the basis of the baseline scenario for greenhouse gas accounting.

The timber harvest plan describes the harvest of timber products and must:

a) reference the forest volume inventory (see Step 9.1.1, parameter *Vi* |BSL) to identify the relative number of trees per hectare potentially available for harvest by species in each stratum;
b) demarcate all non-harvest areas within the forest based on legally required exclusions for environmental features such as slope, conservation covenants or protected vegetation communities;
c) divide the harvestable forest into annual operating areas using common practice;
d) outline the transport system which was/would be used to move harvested timber products from the project area to downstream processing or market entry points; and
e) list necessary harvest and transport machinery.

The timber harvest plan must follow the legal guidelines and local best practice for timber harvest.

For the purpose of estimating the net annual changes in carbon stocks resulting from planned timber harvest in the baseline scenario, a detailed *planned timber harvesting schedule* will be developed from the timber harvest plan, spelling out details of each harvest event in the project area in terms of the following:

a) the species to be harvested;
b) the year (*1,2,3...*) in which each timber harvest is scheduled to occur;
c) the minimum diameters at breast height (DBH), at stump for tree harvesting;
d) the planned harvesting regime (clear-felling, species/stratum-selective logging, area-selective logging);
e) technical specifications for the categories of wood products to be harvested; and
f) the total volumes or fractions to be harvested, broken down by categories of wood

products defined as sawnwood, wood-based panels, other industrial roundwood, paper and paper board, and other.

The planned timber harvest schedule is determined *ex ante* to reflect the timber harvesting plan as stipulated in the legal right to harvest. The *planned timber harvesting schedule* will be developed for all strata within the project area.

The output of the timber harvest plan shall be the mean extracted volume per unit area in each stratum in each year ($V_{EX,i|BSL}$). This value, along with the merchantable volume per unit area in stratum *i* in the baseline scenario (m^3/ha) ($V_{i|BSL}$), will be included in the FullCAM model of the baseline scenario to assess the credibility of the business-as-usual projections and minimise the uncertainty associated with sequestration projections.

The planned timber harvesting schedule will be submitted by proponents as part of the project report.

A new baseline scenario must be prepared for each crediting period (i.e. every 20 years). Each time, the proponent must demonstrate that the new baseline scenario is a) planned timber harvest, and b) realistic, legal and credible. This ensures that crediting reflects changes in forestry legislation, the viability of the timber history and other factors impacting on the additionality of the carbon project.

6.2 List and justify the assumptions on which the baseline is based.

A Historical baseline scenario can be reliably derived from ten (10) years of documented forest management on the project area. Assuming planned timber harvest during this period, ten years of data provides an reasonable indicator of the proponent's typical harvesting intensity or extraction rate. Frequency of timber harvests should be calculated by FullCAM modelling, common practice and/or comparison with reference sites, rather than historical practice, as this would require data from a prohibitively long timeframe.

The baseline scenario needs to be re-evaluated only at the start of a new crediting period. This approach has been adopted because the widespread adoption of forest carbon projects could change political and market conditions. Most notably, reduced harvesting rates (as NFPPs are implemented in native forests) could undermine the viability of the timber industry. Regular re-assessments of the original baseline scenario could therefore indicate that logging is no longer viable, and the carbon stored or sequestered is no longer additional. In this scenario, a declining timber industry would at least in part be a product of the growing carbon market: the credits would therefore remain additional, as emissions from logging would have continued in the absence of forest carbon projects. This possibility is exemplified by the logging industry in Tasmania's private native forests.

Section 7: Greenhouse Gas Assessment Boundary

7.1 Describe the steps and/or processes involved in undertaking the abatement activity and identify all emissions sources and sinks directly or indirectly affected by the activity.

Identify any emissions sources or sinks affected by the activity that will be excluded from the greenhouse gas assessment boundary.

Flowcharts may be used to illustrate typical greenhouse gas assessment boundaries.

A native forest protection project achieves emission reductions and removal enhancements by preventing the logging and clearfell of native forests. The emission sources and sinks modelled in this methodology are summarised below.

Included in modelling	• Emissions from wood product conversion • Decomposition of dead wood from harvested trees • Emissions from wood product retirement • Stock change due to regrowth following timber harvest
Conservatively excluded from modelling	• Decomposition of trees incidentally killed during tree felling • Decomposition of trees killed through road construction and skid trail creation • Emissions from fossil fuels burned in baseine harvesting practices • Emissions through subsequent forest re-entry

7.2 In the table below:

List all emissions sources and sinks affected by the project. Indicate whether the source or sink is to be included or excluded from the baseline or greenhouse gas assessment boundary and provide justification for any exclusions.

All emissions sources and sinks identified in Section 7.1 should be listed in this table. Expand the table to include additional sources and sinks, as necessary.

Additional information justifying the exclusion of emissions sources and sinks can be provided in Section 7.3.

Table 2. Emission sources and sinks affected by the project.

Source:		*Greenhouse gas/carbon pool:*	*Included/ excluded:*	*Justification for exclusion:*
Baseline	Source 1 –Rotting of dead wood	CO_2	Included	The stock change in dead wood is likely to be significant and shall be estimated.
	Source 2 – Retirement of harvested wood products	CO_2	Included	Emissions from the retirement of the harvested wood products is likely to be significant and shall be estimated.

	Source 3 – Combustion of fossil fuels in vehicles, machinery and equipment	CO_2 and NO_x	Excluded	Exclusion is conservative as emissions will be greater in the baseline scenario than in the project scenario.
	Source 4 – Burning of biomass	CO_2, CH_4 and NO_x	Included	If a fire occurs in the project area, the stock change in aboveground trees is likely to be significant.
	Sink 1 – Aboveground trees	CO_2	Included	The stock change in the aboveground tree biomass is likely to be significant and shall be estimated.
	Sink 2 – Harvested wood products	CO_2	Included	The carbon stock stored in the harvested wood products is likely to be significant and shall be estimated.
	Sink 3 – Aboveground non-trees	CO_2	Excluded	The stock change in the aboveground non-tree biomass is not likely to be significant, and exclusion is always conservative when forests remain as forests.
	Sink 4 – Belowground trees	CO_2	Excluded	The stock change in belowground biomass is not likely to be significant, and exclusion is always conservative when forests remain as forests.
	Sink 5 – Litter	CO_2	Excluded	The stock change in the litter is not likely to be significant, and exclusion is always conservative when forests remain as forests.
	Sink 6 – Soil organic carbon	CO_2	Excluded	The stock change in soil organic carbon is not likely to be significant, and exclusion is always conservative when forests remain as forests.
Project activity	Source 1 – Combustion of fossil fuels in vehicles, machinery and equipment	CO_2 and NO_x	Excluded	Exclusion is conservative as emissions will be greater in the baseline scenario than in the project scenario.
	Source 2 – Burning of biomass	CO_2, CH_4 and NO_x	Included	If a fire occurs in the project area, the stock change in aboveground trees is likely to be significant.
	Sink 1 – Aboveground trees	CO_2	Included	The stock change in the aboveground tree biomass is likely to be significant and shall be estimated.
	Sink 2 – Aboveground non-trees	CO_2	Excluded	The stock change in the aboveground non-tree biomass is not likely to be significant, and exclusion is always conservative when forests remain as forests.
	Sink 3 – Belowground trees	CO_2	Excluded	The stock change in belowground biomass is not likely to be

				significant, and exclusion is always conservative when forests remain as forests.
	Sink 4 – Litter	CO_2	Excluded	The stock change in the litter is not likely to be significant, and exclusion is always conservative when forests remain as forests.
	Sink 5 – Soil organic carbon	CO_2	Excluded	The stock change in soil organic carbon is not likely to be significant, and exclusion is always conservative when forests remain as forests.

7.3 (If required) Additional information justifying why a source or sink is excluded.

Section 8: Project Area

If applicable, provide instructions to project proponents on how to determine the Project Area.

Project proponents shall clearly define the spatial boundaries of a project so as to facilitate accurate measuring, monitoring, accounting and verifying of the project's emissions, reductions and removals. The native forest protection project may contain more than one discrete area of land.

When describing physical project boundaries, the following information shall be provided:

- name of the property(ies) (including compartment number, allotment number, local name);
- unique identifier for each discrete stratum used in the timber harvest plan;
- map(s) of the strata and project area (preferably in digital format);
- total land area (i.e. the property size);
- total project area, i.e. that area covered by native forests threatened by legal and planned timber harvest; and
- details of landowner and/or carbon stock owner.

Information shall be provided, and recorded in the project report, to establish that the geographic coordinates of the project boundary (and any stratification inside the boundary) are established, recorded and archived. This will be achieved using geo-referenced spatial data (e.g. maps, GIS datasets, aerial photography).

Section 9: Estimating Abatement

9.1 Provide instructions to project proponents on how to calculate baseline emissions and removals.

Provide formulas and define parameters in each formula, including units.

Where parameters are to be derived through data collection, provide instructions on data collection methods in Section 10.

Step 9.1.1 Calculation of carbon stocks in commercial timber volumes

This step calculates $C_{HB,j,i\,|BSL}$, the mean carbon stock in total harvested biomass in tC/ha, and $C_{EX,j,i\,|BSL}$, the mean carbon stock in extracted timber (merchantable timber that leaves the forest) in tC/ha.

The following equation is used to calculate the merchantable volume of timber per unit area ($V_{j,i\,|BSL}$) that is potentially available for harvest. This shall be based on data from field measurements in sample plots.

The estimate of merchantable volume for each species *j* at the sample plot level will be calculated as:

$$V_{j,i,sp} = \sum_{l=1}^{L} V_{l,j,i,sp} \qquad (1)$$

Where:

$V_{j,j,sp}$	Merchantable volume for species *j* in stratum *i* in sample plot *sp* (m^3);
$V_{l,j,i,sp}$	Merchantable volume for tree *l* of species *j* in stratum *I* in sample plot *sp* (m^3);
l	1, 2, 3 … *L* sequence of individual trees in sample plot;
i	1, 2, 3 … *M* strata;
sp	1, 2, 3 … *SP* sample plots; and
j	1, 2, 3 … *J* tree species

Therefore, the merchantable volume per unit area of species *j* in stratum *i* will be calculated as the mean merchantable volume per species in all sample plots in stratum *i*:

$$V_{j,i|BSL} = \frac{1}{SP} * \sum_{sp=1}^{SP} \frac{V_{j,i,sp}}{A_{sp}} \qquad (2)$$

Where:

$V_{j,i\,|BSL}$	Merchantable volume per unit area of species *j* in stratum *i* in the baseline scenario (m^3/ha);
$V_{j,i,sp}$	Merchantable volume for tree *l* of species *j* in stratum *I* in sample plot *sp* (m^3);
A_{SP}	Area of sample plot *sp* (ha);
i	1, 2, 3 … *M* strata;

sp	1, 2, 3 … *SP* sample plots; and
j	1, 2, 3 … *J* tree species

Since most landowners plan their timber harvest according to the total volume of merchantable timber per unit area, this will be calculated by adding $V_{i,j|BSL}$ for each species in stratum *i*:

$$V_{i|BSL} = \sum_{j=1}^{J} V_{i,j|BSL} \quad (3)$$

$V_{i\|BSL}$	Merchantable volume per unit area in stratum *i* in the baseline scenario (m^3/ha);
$V_{i,j\|BSL}$	Merchantable volume per unit area of species *j* in stratum *i* in the baseline scenario (m^3/ha);
i	1, 2, 3 … *M* strata;
j	1, 2, 3 … *J* tree species

Step 9.1.2 Calculation of dead wood generated in the process of timber harvest

$V_{i|BSL}$ (Equation 3) will be used to develop the timber harvest plan. The timber harvest plan sets the allowable mean extracted volume ($V_{EX,i|BSL}$) from this merchantable volume based on legal limits.

Once the timber harvest plan is complete and $V_{EX,i|BSL}$ is calculated the Biomass Conversion and Expansion Factors (BCEF) method shall be used to determine the carbon stock in harvested biomass. This method is appropriate as forest inventory data and allowable harvest must be based on volume estimates to which expansion factors can be readily applied. The selected BCEF must have a minimum DBH compatible with the minimum DBH defined in the timber harvest plan (Step 6.1), and a range compatible with the trees found on the project site.

Therefore, the carbon stock of timber harvested per unit area in stratum *i* will be calculated from this mean volume of extracted timber:

$$C_{HB,i|BSL} = V_{EX,i|BSL} * BCEF * CF \quad (4)$$

Where:

$C_{HB,i\|BSL}$	Mean carbon stock of harvested biomass per unit area in stratum *i* (tC/ha);
$V_{EX,i\|BSL}$	Mean volume of extracted timber per unit area in stratum *i* (m^3/ha);
BCEF	Biomass conversion and expansion factor applicable to wood removals in the project area (dimensionless);
CF	Carbon fraction of biomass (tC/t.d.m), either the IPCC default value of 0.5 or species/genus-specific values from the literature may be used;
i	1, 2, 3 … *M* strata;

The source of the BCEF shall be chosen with priority from higher to lower preference as follows:

a) Existing local forest type-specific;

b) National forest type-specific or eco-region specific (e.g. from the National GHG inventory);
c) Forest type-specific or eco-region-specific from neighbouring countries with similar conditions;
d) Global forest type or eco-region specific (e.g. IPCC 2006 INV GLs AFOLU Chapter 4 Table 4.5).

Not all of the harvested biomass leaves the forest because the timber harvested has two components: 1) wood removed to market (extracted timber), and 2) wood remaining in the forest as a result of harvest. Therefore, the mean carbon stock of extracted timber per unit area in stratum *i* will be calculated from the mean volume of extracted timber multiplied by density and carbon fractions:

$$C_{EX,i\,|\mathrm{BSL}} = V_{EX,i\,|\mathrm{BSL}} * D * CF \qquad (5)$$

Where:

$C_{EX,i\,\|\mathrm{BSL}}$	Mean carbon stock of extracted timber per unit area in stratum *i* (tC/ha);
$V_{EX,i\,\|\mathrm{BSL}}$	Mean volume of extracted timber per unit area in stratum *i* (m^3/ha);
D	A weighted average of the wood density of all merchantable species present shall be used. There is an abundance of data on the wood density of Australian species or groups of species (e.g. the National Greenhouse Gas inventory, the Farm Forestry Toolbox, peer-reviewed literature). This shall be preferentially used before global defaults (e.g. from the IPCC 2006 INV GLs AFOLU Chapter 4 Tables 4.13 and 4.14);
CF	Carbon fraction of biomass (tC/t.d.m). Either the IPCC default value of 0.5 or species/genus-specific values from the literature may be used, as long as the same value is adopted in all instances where this parameter is used;
i	1, 2, 3 … *M* strata.

This step calculates $\Delta C_{DW,i,p\,|\mathrm{BSL}}$, the change in carbon stock in dead wood resulting from timber harvest in stratum *i*, using $C_{EX,i\,|\mathrm{BSL}}$ and $C_{HB,i\,|\mathrm{BSL}}$ as calculated in Equations 4 and 5.

The simplifying assumption is made that dead wood created during timber harvest is emitted in the year of harvest. Therefore, the change in carbon stock in the dead wood pool in stratum *i* will be calculated as the difference between the total carbon stock of the harvested biomass and the carbon stock of the extracted timber:

$$\Delta C_{DW,i\,|BSL} = A_i * (C_{HB,i\,|\mathrm{BSL}} - C_{EX,i\,|\mathrm{BSL}}) \qquad (6)$$

Where:

$\Delta C_{DW,i\,\|BSL}$	Change in carbon stock of dead wood resulting from timber harvest per unit area in stratum *i* (tC);
A_i	Area of stratum *i* (ha);
$C_{HB,i\,\|\mathrm{BSL}}$	Mean carbon stock of harvested biomass per unit area in stratum *I* (tC/ha);
$C_{EX,i\,\|\mathrm{BSL}}$	Mean carbon stock of extracted timber per unit area in stratum *i* (tC/ha);
i	1, 2, 3 … *M* strata.

Step 9.1.3 Calculation of baseline carbon sequestered in wood products

This step calculates $\Delta C_{WP,i\,|BSL}$ i.e., the net carbon stock change resulting from wood product conversion and retirement in the baseline scenario.

In all cases where wood is harvested for conversion to wood products, carbon stock in the wood products pool must be included in the baseline case. Carbon stocks treated here are those stocks remaining in wood products after 100 years because the bulk of emissions associated with timber harvest, processing and waste, and eventual product retirement occur within this timeframe. This methodology employs the simplifying assumption that the proportion remaining after 100 years is effectively 'permanent'. Therefore, accounting for wood products shall take place at the time of timber harvest.

The conceptual framework detailed in Winjum *et al* (1998) is used here, applying the simplifying assumption that all extracted biomass not retained in long-term wood products after 100 years is emitted in the year harvested, instead of tracking annual emissions through retirement, burning and decomposition.

The wood product class(es), *k*, (sawnwood, wood-based panels, other industrial roundwood, paper and paper board, and other) that are the anticipated end use of the extracted timber must now be selected. It is acceptable practice to assign gross percentages of volume extracted to wood product classes on the basis of local expert knowledge of harvest activities and markets.

The carbon stock of extracted timber has already been calculated as $C_{EX,i|BSL}$ (the product of Equation 5). All factors are derived from Winjum *et al* (1998). Therefore, the proportion of mean carbon stock of extracted timber that remains sequestered in long-term wood products after 100 years is calculated as:

$$C_{WP,i\,|BSL} = \sum_k (C_{EX,i,k|\mathrm{BSL}} * (1 - WW_{\mathrm{k}})*(1 - SLF_{\mathrm{k}})*(1 - OF_{\mathrm{k}}) \qquad (7)$$

Where:

$C_{WP,i\,|BSL}$	Carbon stock sequestered in wood products in stratum *i* as a result of planned timber harvest in the baseline scenario (tC/ha);
$C_{EX,i,k|\mathrm{BSL}}$	Mean carbon stock of extracted timber per unit area in stratum *i* (tC/ha);
WW_{k}	Fraction of biomass carbon from wood waste immediately emitted as a byproduct of milling operations for wood product *k* (dimensionless);
SLF_{k}	Fraction of biomass carbon for wood product *k* that will be emitted to the atmosphere within 5 years of timber harvest (dimensionless);
OF_{k}	Fraction of biomass carbon for wood product type *k* that will be emitted to the atmosphere between 5 and 100 years of timber harvest, dimensionless;
k	wood product classes (1. sawnwood, 2. wood-based panels, 3. other industrial roundwood and 4. paper and paper board);
i	1, 2, 3 … *M* strata.

The specific values for the parameters above are (Winjum *et al.* 1998):

Wood waste fraction (WW):

Winjum *et al* (1998) indicate that the proportion of extracted biomass that is oxidized (burning or decaying) from the production of commodities to be equal to 19% for developed countries.

Short-lived fraction (SLF):
Winjum *et al* (1998) give the following proportions for wood products with short-term (<5 yr) uses (applicable internationally):

Sawnwood	0.2
Woodbase panels	0.1
Other industrial roundwood	0.3
Paper and Paperboard	0.4

Additional oxidized fraction (OF):
Winjum *et al* (1998) gives annual oxidation fractions for each class of wood products split by forest region. This methodology projects these fractions over 95 years to give the additional proportion that is oxidized between the 5th and 100th years after initial harvest:

Wood product class	**Temperate**	**Tropical**
Sawnwood	0.6	0.84
Woodbase panels	0.84	0.97
Other industrial roundwood	0.97	0.99
Paper and paperboard	0.6	0.99

Therefore, the carbon stock change resulting from wood product conversion and retirement is calculated as the difference between the mean carbon stock of extracted timber minus the carbon sequestered in wood products:

$$\Delta C_{WP,i\,|BSL} = A_i * (C_{EX,i\,|BSL} - C_{WP,i\,|BSL}) \qquad (8)$$

Where:

$\Delta C_{WP,i\,\|BSL}$	Change in carbon stock resulting from wood product conversion and retirement from stratum *i* (tC);
A_i	Area of stratum *i* (ha)
$C_{EX,i\,\|BSL}$	Mean carbon stock of extracted timber per unit area in stratum *i* (tC/ha);
$C_{WP,i\,\|BSL}$	Carbon stock sequestered in wood products in stratum *i* as a result of planned timber harvest in the baseline scenario (tC/ha);
i	1, 2, 3 … *M* strata.

Step 9.1.4 Change in carbon stocks due to forest regrowth after harvest

This step calculates $\Delta C_{RG,i,t\,|BSL}$, the carbon sequestration resulting from forest regrowth after timber harvest in stratum *i* (tC).

$$\Delta C_{RG,i,t|BSL} = A_i * GR_{t\,|BSL} \qquad (9)$$

$\Delta C_{RG,i,t\,|BSL}$ Carbon sequestration resulting from forest regrowth after timber harvest in stratum *i* in year *t* (tC);

A_i	The area of stratum *i* (ha);
$GR_{t\,\|BSL}$	Growth rate of forest post-timber harvest for stratum *i* in year *t* (tC/ha/year);
t	1, 2, 3 … *T* years elapsed since the start of the project crediting period;
i	1, 2, 3 … *M* strata.

The annual growth rate *GR* can be determined using most recent version of FullCAM, the Full Carbon Accounting Model developed by the Australian Greenhouse Office and CSIRO to meet the reporting requirements of the UNFCCC. If using FullCAM, appropriate species- and site-data must be downloaded and an accurate logging history incorporated into the model. The FullCAM estimates of carbon stock per unit area (tC/ha) for each stratum must be within 5% of the merchantable volume per unit area in stratum *i* in the baseline scenario (m^3/ha) as calculated from field sampling, i.e. parameter $V_{i|BSL}$ as calculated in Equation 3.

The model should be run twice: once to calculate growth rates in the baseline scenario and once to calculate growth rates in the project scenario. The models should be identical until the first planned logging event in the baseline scenario. The logging events in the baseline scenario should be derived from the timber harvest plan, using the mean volume of extracted timber per unit area in stratum *i* (m^3/ha), i.e. parameter $V_{EX,i|BSL}$ as calculated in Equation 4.

Step 9.1.5 Calculation of baseline scenario greenhouse gas emissions from change in carbon stocks

This step calculates $GHG_{NET\,|BSL}$, the total greenhouse gas emissions in the baseline scenario from each emissions source, in tCO2e. The net carbon stock change to be converted to emissions is equal to the carbon stock change as a result of timber harvest plus the carbon stock change resulting from conversion and retirement of wood products minus carbon sequestration from forest regrowth after harvest. Therefore, the net change in carbon stock is calculated as:

$$\Delta C_{NET\,|BSL} = \sum_{i=1}^{M}(\Delta C_{DW,i\,|BSL} + \Delta C_{WP,i\,|BSL} - \sum_{t=1}^{T}\Delta C_{RG,i,t\,|BSL}) \qquad (10)$$

Where:

$\Delta C_{NET\,\|BSL}$	Net change in carbon stocks in the baseline scenario (tC);
$\Delta C_{DW,i\,\|BSL}$	Change in carbon stock from dead wood resulting from timber harvest per unit area in stratum *i* (tC);
$\Delta C_{WP,i\,\|BSL}$	Change in carbon stock resulting from wood product conversion and retirement from stratum *i* (tC);
$\Delta C_{RG,i,t\,\|BSL}$	Carbon sequestration resulting from forest regrowth after timber harvest in stratum *i* in year *t* (tC);
t	1, 2, 3 … *T* years elapsed since the start of the native forest protection project;
i	1, 2, 3 … *M* strata.

In order to generate the average annual carbon stock change in the baseline scenario, the total net change in carbon stocks across all parcels harvested is divided by the crediting period of twenty years.

$$\Delta C_{NET,t\,|\mathrm{BSL}} = \frac{(\Delta C_{NET\,|\mathrm{BSL}})}{20} \qquad (11)$$

Where:

$\Delta C_{NET,t\,\|BSL}$	Net change in carbon stock in the baseline scenario per annum (tC/year);
$\Delta C_{NET\,\|BSL}$	Net change in carbon stock in the baseline scenario (tC).

The annual carbon stock change in the baseline scenario must be converted to net greenhouse gas emissions and is calculated as:

$$GHG_{NET\,|\mathrm{BSL}} = \Delta C_{NET\,|\mathrm{BSL}} * 44/12 \qquad (12)$$

Where:

$GHG_{NET\,\|BSL}$	Net greenhouse gas emissions in the baseline scenario per annum (tCO2e/year);
$\Delta C_{NET\,\|BSL}$	Net change in carbon stock in the baseline scenario per annum (tC/year);
44/12	Ratio of molecular weights of carbon dioxide and carbon (tCO2-e /tC).

9.2. Provide instructions to project proponents on how to calculate project emissions and removals.

Provide formulae and define parameters in each formula, including units.

Where parameters are to be derived through data collection, provide instructions on data collection methods in Section 10.

This step calculates $GHG_{NET\,|\mathrm{PRJ}}$, the net greenhouse gas emissions in the project scenario, in tCO_2e.

The type and extent of the activities implemented in the project scenario will be described as part of the documentation submitted with the project report. In accordance with the applicability conditions, the project scenario does not allow commercial timber harvest. As a result, carbon stock changes due to vegetation management and fuel removal will be negligible.

Step 9.2.1 Ongoing forest growth in the project scenario

The FullCAM model developed in Step 3.4 will be used to calculate the ongoing forest growth rate in the project scenario, $GR_{t\,|\mathrm{PRJ}}$. This determines the change in carbon stock in each stratum over the project lifetime ($\Delta C_{GR,i\,|\mathrm{PRJ}}$).

$$\Delta C_{GR,i\,|\mathrm{PRJ}} = A_i * \sum^{T}(GR_{i,t\,|\mathrm{PRJ}}) \qquad (13)$$

t = 1

Where:

$\Delta C_{GR,i\,|PRJ}$ Change in carbon stock resulting from sequestration in stratum *i* (tC);
A_i The area of stratum *i* (ha);
$GR_{i,t\,|PRJ}$ Annual growth rate of forest post timber harvest for stratum *i* in year *t* (tC/ha/year);
t 1, 2, 3 … *T* years elapsed since the start of the native forest protection project;
i 1, 2, 3 … *M* strata.

The next equation converts the change in carbon stock per stratum to the greenhouse gas reductions across the project site. This step therefore calculates $\Delta GHG_{GR,t\,|PRJ}$, i.e. the greenhouse gas reductions from sequestration through ongoing forest growth in year *t* (tCO2-e).

$$\Delta GHG_{GR\,|PRJ} = \sum_{i=1}^{M}(\Delta C_{GR,i\,|PRJ}) * 44/12 \qquad (14)$$

Where:

$\Delta GHG_{GR\,|PRJ}$ Change in greenhouse gas emissions resulting from sequestration through ongoing forest growth in the project scenario (tCO2-e);
$\Delta C_{GR,i\,|PRJ}$ Change in carbon stock resulting from sequestration in stratum *i* (tC);
t 1, 2, 3 … *T* years elapsed since the start of the native forest protection project;
i 1, 2, 3 … *M* strata.

Step 9.2.2 Forest disturbance in the project scenario

It is a requirement that any greenhouse gas emissions from natural disturbance above *de minimis* that may occur in the project area are monitored.

Estimation of emissions from natural disturbance shall be calculated depending on the type of disturbance event. $\Delta C_{DIST\_FR,t}$, carbon stock change due to fire disturbance (tCO_2-e), is calculated following Step 9.2.2.1. $\Delta C_{DIST,t\,|PRJ}$, the carbon stock change due to non-fire natural disturbance (tCO_2-e), is calculated following Step 9.2.2.2.

It is assumed that any disturbance in the project scenario would also have occurred in the baseline. Project emissions are therefore equal to the damage to the biomass present in the project case, but absent in the baseline case (harvested and removed). The average aboveground biomass stock present in the project scenario but absent in the baseline scenario before burning for a particular stratum shall be calculated as:

$$B_{i,t\,|PRJ} = V_{EX,i\,|BSL} * BCEF \qquad (15)$$

Where:

$B_{i,t\,|PRJ}$ Average aboveground biomass stock present in the project scenario, but absent

	in the baseline before burning for stratum *i*, time *t* (t.d.m/ha);
$V_{EX,i\ \mid BSL}$	Mean volume of extracted timber per unit area in stratum *i* (m^3/ha);
BCEF	Biomass conversion and expansion factor applicable to wood removals in the project area (dimensionless);
t	1, 2, 3 … *T* years elapsed since the start of the native forest protection project;
i	1, 2, 3 … *M* strata.

Step 9.2.2.1

Where fires occur *ex post* in the project area, the area burned shall be delineated. Therefore, based on the IPCC 2006 Inventory Guidelines, estimation of greenhouse gas emissions from biomass burning shall be calculated as:

$$\Delta GHG_{DIST\_FR\ \mid PRJ} = \sum_{i=1}^{M}(A_{burn,i} * B_{i,t\ \mid PRJ} * COMF_i * G_{g,I} * 10^{-3}.GWP_{CH4} \qquad (16)$$

Where:

$\Delta GHG_{DIST\_FR\ \mid PRJ}$	Net greenhouse gas emissions resulting from fire disturbance (tCO_2-e);
$A_{burn,i}$	Area burnt for stratum *i* at time *t* (ha), based on historical incidence of fire for the purposes of *ex ante* calculations;
$B_{i,t\ \mid PRJ}$	Average aboveground biomass stock present in the project scenario, but absent in the baseline scenario before burning stratum *i* at time *t* (t.d.m/ha);
$COMF_i$	Combustion factor for stratum *i* (default values in Table 2.6 of IPCC 2006 Guidelines) (dimensionless);
$G_{g,I}$	Emission factor for stratum *i* for methane (default values in Volume 4, Chapter 2, Table 2.5 of the IPCC 2006 Guidelines) (g/kg dry matter burnt);
GWP_{CH4}	Global warming potential for CH_4 (IPCC default: 21) (tCO_2-e/tCH_4);
t	1, 2, 3 … T years elapsed since the start of the native forest protection project;
i	1, 2, 3 … *M* strata.

Step 9.2.2.2

For non-fire natural disturbance, it is assumed that a disturbance event in the project scenario would also have occurred in the baseline. Project emissions are therefore equal to the non-fire natural disturbance to biomass absent in the baseline case (harvested and removed) but present in the project case. It is conservatively assumed that the natural disturbance is a stand-replacing disturbance, and that the greenhouse gases emitted as a result of the natural disturbance ($\Delta GHG_{DIST,t}$) are emitted in the year of disturbance.

Where non-fire natural disturbances occur *ex post* in the project area, the area disturbed shall be delineated.

$$\Delta GHG_{DIST} = \sum^{M}(A_{dist,i,t} * B_{i,t\ \mid PRJ} * CF) * 44/12 \qquad (17)$$

$i = 1$

Where:

ΔGHG_{DIST} Net greenhouse gas emissions resulting from non-fire natural disturbance (tCO_2-e);

$A_{dist,i,t}$ Area disturbed for stratum *i* at time *t* (ha), based on historical incidence of disturbance for the purposes of *ex ante* calculations;

$B_{i,t\,|PRJ}$ Average aboveground biomass stock present in the project scenario, but absent in the baseline scenario before burning stratum *i* at time *t* (t.d.m/ha);

CF Carbon fraction of biomass (tC/t.d.m), either the IPCC default value of 0.5 or species/genus-specific values from the literature may be used;

44/12 Ratio of molecular weights of carbon dioxide and carbon (tCO_2-e/tC);

t 1, 2, 3 … *T* years elapsed since the start of the native forest protection project;

i 1, 2, 3 … *M* strata.

Step 9.2.3 Net greenhouse gas emissions in the project scenario

This step calculates $\Delta GHG_{NET\,|PRJ}$, the net greenhouse gas emissions in the project scenario per annum, in tCO_2-e. The annual greenhouse gas emissions in the project scenario is equivalent to the total greenhouse gases sequestered in the aboveground biomass of trees less greenhouse gas emissions resulting from forest disturbance during the project activity, divided by the crediting period of 20 years.

Therefore, annual net greenhouse gas emissions in the project scenario are calculated:

$$GHG_{NET\,|PRJ} = \frac{(\Delta GHG_{GR\,|PRJ} - \Delta GHG_{DIST\_FR} - \Delta GHG_{DIST})}{20} \qquad (18)$$

Where:

$GHG_{NET\,|PRJ}$ Average greenhouse gas emissions or reductions in the project scenario per annum (tCO2-e);

$\Delta GHG_{GR,\,|PRJ}$ Greenhouse gas emissions or reductions from ongoing forest growth of aboveground trees (tCO_2-e);

ΔGHG_{DIST_FR} Greenhouse gas emissions resulting from fire disturbance (tCO_2-e);

ΔGHG_{DIST} Greenhouse gas emissions resulting from non-fire natural disturbance (tCO_2-e);

$\Delta GHG_{NET\,|PRJ} \geq 0$ if sequestration from ongoing forest growth are greater than anticipated emissions from disturbance. $\Delta GHG_{NET\,|PRJ} < 0$ if anticipated emissions from disturbance are greater than sequestration from ongoing forest growth.

9.3 Provide instructions to project proponents on how to calculate net greenhouse gas abatement. This should be the difference between the baseline and project emissions and removals.

Step 9.3.1 Accounting for leakage

Calculations of net greenhouse gas abatement must account for leakage. There are two sources of leakage: leakage from activity shifting by the proponent, and leakage from market effects.

Step 9.3.1.1 Activity shifting leakage

There may be no leakage due to activity shifting.

Where the project proponent has control over only resource use in the project area and has no access to other forest resource, then the only type of leakage emissions calculated is GHG emissions due to market effects that result from project activity.

Where the project proponent controls multiple parcels of land within the country the project proponent must demonstrate that the management plans and/or land-use designations of other lands they control have not materially changed as a result of the planned project (designating new lands as timber concessions or increasing harvest rates in lands already managed for timber) because such changes could lead to reductions in carbon stocks or increases in GHG emissions.

This must be demonstrated through:

- historical records showing trends in harvest volumes paired with records from the with-project time period showing no deviation from historical trends; and
- forest management plans prepared $\geq$ 24 months prior to the start of the project showing harvest plans on all owned/managed lands.

In each offsets report, the proponent must provide documentation for forested area not included in the native forest protection project. These records must include their location(s), area and existing land use(s). Any deviation from the management plans submitted at the project start date must result in net emission reductions or greater removal enhancements.

Where activity shifting occurs, or a project proponent is unable to provide the necessary documentation in offset reports, the project shall not be eligible for crediting.

Step 9.3.1.2 Market leakage

To be determined by DCCEE. Assumed to produce parameter $GHG_{NET\,|LK}$, for inclusion in Equation 20.

Step 9.3.2

The greenhouse gas emissions calculated at Steps 9.1 and 9.2 for the baseline and project scenarios allows an estimation of the level of net GHG emission reductions resulting at the end of each year over the crediting period from the implementation of the proposed native forest protection project.

The annual GHG emission credits are calculated as:

$$GHG_{NET\,|\,\mathrm{NFPP}} = GHG_{NET\,|\,\mathrm{BSL}} + GHG_{NET\,|\,\mathrm{PRJ}} - GHG_{NET\,|\,\mathrm{LK}} \qquad (20)$$

Where:

$GHG_{NET\,|\,\mathrm{NFPP}}$	Net greenhouse gas emissions associated with the implementation of a native forest protection project per annum (tCO_2-e/year);
$GHG_{NET\,|\,\mathrm{BSL}}$	Greenhouse gas emissions in the baseline scenario since the start of the project activity per annum (tCO_2-e/year);
$GHG_{NET\,|\,\mathrm{PRJ}}$	Greenhouse gas emissions in the project scenario since the start of the project activity per annum (tCO_2-e/year); and
$GHG_{NET\,|\,\mathrm{LK}}$	Greenhouse gas emissions from leakage per annum (tCO_2-e/year);

9.4 For bio-sequestration projects provide instructions on the procedures to be used to account for variations that are likely to occur in the amount of carbon stored as a result of climatic cycles or harvesting over 100 years.

Native forest protection projects are not bio-sequestration projects therefore this item is not applicable.

9.5 Provide instructions to project proponents on how to calculate net abatement number or net sequestration number for reporting purposes, *if different from the estimate of net greenhouse gas abatement (Section 9.3)*. For bio-sequestration projects, this calculation should take into account any adjustments to the abatement estimate to address variability, and any abatement already reported and credited.

See Section 9.3.

9.6 Indicate whether the estimation methods and emissions factors are from the NGER (Measurement) Determination or Australia's National Greenhouse Accounts. If not, explain why new or different estimation methods are proposed. Note that the methods set out in the NGER (Measurement) Determination must be used to estimate emissions covered by NGERS.

The NGER (Measurement) Determination does not provide estimation methods for native forest protection projects.

This methodology adopts the NGER (Measurement) Determination's recommended parameter of a 95% confidence interval for the calculation of uncertainty.

9.7 Provide a detailed description of any formulas used and detailed explanations of the parameters included in each formula, along with a description of how each parameter is derived (noting that detailed instructions to proponents on data collection methods for deriving parameters are to be provided in Section 10). Where applicable, provide a citation for the source of equations and/or parameters.

See Section 9.1, 9.2 and 9.3.

Section 10: Data Collection

Provide instructions to project proponents on data collection methods for deriving the parameters used to calculate *baseline emissions and removals* (Section 9.1) and *project emissions and removals* (Section 9.2). Instructions may be provided in the table below.

10.1 Stratification

Within the boundaries of the proponent's property, the stratification process should identify and map all forested areas to be included in the native forest protection project. Any forested areas that are not threatened by logging should be excluded: protected vegetation communities, high conservation value areas, streamside reserves, roadside buffers, etc.

The forested area included in the project must then be stratified for biomass sampling. This stratification can be based on vegetation type, structural features and/or vegetation condition (e.g. subject to fire or logging history). Fieldwork data analysis can be used to consolidate the original strata.

Fieldwork plots should be randomly allocated within strata. The number of sample plots per stratum will be determined from application of the most recent version of the Tool for the "Calculation of the Number of Sample Plots for Measurements within A/R CDM Project Activities", using the Winrock sampling calculator. This tool was developed by Winrock International and is available at http://www.winrock.org/ecosystems/tools.asp. *Ex ante*, sampling error is arguably the main source of uncertainty in native forest protection projects in Australia. To ensure a statistically adequate sample size, the parameter *e* (level of error) should be set to a maximum of 15% in the Winrock sampling calculator, with the parameter *Z(1-a)* (confidence level) set to 95%.

10.2 Collecting field data

For each stratum, mean volume of merchantable biomass is estimated from forest inventory data. Forest inventory data should include the diameter at breast height (*DBH*, 1.3 m above ground level) of all merchantable trees within sample plots. If tree height is required to calibrate the allometric or yield table, the height of at least ten trees must be obtained for each merchantable species in the project area.

Field data must be collected and managed using commonly accepted principles of forest inventory development and management. Standard operating procedures (SOPs) and quality control/quality assurance (QA/QC) procedures should be applied. Various sources exist to assist with the design of a verifiable field inventory based on best practice for sampling, data management and analysis: for example, the IPCC's Good Practice Guidance for Land Use, Land Use Change and Forestry, FAO's National Forest Inventory Field Manual or Winrock International's The Sourcebook for Land Use Change and Forestry Projects.

The forest inventory plan must be specified in the project report and include:

a) the forest stratification process;
b) sample size estimation methods;
c) means to estimate uncertainty; and
d) a sampling framework including sample size, plot size, plot shape and information to determine plot location.

It is acceptable to use pre-existing forest inventory data for this purpose, provided that the pre-existing data:

a) represents the project strata;
b) is not more than 10 years old;
c) where forest inventory data is more than 10 years old, that the volume estimate derived from the pre-existing data has been validated with limited sampling within the project area; and
d) is validated by field surveys. If the validated estimate of volume is within the 95% confidence interval (with 15% variance) of the corresponding estimate or is less than the estimate calculated from pre-existing forest inventory data, the pre-existing forest inventory data may be used. If the validation estimate is greater than the corresponding estimate calculated from pre-existing forest inventory data, the estimate from pre-existing data cannot be used.

Parameter	**Description**	**Unit**	**Measurement procedure**	**Measurement frequency**
Ai	Area covered by stratum *i*	Hectares	Remote sensing data	End of each reporting period
$A_{burn,i,t}$	Area burnt in stratum *i* at time *t*	Hectares	GPS coordinates and/or remote sensing data	End of each reporting period
$A_{dist,i,t}$	Area disturbed in stratum *i* at time *t*	Hectares	GPS coordinates and/or remote sensing data	End of each reporting period
DBH	Diameter at breast height	Centimetres	Field measurements in sample plots	End of each reporting period

10.3 Preparing a forest inventory

Yield tables or allometric equations shall be used to convert field measurements of DBH in the sample plots to merchantable volume, $V_{l,j,i,sp}$. It is acceptable to combine *DBH* and allometric equations if field instruments (e.g. a relascope) that measure the volume of each tree directly have been used. If locally derived equations or yield tables for each species are not available it is acceptable to use relevant regional, national or default data.

It is necessary to verify the applicability of equations used. Allometric equations should be verified by both:

1. Verification of equation conditions. Justification should be provided for the applicability of the equation to the project locations. Such justification should include identification of climatic, edaphic, geographical and taxonomic similarities between the project location and the location in which the equation was derived. Any equation should have an r^2 value greater than 0.5 (50% and a p value that is significant (<0.05 at the 95% confidence level).

2. Additional field verification.
   The following limited measures method must be used for field verification.
   - Select at least 10 trees per species distributed across the age range (but excluding those less than 15 years old, for which there is rarely a great relative inaccuracy in equations);
   - Measure DBH and height to 10cm diameter top
   - Calculate stem volume from measurements; and
   - Plot the estimated volume of all the measured trees along with the curve of volume against diameter as predicted by the allometric equation.

The equation may not be used if >75% of the measured trees have a volume lower than the predicted curve: in this case, another equation must be selected.

Section 11: Monitoring and Reporting

11.1 Outline the elements of the project that will be monitored and describe how monitoring will be undertaken, including:

- frequency of monitoring;
- the Australian Standards, or other relevant standards, that project proponents will need to comply with to calibrate and maintain measurement equipment; and
- any qualifications that operators will need to operate measurement equipment.

The information provided in this section should not duplicate the information provided in Section 10.

Step 11.1.1 Identification of monitoring parameters

The following parameters, described in Step 10, must be monitored in this methodology:

- Area covered by stratum *i* (*Ai*)
- Diameter at breast height of tree (*DBH*)
- Area burnt in stratum *i* at time *t* (*Aburn,i,t*)
- Area affected by natural disturbance in stratum *i* at time *t* ($A_{dist,i,t}$)

These parameters are used in Equation 15 and 16, and must be addressed in the offsets report issued at each reporting event (i.e. at a minimum interval of one year and a maximum interval of five years).

In some project cases monitoring may also be implemented to update stratification. It is a requirement that the monitoring plan presented in the project report shall address the monitoring of project implementation, the monitoring of actual carbon stock changes from project activity, and estimation of *ex post* net carbon stock changes from disturbance.

The description of the monitoring plan in the project report will include the following for each of these monitoring tasks:

a) technical description of the monitoring task;
b) a list of data and parameters to be collected;
c) overview of data collection procedures;

d) quality control and quality assurance procedure;
e) data archiving; and
e) organisation and responsibilities of the parties involved in all the above.

Step 11.1.2 Stratification

This methodology requires that an *ex ante* stratification of the project area in the project scenario is described in the project report. The stratification in the project scenario may be the same as that in the baseline scenario, if the latter is based on carbon density and vegetation type rather than projected timber harvests.

The monitoring plan may include sampling to adjust the number and boundaries of the strata defined *ex ante* where an update is required because of unexpected disturbances occurring during the crediting period affecting differently various parts of an originally homogeneous stratum. Established strata may also be merged if the reasons for their establishment have disappeared.

Step 11.1.3 Monitoring of carbon stock changes

At each reporting event, carbon stock changes over time shall be assessed through repeat sampling of permanent field plots. The resulting forest inventory should be extensive enough to permit an estimate of average biomass accumulation (m^3/ha). The new data will be used to estimate carbon stock changes according to the equations specified in Section 9.2 of this methodology. An offsets report shall be prepared for each reporting period, at a minimum interval of 1 year and maximum interval of five years

11.2 Specify the data and other information about the project that must be included in project reports and project records, including:

- data required to estimate emissions and removals resulting from the project;
- data required to identify and justify baseline scenarios and to support baseline estimation and resetting; and
- information about project implementation or changes in environmental conditions that are required to determine whether the project remains within the scope of the methodology.

11.2.1 Data required to identify, justify and estimate baseline scenarios

The identification of realistic and credible land use scenarios may use land-use records, field surveys, data and feedback from stakeholders and information from other sources as appropriate.

For the preparation of a Historical Baseline Scenario, the following documents for the proponent or property should be referenced:

1. Historical records of forest management for a minimum of 10 or more years preceding the project start date.
2. Historical records indicating that the management practices have surpassed the legal barriers created by local and regional forest legislation.

3. Historical records indicating that the historical management surpasses financial barriers by providing above average financial returns.

For the preparation of a Common Practice Baseline Scenario, the following documents should be referenced:

1. Written forest management recommendations or plans from a qualified forestry agent or expert; or
2. Justification of the choice of a reference area (or multiple reference areas) according to forest type, legal requirements and financial returns; and
3. The historical records and/or management plan for the reference area(s).

11.2.2 Data required to estimate emissions and removals resulting from the project

- Merchantable volume for tree *l* of species *j* in stratum *I* in sample plot *sp* (m^3);
- Area of sample plot *sp* (ha);
- Mean volume of extracted timber per unit area in stratum *i* (m^3/ha);
- Biomass conversion and expansion factor applicable to wood removals in the project area (dimensionless);
- Carbon fraction of biomass (tC/t.d.m), either the IPCC default value of 0.5 or species/genus-specific values from the literature may be used;
- A weighted average of the wood density of all merchantable species present shall be used;
- Area of stratum *i* (ha);
- Growth rate of forest post-timber harvest for stratum *i* in year *t* (tC/ha/year);
- Annual growth rate of forest post timber harvest for stratum *i* in year *t* (tC/ha/year);
- Area burnt for stratum *i* at time *t* (ha), based on historical incidence of fire for the purposes of *ex ante* calculations; and
- Area disturbed for stratum *i* at time *t* (ha), based on historical incidence of disturbance for the purposes of *ex ante* calculations.

11.2.3 Project reports

The project report must include:

- The project title;
- The unique identification and delineation of the project area;
- The project proponent's roles and responsibilities, including contact information and proof of title;
- A brief description of the project area (including project size, geographic location, forest type and land use history);
- Demonstration of the threat to the forest and additionality;
- Description of how the baseline scenario is identified and description of the identified baseline scenario;
- Summary of the forest inventory including the area and mean biomass (m^3/ha) for each stratum;
- The specific methods, technologies and data utilised for stratification, preparation of a forest inventory and quantification of emission reductions or removal enhancements;

- Justification for all parameters identified in Section 11.2.2 and not determined through field sampling;
- Description of the monitoring plan addressing the parameters identified in Section 11.1.1;
- Estimated emission reductions and carbon credits generated over the crediting period; and
- A project schedule identifying reporting periods over the crediting period of 20 years.

11.2.4 Offset reports

The offset reports must:

- Identify the reporting period;
- Report any changes in the forested area;
- Compare projected and actual carbon stock changes in the project scenario;
- Demonstrate the absence of natural disturbance, or estimate the carbon stock changes resulting from natural disturbance; and
- Emission reductions and removal enhancements achieved through the implementation of the native forest protection project.

11.2.5 Project records

Data archiving shall take both electronic and paper forms, and copies of all data shall be provided to each project participant. All electronic data and reports shall also be copied on durable media such as CDs, copies of which are to be stored in multiple locations. All data must be kept for at least seven years after the offsets report was submitted to the Administrator.

The archives shall include:

- ownership documents;
- copies of all original field measurement data;
- strata maps identifying sample plots;
- data analysis spreadsheets;
- estimates of the carbon stock changes in all pools and non-CO2 GHG and corresponding calculation spreadsheets;
- GIS products;
- FullCAM products;
- the project report and accompanying calculations;
- the CFI Monitoring Plan; and
- copies of the offset reports and all supplementary monitoring data.

Section 12: References

Provide a full citation for all reports cited in the draft methodology.

Branthomme, A; Saket, M; Altrell, D; Viorinen, P; Dalsgaard, S; Andersson, LGB (2004)

National Forest Inventory: Field Manual Template (Working Paper 94E), FAO Forestry Department, Rome. Available from <ftp://ftp.fao.org/docrep/fao/008/ae578e/ae578e00.pdf> [accessed 08/11/2010]

CDM (2010) Calculation of the number of sample plots for measurements within A/R CDM project activities, version 01. Available from <http://cdm.unfccc.int/methodologies/ ARmethodologies/tools/ar-am-tool-03-v1.pdf> [accessed 01/06/2011]

GreenCollar Climate Solutions (2011) VM0010 Methodology for Improved Forest Management: Conversion from Logged to Protected Forest, v1.0, Verified Carbon Standard. Available at < http://www.v-c-s.org/sites/v-c-s.org/files/VM0010%20Methodology%20 for%20IFM%20LtPF%20v1.0%2C%2018MAR2011.pdf> [accessed 01/06/2011]

Penman, J; Gytarsky, M; Hiraishi, T; Krug, T; Kruger, D; Pipatti, R; Buendia, L; Miwa, K; Ngara, T; Tanabe, K; Wagner, F (eds) (2003) Good Practice Guidance for Land Use, Land Use Change and Forestry, Intergovernmental Panel on Climate Change. Available from < http://www.ipcc-nggip.iges.or.jp/public/gpglulucf/gpglulucf.html>

Pearson, T; Wilson, S; Brown, S (2005) The Sourcebook for Land Use Change and Forestry Projects, Winrock International. Available from < http://www.winrock.org/ecosystems/files/ winrock-biocarbon_fund_sourcebook-compressed.pdf > [accessed 20/07/2011]

Richards, GP (2001) The FullCAM Carbon Accounting Model: Development, Calibration and Implementation, Australian Greenhouse Office, Canberra. Presented at the IEA Bioenergy Task 38: Workshop, 'Carbon Accounting and Emissions Trading Related to Bioenergy, Wood Products and Carbon Sequestration'. Available at <http://www.ieabioenergy-task38.org/workshops/canberra01/cansession1.pdf> [accessed 19/07/2011]

Verified Carbon Standard (2011) VCS Program Guide: VCS Version 3.0. Available at < http://v-c-s.org/sites/v-c-s.org/files/VCS%20Program%20Guide,%20v3.0_2.pdf> [accessed 01/06/2011]

Voluntary Carbon Standard (2008) Tool for AFOLU Methodological Issues. Available at < http://www.v-c-s.org/sites/v-c-s.org/files/Tool%20for%20AFOLU%20Methodological%20 Issues.pdf> [accessed 01/06/2011]

Voluntary Carbon Standard (2010) VT0001 Tool for the Demonstration and Assessment of Additionality in VCS Agriculture, Forestry and Other Land Use (AFOLU) Project Activities. Available at <http://www.v-c-s.org/sites/v-c-s.org/files/VCS%20Tool%20VT0001-%20Tool %20for%20Demonstration%20and%20Assessment%20of%20Additionality%20in%20AFOLU %20Project%20Acitivities.pdf> [accessed 01/06/2011]

Winjum, J.K., S. Brown, S. and B. Schlamadinger (1998) Forest harvests and wood products: sources and sinks of atmospheric carbon dioxide, *Forest Science* **44** 272-284

Section 13: Appendices

Append and list below all relevant documentation necessary for the DOIC to assess the methodology including cited reports.

Branthomme, A; Saket, M; Altrell, D; Viorinen, P; Dalsgaard, S; Andersson, LGB (2004) National Forest Inventory: Field Manual Template (Working Paper 94E), FAO Forestry Department, Rome. Available from <ftp://ftp.fao.org/docrep/fao/008/ae578e/ae578e00.pdf> [accessed 08/11/2010]

CDM (2010) Calculation of the number of sample plots for measurements within A/R CDM project activities, version 01. Available from <http://cdm.unfccc.int/methodologies/ ARmethodologies/tools/ar-am-tool-03-v1.pdf> [accessed 01/06/2011]

GreenCollar Climate Solutions (2011) VM0010 Methodology for Improved Forest Management: Conversion from Logged to Protected Forest, v1.0, Verified Carbon Standard. Available at < http://www.v-c-s.org/sites/v-c-s.org/files/VM0010%20Methodology%20 for%20IFM%20LtPF%20v1.0%2C%2018MAR2011.pdf> [accessed 01/06/2011]

Penman, J; Gytarsky, M; Hiraishi, T; Krug, T; Kruger, D; Pipatti, R; Buendia, L; Miwa, K; Ngara, T; Tanabe, K; Wagner, F (eds) (2003) Good Practice Guidance for Land Use, Land Use Change and Forestry, Intergovernmental Panel on Climate Change. Available from < http://www.ipcc-nggip.iges.or.jp/public/gpglulucf/gpglulucf.html>

Pearson, T; Wilson, S; Brown, S (2005) The Sourcebook for Land Use Change and Forestry Projects, Winrock International. Available from < http://www.winrock.org/ecosystems/files/ winrock-biocarbon_fund_sourcebook-compressed.pdf > [accessed 20/07/2011]

Redd Forests (2011) Protection of a Tasmanian Native Forest (Project 1 – Redd Forests' Pilot), Verified Carbon Standard. Available from <https://vcsprojectdatabase1.apx.com/ myModule/Interactive.asp?Tab=Projects&p=605&lat=%2D41%2E823394&lon=146%2E9710 44> [accessed 21/07/2011]

Redd Forests (2011) Protection of a Tasmanian Native Forest (Project 3 – Peter Downie), Verified Carbon Standard. Available from <https://vcsprojectdatabase1.apx.com/myModule /Interactive.asp?Tab=Projects&p=587&lat=%2D42%2E49114&lon=147%2E09407> [accessed 21/07/2011]

Redd Forests (2011) Protection of a Tasmanian Native Forest (Project 4 – Grouped Project), Verified Carbon Standard. Available from <https://vcsprojectdatabase1.apx.com/myModule/ProjectDoc/Project_ViewFile.asp?FileID=6927&IDKEY=f98klasmf8jflkasf8098afnasfkj98f0a9sfsakjflsakjf8d09552333> [accessed 26/08/2011]

Richards, GP (2001) The FullCAM Carbon Accounting Model: Development, Calibration and Implementation, Australian Greenhouse Office, Canberra. Presented at the IEA Bioenergy Task 38: Workshop, 'Carbon Accounting and Emissions Trading Related to Bioenergy, Wood Products and Carbon Sequestration'. Available at <http://www.ieabioenergy-task38.org/workshops/canberra01/cansession1.pdf> [accessed 19/07/2011]

Verified Carbon Standard (2011) VCS Program Guide: VCS Version 3.0. Available at < http://v-c-s.org/sites/v-c-s.org/files/VCS%20Program%20Guide,%20v3.0_2.pdf> [accessed 01/06/2011]

Voluntary Carbon Standard (2008) Tool for AFOLU Methodological Issues. Available at < http://www.v-c-s.org/sites/v-c-s.org/files/Tool%20for%20AFOLU%20Methodological%20 Issues.pdf> [accessed 01/06/2011]

Voluntary Carbon Standard (2010) VT0001 Tool for the Demonstration and Assessment of Additionality in VCS Agriculture, Forestry and Other Land Use (AFOLU) Project Activities. Available at <http://www.v-c-s.org/sites/v-c-s.org/files/VCS%20Tool%20VT0001-%20Tool %20for%20Demonstration%20and%20Assessment%20of%20Additionality%20in%20AFOLU %20Project%20Acitivities.pdf> [accessed 01/06/2011]

Winjum, J.K., S. Brown, S. and B. Schlamadinger (1998) Forest harvests and wood products: sources and sinks of atmospheric carbon dioxide, *Forest Science* **44** 272-284

Section 14: Disclosure

Specify documents or parts of documents included as supporting information to the application that are marked CONFIDENTIAL and should not be published and the reasons why. Acceptable justification would include that the information should not be published if it reveals, or could be capable of revealing: • trade secrets; or • any other matter having a commercial value that would be, or could reasonably be expected to be, destroyed or diminished if the information were disclosed.
NA

Section 15: Declaration

This application must be signed by a duly authorised representative of the proponent. The person signing should read the following declaration and sign below.

Division 137 of the Criminal Code makes it an offence for a person to give information to a Commonwealth entity if the person providing the information knows that the information is false or misleading. The maximum penalty for such an offence is imprisonment up to 12 months.

By signing below, the signatory acknowledges that he or she is an authorised representative of the proponent, and that all of the information contained in this application is true and correct. The signatory also acknowledges that any of the information provided in this application may be copied, recorded, used or disclosed by the Department of Climate Change and Energy Efficiency for any purpose relevant to the CFI. Information will not be publicly disclosed by the Department where it has been identified as confidential by the proponent.

Full name of the person signing as a representative of the proponent:	s47F	Date: 26 August 2011
Position:		
Signature:		

Full name of the person signing as a representative of the proponent:	s47F	Date: 31/08/2011
Position:		
Signature:		

s47F

From: DCCEE - DOIC
Sent: Tuesday, 16 August 2011 2:12 PM
To: s47F DCCEE - DOIC
Subject: RE: Redd Forests' NFPP methodology for assessment by the DOIC [SEC=UNCLASSIFIED]

Security Classification:

UNCLASSIFIED

Dear s47F

Thank you for submitting your methodology on Native Forest Protection Projects to the DOIC for assessment under the Carbon Farming Initiative.

We will keep you informed of progress with the methodology. The DOIC's first consideration of the methodology will be to determine if it is ready for public consultation. If you have any further questions about the assessment process, please do not hesitate to ask.

With kind regards

s47F
Director
Domestic Offsets Integrity Committee Secretariat
Carbon Farming Operations Branch
Department of Climate Change and Energy Efficiency

s47F

climatechange.gov.au
A: GPO Box 854, CANBERRA ACT 2601

From: s47F @reddforests.com]
Sent: Tuesday, 16 August 2011 12:12 PM
To: DCCEE - DOIC
Cc: s47F
Subject: Redd Forests' NFPP methodology for assessment by the DOIC

To the Domestic Offsets Integrity Committee Secretariat

Redd Forests is pleased to submit the attached methodology for Native Forest Protection Projects under the Carbon Farming Initiative. Please email or call me if you have any questions.

Yours sincerely,
s47F

CFI Methodology

for Native Forest Protection Projects

Version 1.1

Prepared by Redd Forests Pty Ltd and GreenCollar Pty Ltd

Table of Contents

Section 1: Applicant Details

Name:	s47F
Company:	Redd Forests Pty Ltd
Position:	s47F
Telephone:	
Email:	
Address:	
Postal address (if different to above):	As above

Name:	s47F
Company:	GreenCollar Climate Solutions Pty Ltd
Position:	s47F
Telephone:	
Email:	
Address:	
Postal address (if different to above):	As above

Section 2: Expert Consultation

N/A

Section 3: Existing Methodologies

3.1 Has a similar methodology already been approved for use under the CFI? If yes, outline how the new methodology proposal is different.
No

3.2 Is the draft methodology an adaptation of an existing methodology that has been approved under an international offsets scheme or an offsets scheme in another Australian jurisdiction? If yes, provide a reference for the existing methodology and describe any major differences between the draft methodology and the existing methodology.
Yes. This methodology is based on VM0010 Methodology for Improved Forest Management: Conversion from Logged to Protected Forest. The methodology was developed by GreenCollar Climate Solutions and approved by the Verified Carbon Standard on 11 February 2011. It is available through the VCS website at http://www.v-c-s.org/sites/v-c-s.org/files/VM0010%20Methodology%20for%20IFM%20LtPF%20v1.0%2C%2018MAR2011.pdf.

The Redd Forests IFM methodology has been adapted from the existing methodology in the following ways:

- The definitions and terminology are based on the Carbon Credits (Carbon Farming Initiative) Bill, No ###, 2011.
- The equations have been modified to remove the parameter 'land parcel', *p*. This was considered unnecessary when the equations already contain the parameter 'stratum', *i*.
- The equations have been modified to calculate annualised emission reductions. This figure is multiplied by the number of years in the reporting period to determine the number of CFI credits that the proponent can claim.
- The mechanism for calculating carbon sequestration through forest growth has been revised to utilise FullCAM to, a model developed for the National Carbon Accounting System (NCAS), a constantly evolving 'best practice' approach. FullCAM provides temporally and spatially explicit monitoring and modelling capabilities for land-based emissions and sinks. It is part of a Tier 3 accounting framework and industry best practice in Australia[1], and therefore preferable to the more limited tools available to an internationally applicable methodology.
- The equations and monitoring parameters accounting for loss of carbon stocks through illegal logging have been removed. Illegal logging is not considered a threat in Australia due to widespread recognition of private property, and strong enforcement of commercial forest harvesting regulation.
- The equations accounting for leakage will be revised, in accordance with the standardised leakage assessment for CFI projects.
- The equations accounting for uncertainty have been removed. The key source of uncertainty, sampling error, has been identified and addressed during the stratification of the project area.
- The equations accounting for risk have been removed. Instead, the risk of reversal buffer has been set at 5% in accordance with the Carbon Credits (Carbon Farming Initiative) Bill This replaces the use of the (recently superseded) VCS Tool for AFOLU Non-Permanence Risk Analysis and Buffer Determination.

This methodology also draws on:

- VCS Program Guide 2011[2]
- VCS Tool for AFOLU Methodological Issues[3]
- VCS Tool for the Demonstration and Assessment of Additionality in VCS Agriculture, Forestry and Other Land Use (AFOLU) Project Activities[4]
- Tool for Calculation of the Number of Sample Plots for Measurements within A/R CDM Project Activities[5]

[1] Richards, GP (2001) The FullCAM Carbon Accounting Model: Development, Calibration and Implementation, Australian Greenhouse Office, Canberra. Presented at the IEA Bioenergy Task 38: Workshop, 'Carbon Accounting and Emissions Trading Related to Bioenergy, Wood Products and Carbon Sequestration'. Available at < http://www.ieabioenergy-task38.org/workshops/canberra01/cansession1.pdf> [accessed 19/07/2011]

[2] http://v-c-s.org/sites/v-c-s.org/files/VCS%20Program%20Guide,%20v3.0_2.pdf

[3] http://www.v-c-s.org/sites/v-c-s.org/files/Tool%20for%20AFOLU%20Methodological%20Issues.pdf

[4] http://www.v-c-s.org/methodologies/VT0001

[5] http://cdm.unfccc.int/methodologies/ARmethodologies/tools/ar-am-tool-03-v1.pdf

Section 4: Methodology Glossary

Provide a glossary of terms that are specific to the draft methodology.	
|BSL	The suffix featured to indicate physical quantities referring to the **baseline scenario**
|NFPP	The suffix featured to indicate physical quantities referring to the **native forest protection project**
|PRJ	The suffix featured to indicate physical quantities referring to the **project scenario**
Aboveground biomass	Living biomass above the soil, including the stem, stump, branches, bark, seeds and foliage
BCEF	Biomass conversion and expansion factor
Carbon pool	A reservoir of carbon that has the potential to accumulate (or lose) carbon over time. For LULUCF projects, this encompasses aboveground biomass, belowground biomass, litter, dead wood and soil
Carbon stock	The quantity of carbon held within a pool, measured in tonnes of CO2
Commercial timber harvest	Removal of merchantable trees from a forest to obtain income from the wood products. For the purpose of this methodology, a commercial timber harvest must be planned and legally permitted
DBH	Diameter at breast height
Forest inventory	A system for measuring the extent, quantity, and condition of a forest by sampling through: a) a set of objective sampling methods designed to quantify the spatial distribution, composition, and rates of change of forest parameters within specified levels of precision for the purpose of management; b) the listing of data from such a survey.
Project area	The area of land within the property available for logging and timber extraction operations as defined in the timber harvest plan. This excludes all non-forested area and any forested area protected under other mechanisms (streamside reserves, roadside buffers, conservation covenants, etc).
Timber harvest plan	Description of the methods and operations needed to harvest timber from a forest under a given set of legal conditions for harvest. This includes: a) demarcation of non-harvest areas within the forest, b) division of the harvestable forest into annual operating areas presented as descriptions and maps, c) the design and presentation of the transport system for the removal of harvested timber products, d) a description of the harvest and transport machinery used for timber harvest.
Wood products	Products derived from wood harvested from a forest, including fuelwood and logs and the products derived from them such as sawn timber, plywood, wood pulp, paper

Section 5: Methodology (or Activity) Scope

5.1 Describe the specific abatement activities, technologies or management practices to which the methodology applies. Explain how the abatement activities, technologies or management practices will reduce or avoid emissions or remove and sequester greenhouse gases from the atmosphere.

This methodology calculates the abatement of emissions from a native forest protection project, specifically the prevention of clearing and clear-felling of native forests.

Native forests across Australia have historically been logged for wood products, varying from low-value wood chips to high-value sawnwood. This has traditionally been one of the only means to generate income from forestry. There has also been widespread conversion of native forests to other land uses. However, the consequences of ongoing logging and/or conversion are substantial emissions from the logging process, and the steady degradation or loss of carbon stocks in native forest.

The establishment of native forest protection projects is intended to prevent the emissions generated through business-as-usual logging practices, and to maintain and enhance the carbon stocks in native forests. Such projects have the additional benefits of enhancing local biodiversity, diversifying landowners' income and maintaining the aesthetic and recreational values of the forest landscape.

The number of greenhouse gas emissions prevented by the project is determined by the difference between the baseline and project scenarios, and after taking leakage into account. Calculation of greenhouse gas emissions requires the application of equations presented in Section 9. Baseline scenario projections are calculated *ex ante* and are not adjusted throughout the project lifetime. Project scenario projections are calculated *ex ante*, and adjusted *ex post* based on monitoring data collected during the crediting period.

The baseline net greenhouse gas emissions are determined from calculation of deadwood generated in the process of timber harvest, the emissions resulting from production and subsequent retirement of wood products derived from the timber harvesting, minus the rates of forest regrowth after timber harvest. Baseline commercial timber volumes must be derived for development of the timber harvest plan and for *ex post* accounting of emissions resulting from natural forest disturbance.

Net greenhouse gas emissions in the project scenario will be equal to carbon sequestration through ongoing forest growth minus any emissions resulting from natural disturbance. *Ex ante* estimations of natural disturbance for the project scenario shall be based on historical incidence of fire and natural disturbance on the project site; the data may be from the project region if site-specific data is not available. For all offsets reports, data collected for monitored parameters for natural disturbance must be included using the equations given in Section 9.

5.2 List the circumstances or conditions under which the activities, technologies or management practices are to be implemented. If they can be implemented under different circumstances or conditions (for example, climatic conditions, soil types and other regionally specific conditions), specify any differences in implementation for each of the different circumstances or conditions.

Specific conditions under which this methodology is applicable are:

- The project area must contain native forests, as defined under Section 5 of the Carbon Credits (Carbon Farming Initiative) Bill.
- Forest management, harvesting and carbon rights must be demonstrated by documentary proof of legal ownership of the land, a legal lease on the forest or any contracts associated with forest use.
- Forest management in the baseline scenario must be planned timber harvest or clearfell for land use conversion.
- A legal right to harvest, issued by the relevant government body, must pre-exist the implementation of the project. The legality of the planned timber harvest or conversion must be demonstrated by valid harvesting permits; by recent harvesting permits combined with evidence that forest management laws have not changed; or by evidence that the project site is representative of other harvested forestlands and within commercially viable distance of transport networks and processing options.
- Project proponents must demonstrate intent to harvest the area prior to any evidence of intended carbon-financed forest protection. Projects shall provide any of the following documented evidence:
    - A history of timber harvest on the project area
    - A history of timber harvest by the landowner
    - A valid harvesting permit on the property
- In the project scenario, forest use is limited to activities that do not result in commercial timber harvest or forest degradation.
- Planned timber harvest must be estimated using forest inventory methods that determine allowable offtake as volume of timber (m^3/ha).
- The boundaries of the forest land must be clearly defined and documented.
- Baseline scenario, project scenario and project case cannot include wetland or peatland.

If the native forest protection project satisfies these eligibility criteria, it will pass the additionality test detailed in the Carbon Credits (Carbon Farming Initiative) Bill, i.e.

a) the project is of a kind specified in the regulations; and
b) the project is not required to be carried out by or under a law of the Commonwealth, a State or a Territory.

5.3. (Optional) Provide background information about the abatement activities, technologies or management practices. This could include case studies that demonstrate the successful implementation of the abatement activities, technologies or management practices.

Redd Forests has implemented three native forest protection projects in Tasmania in accordance with 'VM0010 Methodology for Improved Forest Management: Conversion from Logged to Protected Forest' (on which this methodology is based). These projects have been validated and verified under the Verified Carbon Standard, and the credits from the first year of the abatement activities have been registered, issued and sold.

The Project Descriptions for these case studies are available from the VCS project registry:

- Protection of a Tasmanian native forest (Redd Forests' pilot). Implemented on 890 hectares and generating 4,965 VCUs per annum. Available from <https://vcsprojectdatabase1.apx.com/myModule/Interactive.asp?Tab=Projects&p

=605&lat=%2D41%2E823394&lon=146%2E971044>.

- Protection of a Tasmanian native forest (Project 3 – Peter Downie). Implemented on 7,666 hectares and generating 55,549 VCUs per annum. Available from < https://vcsprojectdatabase1.apx.com/myModule/Interactive.asp?Tab=Projects&p=587&lat=%2D42%2E49114&lon=147%2E09407>.
- Protection of a Tasmanian native forest (Project 4 – Grouped Project). Implemented on XXXX hectares to date, but permits the addition of individual proponents and project activity instances within the Grouped Project. Available from <website>.

Section 6: Identifying the Baseline

6.1 Specify the process for identifying the project baseline.

Project proponents must identify realistic, legal and credible land use scenarios that could have occurred on the land within the proposed project boundary in the absence of the native forest protection project. The baseline scenarios can be based on historical practice, common practice or projected baselines.

As per the applicability conditions, the project must demonstrate a baseline scenario of planned land use change (timber harvest or conversion).

The baseline scenario must be tested using an investment analysis. This analysis is developed from the VCS Tool for the Demonstration and Assessment of Additionality in VCS Agriculture, Forestry and Other Land Use (AFOLU) Project Activities**.** The proposed native forest protection project, without the revenue from the sale of GHG credits, should be economically or financially less attractive than at least one of the other land use scenarios.

- If the project activity generates no financial benefits other than carbon-related income, this is considered an adequate demonstration of the baseline scenario's credibility and feasibility.
- If the project activity generates additional sources of income to carbon finance, the revenue from these additional sources must be compared to the revenue generated in the baseline scenario. Identify appropriate financial indicators (IRR, NPV, cost-benefit ratio, required rate of return, etc) for the project type and decision context. Calculate the selected financial indicator(s) for the proposed CFI project *without* carbon finance and for the baseline scenario(s). Include all relevant costs and revenues, and present the investment analysis in a transparent manner. If the CFI project is to be implemented, it should be clearly demonstrated that carbon finance is required to make the project financially or economically as attractive as at least one of the identified baseline scenarios.

Once the baseline scenario of planned timber harvest is demonstrated, project proponents must prepare a timber harvest plan for the baseline scenario. A Historical Baseline Scenario must be used where data is available, otherwise a Common Practice Baseline Scenario shall be used.

A Historical Baseline Scenario, and a timber harvest plan derived from the historical practices on the property or by the proponent, can be modelled as the project baseline if appropriate documentation exists (identified in Section 11.2.1).

All other cases must model baseline harvest based on common practice. Common practice will be planned timber harvest under the legal requirements for forest management and will be determined from a timber harvest plan developed from scenario modelling of the project area. This can be based on advice from qualified forestry agents or experts, and/or comparison with a reference area (or multiple reference areas) already under timber harvest management that complies with legal requirements for forest management and selected to be representative of local common practice for timber harvest.

Common practice cannot contradict management of the baseline agent except where common practice represents a lower harvest intensity (in m^3/ha) than management by the baseline agent.

Where there is limited capacity to generate the baseline scenario using a reference site in the region of the project area, multiple reference areas may be selected to cover a country so long as the reference areas are in the same region as the project area, with comparable forest types, climate and elevation (±20%).

6.1.2 A Timber Harvest Plan

The description of harvesting in the form of a timber harvest plan forms the basis of the baseline scenario for greenhouse gas accounting.

The timber harvest plan describes the harvest of timber products and must:

a) reference the forest volume inventory (see Step 9.1.1, parameter V_i |BSL) to identify the relative number of trees per hectare potentially available for harvest by species in each stratum;
b) demarcate all non-harvest areas within the forest based on legally required exclusions for environmental features such as slope, conservation covenants or protected vegetation communities;
c) divide the harvestable forest into annual operating areas using common practice;
d) outline the transport system which was/would be used to move harvested timber products from the project area to downstream processing or market entry points; and
e) list necessary harvest and transport machinery.

The timber harvest plan must follow the legal guidelines and local best practice for timber harvest.

For the purpose of estimating the net annual changes in carbon stocks resulting from planned timber harvest in the baseline scenario, a detailed *planned timber harvesting schedule* will be developed from the timber harvest plan, spelling out details of each harvest event in the project area in terms of the following:

a) the species to be harvested;
b) the year (*1,2,3...*) in which each timber harvest is scheduled to occur;
c) the minimum diameters at breast height (DBH), at stump for tree harvesting;
d) the planned harvesting regime (clear-felling, species/stratum-selective logging, area-selective logging);

e) technical specifications for the categories of wood products to be harvested; and
f) the total volumes or fractions to be harvested, broken down by categories of wood products defined as sawnwood, wood-based panels, other industrial roundwood, paper and paper board, and other.

The planned timber harvest schedule is determined *ex ante* to reflect the timber harvesting plan as stipulated in the legal right to harvest. The *planned timber harvesting schedule* will be developed for all strata within the project area.

The output of the timber harvest plan shall be the mean extracted volume per unit area in each stratum in each year ($V_{EX,i|BSL}$). This value, along with the merchantable volume per unit area in stratum *i* in the baseline scenario (m^3/ha) ($V_{i|BSL}$), will be included in the FullCAM model of the baseline scenario to assess the credibility of the business-as-usual projections and minimise the uncertainty associated with sequestration projections.

The planned timber harvesting schedule will be submitted by proponents as part of the project report.

A new baseline scenario must be prepared for each crediting period (i.e. every 20 years). Each time, the proponent must demonstrate that the new baseline scenario is a) planned timber harvest, and b) realistic, legal and credible. This ensures that crediting reflects changes in forestry legislation, the viability of the timber history and other factors impacting on the additionality of the carbon project.

6.2 List and justify the assumptions on which the baseline is based.

A Historical baseline scenario can be reliably derived from ten (10) years of documented forest management on the project area. Assuming planned timber harvest during this period, ten years of data provides an reasonable indicator of the proponent's typical harvesting intensity or extraction rate. Frequency of timber harvests should be calculated by FullCAM modelling, common practice and/or comparison with reference sites, rather than historical practice, as this would require data from a prohibitively long timeframe.

The baseline scenario needs to be re-evaluated only at the start of a new crediting period. This approach has been adopted because the widespread adoption of forest carbon projects could change political and market conditions. Most notably, reduced harvesting rates (as NFPPs are implemented in native forests) could undermine the viability of the timber industry. Regular re-assessments of the original baseline scenario could therefore indicate that logging is no longer viable, and the carbon stored or sequestered is no longer additional. In this scenario, a declining timber industry would at least in part be a product of the growing carbon market: the credits would therefore remain additional, as emissions from logging would have continued in the absence of forest carbon projects. This possibility is exemplified by the logging industry in Tasmania's private native forests.

Section 7: Greenhouse Gas Assessment Boundary

7.1 Describe the steps and/or processes involved in undertaking the abatement activity and identify all emissions sources and sinks directly or indirectly affected by the activity. Identify any emissions sources or sinks affected by the activity that will be excluded from the greenhouse gas assessment boundary. Flowcharts may be used to illustrate typical greenhouse gas assessment boundaries.

A native forest protection project achieves emission reductions and removal enhancements by preventing the logging and clearfell of native forests. The emission sources and sinks modelled in this methodology are summarised below.

Included in modelling	• Emissions from wood product conversion • Decomposition of dead wood from harvested trees • Emissions from wood product retirement • Stock change due to regrowth following timber harvest
Conservatively excluded from modelling	• Decomposition of trees incidentally killed during tree felling • Decomposition of trees killed through road construction and skid trail creation • Emissions from fossil fuels burned in baseine harvesting practices • Emissions through subsequent forest re-entry

7.2 In the table below: List all emissions sources and sinks affected by the project. Indicate whether the source or sink is to be included or excluded from the baseline or greenhouse gas assessment boundary and provide justification for any exclusions. All emissions sources and sinks identified in Section 7.1 should be listed in this table. Expand the table to include additional sources and sinks, as necessary. Additional information justifying the exclusion of emissions sources and sinks can be provided in Section 7.3.

Table 2. Emission sources and sinks affected by the project.

Source:		*Greenhouse gas/carbon pool:*	*Included/ excluded:*	*Justification for exclusion:*
Baseline	Source 1 –Rotting of dead wood	CO_2	Included	The stock change in dead wood is likely to be significant and shall be estimated.
	Source 2 – Retirement of harvested wood products	CO_2	Included	Emissions from the retirement of the harvested wood products is likely to be significant and shall be estimated.

	Source 3 – Combustion of fossil fuels in vehicles, machinery and equipment	CO_2 and NO_x	Excluded	Exclusion is conservative as emissions will be greater in the baseline scenario than in the project scenario.
	Source 4 – Burning of biomass	CO_2, CH_4 and NO_x	Included	If a fire occurs in the project area, the stock change in aboveground trees is likely to be significant.
	Sink 1 – Aboveground trees	CO_2	Included	The stock change in the aboveground tree biomass is likely to be significant and shall be estimated.
	Sink 2 – Harvested wood products	CO_2	Included	The carbon stock stored in the harvested wood products is likely to be significant and shall be estimated.
	Sink 3 – Aboveground non-trees	CO_2	Excluded	The stock change in the aboveground non-tree biomass is not likely to be significant, and exclusion is always conservative when forests remain as forests.
	Sink 4 – Belowground trees	CO_2	Excluded	The stock change in belowground biomass is not likely to be significant, and exclusion is always conservative when forests remain as forests.
	Sink 5 – Litter	CO_2	Excluded	The stock change in the litter is not likely to be significant, and exclusion is always conservative when forests remain as forests.
	Sink 6 – Soil organic carbon	CO_2	Excluded	The stock change in soil organic carbon is not likely to be significant, and exclusion is always conservative when forests remain as forests.
Project activity	Source 1 – Combustion of fossil fuels in vehicles, machinery and equipment	CO_2 and NO_x	Excluded	Exclusion is conservative as emissions will be greater in the baseline scenario than in the project scenario.
	Source 2 – Burning of biomass	CO_2, CH_4 and NO_x	Included	If a fire occurs in the project area, the stock change in aboveground trees is likely to be significant.
	Sink 1 – Aboveground trees	CO_2	Included	The stock change in the aboveground tree biomass is likely to be significant and shall be estimated.
	Sink 2 – Aboveground non-trees	CO_2	Excluded	The stock change in the aboveground non-tree biomass is not likely to be significant, and exclusion is always conservative when forests remain as forests.
	Sink 3 – Belowground trees	CO_2	Excluded	The stock change in belowground biomass is not likely to be

				significant, and exclusion is always conservative when forests remain as forests.
	Sink 4 – Litter	CO_2	Excluded	The stock change in the litter is not likely to be significant, and exclusion is always conservative when forests remain as forests.
	Sink 5 – Soil organic carbon	CO_2	Excluded	The stock change in soil organic carbon is not likely to be significant, and exclusion is always conservative when forests remain as forests.

7.3 (If required) Additional information justifying why a source or sink is excluded.

Section 8: Project Area

If applicable, provide instructions to project proponents on how to determine the Project Area.

Project proponents shall clearly define the spatial boundaries of a project so as to facilitate accurate measuring, monitoring, accounting and verifying of the project's emissions, reductions and removals. The native forest protection project may contain more than one discrete area of land.

When describing physical project boundaries, the following information shall be provided:

- name of the property(ies) (including compartment number, allotment number, local name);
- unique identifier for each discrete stratum used in the timber harvest plan;
- map(s) of the strata and project area (preferably in digital format);
- total land area (i.e. the property size);
- total project area, i.e. that area covered by native forests threatened by legal and planned timber harvest; and
- details of landowner and/or carbon stock owner.

Information shall be provided, and recorded in the project report, to establish that the geographic coordinates of the project boundary (and any stratification inside the boundary) are established, recorded and archived. This will be achieved using geo-referenced spatial data (e.g. maps, GIS datasets, aerial photography).

Section 9: Estimating Abatement

9.1 Provide instructions to project proponents on how to calculate baseline emissions and removals.

Provide formulas and define parameters in each formula, including units.

Where parameters are to be derived through data collection, provide instructions on data collection methods in Section 10.

Step 9.1.1 Calculation of carbon stocks in commercial timber volumes

This step calculates $C_{HB,j,i\,|BSL}$, the mean carbon stock in total harvested biomass in tC/ha, and $C_{EX,j,i\,|BSL}$, the mean carbon stock in extracted timber (merchantable timber that leaves the forest) in tC/ha.

The following equation is used to calculate the merchantable volume of timber per unit area ($V_{j,i\,|BSL}$) that is potentially available for harvest. This shall be based on data from field measurements in sample plots.

The estimate of merchantable volume for each species *j* at the sample plot level will be calculated as:

$$V_{j,i,sp} = \sum_{l=1}^{L} V_{l,j,i,sp} \quad (1)$$

Where:

$V_{l,j,sp}$	Merchantable volume for species *j* in stratum *i* in sample plot *sp* (m^3);
$V_{l,l,j,sp}$	Merchantable volume for tree *l* of species *j* in stratum *I* in sample plot *sp* (m^3);
l	1, 2, 3 … *L* sequence of individual trees in sample plot;
i	1, 2, 3 … *M* strata;
sp	1, 2, 3 … *SP* sample plots; and
j	1, 2, 3 … *J* tree species

Therefore, the merchantable volume per unit area of species *j* in stratum *i* will be calculated as the mean merchantable volume per species in all sample plots in stratum *i*:

$$V_{j,i|BSL} = \frac{1}{SP} * \sum_{sp=1}^{SP} \frac{V_{j,i,sp}}{A_{sp}} \quad (2)$$

Where:

$V_{i,j\,|BSL}$	Merchantable volume per unit area of species *j* in stratum *i* in the baseline scenario (m^3/ha);
$V_{l,j,sp}$	Merchantable volume for tree *l* of species *j* in stratum *I* in sample plot *sp* (m^3);
A_{SP}	Area of sample plot *sp* (ha);
i	1, 2, 3 … *M* strata;

sp	1, 2, 3 … *SP* sample plots; and
j	1, 2, 3 … *J* tree species

Since most landowners plan their timber harvest according to the total volume of merchantable timber per unit area, this will be calculated by adding $V_{i,j|BSL}$ for each species in stratum *i*:

$$V_{i|BSL} = \sum_{j=1}^{J} V_{i,j|BSL} \quad (3)$$

$V_{i\|BSL}$	Merchantable volume per unit area in stratum *i* in the baseline scenario (m^3/ha);
$V_{i,j\|BSL}$	Merchantable volume per unit area of species *j* in stratum *i* in the baseline scenario (m^3/ha);
i	1, 2, 3 … *M* strata;
j	1, 2, 3 … *J* tree species

Step 9.1.2 Calculation of dead wood generated in the process of timber harvest

$V_{i|BSL}$ (Equation 3) will be used to develop the timber harvest plan. The timber harvest plan sets the allowable mean extracted volume ($V_{EX,i|BSL}$) from this merchantable volume based on legal limits.

Once the timber harvest plan is complete and $V_{EX,i|BSL}$ is calculated the Biomass Conversion and Expansion Factors (BCEF) method shall be used to determine the carbon stock in harvested biomass. This method is appropriate as forest inventory data and allowable harvest must be based on volume estimates to which expansion factors can be readily applied. The selected BCEF must have a minimum DBH compatible with the minimum DBH defined in the timber harvest plan (Step 6.1), and a range compatible with the trees found on the project site.

Therefore, the carbon stock of timber harvested per unit area in stratum *i* will be calculated from this mean volume of extracted timber:

$$C_{HB,i|BSL} = V_{EX,i|BSL} * BCEF * CF \quad (4)$$

Where:

$C_{HB,i\|BSL}$	Mean carbon stock of harvested biomass per unit area in stratum *i* (tC/ha);
$V_{EX,i\|BSL}$	Mean volume of extracted timber per unit area in stratum *i* (m^3/ha);
BCEF	Biomass conversion and expansion factor applicable to wood removals in the project area (dimensionless);
CF	Carbon fraction of biomass (tC/t.d.m), either the IPCC default value of 0.5 or species/genus-specific values from the literature may be used;
i	1, 2, 3 … *M* strata;

The source of the BCEF shall be chosen with priority from higher to lower preference as follows:

a) Existing local forest type-specific;

b) National forest type-specific or eco-region specific (e.g. from the National GHG inventory);
c) Forest type-specific or eco-region-specific from neighbouring countries with similar conditions;
d) Global forest type or eco-region specific (e.g. IPCC 2006 INV GLs AFOLU Chapter 4 Table 4.5).

Not all of the harvested biomass leaves the forest because the timber harvested has two components: 1) wood removed to market (extracted timber), and 2) wood remaining in the forest as a result of harvest. Therefore, the mean carbon stock of extracted timber per unit area in stratum *i* will be calculated from the mean volume of extracted timber multiplied by density and carbon fractions:

$$C_{EX,i\,|\mathrm{BSL}} = V_{EX,i\,|\mathrm{BSL}} * D * CF \qquad (5)$$

Where:

$C_{EX,i\,|\mathrm{BSL}}$ Mean carbon stock of extracted timber per unit area in stratum *i* (tC/ha);
$V_{EX,i\,|\mathrm{BSL}}$ Mean volume of extracted timber per unit area in stratum *i* (m^3/ha);
D A weighted average of the wood density of all merchantable species present shall be used. There is an abundance of data on the wood density of Australian species or groups of species (e.g. the National Greenhouse Gas inventory, the Farm Forestry Toolbox, peer-reviewed literature). This shall be preferentially used before global defaults (e.g. from the IPCC 2006 INV GLs AFOLU Chapter 4 Tables 4.13 and 4.14);
CF_j Carbon fraction of biomass (tC/t.d.m). Either the IPCC default value of 0.5 or species/genus-specific values from the literature may be used, as long as the same value is adopted in all instances where this parameter is used;
i 1, 2, 3 … *M* strata.

This step calculates $\Delta C_{DW,i,p\,|\mathrm{BSL}}$, the change in carbon stock in dead wood resulting from timber harvest in stratum *i*, using $C_{EX,i\,|\mathrm{BSL}}$ and $C_{HB,i\,|\mathrm{BSL}}$ as calculated in Equations 4 and 5.

The simplifying assumption is made that dead wood created during timber harvest is emitted in the year of harvest. Therefore, the change in carbon stock in the dead wood pool in stratum *i* will be calculated as the difference between the total carbon stock of the harvested biomass and the carbon stock of the extracted timber:

$$\Delta C_{DW,i\,|BSL} = A_i * (C_{HB,i\,|\mathrm{BSL}} - C_{EX,i\,|\mathrm{BSL}}) \qquad (6)$$

Where:

$\Delta C_{DW,i,p\,|BSL}$ Change in carbon stock of dead wood resulting from timber harvest per unit area in stratum *i* (tC);
A_i Area of stratum *i* (ha);
$C_{HB,i\,|\mathrm{BSL}}$ Mean carbon stock of harvested biomass per unit area in stratum *I* (tC/ha);
$C_{EX,i\,|\mathrm{BSL}}$ Mean carbon stock of extracted timber per unit area in stratum *i* (tC/ha);
i 1, 2, 3 … *M* strata.

Step 9.1.3 Calculation of baseline carbon sequestered in wood products

This step calculates $\Delta C_{WP,i\,|BSL}$ i.e., the net carbon stock change resulting from wood product conversion and retirement in the baseline scenario.

In all cases where wood is harvested for conversion to wood products, carbon stock in the wood products pool must be included in the baseline case. Carbon stocks treated here are those stocks remaining in wood products after 100 years because the bulk of emissions associated with timber harvest, processing and waste, and eventual product retirement occur within this timeframe. This methodology employs the simplifying assumption that the proportion remaining after 100 years is effectively 'permanent'. Therefore, accounting for wood products shall take place at the time of timber harvest.

The conceptual framework detailed in Winjum *et al* (1998) is used here, applying the simplifying assumption that all extracted biomass not retained in long-term wood products after 100 years is emitted in the year harvested, instead of tracking annual emissions through retirement, burning and decomposition.

The wood product class(es), *k*, (sawnwood, wood-based panels, other industrial roundwood, paper and paper board, and other) that are the anticipated end use of the extracted timber must now be selected. It is acceptable practice to assign gross percentages of volume extracted to wood product classes on the basis of local expert knowledge of harvest activities and markets.

The carbon stock of extracted timber has already been calculated as $C_{EX,i|BSL}$ (the product of Equation 5). All factors are derived from Winjum *et al* (1998). Therefore, the proportion of mean carbon stock of extracted timber that remains sequestered in long-term wood products after 100 years is calculated as:

$$C_{WP,i\,|BSL} = \sum_k (C_{EX,i,k|\mathrm{BSL}} * (1 - WW_\mathrm{k})*(1 - SLF_\mathrm{k})*(1 - OF_\mathrm{k}) \qquad (7)$$

Where:

$C_{WP,i\,|BSL}$	Carbon stock sequestered in wood products in stratum *i* as a result of planned timber harvest in the baseline scenario (tC/ha);
$C_{EX,i,k|\mathrm{BSL}}$	Mean carbon stock of extracted timber per unit area in stratum *i* (tC/ha);
WW_k	Fraction of biomass carbon from wood waste immediately emitted as a byproduct of milling operations for wood product *k* (dimensionless);
SLF_k	Fraction of biomass carbon for wood product *k* that will be emitted to the atmosphere within 5 years of timber harvest (dimensionless);
OF_k	Fraction of biomass carbon for wood product type *k* that will be emitted to the atmosphere between 5 and 100 years of timber harvest, dimensionless;
k	wood product classes (1. sawnwood, 2. wood-based panels, 3. other industrial roundwood and 4. paper and paper board);
i	1, 2, 3 … *M* strata.

The specific values for the parameters above are (Winjum *et al.* 1998):

Wood waste fraction (WW):

Winjum *et al* (1998) indicate that the proportion of extracted biomass that is oxidized (burning or decaying) from the production of commodities to be equal to 19% for developed countries.

Short-lived fraction (SLF):
Winjum *et al* (1998) give the following proportions for wood products with short-term (<5 yr) uses (applicable internationally):

Sawnwood	0.2
Woodbase panels	0.1
Other industrial roundwood	0.3
Paper and Paperboard	0.4

Additional oxidized fraction (OF):
Winjum *et al* (1998) gives annual oxidation fractions for each class of wood products split by forest region. This methodology projects these fractions over 95 years to give the additional proportion that is oxidized between the 5th and 100th years after initial harvest:

Wood product class	Temperate	Tropical
Sawnwood	0.6	0.84
Woodbase panels	0.84	0.97
Other industrial roundwood	0.97	0.99
Paper and paperboard	0.6	0.99

Therefore, the carbon stock change resulting from wood product conversion and retirement is calculated as the difference between the mean carbon stock of extracted timber minus the carbon sequestered in wood products:

$$\Delta C_{WP,i\,|\mathrm{BSL}} = A_i * (C_{EX,i\,|\mathrm{BSL}} - C_{WP,i\,|\mathrm{BSL}}) \quad (8)$$

Where:

$\Delta C_{WP,i\,|BSL}$	Change in carbon stock resulting from wood product conversion and retirement from stratum *i* (tC);
A_i	Area of stratum *i* (ha)
$C_{EX,i\,|\mathrm{BSL}}$	Mean carbon stock of extracted timber per unit area in stratum *i* (tC/ha);
$C_{WP,i\,|\mathrm{BSL}}$	Carbon stock sequestered in wood products in stratum *i* as a result of planned timber harvest in the baseline scenario (tC/ha);
i	1, 2, 3 … *M* strata.

Step 9.1.4 Change in carbon stocks due to forest regrowth after harvest

This step calculates $\Delta C_{RG,i,p\,|\mathrm{BSL}}$, the carbon sequestration resulting from forest regrowth after timber harvest in stratum *i* (tC).

$$\Delta C_{RG,i,t|\mathrm{BSL}} = A_i * GR_{t\,|\mathrm{BSL}} \quad (9)$$

$\Delta C_{RG,i,t\,|\mathrm{BSL}}$ Carbon sequestration resulting from forest regrowth after timber harvest in stratum *i* in year *t* (tC);

A_i	The area of stratum *i* (ha);
$GR_{t\,|BSL}$	Growth rate of forest post-timber harvest for stratum *i* in year *t* (tC/ha/year);
t	1, 2, 3 … *T* years elapsed since the start of the project crediting period;
i	1, 2, 3 … *M* strata.

The annual growth rate *GR* can be determined using most recent version of FullCAM, the Full Carbon Accounting Model developed by the Australian Greenhouse Office and CSIRO to meet the reporting requirements of the UNFCCC. If using FullCAM, appropriate species- and site-data must be downloaded and an accurate logging history incorporated into the model. The FullCAM estimates of carbon stock per unit area (tC/ha) for each stratum must be within 5% of the merchantable volume per unit area in stratum *i* in the baseline scenario (m^3/ha) as calculated from field sampling, i.e. parameter $V_{i|BSL}$ as calculated in Equation 3.

The model should be run twice: once to calculate growth rates in the baseline scenario and once to calculate growth rates in the project scenario. The models should be identical until the first planned logging event in the baseline scenario. The logging events in the baseline scenario should be derived from the timber harvest plan, using the mean volume of extracted timber per unit area in stratum *i* (m^3/ha), i.e. parameter $V_{EX,i|BSL}$ as calculated in Equation 4.

Step 9.1.5 Calculation of baseline scenario greenhouse gas emissions from change in carbon stocks

This step calculates $GHG_{NET\,|BSL}$, the total greenhouse gas emissions in the baseline scenario from each emissions source, in tCO2e. The net carbon stock change to be converted to emissions is equal to the carbon stock change as a result of timber harvest plus the carbon stock change resulting from conversion and retirement of wood products minus carbon sequestration from forest regrowth after harvest. Therefore, the net change in carbon stock is calculated as:

$$\Delta C_{NET\,|BSL} = \sum_{i=1}^{M}(\Delta C_{DW\,|BSL} + \Delta C_{WP,i\,|BSL} - \sum_{t=1}^{T}\Delta C_{RG,i\,|BSL}) \qquad (10)$$

Where:

$\Delta C_{NET\,|BSL}$	Net change in carbon stocks in the baseline scenario (tC);
$\Delta C_{DW,i\,|BSL}$	Change in carbon stock from dead wood resulting from timber harvest per unit area in stratum *i* (tC);
$\Delta C_{WP,i\,|BSL}$	Change in carbon stock resulting from wood product conversion and retirement from stratum *i* (tC);
$\Delta C_{RG,i,t\,|BSL}$	Carbon sequestration resulting from forest regrowth after timber harvest in stratum *i* in year *t* (tC);
t	1, 2, 3 … *T* years elapsed since the start of the native forest protection project;
i	1, 2, 3 … *M* strata.

In order to generate the average annual carbon stock change in the baseline scenario, the total net change in carbon stocks across all parcels harvested is divided by the crediting period of twenty years.

$$\Delta C_{NET,t\,|\mathrm{BSL}} = \frac{(\Delta C_{NET\,|\mathrm{BSL}})}{20} \qquad (11)$$

Where:

$\Delta C_{NET\,|\mathrm{BSL}}$ Net change in carbon stock in the baseline scenario per annum (tC/year);

$\Delta C_{NET\,|\mathrm{BSL}}$ Net change in carbon stock in the baseline scenario (tC).

The annual carbon stock change in the baseline scenario must be converted to net greenhouse gas emissions and is calculated as:

$$GHG_{NET\,|\mathrm{BSL}} = \Delta C_{NET\,|\mathrm{BSL}} * 44/12 \qquad (12)$$

Where:

$GHG_{NET\,|\mathrm{BSL}}$ Net greenhouse gas emissions in the baseline scenario per annum (tCO2e/year);

$\Delta C_{NET\,|\mathrm{BSL}}$ Net change in carbon stock in the baseline scenario per annum (tC/year);

44/12 Ratio of molecular weights of carbon dioxide and carbon (tCO2-e /tC).

9.2. Provide instructions to project proponents on how to calculate project emissions and removals.

Provide formulae and define parameters in each formula, including units.

Where parameters are to be derived through data collection, provide instructions on data collection methods in Section 10.

This step calculates $GHG_{NET\,|\mathrm{PRJ}}$, the net greenhouse gas emissions in the project scenario, in tCO_2e.

The type and extent of the activities implemented in the project scenario will be described as part of the documentation submitted with the project report. In accordance with the applicability conditions, the project scenario does not allow commercial timber harvest. As a result, carbon stock changes due to vegetation management and fuel removal will be negligible.

Step 9.2.1 Ongoing forest growth in the project scenario

This step calculates $\Delta GHG_{GR,t\,|\mathrm{PRJ}}$ i.e., the greenhouse gas reductions from sequestration through ongoing forest growth in year *t* (tCO2-e).

The FullCAM model developed in Step 3.4 will be used to calculate the ongoing forest growth rate in the project scenario, $GR_{t\,|\mathrm{PRJ}}$.

$$\Delta C_{GR,i\,|PRJ} = A_i * \sum_{t=1}^{T}(GR_{i,t\,|PRJ}) \quad (13)$$

Where:

$\Delta C_{GR,i\,|BSL}$ Change in carbon stock resulting from sequestration in stratum *i* (tC);
A_i The area of stratum *i* (ha);
$GR_{i,t\,|PRJ}$ Annual growth rate of forest post timber harvest for stratum *i* in year *t* (tC/ha/year);
t 1, 2, 3 … *T* years elapsed since the start of the native forest protection project;
i 1, 2, 3 … *M* strata.

The next equation converts the change in carbon stock per stratum to the greenhouse gas reductions across the project site.

$$\Delta GHG_{GR\,|PRJ} = \sum_{i=1}^{M}(\Delta C_{GR,i\,|PRJ}) * 44/12 \quad (14)$$

Where:

$\Delta GHG_{GR,t\,|PRJ}$ Change in greenhouse gas emissions resulting from sequestration through ongoing forest growth in the project scenario (tCO2-e);
$\Delta C_{GR,t\,|BSL}$ Change in carbon stock resulting from sequestration in stratum *i* (tC);
t 1, 2, 3 … *T* years elapsed since the start of the native forest protection project;
i 1, 2, 3 … *M* strata.

Step 9.2.2 Forest disturbance in the project scenario

It is a requirement that any greenhouse gas emissions from natural disturbance above *de minimis* that may occur in the project area are monitored.

Estimation of emissions from natural disturbance shall be calculated depending on the type of disturbance event. $\Delta C_{DIST\_FR,t}$, carbon stock change due to fire disturbance (tCO_2-e), is calculated following Step 9.2.2.1. $\Delta C_{DIST,t\,|PRJ}$, the carbon stock change due to non-fire natural disturbance (tCO_2-e), is calculated following Step 9.2.2.2.

It is assumed that any disturbance in the project scenario would also have occurred in the baseline. Project emissions are therefore equal to the damage to the biomass present in the project case, but absent in the baseline case (harvested and removed). The average aboveground biomass stock present in the project scenario but absent in the baseline scenario before burning for a particular stratum shall be calculated as:

$$B_{i,t\,|PRJ} = V_{EX,i\,|BSL} * BCEF \quad (15)$$

Where:

$B_{i,t\,|PRJ}$ Average aboveground biomass stock present in the project scenario, but absent

	in the baseline before burning for stratum *i*, time *t* (t.d.m/ha);
$V_{EX,i}$ |BSL	Mean volume of extracted timber per unit area in stratum *i* (m^3/ha);
BCEF	Biomass conversion and expansion factor applicable to wood removals in the project area (dimensionless);
t	1, 2, 3 … *T* years elapsed since the start of the native forest protection project;
i	1, 2, 3 … *M* strata.

Step 9.2.2.1

Where fires occur *ex post* in the project area, the area burned shall be delineated. Therefore, based on the IPCC 2006 Inventory Guidelines, estimation of greenhouse gas emissions from biomass burning shall be calculated as:

$$\Delta GHG_{DIST\_FR}\,|_{PRJ} = \sum_{i=1}^{M}(A_{burn,i} * B_{i,t}\,|_{PRJ} * COMF_i * G_{g,I} * 10^{-3}.GWP_{CH4} \qquad (16)$$

Where:

ΔGHG_{DIST_FR}	Net greenhouse gas emissions resulting from fire disturbance (tCO_2-e);
$A_{burn,i}$	Area burnt for stratum *i* at time *t* (ha), based on historical incidence of fire for the purposes of *ex ante* calculations;
$B_{i,t}$ |PRJ	Average aboveground biomass stock present in the project scenario, but absent in the baseline scenario before burning stratum *i* at time *t* (t.d.m/ha);
$COMF_i$	Combustion factor for stratum *i* (default values in Table 2.6 of IPCC 2006 Guidelines) (dimensionless);
$G_{g,I}$	Emission factor for stratum *i* for methane (default values in Volume 4, Chapter 2, Table 2.5 of the IPCC 2006 Guidelines) (g/kg dry matter burnt);
GWP_{CH4}	Global warming potential for CH_4 (IPCC default: 21) (tCO_2-e/tCH_4);
t	1, 2, 3 … T years elapsed since the start of the native forest protection project;
i	1, 2, 3 … *M* strata.

Step 9.2.2.2

For non-fire natural disturbance, it is assumed that a disturbance event in the project scenario would also have occurred in the baseline. Project emissions are therefore equal to the non-fire natural disturbance to biomass absent in the baseline case (harvested and removed) but present in the project case. It is conservatively assumed that the natural disturbance is a stand-replacing disturbance, and that the greenhouse gases emitted as a result of the natural disturbance ($\Delta GHG_{DIST,t}$) are emitted in the year of disturbance.

Where non-fire natural disturbances occur *ex post* in the project area, the area disturbed shall be delineated.

$$\Delta GHG_{DIST} = \sum_{i=1}^{M}(A_{dist,i,t} * B_{i,t}\,|_{PRJ} * CF) * 44/12 \qquad (17)$$

Where:

ΔGHG_{DIST} Net greenhouse gas emissions resulting from non-fire natural disturbance (tCO_2-e);
$A_{dist,i}$ Area disturbed for stratum *i* at time *t* (ha), based on historical incidence of disturbance for the purposes of *ex ante* calculations;
$B_{i,t\ |PRJ}$ Average aboveground biomass stock present in the project scenario, but absent in the baseline scenario before burning stratum *i* at time *t* (t.d.m/ha);
CF Carbon fraction of biomass (tC/t.d.m), either the IPCC default value of 0.5 or species/genus-specific values from the literature may be used;
44/12 Ratio of molecular weights of carbon dioxide and carbon (tCO_2-e/tC);
t 1, 2, 3 … *T* years elapsed since the start of the native forest protection project;
i 1, 2, 3 … *M* strata.

Step 9.2.3 Net greenhouse gas emissions in the project scenario

This step calculates $\Delta GHG_{NET\ |PRJ}$, the net greenhouse gas emissions in the project scenario per annum, in tCO_2-e. The annual greenhouse gas emissions in the project scenario is equivalent to the total greenhouse gases sequestered in the aboveground biomass of trees less greenhouse gas emissions resulting from forest disturbance during the project activity, divided by the crediting period of 20 years.

Therefore, annual net greenhouse gas emissions in the project scenario are calculated:

$$GHG_{NET\ |PRJ} = \frac{(\Delta GHG_{GR\ |PRJ} - \Delta GHG_{DIST\_FR} - \Delta GHG_{DIST})}{20} \qquad (18)$$

Where:

$GHG_{NET\ |PRJ}$ Average greenhouse gas emissions or reductions in the project scenario per annum (tCO2-e);
$\Delta GHG_{GR,\ |PRJ}$ Greenhouse gas emissions or reductions from ongoing forest growth of aboveground trees (tCO_2-e);
ΔGHG_{DIST_FR} Greenhouse gas emissions resulting from fire disturbance (tCO_2-e);
ΔGHG_{DIST} Greenhouse gas emissions resulting from non-fire natural disturbance (tCO_2-e);

$\Delta GHG_{NET\ |PRJ} \geq 0$ if sequestration from ongoing forest growth are greater than anticipated emissions from disturbance. $\Delta GHG_{NET,t\ |PRJ} < 0$ if anticipated emissions from disturbance are greater than sequestration from ongoing forest growth.

9.3 Provide instructions to project proponents on how to calculate net greenhouse gas abatement. This should be the difference between the baseline and project emissions and removals.

Step 9.3.1 Accounting for leakage

Calculations of net greenhouse gas abatement must account for leakage. There are two sources of leakage: leakage from activity shifting by the proponent, and leakage from market effects.

Step 9.3.1.1 Activity shifting leakage

There may be no leakage due to activity shifting.

Where the project proponent has control over only resource use in the project area and has no access to other forest resource, then the only type of leakage emissions calculated is GHG emissions due to market effects that result from project activity.

Where the project proponent controls multiple parcels of land within the country the project proponent must demonstrate that the management plans and/or land-use designations of other lands they control have not materially changed as a result of the planned project (designating new lands as timber concessions or increasing harvest rates in lands already managed for timber) because such changes could lead to reductions in carbon stocks or increases in GHG emissions.

This must be demonstrated through:

- historical records showing trends in harvest volumes paired with records from the with-project time period showing no deviation from historical trends; and
- forest management plans prepared $\geq$ 24 months prior to the start of the project showing harvest plans on all owned/managed lands.

In each offsets report, the proponent must provide documentation for forested area not included in the native forest protection project. These records must include their location(s), area and existing land use(s). Any deviation from the management plans submitted at the project start date must result in net emission reductions or greater removal enhancements.

Where activity shifting occurs, or a project proponent is unable to provide the necessary documentation in offset reports, the project shall not be eligible for crediting.

Step 9.3.1.2 Market leakage

To be determined by DCCEE. Assumed to produce parameter $GHG_{NET\,|LK}$, for inclusion in Equation 20.

Step 9.3.2

The greenhouse gas emissions calculated at Steps 9.1 and 9.2 for the baseline and project scenarios allows an estimation of the level of net GHG emission reductions resulting at the end of each year over the crediting period from the implementation of the proposed native forest protection project.

The annual GHG emission credits are calculated as:

$$GHG_{NET\,|NFPP} = GHG_{NET\,|BSL} + GHG_{NET\,|PRJ} - GHG_{NET\,|LK} \qquad (20)$$

Where:

$GHG_{NET \mid NFPP}$	Net greenhouse gas emissions associated with the implementation of a native forest protection project per annum (tCO_2-e/year);
$GHG_{NET \mid BSL}$	Greenhouse gas emissions in the baseline scenario since the start of the project activity per annum (tCO_2-e/year);
$GHG_{NET \mid PRJ}$	Greenhouse gas emissions in the project scenario since the start of the project activity per annum (tCO_2-e/year); and
$GHG_{NET \mid LK}$	Greenhouse gas emissions from leakage per annum (tCO_2-e/year);

9.4 For bio-sequestration projects provide instructions on the procedures to be used to account for variations that are likely to occur in the amount of carbon stored as a result of climatic cycles or harvesting over 100 years.

Native forest protection projects are not bio-sequestration projects.

Afforestation and reforestation (bio-sequestration) projects generate carbon credits through greenhouse gas removal enhancements, specifically the sequestration of carbon through forest growth. In this scenario, the role of the carbon market is to provide financial incentives for the creation of a carbon sink. An effective sink needs to stand for the period required for the average CO_2 molecule to be re-absorbed by natural sinks, i.e. 100 years.

Native forest protection projects generate carbon credits through emission avoidance, specifically preventing carbon emissions associated with logging practices. In this scenario, the role of the carbon market is to provide financial incentives that change business-as-usual practices to produce a more favourable carbon outcome. To do this effectively requires a long-term carbon price. Otherwise, emitters will return to high-emission, business-as-usual practices, since these offer lower costs or higher returns in the absence of a price on carbon. For this reason, it is necessary to maintain financial incentives for changing harvesting practices. In other words, the crediting period should be equal to the liability period for native forest protection projects. Landowners can then choose to implement a native forest protection project, if the return from the carbon market is competitive with the return from timber production.

Native forest protection projects can be likened to the energy sector. Imposing a carbon price for twenty years may encourage a shift away from coal-fired power plants towards natural gas or even – with luck – promote renewable energy alternatives. However, if the carbon price ends after twenty years, coal will again become an attractive energy option: old coal-fired power plants can re-open and/or new ones be established. The carbon market in this context does not impose long-term requirements, but uses a long-term carbon price to make low-carbon practices more financially attractive.

Similarly, offering carbon finance opportunities provides an incentive for proponents to stop the emissions generated from logging, and to shift towards low-carbon land management practices. However, there needs to be a long-term price on carbon to maintain and reward these practices. If there is no financial incentive for low-carbon practices, landowners will seek traditional income streams from historical carbon-intesnive practices, such as timber harvest or land use conversion.

Therefore, a liability period of 100 years and a crediting period of 20 years does not reflect the nature of a native forest protection project. 'Avoided emissions' projects such as native forest protection projects require long-term access to the carbon market to encourage a change in forest management practices, while ‘bio-sequestration’ projects such as A/R can entail a permanence requirement of 100 years.

Projects using this methodology therefore have a crediting period of 20 years. There is no liability for the permanence of carbon stocks beyond this point, i.e. NFPPs using this methodology are not subject to the 100 year permanence requirement. If the proponent is seeking to maintain a native forest protection project, the baseline scenario must be re-assessed and revised. Re-evaluation of the baseline scenario at the end of each crediting period will ensure that CFI credits generated through NFPPs are still additional, i.e. that planned timber harvest remains realistic, legal and credible. If logging of native forests is no longer legal or viable for the project area, then the proponent’s land will no longer be eligible as a native forest protection project under the Carbon Farming Initiative. This addresses concerns about additionality while ensuring that landowners are rewarded for implementing low-carbon practices that otherwise do not yield a competitive revenue stream.

9.5 Provide instructions to project proponents on how to calculate net abatement number or net sequestration number for reporting purposes, *if different from the estimate of net greenhouse gas abatement (Section 9.3)*. For bio-sequestration projects, this calculation should take into account any adjustments to the abatement estimate to address variability, and any abatement already reported and credited.
See Section 9.3.

9.6 Indicate whether the estimation methods and emissions factors are from the NGER (Measurement) Determination or Australia’s National Greenhouse Accounts. If not, explain why new or different estimation methods are proposed. Note that the methods set out in the NGER (Measurement) Determination must be used to estimate emissions covered by NGERS.
The NGER (Measurement) Determination does not provide estimation methods for native forest protection projects. This methodology adopts the NGER (Measurement) Determination’s recommended parameter of a 95% confidence interval for the calculation of uncertainty.

9.7 Provide a detailed description of any formulas used and detailed explanations of the parameters included in each formula, along with a description of how each parameter is derived (noting that detailed instructions to proponents on data collection methods for deriving parameters are to be provided in Section 10). Where applicable, provide a citation for the source of equations and/or parameters.
See Section 9.1, 9.2 and 9.3.

Section 10: Data Collection

Provide instructions to project proponents on data collection methods for deriving the parameters used to calculate *baseline emissions and removals* (Section 9.1) and *project emissions and removals* (Section 9.2). Instructions may be provided in the table below.

10.1 Stratification

Within the boundaries of the proponent's property, the stratification process should identify and map all forested areas to be included in the native forest protection project. Any forested areas that are not threatened by logging should be excluded: protected vegetation communities, high conservation value areas, streamside reserves, roadside buffers, etc.

The forested area included in the project must then be stratified for biomass sampling. This stratification can be based on vegetation type, structural features and/or vegetation condition (e.g. subject to fire or logging history). Fieldwork data analysis can be used to consolidate the original strata.

Fieldwork plots should be randomly allocated within strata. The number of sample plots per stratum will be determined from application of the most recent version of the Tool for the "Calculation of the Number of Sample Plots for Measurements within A/R CDM Project Activities", using the Winrock sampling calculator. This tool was developed by Winrock International and is available at http://www.winrock.org/ecosystems/tools.asp. *Ex ante*, sampling error is arguably the main source of uncertainty in native forest protection projects in Australia. To ensure a statistically adequate sample size, the parameter *e* (level of error) should be set to a maximum of 15% in the Winrock sampling calculator, with the parameter *Z(1-a)* (confidence level) set to 95%.

10.2 Collecting field data

For each stratum, mean volume of merchantable biomass is estimated from forest inventory data. Forest inventory data should include the diameter at breast height (*DBH*, 1.3 m above ground level) of all merchantable trees within sample plots. If tree height is required to calibrate the allometric or yield table, the height of at least ten trees must be obtained for each merchantable species in the project area.

Field data must be collected and managed using commonly accepted principles of forest inventory development and management. Standard operating procedures (SOPs) and quality control/quality assurance (QA/QC) procedures should be applied. Various sources exist to assist with the design of a verifiable field inventory based on best practice for sampling, data management and analysis: for example, the IPCC's Good Practice Guidance for Land Use, Land Use Change and Forestry, FAO's National Forest Inventory Field Manual or Winrock International's The Sourcebook for Land Use Change and Forestry Projects.

The forest inventory plan must be specified in the project report and include:

a) the forest stratification process;
b) sample size estimation methods;
c) means to estimate uncertainty; and
d) a sampling framework including sample size, plot size, plot shape and information to determine plot location.

It is acceptable to use pre-existing forest inventory data for this purpose, provided that the pre-existing data:

a) represents the project strata;
b) is not more than 10 years old;
c) where forest inventory data is more than 10 years old, that the volume estimate derived from the pre-existing data has been validated with limited sampling within the project area; and
d) is validated by field surveys. If the validated estimate of volume is within the 95% confidence interval (with 15% variance) of the corresponding estimate or is less than the estimate calculated from pre-existing forest inventory data, the pre-existing forest inventory data may be used. If the validation estimate is greater than the corresponding estimate calculated from pre-existing forest inventory data, the estimate from pre-existing data cannot be used.

Parameter	**Description**	**Unit**	**Measurement procedure**	**Measurement frequency**
Ai	Area covered by stratum *i*	Hectares	Remote sensing data	End of each reporting period
$A_{burn,i,t}$	Area burnt in stratum *i* at time *t*	Hectares	GPS coordinates and/or remote sensing data	End of each reporting period
$A_{dist,i,t}$	Area disturbed in stratum *i* at time *t*	Hectares	GPS coordinates and/or remote sensing data	End of each reporting period
DBH	Diameter at breast height	Centimetres	Field measurements in sample plots	End of each reporting period

10.3 Preparing a forest inventory

Yield tables or allometric equations shall be used to convert field measurements of DBH in the sample plots to merchantable volume, $V_{l,j,i,sp}$. It is acceptable to combine *DBH* and allometric equations if field instruments (e.g. a relascope) that measure the volume of each tree directly have been used. If locally derived equations or yield tables for each species are not available it is acceptable to use relevant regional, national or default data.

It is necessary to verify the applicability of equations used. Allometric equations should be verified by both:

1. Verification of equation conditions. Justification should be provided for the applicability of the equation to the project locations. Such justification should include identification of climatic, edaphic, geographical and taxonomic similarities between the project location and the location in which the equation was derived. Any equation should have an r^2 value greater than 0.5 (50% and a p value that is significant (<0.05 at the 95% confidence level).

2. Additional field verification.
   The following limited measures method must be used for field verification.
   - Select at least 10 trees per species distributed across the age range (but excluding those less than 15 years old, for which there is rarely a great

relative inaccuracy in equations);
- Measure DBH and height to 10cm diameter top
- Calculate stem volume from measurements; and
- Plot the estimated volume of all the measured trees along with the curve of volume against diameter as predicted by the allometric equation.

The equation may not be used if >75% of the measured trees have a volume lower than the predicted curve: in this case, another equation must be selected.

Section 11: Monitoring and Reporting

11.1 Outline the elements of the project that will be monitored and describe how monitoring will be undertaken, including:
- frequency of monitoring;
- the Australian Standards, or other relevant standards, that project proponents will need to comply with to calibrate and maintain measurement equipment; and
- any qualifications that operators will need to operate measurement equipment.

The information provided in this section should not duplicate the information provided in Section 10.

Step 11.1.1 Identification of monitoring parameters

The following parameters, described in Step 10, must be monitored in this methodology:
- Area covered by stratum *i* (*Ai*)
- Diameter at breast height of tree (*DBH*)
- Area burnt in stratum *i* at time *t* (*Aburn,i,t*)
- Area affected by natural disturbance in stratum *i* at time *t* ($A_{dist,I,t}$)

These parameters are used in Equation 15 and 16, and must be addressed in the offsets report issued at each reporting event (i.e. at a minimum interval of one year and a maximum interval of five years).

In some project cases monitoring may also be implemented to update stratification. It is a requirement that the monitoring plan presented in the project report shall address the monitoring of project implementation, the monitoring of actual carbon stock changes from project activity, and estimation of *ex post* net carbon stock changes from disturbance.

The description of the monitoring plan in the project report will include the following for each of these monitoring tasks:

a) technical description of the monitoring task;
b) a list of data and parameters to be collected;
c) overview of data collection procedures;
d) quality control and quality assurance procedure;
e) data archiving; and
e) organisation and responsibilities of the parties involved in all the above.

Step 11.1.2 Stratification

This methodology requires that an *ex ante* stratification of the project area in the project scenario is described in the project report. The stratification in the project scenario may be the same as that in the baseline scenario, if the latter is based on carbon density and vegetation type rather than projected timber harvests.

The monitoring plan may include sampling to adjust the number and boundaries of the strata defined *ex ante* where an update is required because of unexpected disturbances occurring during the crediting period affecting differently various parts of an originally homogeneous stratum. Established strata may also be merged if the reasons for their establishment have disappeared.

Step 11.1.3 Monitoring of carbon stock changes

At each reporting event, carbon stock changes over time shall be assessed through repeat sampling of permanent field plots. The resulting forest inventory should be extensive enough to permit an estimate of average biomass accumulation (m^3/ha). The new data will be used to estimate carbon stock changes according to the equations specified in Section 9.2 of this methodology. An offsets report shall be prepared for each reporting period, at a minimum interval of 1 year and maximum interval of five years

11.2 Specify the data and other information about the project that must be included in project reports and project records, including:

- data required to estimate emissions and removals resulting from the project;
- data required to identify and justify baseline scenarios and to support baseline estimation and resetting; and
- information about project implementation or changes in environmental conditions that are required to determine whether the project remains within the scope of the methodology.

11.2.1 Data required to identify, justify and estimate baseline scenarios

The identification of realistic and credible land use scenarios may use land-use records, field surveys, data and feedback from stakeholders and information from other sources as appropriate.

For the preparation of a Historical Baseline Scenario, the following documents for the proponent or property should be referenced:

1. Historical records of forest management for a minimum of 10 or more years preceding the project start date.
2. Historical records indicating that the management practices have surpassed the legal barriers created by local and regional forest legislation.
3. Historical records indicating that the historical management surpasses financial barriers by providing above average financial returns.

For the preparation of a Common Practice Baseline Scenario, the following documents should be referenced:

1. Written forest management recommendations or plans from a qualified forestry agent or expert; or
2. Justification of the choice of a reference area (or multiple reference areas) according to forest type, legal requirements and financial returns; and
3. The historical records and/or management plan for the reference area(s).

11.2.2 Data required to estimate emissions and removals resulting from the project

- Merchantable volume for tree *l* of species *j* in stratum *I* in sample plot *sp* (m^3);
- Area of sample plot *sp* (ha);
- Mean volume of extracted timber per unit area in stratum *i* (m^3/ha);
- Biomass conversion and expansion factor applicable to wood removals in the project area (dimensionless);
- Carbon fraction of biomass (tC/t.d.m), either the IPCC default value of 0.5 or species/genus-specific values from the literature may be used;
- A weighted average of the wood density of all merchantable species present shall be used;
- Area of stratum *i* (ha);
- Growth rate of forest post-timber harvest for stratum *i* in year *t* (tC/ha/year);
- Annual growth rate of forest post timber harvest for stratum *i* in year *t* (tC/ha/year);
- Area burnt for stratum *i* at time *t* (ha), based on historical incidence of fire for the purposes of *ex ante* calculations; and
- Area disturbed for stratum *i* at time *t* (ha), based on historical incidence of disturbance for the purposes of *ex ante* calculations.

11.2.3 Project reports

The project report must include:

- The project title;
- The unique identification and delineation of the project area;
- The project proponent's roles and responsibilities, including contact information and proof of title;
- A brief description of the project area (including project size, geographic location, forest type and land use history);
- Demonstration of the threat to the forest and additionality;
- Description of how the baseline scenario is identified and description of the identified baseline scenario;
- Summary of the forest inventory including the area and mean biomass (m^3/ha) for each stratum;
- The specific methods, technologies and data utilised for stratification, preparation of a forest inventory and quantification of emission reductions or removal enhancements;
- Justification for all parameters identified in Section 11.2.2 and not determined through field sampling;
- Description of the monitoring plan addressing the parameters identified in Section 11.1.1;
- Estimated emission reductions and carbon credits generated over the crediting

period; and
- A project schedule identifying reporting periods over the crediting period of 20 years.

11.2.4 Offset reports

The offset reports must:
- Identify the reporting period;
- Report any changes in the forested area;
- Compare projected and actual carbon stock changes in the project scenario;
- Demonstrate the absence of natural disturbance, or estimate the carbon stock changes resulting from natural disturbance; and
- Emission reductions and removal enhancements achieved through the implementation of the native forest protection project.

11.2.5 Project records

Data archiving shall take both electronic and paper forms, and copies of all data shall be provided to each project participant. All electronic data and reports shall also be copied on durable media such as CDs, copies of which are to be stored in multiple locations. All data must be kept for at least seven years after the offsets report was submitted to the Administrator.

The archives shall include:
- ownership documents;
- copies of all original field measurement data;
- strata maps identifying sample plots;
- data analysis spreadsheets;
- estimates of the carbon stock changes in all pools and non-CO2 GHG and corresponding calculation spreadsheets;
- GIS products;
- FullCAM products;
- the project report and accompanying calculations;
- the CFI Monitoring Plan; and
- copies of the offset reports and all supplementary monitoring data.

Section 12: References

Provide a full citation for all reports cited in the draft methodology.

Branthomme, A; Saket, M; Altrell, D; Viorinen, P; Dalsgaard, S; Andersson, LGB (2004) National Forest Inventory: Field Manual Template (Working Paper 94E), FAO Forestry Department, Rome. Available from <ftp://ftp.fao.org/docrep/fao/008/ae578e/ae578e00.pdf> [accessed 08/11/2010]

CDM (2010) Calculation of the number of sample plots for measurements within A/R CDM project activities, version 01. Available from <http://cdm.unfccc.int/methodologies/ARmethodologies/tools/ar-am-tool-03-v1.pdf> [accessed 01/06/2011]

GreenCollar Climate Solutions (2011) VM0010 Methodology for Improved Forest Management: Conversion from Logged to Protected Forest, v1.0, Verified Carbon Standard. Available at < http://www.v-c-s.org/sites/v-c-s.org/files/VM0010%20Methodology%20for%20IFM%20LtPF%20v1.0%2C%2018MAR2011.pdf> [accessed 01/06/2011]

Penman, J; Gytarsky, M; Hiraishi, T; Krug, T; Kruger, D; Pipatti, R; Buendia, L; Miwa, K; Ngara, T; Tanabe, K; Wagner, F (eds) (2003) Good Practice Guidance for Land Use, Land Use Change and Forestry, Intergovernmental Panel on Climate Change. Available from < http://www.ipcc-nggip.iges.or.jp/public/gpglulucf/gpglulucf.html>

Pearson, T; Wilson, S; Brown, S (2005) The Sourcebook for Land Use Change and Forestry Projects, Winrock International. Available from < http://www.winrock.org/ecosystems/files/winrock-biocarbon_fund_sourcebook-compressed.pdf > [accessed 20/07/2011]

Richards, GP (2001) The FullCAM Carbon Accounting Model: Development, Calibration and Implementation, Australian Greenhouse Office, Canberra. Presented at the IEA Bioenergy Task 38: Workshop, 'Carbon Accounting and Emissions Trading Related to Bioenergy, Wood Products and Carbon Sequestration'. Available at <http://www.ieabioenergy-task38.org/workshops/canberra01/cansession1.pdf> [accessed 19/07/2011]

Verified Carbon Standard (2011) VCS Program Guide: VCS Version 3.0. Available at < http://v-c-s.org/sites/v-c-s.org/files/VCS%20Program%20Guide,%20v3.0_2.pdf> [accessed 01/06/2011]

Voluntary Carbon Standard (2008) Tool for AFOLU Methodological Issues. Available at < http://www.v-c-s.org/sites/v-c-s.org/files/Tool%20for%20AFOLU%20Methodological%20Issues.pdf> [accessed 01/06/2011]

Voluntary Carbon Standard (2010) VT0001 Tool for the Demonstration and Assessment of Additionality in VCS Agriculture, Forestry and Other Land Use (AFOLU) Project Activities. Available at <http://www.v-c-s.org/sites/v-c-s.org/files/VCS%20Tool%20VT0001-%20Tool%20for%20Demonstration%20and%20Assessment%20of%20Additionality%20in%20AFOLU%20Project%20Acitivities.pdf> [accessed 01/06/2011]

Winjum, J.K., S. Brown, S. and B. Schlamadinger (1998) Forest harvests and wood products: sources and sinks of atmospheric carbon dioxide, *Forest Science* **44** 272-284

Section 13: Appendices

Append and list below all relevant documentation necessary for the DOIC to assess the methodology including cited reports.
Branthomme, A; Saket, M; Altrell, D; Viorinen, P; Dalsgaard, S; Andersson, LGB (2004) National Forest Inventory: Field Manual Template (Working Paper 94E), FAO Forestry Department, Rome. Available from

<ftp://ftp.fao.org/docrep/fao/008/ae578e/ae578e00.pdf> [accessed 08/11/2010]

CDM (2010) Calculation of the number of sample plots for measurements within A/R CDM project activities, version 01. Available from <http://cdm.unfccc.int/methodologies/ARmethodologies/tools/ar-am-tool-03-v1.pdf> [accessed 01/06/2011]

GreenCollar Climate Solutions (2011) VM0010 Methodology for Improved Forest Management: Conversion from Logged to Protected Forest, v1.0, Verified Carbon Standard. Available at < http://www.v-c-s.org/sites/v-c-s.org/files/VM0010%20Methodology%20for%20IFM%20LtPF%20v1.0%2C%2018MAR2011.pdf> [accessed 01/06/2011]

Penman, J; Gytarsky, M; Hiraishi, T; Krug, T; Kruger, D; Pipatti, R; Buendia, L; Miwa, K; Ngara, T; Tanabe, K; Wagner, F (eds) (2003) Good Practice Guidance for Land Use, Land Use Change and Forestry, Intergovernmental Panel on Climate Change. Available from < http://www.ipcc-nggip.iges.or.jp/public/gpglulucf/gpglulucf.html>

Pearson, T; Wilson, S; Brown, S (2005) The Sourcebook for Land Use Change and Forestry Projects, Winrock International. Available from < http://www.winrock.org/ecosystems/files/winrock-biocarbon_fund_sourcebook-compressed.pdf > [accessed 20/07/2011]

Redd Forests (2011) Protection of a Tasmanian Native Forest (Project 1 – Redd Forests' Pilot), Verified Carbon Standard. Available from <https://vcsprojectdatabase1.apx.com/myModule/Interactive.asp?Tab=Projects&p=605&lat=%2D41%2E823394&lon=146%2E971044> [accessed 21/07/2011]

Redd Forests (2011) Protection of a Tasmanian Native Forest (Project 3 – Peter Downie), Verified Carbon Standard. Available from <https://vcsprojectdatabase1.apx.com/myModule/Interactive.asp?Tab=Projects&p=587&lat=%2D42%2E49114&lon=147%2E09407> [accessed 21/07/2011]

Redd Forests (2011) Protection of a Tasmanian Native Forest (Project 4 – Grouped Project), Verified Carbon Standard. Available from <link> [accessed date]

Richards, GP (2001) The FullCAM Carbon Accounting Model: Development, Calibration and Implementation, Australian Greenhouse Office, Canberra. Presented at the IEA Bioenergy Task 38: Workshop, 'Carbon Accounting and Emissions Trading Related to Bioenergy, Wood Products and Carbon Sequestration'. Available at <http://www.ieabioenergy-task38.org/workshops/canberra01/cansession1.pdf> [accessed 19/07/2011]

Verified Carbon Standard (2011) VCS Program Guide: VCS Version 3.0. Available at < http://v-c-s.org/sites/v-c-s.org/files/VCS%20Program%20Guide,%20v3.0_2.pdf> [accessed 01/06/2011]

Voluntary Carbon Standard (2008) Tool for AFOLU Methodological Issues. Available at < http://www.v-c-s.org/sites/v-c-s.org/files/Tool%20for%20AFOLU%20Methodological%20Issues.pdf> [accessed 01/06/2011]

Voluntary Carbon Standard (2010) VT0001 Tool for the Demonstration and Assessment of Additionality in VCS Agriculture, Forestry and Other Land Use (AFOLU) Project Activities. Available at <http://www.v-c-s.org/sites/v-c-s.org/files/VCS%20Tool%20VT0001-%20Tool%20for%20Demonstration%20and%20Assessment%20of%20Additionality%20in%20AFOLU

%20Project%20Acitivities.pdf> [accessed 01/06/2011]

Winjum, J.K., S. Brown, S. and B. Schlamadinger (1998) Forest harvests and wood products: sources and sinks of atmospheric carbon dioxide, *Forest Science* **44** 272-284

Section 14: Disclosure

Specify documents or parts of documents included as supporting information to the application that are marked CONFIDENTIAL and should not be published and the reasons why. Acceptable justification would include that the information should not be published if it reveals, or could be capable of revealing: • trade secrets; or • any other matter having a commercial value that would be, or could reasonably be expected to be, destroyed or diminished if the information were disclosed.
NA

Section 15: Declaration

This application must be signed by a duly authorised representative of the proponent. The person signing should read the following declaration and sign below.

Division 137 of the Criminal Code makes it an offence for a person to give information to a Commonwealth entity if the person providing the information knows that the information is false or misleading. The maximum penalty for such an offence is imprisonment up to 12 months.

By signing below, the signatory acknowledges that he or she is an authorised representative of the proponent, and that all of the information contained in this application is true and correct. The signatory also acknowledges that any of the information provided in this application may be copied, recorded, used or disclosed by the Department of Climate Change and Energy Efficiency for any purpose relevant to the CFI. Information will not be publicly disclosed by the Department where it has been identified as confidential by the proponent.

Full name of the person signing as a representative of the proponent:	s47F	Date:	01 August 2011
Position:	Project Manager, Redd Forests		
Signature:			

Full name of the person signing as a representative of the proponent:	s47F	Date:	01 August 2011
Position:	Associate, GreenCollar Climate Solutions		
Signature:			

s47F

From: DCCEE - DOIC
Sent: Thursday, 25 August 2011 6:57 PM
To: s47F _reddforests.com'
Subject: Redd Forests Methodology [SEC=UNCLASSIFIED]

Security Classification: UNCLASSIFIED

Dear s47F

In the preliminary screening of the draft CFI methodology for Native Forest Protection Projects the DOIC secretariat have identified a number of minor issues that we request be addressed prior to the methodology being forwarded to the Domestic Offsets Integrity Committee (DOIC).

- The third dot point in section 5.3 is missing information, currently marked with XXXX and <website>, could you please fill in this information (p.8).
- Section 9.1.1, in equations 1, 2, 5, 10, 11, 13, 14, 16 and 17 the variables provided in the explanatory section do not match the variables listed in the equation. For example, in equation 1 the first value $V_{j, i, sp}$ is listed below the equation as $V_{I, j, sp}$.
- Section 9.4, fourth line from the bottom of page 25, intensive is misspelt (p.25).
- Section 11.1 references a chart in step 10, but it changes $A_{dist, i, t}$ (p.28) to $A_{dist, I, t}$ (p.29).
- Section 13, the reference for Redd Forests (2011) Protection of a Tasmanian Native Forest (Project 4 – Grouped Project), Verified Carbon Standard, is not complete (p.36).

Could you also please ensure that section 15, the declaration has been completed, including the signatures of both of the listed proponents.

In addition to these changes we would appreciate if you could please forward us copy of all references cited in section 12 of the draft methodology. I have noticed that url links are provided for all of the references however a number of the links are not functional.

Regards,

s47F

Carbon Farming Operations Branch | Land Division
Department of Climate Change and Energy Efficiency
GPO Box 854, Canberra ACT 2601
s47F
s47F @climatechange.gov.au

Australian Government

MINISTERS

Minister for Climate Change and Energy Efficiency

THE HON GREG COMBET AM MP
MINISTER FOR CLIMATE CHANGE AND ENERGY EFFICIENCY

Domestic Offsets Integrity Committee open for business

Media release
27 October 2010

An expert panel to assess proposed methods for developing and selling carbon credits has been announced by the Federal Government, delivering the first step under the Carbon Farming Initiative (CFI).

"The Domestic Offsets Integrity Committee will assess the specific methods for measuring carbon credits," the Minister for Climate Change and Energy Efficiency, Greg Combet, said.

"As we indicated during the election campaign, this will enable farmers, foresters and landholders to receive offset credits for actions that reduce or store carbon pollution. These credits can then be sold, providing opportunities for them to generate income as Australia moves towards a low-pollution future.

"The National Carbon Offsets Standard, introduced 1 July 2010, has established the rules for companies to become carbon neutral or to sell carbon neutral products. The Carbon Farming Initiative (CFI) will set out what farmers, foresters and landholders need to do to generate carbon credits and it will establish an independent regulator to verify carbon credit claims."

Reforestation, capturing emissions from existing landfill ('legacy waste'), and better management of livestock manure are some of the ways to generate carbon credits, he explained.

"Once the credits are verified, they can be traded on Australia's voluntary carbon market and on overseas markets, generating revenue while reducing carbon pollution," Mr Combet said.

"Offset credits can be purchased by individuals and corporations to compensate for their own carbon pollution. Buyers of offset credits will include businesses that choose to go carbon neutral, and companies that sell carbon neutral products.

"This is another example of Government action to tackle climate change and create new business opportunities in the low-pollution economy of the future.

"I am pleased to announce the appointment of six experts who will form an independent panel, the Domestic Offsets Integrity Committee. They have the important responsibility of assessing the detailed methods which will provide a new income stream for farmers, foresters and landholders, and help the environment by reducing carbon pollution.

"After consultations with interested groups and a period for public submissions, the committee will provide independent advice to me on methodologies that can be approved in advance of the CFI legislation which we plan to bring before the Parliament in the first half of 2011. The committee I am announcing today is an interim body that will be replaced with a statutory committee when the legislation has passed.

"The sooner we get these rigorous measures in place, the sooner investment opportunities and measures to abate carbon pollution will be available."

Mr Combet said the diverse range of skills and backgrounds represented on the Committee would ensure the methods recommended for approval were rigorous and would lead to verifiable abatement of carbon pollution.

The members of the Committee are;

- Mr Duncan McGregor (Chair);
- Mr Rob Fowler;
- Dr J. Mark Dangerfield;
- Professor Annette Cowie;
- Dr Brian Keating; and,
- Ms Shayleen Thompson.

Further information will be available at www.climatechange.gov.au

Media contact: Tim Fitzsimmons 02 6277 7920 or 0447 202 469

Biographies – Domestic Offsets Integrity Committee members:

Mr Duncan McGregor:
Partner and specialist climate change, environment and development lawyer at Minter Ellison in Sydney. He is highly regarded within his professional field and considered an expert in the field of climate change law. He provides ongoing legal advice to a wide variety of corporations on climate change and carbon issues, as well as acting for entities such as the Australian Indigenous Chamber of Commerce on Indigenous carbon trading related to biosequestration and renewable energy.

Mr Rob Fowler:
Well-known offsets expert with extensive experience which is directly relevant to the functions of the DOIC. As a former administrator of the NSW Greenhouse Gas Abatement Scheme, he has an understanding of the practicalities of implementing a major offsets program. He has been a methodology expert within the UNFCCC since 2004 and has reviewed a wide variety of crediting methodologies and projects. He also has relevant experience through his work with the Gold Standard (one of the major international offset standards).

Dr J. Mark Dangerfield:
Ecologist, environmental scientist and author. He is a member of the NSW Natural Resource Advisory Council and one of three global experts accredited to assess agriculture and land management projects generating carbon credits under the Voluntary Carbon Standard.

Professor Annette Cowie:
Well-known scientist with high profile in Australia and internationally, who has published widely in academic and trade journals on biochar, soil emissions, forest carbon sequestration, and carbon in wood products. She also has practical experience with offsets programs, including the forest offset component of GGAS.

Dr Brian Keating:
(CSIRO nominee) Director of the CSIRO Sustainable Agriculture Flagship. Dr Keating is an expert in the areas of agronomy, crop physiology, farming systems, science management and simulation modelling. His work has addressed a diverse set of issues including farming system design, soil and water management and climate risk management. He also holds several professional positions, including the role of Director of the International Consortium for Agricultural Systems Application.

Ms Shayleen Thompson:
(Department of Climate Change and Energy Efficiency representative) Head of the Land Division in the Department of Climate Change and Energy Efficiency. She has worked on international and domestic climate change policy and programs since 1995. The Land Division was established in July 2010 to provide a coherent and coordinated approach to climate change mitigation and carbon accounting in the land sector in both international and domestic spheres.

Australian Government
Department of Climate Change and Energy Efficiency

Interim Guidelines for Submitting Methodologies

Legislation to establish the Carbon Farming Initiative was introduced to the Parliament on 24 March 2011. Methodology Proponents should refer to the latest version of the legislation for further information on the scheme. An explanatory memorandum, which explains each of the provisions in the legislation, is also available.

These interim guidelines are to be used to submit draft methodologies to the Interim Domestic Offsets Integrity Committee (DOIC) prior to the passage of the Carbon Farming Initiative (CFI) legislation. They will be updated following the passage of the CFI legislation.

Contents

Disclaimer

The material in this document is made available for general information only and on the understanding that the Commonwealth is not providing advice, nor indicating a commitment to a preferred policy position. Before relying on any material contained in this document, entities should familiarise themselves with the CFI and obtain professional advice suitable to their particular circumstances. While reasonable efforts have been made to ensure the accuracy, correctness and reliability of the material contained in this document, the Commonwealth does not accept responsibility for the accuracy or completeness of the contents or any inferences, and expressly disclaims liability for any loss, however caused and whether due to negligence or otherwise, arising directly or indirectly from the use of, inferences drawn, deductions made, or acts done in reliance on this document or the information contained in it, by any person.

Privacy

As a Commonwealth agency, the Department of Climate Change and Energy Efficiency is bound by the Privacy Act 1988 (Cth). Any personal information that you submit as part of an application for assessment of a draft methodology will be collected and securely stored by the Department. Any personal information collected about you will only be used in relation to your application. Your personal information may be used by the Department for consultation purposes or to contact you in the future.

For more information about the Department's privacy practices, see the full privacy notice on the Department's website. If you have any questions about privacy issues please contact:

Privacy Contact Officer
Department of Climate Change and Energy Efficiency
GPO Box 854
Canberra ACT 2601
Phone: + 61 2 6159 7000
Website: www.climatechange.gov.au

Intellectual Property

Any entity that submits an application for assessment of a draft methodology as part of the CFI warrants that they own or have a licence to use all of the relevant intellectual property rights in the application submitted.

Purpose of these interim guidelines

These interim guidelines provide information for methodology proponents on how to prepare a draft methodology for assessment by the Interim DOIC for use under the CFI prior to the passage of the CFI legislation. They include information about the different aspects of a CFI methodology and a template for submitting proposed methodologies and supporting evidence to the Interim DOIC for assessment.

The interim guidelines are organised into four distinct parts covering:

- Part 1 – overview of the CFI and the methodology assessment process;
- Part 2 – explanation of how to develop a draft methodology;
- Part 3 – the standards for evidence submitted in support of a draft methodology; and
- A template (PDF 433 KB) (RTF 893 KB) for presenting methodologies and supporting evidence to the DOIC (provided in a separate document).

These interim guidelines have been prepared to enable early assessment of CFI methodologies and fast-track the development of offset projects on scheme commencement. They will allow stakeholders to begin resolving technical issues pending passage of the CFI legislation. They will be reviewed and updated to ensure consistency with scheme requirements following passage of the CFI legislation. At the time of publication, the Government is currently finalising the CFI legislation in light of consultation and these guidelines are not intended to pre-empt that process.

Part 1: The Carbon Farming Initiative (CFI)

The CFI will be a legislative scheme that provides for credits to be issued in return for the abatemen of greenhouse gases (i.e. reduced or avoided emissions and removals) through activities in the land sector.

The CFI will provide farmers, forest growers and landholders with opportunities to generate carbon credits for sale in domestic and international markets. To be eligible to receive CFI credits, abatement projects would need to meet scheme eligibility criteria and apply a methodology approve for use under the CFI.

More informationis available on the Carbon Farming Initiative web pages.

Eligible activities

The Government has proposed that the CFI would credit land sector abatement, whether or not it is recognised towards Australia's Kyoto Protocol target. Credits representing non-Kyoto abatement would be distinguished from credits that are issued for Kyoto-recognised abatement.

Eligible abatement activities may include:

- Reductions in emissions from agricultural production, including from:
  - Livestock digestion;
  - Fertiliser application or use;
  - Manure management in intensive livestock farming;
  - Burning of stubble and agricultural crop residues; and
  - Rice cultivation;
- Reforestation and avoided deforestation, in line with relevant definitions in Australia's National Greenhouse Accounts for Kyoto Protocol compliance purposes;
- Savanna fire management;
- Reductions in emissions from 'legacy waste' deposited in landfill facilities; and
- Land sector abatement activities that are not recognised towards Australia's obligations under the Kyoto Protocol, including:
  - Revegetation;
  - Improved forest management;
  - Management of agricultural soils ('soil carbon'); and
  - Feral animal management.

More information is available on what is included in Australia's National Greenhouse Accounts.

CFI legislation

The CFI legislation would set out common requirements for abatement projects, including eligibility criteria, crediting periods, and requirements for reporting, auditing and verifying abatement. The legislation would also include provisions for streamlining assessment of additionality, where appropriate, and ensuring credits issued for sequestration projects represent permanent abatement.

CFI methodologies will be legislative instruments and do not need to include provisions or rules for matters that are addressed in the enabling Act. They will contain activity-specific rules, providing detailed instructions to project proponents on how to implement, monitor and report on offset projects.

All CFI projects must be undertaken in accordance with an approved methodology. In deciding whether a project is an eligible offsets project under the CFI, the scheme Administrator will assess whether the project conforms to the requirements set out in an approved methodology.

An exposure draft of the CFI legislation is available online.

This draft was made available for consultation only and to help stakeholders prepare their submissions on the proposed CFI design. The legislation is to be finalised taking stakeholder feedback into account following the public submission period and prior to introduction to Parliamen in early 2011. All methodologies will need to be consistent with the final requirements of the legislation passed by Parliament and the Department will work with stakeholders to ensure that any risks of inconsistencies are managed appropriately.

CFI methodologies

CFI methodologies must relate to eligible abatement activities and will need to contain:

- a description of the abatement activities;
- a description of the greenhouse gases and emissions sources and sinks affected by a project;
- procedures for determining a baseline which represents emissions and removals that would occur in the absence of the project;
- procedures, including models, for estimating or measuring abatement relative to the baseline;
- project-specific data collection and monitoring requirements; and
- any additional reporting and record keeping requirements which are specific to the project anc not included in the CFI legislation.

Applications for assessment of draft methodologies will need to include supporting evidence to enable the DOIC to assess whether the proposed methodology is consistent with the offsets integrity standards outlined below and other requirements specified in these guidelines.

Application of methodologies

Abatement projects will be approved for a defined crediting period during which the application of the project methodology is assured.

If the project methodology is amended or revoked during the crediting period, the new or amended methodology will apply from commencement of the subsequent crediting period. Project proponents could apply to use an amended methodology during the current crediting period, but would not be required to do so.

Crediting periods would be specified in the CFI legislation and may vary for different activities.

Methodologies will be periodically reviewed by the Department of Climate Change and Energy Efficiency. Any amendments would need to be assessed by the DOIC and approved by the Minister for Climate Change and Energy Efficiency.

Domestic Offsets Integrity Committee (DOIC)

All methodologies must be assessed by an independent expert panel known as the Domestic Offsets Integrity Committee (DOIC).

The Minister for Climate Change and Energy Efficiency established an Interim DOIC to enable project developers to bring methodologies forward for assessment prior to passage of the CFI legislation. The interim committee was established on 27 October 2010. The Interim DOIC will assess whether draft methodologies and supporting evidence meet the requirements of the CFI, including the offsets integrity standards listed below. Adherence to these standards will ensure that CFI methodologies and projects are rigorous and lead to real and verifiable abatement.

More information is available on the Domestic Offsets Integrity Committee.

Offsets integrity standards

The environmental integrity of the scheme will directly affect consumer confidence and the amount that buyers are willing to pay for CFI credits. For this reason, it is important that abatement credited under the CFI meets internationally recognised offsets integrity standards designed to ensure that abatement is real and verifiable. These integrity standards include:

- **Additional** – a project must result in abatement that would not have occurred in the absence o the project's expected returns from the sale of CFI credits. There would be no reduction in emissions as a result of the CFI if the project activity is already in widespread use by landholders.
- **Permanent** – permanence is an important characteristic of abatement projects involving the removal of carbon from the atmosphere and its long-term storage in plants, soil or other carbo sinks. There would be no real abatement if carbon were to be stored and subsequently releasec to the atmosphere. For practical purposes, biological carbon stores are generally considered permanent if they are maintained (on a net basis) for at least 100 years.
- **Accounting for all emissions sources and sinks** – all emissions sources and sinks directly or indirectly affected by the project must be identified and accounted for. This is also referred to as avoidance of leakage. There would be no real abatement if a project's emissions reductions or removals were nullified or replaced by a consequential increase in emissions elsewhere.
- **Accounting for variability** – many bio-sequestration activities are subject to a high degree of variability as a result of natural climatic or production cycles. Abatement estimates will need to be adjusted to account for variations that are likely to occur in carbon stores over a 100 yea period.
- **Measurable and verifiable** – abatement must be credibly measured or estimated to ensure each offset credit represents one tonne of carbon dioxide equivalent (CO2-e) of emissions reduction or removal. Data collection, estimation and modelling approaches must be consister over time and enable abatement estimates to be verified. Conservative assumptions, numerical values and procedures must be used to ensure that abatement and other claims are not over-estimated. Projects must be audited by an independent, qualified third party.
- **Internationally consistent** – estimation methods must be not inconsistent with (but need not necessarily be the same as) the methods applied in compiling Australia's National Greenhouse Accounts (as detailed in the National Inventory Report), where relevant, and internationally

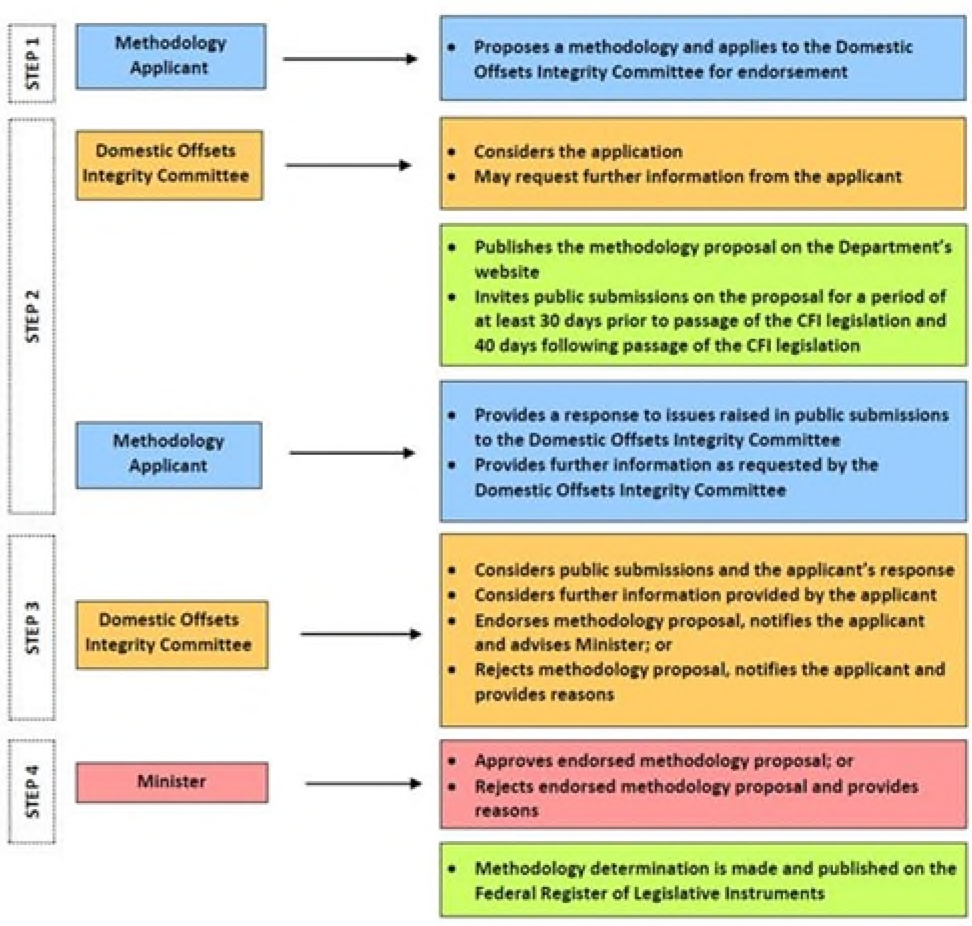
agreed methodologies and reporting practices adopted by the United Nations Framework Convention on Climate Change (UNFCCC).
- **Supported by peer-reviewed science** – where emissions estimation methods are not the same as those used for Australia's National Greenhouse Accounts, scientific evidence used to support the estimation methods must be peer-reviewed.

The DOIC will apply the standards consistently with their articulation in the legislation which is passed by Parliament.

Methodology assessment process

The key steps and roles and responsibilities in the methodology assessment process are outlined in Figure 1.

Figure 1: Methodology assessment process



Text description of Figure 1

Further information

The DOIC will undertake an initial review of the application for assessment of a draft methodology and may request further information from a methodology proponent if the methodology is incomplete, introduces untested scientific claims or is not supported by evidence.

The DOIC may separately commission, through the Department of Climate Change and Energy Efficiency, additional expert assessment of proposed methods or supporting evidence.

Public consultation

The DOIC will publish draft methodologies and supporting evidence on the Department of Climate Change and Energy Efficiency website and invite public comments for a minimum period of 30 days prior to the passage of the CFI legislation and for a minimum period of 40 days following the passage of the CFI legislation.

A proponent could request that information used as supporting evidence, for example proprietary model code and parameter sets or data, remain confidential. However, if the DOIC deemed that the protection of confidential information would prevent the public from making a proper assessment of the draft methodology, the DOIC could choose not to progress the methodology application.

Public feedback on draft methodologies will be provided to the methodology proponent and published on the Department of Climate Change and Energy Efficiency website.

Methodology proponents must submit a written response to the DOIC addressing any concerns raised in public comments.

The DOIC will consider both the public comments and the methodology proponent's responses in making its recommendations to the Minister for Climate Change and Energy Efficiency. The DOIC will provide the methodology proponent with reasons if they decide not to recommend a methodology for approval by the Minister.

Methodology approval and publication

The Minister may accept the DOIC's recommendation and approve a methodology.

Prior to the passage of the CFI legislation, approved methodologies will be published on the Department of Climate Change and Energy Efficiency website.

Supporting information submitted to the DOIC as part of an application for assessment of a draft methodology will not be included or published as part of the approved methodology. However, methodologies could not be approved if subject to confidentiality requirements which would prevent or unduly restrict public dissemination or use.

Following passage of the CFI legislation, approved methodologies will be made into methodology determinations (legislative instruments) under the CFI legislation and published on the Federal Register of Legislative Instruments. This will promote scheme integrity and facilitate broad participation in the scheme.

Applications for assessment of methodologies after commencement of CFI legislation

After the commencement of the CFI legislation, applications for the assessment of methodologies will need to comply with any requirements in the Act, regulations or approved forms of the DOIC. The DOIC and Department of Climate Change and Energy Efficiency will take into account experience with these guidelines in formalising the legal requirements for methodology applications Transitional arrangements will ensure that there is no need to re-submit methodology applications which are already being processed or have already been approved.

Part 2: Preparing a draft methodology

Applications for assessment of draft methodologies will consist of:

1. details of a draft methodology, including detailed instructions to project proponents on how to implement an abatement project for the eligible activity; and
2. supporting evidence to enable the DOIC to assess the draft methodology against the offsets integrity standards and other requirements specified in these guidelines.

This section of the guidelines explains the steps involved in preparing a draft methodology and the information that must be included in the application template (provided in a separate document).

All methodologies intended for use under the CFI must be assessed by the DOIC.

Step 1: Determine whether a new methodology is necessary

Each CFI methodology must apply to a distinct type of abatement activity. Before developing and submitting a draft methodology for assessment by the DOIC, methodology proponents should determine whether there is an approved CFI methodology for the proposed activity.

Where a new methodology proposal is similar to an approved CFI methodology, the proponent would need to explain to the DOIC how the new methodology proposal is different.

Approved CFI methodologies will be published on the Carbon Farming Initiative web pages.

Methodologies may have already been approved for similar abatement activities under an offset scheme in another country or Australian jurisdiction. Methodology proponents should consider whether these could be consolidated or adapted to Australian conditions.

Where a draft methodology is an adaptation of an existing methodology from another offset scheme, the proponent should include references to the existing methodology in the supporting evidence to their application for assessment by the DOIC.

Methodology proponents are encouraged to contact the Department of Climate Change and Energy Efficiency to determine whether methodologies similar to their proposal are under development in Australia by private methodology proponents or governments. The Department will promote collaboration between methodology proponents where possible.

The Department of Climate Change and Energy Efficiency is considering approaches to the development of CFI methodologies that apply to multiple related abatement activities. Methodology proponents interested in developing a multiple activity methodology are encouraged to contact the Department.

More information on what the Department is doing to support methodology development is available. Enquiries regarding methodology development can be directed to the Department by email at: CFI@climatechange.gov.au.

Step 2: Define the scope of the methodology

The scope of the methodology refers to the activities, technologies or management practices to be implemented by abatement projects and the circumstances or conditions under which they may be applied. The scope of the methodology may be defined with reference to related activities, technologies or management practices.

Methodologies must be capable of being applied by any potential project proponent implementing the abatement activities in the specified circumstances. This will minimise the need for individual project proponents to develop unique methodologies within a single activity category.

Methodology proponents will need to describe the abatement activities, including how they will reduce or avoid emissions or remove and sequester greenhouse gases from the atmosphere.

Methodology proponents will also need to specify and justify any climatic or other environmental conditions, such as land or soil types, under which activities must be undertaken. For example, a methodology for savanna fire management may be applicable to specific types of savanna grass lands only. If the activities can be undertaken in different circumstances or conditions, the methodology proponent should specify whether the activities need to be implemented differently in different conditions. For example, if an activity can be undertaken at an existing or a new facility, th draft methodology should specify any differences in the implementation of the abatement activity.

Under the Australian Constitution, Commonwealth legislation cannot discriminate between states. To enable approved methodologies to be converted into legislative instruments under the CFI legislation, methodologies must not be restricted to a particular state or any part of a state. Any specific geographic or climatic conditions specified in the scope of the methodology, such as savanna regions, rainfall bands or landscape attributes, should be described without referring to state jurisdictional or regional boundaries.

Step 3: Define process for identifying a project baseline

Project abatement is estimated relative to a baseline that represents the emissions or greenhouse gas removals that would have occurred in the absence of the project.

Methodology proponents will need to specify the process for identifying the baseline most likely to occur in the absence of the project. Selecting the right baseline is critical to ensuring that the estimated abatement is real and genuine.

There are various methods for developing baselines including:

- **Historical baselines** – it will sometimes be reasonable to assume that in the absence of a project, emissions and removals will be the same in the future as they have been in the past. Ir these cases it would be reasonable to derive baselines from historical emissions data. For example, this would normally be the case for reforestation or revegetation.
- **Projected baselines** – baselines can be set using projected or modelled estimates of future emissions under various scenarios.
- **Comparison baselines** – baselines can also be derived by monitoring and comparing emissions from the abatement project to that of a comparison or control project. Methodology proponents proposing to use comparison baselines will need to provide evidence that the land

area or farm used to provide a comparison is operating in genuinely comparable circumstances and environmental conditions.

In supporting evidence, the methodology proponent will need to justify and provide evidence to support the proposed approach to identifying and selecting the project baseline, including all assumptions.

In some cases, different methods for developing baselines will be justifiable depending on the particular circumstances of a project. Some draft methodologies may need to present several approaches to identifying the project baseline and provide clear guidance on how project proponents should go about selecting the one that best suits their particular circumstances.

Standardised baselines

Over time, it may be possible to incorporate standardised baselines that are representative of particular industry practices under particular circumstances or conditions into methodologies. The development of standardised baselines will reduce the costs of project proponents associated with determining individual project baselines.

Standardised baselines would be assessed by the DOIC. Emissions reductions below these baselines would be the project abatement.

Methodology applicants interested in exploring the potential for standardised baselines for a particular activity are encouraged to contact the Department of Climate Change and Energy Efficiency.

Step 4: Define greenhouse gas assessment boundary

Greenhouse gas assessment boundary

Draft methodologies must identify the activity's greenhouse gas assessment boundary.

The greenhouse gas assessment boundary is not a physical or geographic boundary, but rather is the boundary for assessing the greenhouse gas effects of the project.

The draft methodology should identify all emissions sources and sinks directly or indirectly affected by the activity. This would include emissions from, for example, electricity consumption and fuel use.

All identified emissions sources and sinks should be included in the greenhouse gas assessment boundary, unless there are reasonable grounds for exclusion. For example, very small emissions sources may be excluded on the basis of immateriality where the cost of ongoing monitoring is unreasonable. Emissions sources may also be excluded if they are outside of the project proponent's control and cannot reasonably be estimated or measured by the project proponent (see 'leakage' below). Draft methodologies must justify the exclusion of any emissions sources or sinks from the greenhouse gas assessment boundary.

Emissions sources and sinks that would result in net emissions reductions or removals but are ineligible for crediting must be excluded from the greenhouse gas assessment boundary. An example would be a reduction in emissions from the displacement of coal-fired electricity because additional electricity has been generated from landfill gas. For further information on what is proposed to be eligible for crediting, refer to the list provided in Part 1.

Detailed process descriptions (such as flowcharts) may be provided to illustrate typical greenhouse gas assessment boundaries. Methodology proponents may also submit a draft project plan as an example.

Leakage

Increases in emissions caused by the activity that are outside of the control of the project proponent and cannot reasonably be estimated or measured by the project proponent represent potential sources of leakage.

For example, leakage could occur if a producer reduces production as a result of an abatement project. Other producers catering to the same market might then increase production to meet economic demand, increasing emissions outside the project. Abatement projects involving avoided deforestation or reductions in livestock production may be susceptible to this form of leakage.

The Department of Climate Change and Energy Efficiency will consult with stakeholders on options to address leakage and will provide further guidance in coming months. The approach proposed in the guidance may result in a reduction in abatement estimates to take account of leakage risks.

Step 5: Define procedures for determining Project Area (where applicable)

The Project Area is an area of land on which the project has been, is being, or is to be carried out. The CFI regulations will outline procedures for determining the Project Area, including standards fo surveying and the use of spatial systems. This information does not need to be repeated in the methodology. Methodology proponents who would like further guidance on these standards are encouraged to contact the Department of Climate Change and Energy Efficiency.

Where the estimation of greenhouse gas emissions and removals is *based on a unit of land area* (for example bio-sequestration projects), draft methodologies will need to specify any rules that project proponents should follow to delineate and disaggregate the Project Area (for instance, stratification rules to distinguish between areas planted with different tree species). Draft methodologies should also indicate requirements for identifying features (for example, landforms) within the Project Area.

Step 6: Define procedures for estimating abatement

Draft methodologies must provide clear instructions to project proponents on how to estimate baseline emissions and removals and project emissions and removals. The abatement from the project is the difference between the baseline and project emissions and removals. Abatement should be estimated in tonnes of carbon dioxide equivalent.

Estimates of baseline and project emissions and removals must include all emissions sources and sinks identified in the greenhouse gas assessment boundary (see Step 4).

The draft methodology should include all formulas or algorithms that the project proponent will need to use to calculate emissions and removals, including a description of all parameters.

Where baseline conditions fluctuate over time, baseline calculations may need to incorporate adjustments, for example adjustments based on climatic data. Where applicable, the draft methodology should incorporate such adjustments in the procedures for calculating the project baseline and provide instructions to project proponents on how the baseline is to be adjusted.

Baseline and project emissions and removals can be estimated using direct measurement or modelling. The measurement and/or modelling approaches used to calculate baseline emissions and removals must be consistent with the procedures used to calculate project emissions and removals.

Methodology proponents will need to describe in full the estimation and modelling approaches used to estimate emissions and removals. This includes:

- the generic form of models and validation statistics, demonstrating their quality of fit against local data;
- parameters enabling models to represent cause and effect relationships in specific environments (such as species, soils and markets), clearly defining the locations and conditions under which it is appropriate to use a model;
- input data defining each scenario for which a model is run to generate outputs, including management actions (such as ploughing, fertilising and harvesting); and
- the software via which the model can be applied, documenting versions and relevant updates.

The draft methodology will need to explain what project proponents need to do to establish the parameter sets that allow the model to be tailored to the particular circumstances outlined in the methodology scope. For example, project proponents may need to collect project-level data sets for soil, species and/or climatic conditions and fit model parameters to these data using statistical methods (see Step 7).

Where site selection is part of the methodology, statistically valid sampling techniques need to be included and justified in supporting evidence.

Methods for calculating baseline and project emissions and removals may need to be reviewed and changed over time and the methodology updated accordingly. This may be necessary, for example, i more accurate scientific evidence becomes available to estimate baseline and project emissions and removals. If a methodology is amended or revoked during the crediting period, the new or amended methodology will apply from commencement of the subsequent crediting period. Project proponents could apply to use an amended methodology during the current crediting period, but would not be required to do so.

Accounting protocols

In many cases, protocols for estimating greenhouse gas emissions have already been established under the National Greenhouse and Energy Reporting System (NGERS) and Australia's National Greenhouse Accounts.

Draft methodologies must:

- use methods set out in the NGER (Measurement) Determination to calculate emissions covered by NGERS;
- include consistent data collection procedures; and
- use global warming potentials adopted in NGERS.

If methods are not included in the NGER (Measurement) Determination, the draft methodology should use estimation approaches, measurement standards and emissions factors previously adopted in Australia's National Greenhouse Accounts, where these are available and suitable to project-level emissions estimates. If methods are unavailable or those previously adopted under Australia's National Greenhouse Accounts are unsuitable, proponents may propose new or alternative methods. These will need to be supported by credible scientific evidence (see Part 3).

The NGER (Measurement) Determination is available online.

Variability and averaging

Many bio-sequestration activities are subject to a high degree of variability as a result of natural climatic or production cycles. Some abatement, such as soil carbon, will be subject to short-term cycles following human-induced and natural disturbance, while others may be subject to longer term variability (such as harvest cycles in forestry).

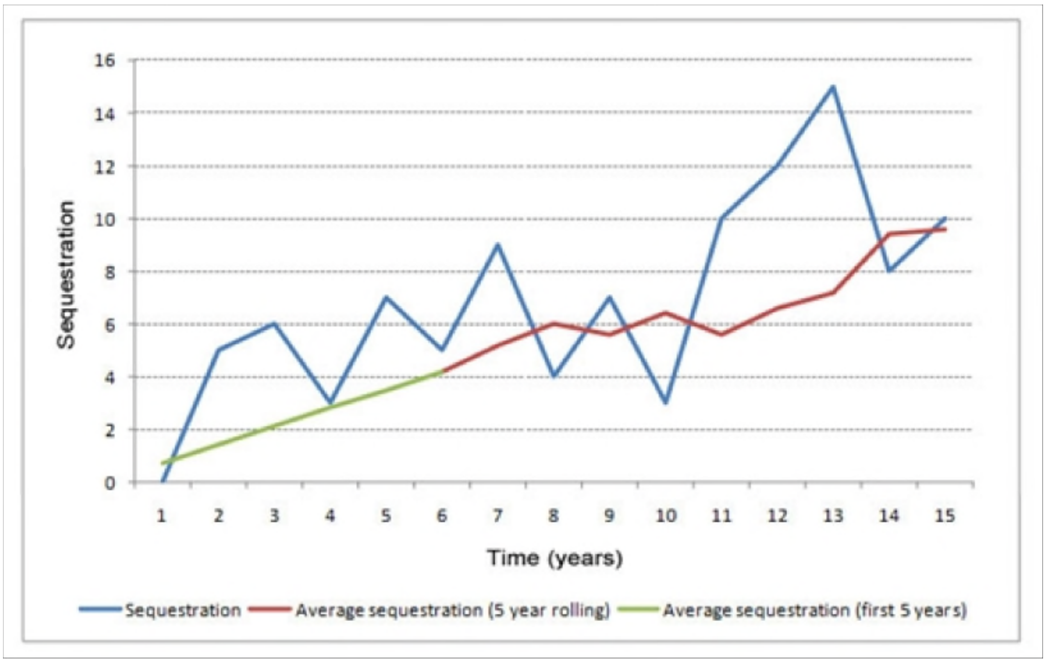
For bio-sequestration activities, the draft methodology needs to specify the procedures that project proponents should use to adjust the abatement estimates to account for variations that are likely to occur in the amount of carbon stored over 100 years. There are a range of potential methods for doing this, including addressing variability within the models used to estimate project emissions and removals.

Where there is a positive overall trend in carbon stocks as a result of management actions it may be feasible to use an 'averaging' approach to estimate abatement over a relative time period. The method of averaging, including the time periods for averaging, will need to be included in the methodology. This will help reduce the likelihood that project proponents would need to surrender large numbers of credits when carbon stores are lost and provide more credible, conservative abatement estimates.

Variability can be accounted for using rolling or projected averages. Projected averages can be updated over time as estimates are obtained.

In Figure 2, a rolling average is used to estimate abatement for a bio-sequestration project subject to significant inter-annual variability. Abatement could initially be projected using a model or similar estimate approach (indicated by the green line). This can be updated as proponents report actual levels of sequestration achieved (blue line). Over time, sufficient data could be collected to enable the projected average to be replaced with a rolling average, which would be calculated using estimates of past abatement (red line). The period over which a rolling average is calculated can be set to reflect the expected variation associated with the activity.

Figure 2: Estimating changes in carbon storage for variability at annual or inter-annual timescale



Text description of Figure 2

A similar approach can be used to estimate longer term abatement for forests that are periodically harvested.

Net abatement number or net sequestration number

The draft methodology should specify the procedure for calculating the net abatement number or net sequestration number for reporting purposes.

For emissions reduction projects, the net abatement number for reporting purposes will be the abatement estimate calculated as the difference between the baseline and project emissions and removals.

For bio-sequestration projects, the procedure for calculating net sequestration number should take into account any adjustments to the abatement estimate to address variability (for example, averaging) and any abatement already reported and credited.

Step 7: Outline processes for data collection, monitoring and reporting

The CFI legislation will include common reporting, record keeping and audit requirements. Guidance for project proponents on reporting, record keeping and auditing for projects will be provided separately.

Methodologies need to include project-specific requirements for data collection, monitoring and reporting. For example, methodologies will need to include rules for monitoring and reporting on:

- the conditions under which abatement activities must be undertaken in order for projects to conform to the methodology;
- emissions and removals resulting from the project; and
- the data required to identify and justify baseline scenarios and to support baseline estimation and resetting.

All measurement systems have errors and are subject to uncertainty. Monitoring and reporting systems must achieve confidence levels and manage uncertainty. Where available, methodologies should use the standards and procedures laid out in the NGERS determinations.

In many cases, standards for measurement and estimation systems will already exist, either under NGERS or across a range of Australian and international standards. The monitoring and reporting section of a draft methodology must specify which Australian Standards, or other relevant standards need to be complied with, including frequency of calibration and maintenance requirements for measuring equipment and qualifications for equipment operators.

Part 3: Supporting evidence

Methodology proponents must provide supporting evidence to enable the DOIC to assess the validity of the proposed methodologies.

Evidence provided to support draft methodologies must be:

- **Complete** – all claims (including methods for quantifying greenhouse gas emissions and removals) must be supported by evidence.
- **Transparent** – claims must be transparently documented and reproducible, such that they are capable of being independently audited.
- **Relevant** – all information, claims and decisions must be directly relevant to proving that the integrity standards and other legislative requirements have been met.
- **Consistent** – all information, claims and decisions made must be consistent across all aspects of methodology development.
- **Credible** – bias and uncertainties must be reduced as far as is practical. Approaches to data collection must be rigorous and applied appropriately, while estimation and modelling approaches must be consistent and reliable.

It is in a methodology proponent's interest to provide as much information as necessary for the DOIC to assess the application. Note that the assessment process will take longer if the DOIC needs to obtain further evidence.

International consistency and peer-reviewed science

Estimation methods must be underpinned by credible scientific evidence that is subject to international expert review or scientific peer-review processes. Peer-review is the practice of independent review and critique by scientific peers used to test scientific evidence prior to publication in scientific journals.

The estimation methods that the Australian Government uses to develop the National Greenhouse Accounts are subject to international expert review under the United Nations Framework Convention on Climate Change. Like scientific peer-review, this tests the scientific rigor and ensures the credibility of estimation methods.

For this reason, further evidence of scientific peer-review will not be required for estimation methodologies that are used for the NGERS and Australia's National Greenhouse Accounts.

The Department of Climate Change and Energy Efficiency is continually developing and improving the methodologies used to formulate the national accounts. Methodology proponents are encouraged to seek advice from the Department on incorporation of new estimation methodologies in the national accounts.

The DOIC will review estimation methods that are not the same as those applied in compiling Australia's National Greenhouse Accounts, and assess whether sufficient evidence has been provided to support draft methodologies. In doing so, the DOIC may seek further advice from technical or scientific experts or request further information or evidence from the methodology proponent.

Methodology proponents must reference the published scientific literature (or scientific evidence and academic review processes) on which elements of the draft methodology are based.

Methodology proponents must provide expert evidence to support the application of peer-reviewed estimation methods in different circumstances (for example to different species, regions, soil types or climates) to those for which the methods were originally peer-reviewed.

Where draft methodologies are proposed to apply more broadly than for a specific region (and are not the same as Australia's National Greenhouse Accounts) the methodology proponent must indicate how the estimation approach takes account of variation between different regions, and provide supporting evidence.

Glossary

Abatement	The reduction or avoidance of greenhouse gas emissions or the enhancement of greenhouse gas removal from the atmosphere by sinks (sequestration) through the planned activity.
Abatement activities	Activities conducted for purpose of achieving abatement.
Abatement project	A project which applies an approved offset methodology and implements abatement activities to obtain carbon credits.
Accounting protocols	Protocols for estimating greenhouse gas emissions, such as those established under the National Greenhouse and Energy Reporting System and Australia's National Greenhouse Accounts. These include estimation approaches, measurement standards and emissions factors.
Additionality	A requirement that a project or activity provide net abatement beyond that which would occur in the absence of the project.
Baseline emissions	The emissions or removals likely to have occurred in the absence of the project.
Bio-sequestration	Removal of carbon dioxide from the atmosphere by storing carbon in living biomass, dead organic matter or soil.
Carbon credit	A property right enabling an amount of abatement, usually equivalent to one tonne carbon dioxide equivalent (CO2-e), to be traded in carbon markets.
Carbon pool	

	A reservoir which has the capacity to accumulate or release carbon, including living trees, other vegetation, debris, soil, the ocean and the atmosphere.
Crediting period	The period a project can generate carbon credits without revising a methodology.
Domestic Offsets Integrity Committee (DOIC)	An independent expert committee that will assess domestic offset methodologies and provide recommendations to the Minister for Climate Change and Energy Efficiency on their approval.
Emissions source	A human-induced process that emits greenhouse gases into the atmosphere
Global warming potential	An index measuring the radiative forcing of a unit mass of a greenhouse gas in the present-day style="border-bottom: 1px solid #333;" atmosphere integrated over a chosen time horizon, relative to that of carbon dioxide.
Greenhouse gas assessment boundary	All of the greenhouse gas emissions sources and sinks directly or indirectly affected by an abatement activity.
Greenhouse gases	The atmospheric gases responsible for causing global warming and climate change. The six classes of greenhouse gases included under the Kyoto Protocol are carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydro-fluorocarbons (HFCs), per-fluorocarbons (PFCs) and sulphur hexafluoride (SF_6).
Kyoto Protocol	An international agreement created under the United Nations Framework Convention on Climate Change (UNFCCC) to reduce the collective greenhouse gas emissions of developed countries.
Legacy waste	Waste deposited in landfill facilities prior to a date to be determined by the Minister for Climate Change and Energy Efficiency.
Leakage	Emissions sources that are outside of the control of the project proponent and not captured as part of the greenhouse gas assessment boundary.
Methodology	A set of instructions for how to conduct, measure and report on a specific abatement activity under certain circumstances or conditions.
Methodology proponent	An entity that develops and submits a draft methodology to the DOIC for assessment.
Methodology scope	The activities, technologies or management practices to be implemented by abatement projects applying the methodology and the circumstances or conditions under which they are to be implemented.
National Greenhouse Accounts	Comprehensive reports on Australia's greenhouse gas emissions prepared by the Department of Climate Change and Energy Efficiency. They assist the Government in developing climate change policy and setting emissions targets, meeting Australia's reporting commitments under the UNFCCC and tracking progress against Australia's target under the Kyoto Protocol.

National Greenhouse and Energy Reporting System (NGERS)	The national reporting framework for information related to the greenhouse gas emissions, and energy production and use of corporations operating in Australia. The framework is established under Commonwealth legislation, and makes registration and reporting mandatory for corporations whose greenhouse gas emissions or energy production or use meet certain thresholds.
Offsets integrity standards	Internationally recognised standards designed to ensure that abatement is real and verifiable.
Permanence	An assurance that carbon stored through abatement activities is not later reversed. Carbon stores are generally considered to be permanent if not reversed within a period of 100-years.
Project proponent	An entity that develops and applies to register an abatement project.
Sequestration	See Bio-sequestration.
Sink	A human-induced biological process that absorbs and stores greenhouse gases from the atmosphere.
Standardised baseline	A generic baseline defining industry practice in certain circumstances or conditions.
United Nations Framework Convention on Climate Change (UNFCCC)	An international treaty, adopted in 1992, aimed at achieving the stabilisation of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system.

Download

- Interim Methodology Guidelines (PDF 605 KB)
- Interim Template for Submitting Methodologies (PDF 432 KB)
- Interim Template for Submitting Methodologies (RTF 892 KB)

Australian Government
Department of Climate Change and Energy Efficiency

Offset methodologies

Offset projects established under the Carbon Farming Initiative will need to use methodologies approved by the Government. These contain the detailed rules for implementing and monitoring specific abatement activities and generating carbon credits under the scheme.

Methodologies may be developed by private proponents and industry associations as well as government agencies.

An independent expert committee, the Domestic Offsets Integrity Committee, has been established to assess offset methodologies and advise the Minister for Climate Change and Energy Efficiency on their approval. The Committee will ensure that methodologies are rigorous and lead to real abatement.

As part of its assessment, the Domestic Offsets Integrity Committee will publish proposed methodologies on this website for public comment. Any comments submitted will be considered by the Committee in making its recommendations to the Minister.

Approved methodologies will also be made available on this website for use by project proponents.

Offset methodologies and intellectual property rights

Methodologies that are approved by the Minister may be the subject of intellectual property rights held by third parties. Approval of a methodology is no authorisation whatsoever by the Commonwealth that a person may exploit or otherwise use any third party intellectual property necessary to use the methodology, or to carry out all aspects of the project as proposed. Appropriate permission to use any such intellectual property, and any other rights that are required to carry out the project, will need to be negotiated with the holders of the rights. The Australian Government cannot guarantee that such permission will be given.

If the Department is alerted by the methodology proponent to any specific intellectual property right that may apply to a particular methodology (eg, a patent, or patent application), it will endeavour to provide information to interested parties about those rights. Project proponents should contact the methodology proponent to determine what permissions may be required in order to avoid infringing those rights. Third party holders of intellectual property rights may charge project proponents for permission to use those rights.

Methodology development

The Department of Climate Change and Energy Efficiency and the Department of Agriculture, Fisheries and Forestry are working with industry to develop offset methodologies that have broad application.

This work is being progressed through a number of methodology work streams, including:

- Reforestation, forest management and native forest protection;
- Savanna fire management;
- Landfill gas recovery;
- Manure management;
- Management of methane from livestock; and
- Soil carbon and biochar.

Technical working groups comprising representatives of expert and practitioner groups have been established by the departments to review current scientific knowledge, determine any requirements for additional research and finalise methodologies under each work stream. These methodologies are expected to be rolled out progressively.

For further information on the working groups contact CFI@climatechange.gov.au or 02 6159 7237

Submitting a methodology for assessment

The Domestic Offsets Integrity Committee is accepting methodologies for assessment.

Applications for assessment of proposed Carbon Farming Initiative methodologies must be prepared in accordance with the Interim Guidelines for Submitting Methodologies using the template provided.

Applications should be submitted to the Domestic Offsets Integrity Committee Secretariat at the Department of Climate Change and Energy Efficiency at DOIC@climatechange.gov.au.

Further information

- Email Carbon Farming Initiative
- Phone: 02 6159 7294

DRAFT METHODOLOGY

AVOIDED DEFORESTATION METHODOLOGY

PREPARED BY
RESOURCECO CARBON,
BALANCE CARBON AND
CORPORATE CARBON ADVISORY

VERSION 3.0, JUNE 2012

BALANCE CARBON
PO BOX 3436 RUNDLE MALL ADELAIDE SA 5000
T: +61 8 8212 8355 F: +61 8 8370 0032
E: info@balancecarbon.com.au
W: www.balancecarbon.com.au

RESOURCECO CARBON
PO BOX 542 ENFIELD PLAZA SA 5085
T: +61 8 8347 3329 F: +61 8 8347 3556
E: info@resourceco.com.au
W: www.resourceco.com.au

CORPORATE CARBON ADVISORY PTY LTD
PO Box 705, Glebe NSW 2037
T: +61 2 9571 4511 F: +61 2 9571 4522
E: info@corporatecarbon.com.au
W: www.corporatecarbon.com.au

Intellectual Property

Any entity that submits an application for assessment of a draft methodology as part of the CFI warrants that they own or have a licence to use all of the relevant intellectual property rights in the application submitted.

Methodology applications should be submitted to:
DOIC Secretariat
Department of Climate Change and Energy Efficiency
GPO Box 854
CANBERRA ACT 2601

Or DOIC@climatechange.gov.au

Table of contents

Table of figures:

Section 1: Applicant details

Name:	s47F
Company:	ResourceCo Carbon
Position:	s47F
Telephone:	
Email:	s47F @resourceco.com.au
Address:	Corner Wingfield and Hines Roads, Wingfield, SA, 5013
Postal address (if different to above):	PO Box 542, Enfield Plaza, SA, 5085

Section 2: Expert consultation

Have you consulted technical experts in the development of this methodology? If yes, please provide names and affiliations.

Name	*Affiliation*	*Does this expert endorse all or part of the draft methodology?*
s47F	Corporate Carbon Advisory	Yes
	Balance Carbon Pty Ltd	Yes
	Balance Carbon Pty Ltd	Yes

Section 3: Existing methodologies

3.1 Has a similar methodology already been approved for use under the CFI? If yes, outline how the new methodology proposal is different.

No – there are no approved methodologies for native forest protection under the CFI at the time of this submission.

3.2 Is the draft methodology an adaptation of an existing methodology that has been approved under an international offsets scheme or an offsets scheme in another Australian jurisdiction? If yes, provide a reference for the existing methodology and describe any major differences between the draft methodology and the existing methodology.

This methodology has been prepared giving consideration to relevant elements from the following draft methodologies:

- Draft Methodology for Native Forest Protection Projects (GreenCollar, Redd - Version 2.0)
  - Focus on avoided deforestation.
- Measurement Based Methodology for Farm Forestry Projects (Future Farm Industries CRC Ltd, John McGrath, Draft version 1.4).
  - Also uses FullCAM as a basis for measurement.

ISO14064-2:2006

Greenhouse gases -- Part 2: Specification with guidance at the project level for quantification, monitoring and reporting of greenhouse gas emission reductions or removal enhancements

Section 4: Methodology glossary

Provide a glossary of terms that are specific to the draft methodology.

AGO	Australian Greenhouse Office (Replaced by the Department of Climate Change and Energy Efficiency)
Biomass	Any organic materials located within the biosphere, for example, trees, plants and other crops
Carbon Pool	The quantity of carbon that is stored within the above ground, below ground and debris store at a given point in time (or averaged over time) and is expressed in units of mass
Carbon Stock Change	The difference in the quantum of carbon stored within a certain pool over a period of time and is expressed in units of mass
$C_{baseline}$	The carbon stored in the landscape if the project is not implemented. This includes all forms of carbon including above ground woody biomass, litter and debris and below ground carbon
CFI Regulations	Carbon Credits (Carbon Farming Initiative) Regulations 2011
$C_{harvest}$	The carbon harvested into long-lived products. This value will generally be set to zero as there is no provision with Kyoto for the recognition of harvest products

$C_{project}$	The carbon stored in the landscape with the project implemented. This includes all forms of carbon including above ground woody biomass, litter and debris and below ground carbon
DCCEE	Department of Climate Change and Energy Efficiency (formerly the Australian Greenhouse Office)
FullCAM	The Full Carbon Accounting Model that was developed by the Australian Government and is used to model the carbon stock and carbon stock changes in Australian forests and soil systems.
Forest	A forest consists of trees that: – have attained, or have the potential to attain, a crown cover of at least 20% of the area occupied by the stand; and – have reached, or have the potential to reach at maturity in situ, a height of at least 2 metres
Initial Carbon Stock	The stock of carbon stored at the start of the project
IPCC	Intergovernmental Panel on Climate Change
GHG	Greenhouse gas

Native Forest	is defined as an area of land that:
	– is dominated by trees that
	  – are located within their natural range; and
	  – have attained, or have the potential to attain, a crown cover of at least 20 per cent of the area of land; and
	  – have reached, or have the potential to reach, a height of at least 2 metres; and
	– is not a plantation

NGER Act	National Greenhouse and Energy Reporting Act 2007 - as amended.
NGER Determination	National Greenhouse and Energy Reporting (Measurement) Determination 2008 - as amended.
NGER Regulations	National Greenhouse and Energy Reporting Regulations 2008 - as amended.
NRM	Natural Resource Management
SRP	Site reference point
Tree	A perennial plant that has primary supporting structures consisting of a secondary xylem

Section 5: Methodology (or activity) scope

5.1 Describe the specific abatement activities, technologies or management practices to which the methodology applies. Explain how the abatement activities, technologies or management practices will reduce or avoid emissions or remove and sequester greenhouse gases from the atmosphere.

Avoided Deforestation –
Surrender of Land Clearing Permits for Native Forest or Prescribed Native Forest

This project activity comprises the surrender of permits that have been issued for the clearance of native forest including for sites that would meet the definition of a Prescribed Native Forest under the CFI Act 2011. The surrender of these permits will mean that planned clear felling activities will not proceed and thereby ensure that carbon currently stored in the landscape is not lost to the atmosphere resulting in a significant abatement of carbon emissions (avoided emissions).

It has been well established that deforestation coupled with changes in land-use typically results in the release of carbon stored in these forest systems. The amount of carbon released through deforestation can be calculated as the difference between the carbon that is currently stored in the landscape against the amount that would be stored in the landscape assuming that the clear-felling goes ahead with subsequent changes in the use of the land.

Globally the impact of carbon dioxide (CO_2) emissions from deforestation and land-use change are widely acknowledged and have been estimated at around 1.0 billion tonnes of carbon dioxide equivalent (CO_2-e) per year over the period 2000 to 2010 (Global Carbon Project, 2012). The Department of Climate Change and Energy Efficiency (DCCEE) has estimated that emissions from deforestation in Australia will average 49 million tonnes CO_2-e per year over the Kyoto period (2008-2012) and that this will continue at a similar value through to 2030 (Government of Australia, 2011). This represents around 8-10% of Australia's total emissions (Government of Australia, 2011).

In a submission to the UNFCCC the Government of Australia formally documented its view about the importance of Reducing Emissions from Deforestation and Forest Degradation (REDD) in developing countries by noting that (Government of Australia, 2007a):

> *"REDD is crucial to reducing global greenhouse gas emissions as this sector contributes almost twenty percent of global emissions. The post-2012 outcome should adequately address emissions from REDD in a manner that is fair, environmentally effective and economically efficient."*

This acknowledgement of the importance of avoided deforestation for developing countries and highlighting the key points about "… environmentally effective ..." and "… economically efficient ..." translates equally well into support for avoided deforestation projects in Australia. Furthermore, such projects are particularly relevant where they can be linked to increasing opportunities for indigenous Australians to live and work on-country and thereby contribute to the preservation of both natural and cultural heritage values from Australian landscape systems.

Additional benefits will also accrue from the proposed activity when it is applied to avoided deforestation in Prescribed Native Forests. This will provide for the on-going protection of areas with high biodiversity conservation and/or cultural values and augment the resilience of Australian landscapes and the capacity for these natural systems to adapt to climate change. Such projects will deliver numerous flow-on benefits through related social, cultural and economic activities that rely upon natural resources and the associated landscape systems.

The Government of Australia has previously identified itself as a leader in reducing emissions from deforestation as detailed in their 2007 submission to the UNFCCC where it noted that (Government of Australia, 2007b):

> *"Australia has extensive experience in reducing emissions from the land use, land-use change and forestry sector, including from deforestation. Australia, therefore, makes this submission in the spirit of sharing experiences, and hopes that these may be useful to Parties as they consider policy approaches and methodological underpinnings to reducing emissions from deforestation."*

This global leadership role positions Australia at the forefront of efforts to address the implications of land use change through deforestation and provides a platform for Australian communities to act on deforestation and land use change to address the long-term challenge of reducing carbon emissions.

5.2 List the circumstances or conditions under which the activities, technologies or management practices are to be implemented. If they can be implemented under different circumstances or conditions (for example, climatic conditions, soil types and other regionally specific conditions), specify any differences in implementation for each of the different circumstances or conditions.

This methodology is applicable for any deforestation project in which the area of land targeted for clearance can be defined as a Native forest or as a Prescribed Native Forest (as defined in the CFI Act 2011).

The activity will avoid emissions associated with a deforestation event in circumstances where the amount of carbon stored in the area earmarked for clearing will be greater than the amount that would be stored in the system under the alternative (baseline) land use scenario.

Alternative land uses may include any number of activities including (but not limited to):

- Forestry production of timber;
- Expansion or development of pastoral industries;
- Expansion or development of horticultural production systems;
- Development of urban or peri-urban infrastructure.

In most cases relevant planning and regulations (e.g. NRM Plans, Development Plans, regional forest agreements etc) will indicate the nature of the alternative land use scenarios and in some cases uses may be prescribed on the clearance permits. The alternative land-use scenario will represent a baseline against which the avoided deforestation will be compared.

5.3 (Optional) Provide background information about the abatement activities, technologies or management practices. This could include case studies that demonstrate the successful implementation of the abatement activities, technologies or management practices.
In any natural system there is a dynamic exchange of CO_2 between the biota, soil and atmosphere. This flux operates such that a pool of carbon is held within the landscape system. Changes in land use can shift the balance in carbon storage and will generally result in a net loss of carbon into the atmosphere with a concomitant negative impact on greenhouse processes. Avoided deforestation allows land managers to preserve areas of native vegetation (particularly native forests) and thereby retain the carbon pools associated with those vegetation systems. This results in a reduction in the amount of greenhouse gases that are emitted due to clearance as well as providing a host of concomitant benefits including: 1. Protection of biodiversity assets and conservation of ecosystem processes. 2. Preservation of landscapes for ongoing indigenous cultural use and appreciation. 3. Improved resilience of natural systems to climate change impacts. 4. Increased capacity for natural systems to adapt to climate change. 5. Improved protection of soil and water resources due to fewer impacts on catchments and local hydrology.

Section 6: Identifying the baseline

6.1 Specify the process for identifying the project baseline.
The project baseline represents the situation that would occur in the absence of the project. The project baseline is the amount of carbon that would be stored in the landscape (averaged over time) under the alternative land-use scenario which follows the deforestation event. These alternative land-uses may include: 1. Plantation forestry production; 2. Expansion or development of pastoral industries; 3. Expansion or development of horticultural production systems; 4. Other activities including the development of urban or peri-urban infrastructure. The general baseline scenario is presented in Figure 1 below.

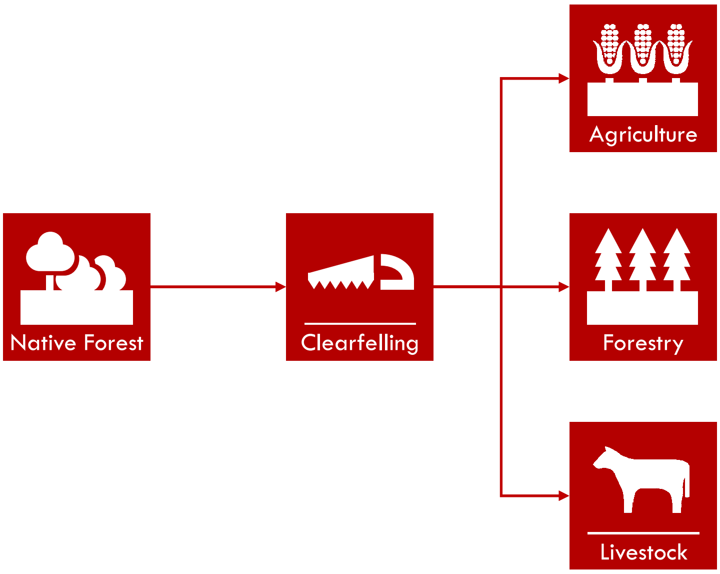


Figure 1 – Native forest clearance followed by allocation of the cleared lands to alternative land uses including forestry and agriculture results in a net loss of carbon from the landscape (due to the clear-felling) which is offset to some extent by the carbon stored under the alternative land use scenarios.

Baseline estimates comprise a calculation of the amount of carbon stored in the landscape averaged over a 100 year period immediately following the clearance event. This value is obtained using FullCAM, parameterised with the default settings, for the geographical location of the proposed project. Such parameterisation will include the use of AGO data on the soil type, climate history and existing vegetation in the project area. The baseline land use scenario adopted for the given project will be defined through a review of alternative land management options applicable to the site. In most cases the baseline land management option will have been incorporated into relevant development plans including regional NRM plans or similar documents.

Once the baseline scenario has been established the carbon stocks will be modelled using a series of "events", defined within FullCAM, consistent with the management actions anticipated in the baseline scenario. These "events" will be utilised by FullCAM to predict the carbon stock that is stored in the landscaped over a 100 year time-series. The start date for the averaging period (defined as the "clearfelling date") will be set as either July 1, 2010 or any other date that is deemed appropriate given the forest clearance permits that are surrendered for the purposes of delivering the project.

In parameterising FullCAM any default value may be replaced by data from either:

1. Direct measurements on the landscape system which is the subject of the project; or
2. Direct measurement from comparable landscape systems which would typically be areas that are in the same bio-region and that have comparable soil and climate conditions.

6.2 List and justify the assumptions on which the baseline is based.
This methodology applies to the emissions avoided by a project that surrenders permits for the clearance of native forests (i.e. where an existing right to clear is not exercised). Under such circumstances the abatement realised from the project will be defined by the difference in the amount of carbon stored in the landscape under the project scenario (surrender of permits leaving the native forest intact) vs the amount of carbon stored in the landscape under the baseline scenario (clearance of native forest with conversion of the land to an alternative land-use). Assumptions: 1. Clearfelling is designed to derive a commercial benefit thus the permit to clear is of value and in the absence of a carbon benefit they will be utilised and this will result in the clearing of land. Giving up this permit will result in financial loss and therefore drives additionality 2. Main commercial ventures on cleared land will be forestry, pastoral activities or agriculture (e.g. horticulture). 3. Baseline is limited to a single forest rotation on the grounds that there is no guarantee about the continuation of forestry activities and there is no legislative requirement for the proponent to return the land to a forested state. 4. All baseline land use scenarios comprise activities that result in GHG emissions (e.g. use of diesel for vehicles and transport, application of synthetic fertilisers, enteric emissions from livestock and/or electricity from milling). The assumption is that these will all be substantially greater than the project based emissions by at least an order of magnitude and they have been excluded on the basis of being conservative. The baseline will therefore be set at a very conservative level relative to the project.

Section 7: Greenhouse gas assessment boundary

7.1 Describe the steps and/or processes involved in undertaking the abatement activity and identify all emissions sources and sinks directly or indirectly affected by the activity. Identify any emissions sources or sinks affected by the activity that will be excluded from the greenhouse gas assessment boundary. Flowcharts may be used to illustrate typical greenhouse gas assessment boundaries.
The project scenario is created by a decision not to clear existing native forest through the surrender of forest clearance permits. The project scenario is presented in Figure 2 below.

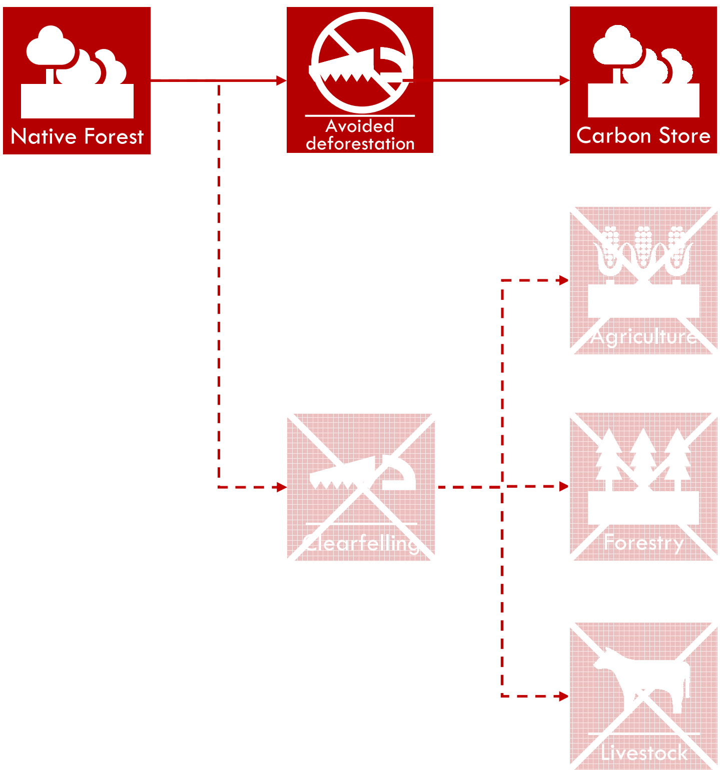


Figure 2 – Avoided emissions by avoiding deforestation and retaining the forest carbon pool through the implementation of the project.

The greenhouse gas assessment boundary identifies those greenhouse gas sources and sinks that will be assessed in order to calculate the greenhouse gas abatement arising as a result of the project. The greenhouse gas assessment boundary is shown in Figure 3 below.

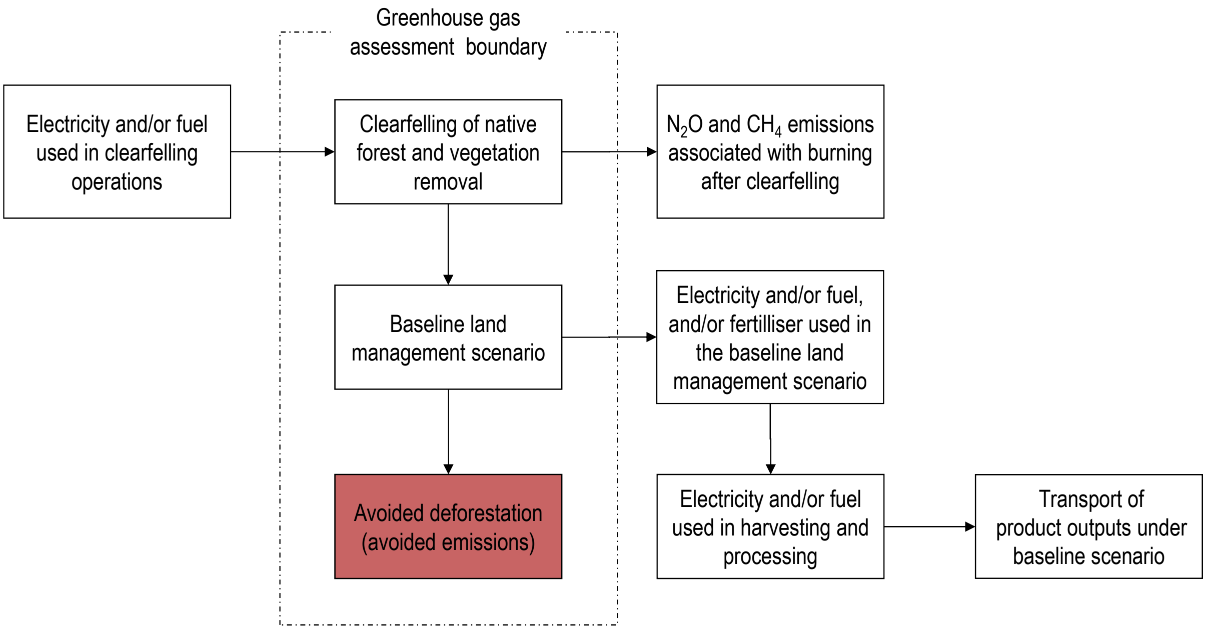


Figure 3 – Greenhouse gas assessment boundary

The greenhouse gas assessment boundary includes the entire project and all identified greenhouse gas emissions that are either controlled or influenced by the project. Greenhouse gas sources and sinks within the landscape assessment boundary include:

- Carbon dioxide lost to the atmosphere from the landscape associated with clearfelling
- Carbon sequestered into the landscape under the baseline land management scenario.

Emission sources excluded from the assessment include all those associated with the operational management of the baseline land management scenario including:

- electricity and/or fuel used in the clearfelling process;
- nitrous oxide and methane emissions associated with the burning of debris generated through the clearfelling;
- electricity and/or fuel used in the process of managing the baseline scenario;
- electricity and/or fuel used in the harvest and processing of products obtained under the baseline scenario;
- electricity and/or fuel used in the transport of product obtained under the baseline scenario.

All these exclusions are seen as being conservative in that they will be very much greater in magnitude than those seen under the project scenario where the associated emissions will generally be immaterial relative to the quantum of emissions associated with the clearfelling (typically less than 5% of the emissions associated with the baseline scenario (see for example Measurement Based Methodology for Farm Forestry Projects).

Figure 4 identifies the flow of greenhouse gases through the project, including the avoided forest clearance emissions.

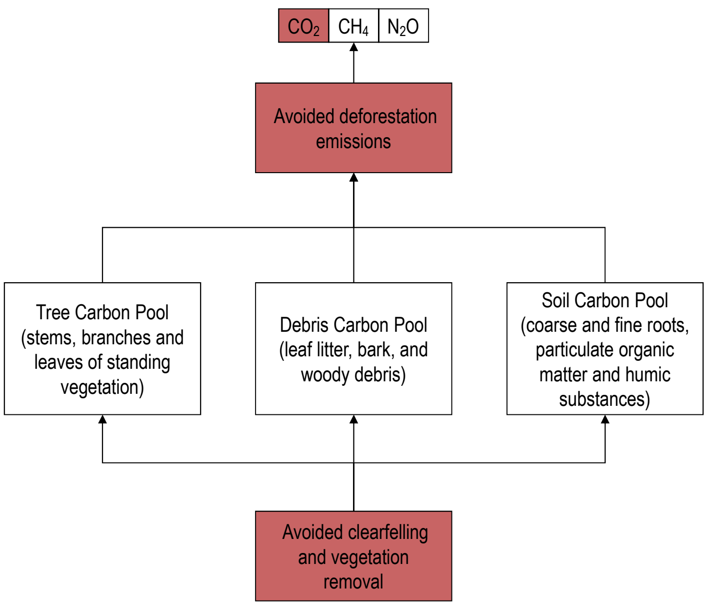


Figure 4 – Greenhouse gas flows through the project

The steps involved in undertaking the abatement project include the following:

- surrendering (handing back to issuing authority) of native forest clearance permits or alternatively for the relevant land management agency to make a formal decision to forgo the option to seek permits for clearance of a native forest area;

- initial assessment of carbon stocks using FullCAM model predictions;
- there will be an option to true-up estimates of project carbon stocks and baseline predictions through field based sampling which allows for a revision of FullCAM parameters by replacing default values with field measurements to better reflect actual project performance within the FullCAM modelling framework (or other alternative acceptable to the relevant regulatory authority). This may include;
  - Data sourced via direct measurements from the project area (change parameterisation of the project scenario).
  - Data sourced from nearby sites under management regimes consistent with the baseline scenario (change parameterisation of the baseline scenario).

7.2 In the table below:

List all emissions sources and sinks affected by the project. Indicate whether the source or sink is to be included or excluded from the baseline or greenhouse gas assessment boundary and provide justification for any exclusions.

All emissions sources and sinks identified in Section 7.1 should be listed in this table. Expand the table to include additional sources and sinks, as necessary.

Additional information justifying the exclusion of emissions sources and sinks can be provided in Section 7.3.

Table showing emission sources that are variously included or excluded in the analysis of the emissions benefit to be realised from the project analysis.

	Source	**Gas**	**Included / Excluded**	**Justification for exclusion**
Baseline	Emissions from clearfelling of native forest	CO_2	Included	
		CH_4	Excluded	CH_4 emissions are small compared to CO_2 emissions from native forest clearance – conservative
		N_2O	Excluded	N_2O emissions are small compared to CO_2 emissions from native forest clearance – conservative
	Electricity and/or fuel used in clearfelling operations	CO_2, CH_4, & N2O	Excluded	The emissions from the clearfelling activity are excluded as they will be small compared to the total emissions from native forest clearance – conservative
	Electricity and/or fuel used in the baseline land management scenario	CO_2, CH_4, & N2O	Excluded	Small relative to project related emissions – conservative

	Source	Gas	Included / Excluded	Justification for exclusion
	Baseline land management scenario	CO2	Included	
		CH4	Excluded	Small relative to project – conservative
		N2O	Excluded	Small relative to project – conservative
	Electricity and/or fuel used in the harvesting and processing of product from the baseline scenario	CO_2, CH_4, & N2O	Excluded	Small relative to project – conservative
	Electricity and/or fuel used in the transport of product from the baseline scenario	CO_2, CH_4, & N2O	Excluded	Small relative to project – conservative
Project Activity	Electricity and/or fuel used in the project management scenario	CO_2, CH_4, & N2O	Excluded	This would be substantially less than comparable emissions in the baseline scenario
	Standing stock of carbon in native forest at start of project	CO2	Included	
		CH4 & N2O	Excluded	This does not exist as a sink
	Fugitive gas emissions from biological processes in the native forest	CH4 & N2O	Excluded	This would be substantially less than comparable emissions in the baseline scenario where fertilizer use and other land management practices would exacerbate such emissions

7.3 (If required) Additional information justifying why a source or sink is excluded.
Not required.

Section 8: Project Area

If applicable, provide instructions to project proponents on how to determine the Project Area.

The project area will be defined as the area specified in the forest clearance permits or associated documentation. This will comprise a series of plots for which the boundaries will be defined as a polygon using latitude and longitude (or UTM) coordinates for a series of points with lines joining them to represent the outer boundaries of the project area. A project may comprise multiple plots and multiple clearance permits.

The plots should be identified using a unique identifier and mapped onto the landscape using a GIS system. For each plot a point that represents the geographical centroid will be defined. This point will be used to locate the plot in FullCAM. Note that where such a point is within 100 m or so of a large water body FullCAM may not be able to register the point for the purposes of modelling the carbon fluxes; in such a circumstance an alternative point within the plot (including any of the plot boundary points) may be used to register the position of the plot in FullCAM.

Section 9: Estimating abatement

9.1 Provide instructions to project proponents on how to calculate baseline emissions and removals. Provide formulas and define parameters in each formula, including units.

Where parameters are to be derived through data collection, provide instructions on data collection methods in Section 10.

Note on using factors to estimate project abatement and also emissions:

In this methodology the abatement is defined as the difference in the amount of carbon stored in the landscape under two different scenarios. The baseline scenario represents the carbon stored under the land management regime that will be implemented in the absence of the project. The project scenario represents the carbon stored under a land management regime in which the native forest is retained through the surrendering of rights to clearfell.

In both cases the amount of carbon in the landscape is calculated using FullCAM the parameterisation of which should be undertaken using any of the data sources listed below:

1. AGO data obtained via the “Data Builder” utility which is used by FullCAM to provide default values; and /or
2. Data sourced via direct measurements from the project area (particularly for parameterisation of the project scenario); and/or
3. Data sourced from nearby sites under management regimes consistent with the baseline scenario (particularly for parameterisation of the baseline scenario); and/or
4. Data sourced from published literature and/or
5. Forestry management plan predictions noting the context within which these may have been developed; particularly for parameterisation of the baseline scenario.

In all cases the minimum data requirements for execution of FullCAM need to be met and so, in the absence of any other data, the FullCAM defaults will be used. In cases where other data sources are available then these can be used in place of any of the FullCAM default values. Where AGO default values are not available then site data should be collected to parameterise FullCAM. Where site data are collected the methodology for data collection shall be any method for vegetation assessment that meets AGO standards.

Default data values for FullCAM will be obtained by setting up the FullCAM Data Builder with a latitude and longitude values for a “site reference point” (SRP). The SRP should sit on or within the boundaries of the area chosen for the project activities. Note that if the Data Builder fails to return data (as may happen if the SRP is in close proximity to a large body of water) then the SRP can be moved to any other location within the project area to ensure that FullCAM is able to access AGO data via the FullCAM Data Builder.

A key issue for the model is the parameterisation of M (the maximum above ground biomass) and r (the non-endemic species multiplier) both of which are critical parameters in assessing the performance of the baseline scenario in comparison with the project scenario. In most cases these parameters can only be estimated from direct field measurement or alternatively need to be set using the most conservative AGO default parameters.

For the baseline estimation the amount of carbon is defined as the average carbon stored in the landscape over a 100 year period using the average climatic data for the project location as defined using FullCAM.

9.2 Provide instructions to project proponents on how to calculate project emissions and removals. Provide formulas and define parameters in each formula, including units.

Where parameters are to be derived through data collection, provide instructions on data collection methods in Section 10.

Project emissions are calculated as detailed in 9.1 but using the assumption that the amount of carbon currently in the system is a reasonable assessment of the steady-state situation. If recent history has provided for major changes (e.g. bushfire events) then it is reasonable to work out the average carbon stored in the forest system for an extended (e.g. 20 year period) but this period should not exceed 100 years of past history. Where there is a reasonable expectation of further growth of the existing native forest area (e.g. in a situation where historical land management has resulted in losses of carbon from the forest pool) then the project scenario can also be modelled forward from the project start date for a period not exceeding 100 years.

9.3 Provide instructions to project proponents on how to calculate *net greenhouse gas abatement*. This should be the difference between the baseline and project emissions and removals.

Net Greenhouse Gas Abatement (A)

The calculation can therefore be summarised as:

Abatement = $C_{project}$ - $C_{baseline}$ [- $C_{harvest}$] ....Equation 1

$C_{project}$ = FullCAM estimate of the carbon stored in the landscape if the land is managed according to the project scenario (i.e. avoided clearance of native forest)

$C_{baseline}$ = FullCAM estimate of carbon stored in the landscape under the baseline land-use scenario (i.e. implementation of clearance and changed land use; based on an average over a 100 year period following the date of the clearfelling event).

$C_{harvest}$ = FullCAM estimate of carbon removed for products after accounting for decomposition rates of the product; in cases where products are short-lived (e.g. wood-chips for pulp manufacture) this will be set to zero; where long-lived products (such as saw-logs) are produced then this value may be greater than zero.

This methodology assumes that the abatement is the difference between the carbon dioxide that is released from a native forest, including a prescribed native forest, through a clearfelling activity and the amount that is retained in the landscape if the vegetation system is kept intact (Equation 1).

9.4 For bio-sequestration projects provide instructions on the procedures to be used to account for variations that are likely to occur in the amount of carbon stored as a result of climatic cycles or harvesting over 100 years.
This methodology calculates the baseline scenario based on the average carbon store over a 100 year period using the average climatic data for the project location as defined using FullCAM.
9.5 Provide instructions to project proponents on how to calculate net abatement number or net sequestration number for reporting purposes, *if different from the estimate of net greenhouse gas abatement (Section 9.3)*. For bio-sequestration projects, this calculation should take into account any adjustments to the abatement estimate to address variability, and any abatement already reported and credited.
The net abatement number is defined as the difference between the FullCAM predicted value of carbon currently stored in the landscape (or the average amount stored over a defined period including the project start date) vs the amount predicted under the baseline scenario averaged over a 100 year period into the future (after the project implementation date). While it is recognised that the amount of carbon stored in the landscape under the project scenario may change through time (due to climate processes or improved management of native forests) there is no way to estimate how these differences may have affected the amount of carbon stored under the baseline scenario as such these changes can be excluded.

9.6 Indicate whether the estimation methods and emissions factors are from the NGER (Measurement) Determination or Australia's National Greenhouse Accounts. If not, explain why new or different estimation methods are proposed. Note that the methods set out in the NGER (Measurement) Determination must be used to estimate emissions covered by NGERS.
All estimation methods and emissions factors are derived from the National Carbon Accounting Toolbox as defined in the FullCAM model documentation.

9.7 Provide a detailed description of any formulas used and detailed explanations of the parameters included in each formula, along with a description of how each parameter is derived(noting that detailed instructions to proponents on data collection methods for deriving parameters are to be provided in Section 10). Where applicable, provide a citation for the source of equations and/or parameters.
Apart from the relatively simple formulas used to calculate summary factors (that is, simple addition, subtraction, multiplication and division), all equations are from: – Richards, G.P. & Evans, D.M.W. (2000). Full Carbon Accounting Model (FullCAM), National Carbon Accounting System, Australian Greenhouse Office, Canberra. Version 3.1 – National Greenhouse and Energy Reporting (Measurement) Determination 2008 as amended Detailed descriptions of the formulae used and detailed explanations of the parameters included in each formula, along with a description of how each parameter is derived, are contained within the above two sources. They are not reproduced here.

Section 10: Data Collection

Provide instructions to project proponents on data collection methods for deriving the parameters used to calculate *baseline emissions and removals* (Section 9.1) and *project emissions and removals* (Section 9.2). Instructions may be provided in the table below.
All parameters represent default values from FullCAM other than where alternative values are available from documented sources or direct field measurements of the project site or adjacent sites under comparable management regimes.

Section 11: Monitoring and reporting

11.1 Outline the elements of the project that will be monitored and describe how monitoring will be undertaken, including:

- frequency of monitoring;
- the Australian Standards, or other relevant standards, that project proponents will need to comply with to calibrate and maintain measurement equipment; and
- any qualifications that operators will need to operate measurement equipment.

The information provided in this section should not duplicate the information provided in Section 10.

Monitoring

A project monitoring plan is to be prepared to cover the following issues:

- project organisation
  - organisational description
  - project description
  - variables in baseline emissions
- operational control
  - project parameters
  - operations and activities requiring control to ensure abatement
  - identification of risks to abatement
  - control of risks to abatement
- training and competence
  - responsibilities for monitoring and measuring
  - required qualifications
- preventative and corrective action
  - procedures for corrective action
  - personnel responsible for investigating corrective action
- monitoring equipment (as applicable)
  - calibration and maintenance
  - purpose of equipment
- data
  - procedures for measuring and monitoring
  - accredited laboratories
  - sampling practices

- quality control practices
- statistical error

– records

- required records
- availability of records
- responsibilities

– independent verification of abatement

- timing of verification
- process

– any other relevant factors to the project.

An internal audit is to be conducted on a 5 year basis to review the project monitoring plan.

11.2 Specify the data and other information about the project that must be included in project reports and project records, including:

- data required to estimate emissions and removals resulting from the project;
- data required to identify and justify baseline scenarios and to support baseline estimation and resetting; and
- information about project implementation or changes in environmental conditions that are required to determine whether the project remains within the scope of the methodology.

Part 1 Project Records

The following records need to be kept.

General Information:

– process flow description of the facility

– changes in process configuration

– independent audit records and results

– details of any quality assurance accreditation

– project monitoring plan.

Part 2 Project Reports

Certain project records will need to be included in project reports. Project reports required include:

– report for the first reporting period

– ongoing reports for subsequent reporting periods

Report for the first reporting period

This report must be made at the end of the first reporting period and contain the following information:

- net greenhouse gas abatement number
- independent audit report
- baseline emissions
- project emissions.

Report for subsequent reporting periods

Ongoing reports must be made at the end of each subsequent reporting period and must contain the same information as for the first reporting period.

Section 12: References

Provide a full citation for all reports cited in the draft methodology.

All icons derived from UNFCCC, 2010, 'Clean Development Mechanism Methodology Booklet', United Nations Framework Convention on Climate Change, Bonn, accessed at http://cdm.unfccc.int/methodologies/documentation/meth_booklet.pdf, April 2011.

CDM Executive Board, 2010, 'Approved baseline and monitoring methodology AM0025: Avoided emissions from organic waste through alternative waste treatment processes', United Nations Framework Convention on Climate Change, Bonn, accessed at http://cdm.unfccc.int/UserManagement/FileStorage/9WVIN7Z06A8UGLFPO4Y51BDMJ23QXT, April 2011.

CDM Executive Board, 2011, 'Methodological tool: Combined tool to identify the baseline scenario and demonstrate additionality (Version 03.0.0)', United Nations Framework Convention on Climate Change, Bonn, accessed at http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-02-v3.0.0.pdf, May 2011.

DCCEE, 2011, 'Draft Methodology for the Capture and Combustion of Landfill Gas', Department of Climate Change and Energy Efficiency, Canberra, accessed at http://www.climatechange.gov.au/government/initiatives/carbon-farming-initative/methodology-development/methodologies-under-consideration/~/media/publications/carbon-farming-initative/landfill-methodology-pdf.pdf, June 2011.

National Greenhouse and Energy Reporting (Measurement) Determination 2008 – as amended, accessed at http://www.comlaw.gov.au/Details/F2010C00563/4afed578-db2e-4de1-86f1-34f49e8c37c3, June 2011.

National Greenhouse and Energy Reporting Regulations 2008 – as amended, accessed at http://www.comlaw.gov.au/Details/F2009C01309/2c789639-74e4-4106-8306-892439b42d43, June 2011.

Section 13: Appendices

Append and list below all relevant documentation necessary for the DOIC to assess the methodology including cited reports.

Section 14: Disclosure

Specify documents or parts of documents included as supporting information to the application that are marked CONFIDENTIAL and should not be published and the reasons why. Acceptable justification would include that the information should not be published if it reveals, or could be capable of revealing: • trade secrets; or • any other matter having a commercial value that would be, or could reasonably be expected to be, destroyed or diminished if the information were disclosed.	
Document/Part of document	*Reason for maintaining confidentiality*

Section 15: Declaration

This application must be signed by a duly authorised representative of the proponent. The person signing should read the following declaration and sign below.

Division 137 of the Criminal Code makes it an offence for a person to give information to a Commonwealth entity if the person providing the information knows that the information is false or misleading. The maximum penalty for such an offence is imprisonment up to 12 months.

By signing below, the signatory acknowledges that he or she is an authorised representative of the proponent, and that all of the information contained in this application is true and correct. The signatory also acknowledges that any of the information provided in this application may be copied, recorded, used or disclosed by the Department of Climate Change and Energy Efficiency for any purpose relevant to the CFI. Information will not be publicly disclosed by the Department where it has been identified as confidential by the proponent.

Full name of the person signing as representative of the proponent	s47F	*Date* 29 June 2012
Position	– ResourceCo Carbon	
Signature		

CARBON FARMING INITIATIVE

Template for Submitting Methodologies

Methodology for Native Forest Protection

(Avoided Deforestation)

Version 3.0

s47F

This template is to be used to submit a methodology proposal to the Domestic Offsets Integrity Committee (DOIC).

Disclaimer

This document is made available to enable applicants to submit a methodology proposal for assessment by the Domestic Offsets Integrity Committee and the Minister for Climate Change and Energy Efficiency (DCCEE). The views expressed herein are not necessarily the views of the Commonwealth of Australia, and the Commonwealth does not accept responsibility for any information or advice contained herein.

The material in this document is made available for general information only and on the understanding that the Commonwealth is not providing advice, nor indicating a commitment to a preferred policy position. The Commonwealth does not accept responsibility for the accuracy or completeness of the contents or any inferences, and expressly disclaims liability for any loss, however caused and whether due to negligence or otherwise, arising directly or indirectly from the use of, inferences drawn, deductions made, or acts done in reliance on, this document or the information contained in it, by any person. The publication of a methodology proposal for consultation does not indicate that the proposal is compliant with the *Carbon Credits (Carbon Farming Initiative) Act 2011* (the Act), that it will be endorsed by Domestic Offsets Integrity Committee or made into a methodology determination by the Minister. Proposals may need substantial revision before being endorsed by the Domestic Offsets Integrity Committee.

A methodology proposal that is open for public consultation must not be relied upon for planning an offsets project as there is no guarantee that it will be made into a methodology determination by the Minister.

Entities planning to undertake an offsets project based on a methodology determination should familiarise themselves with the Carbon Farming Initiative (CFI) and obtain professional advice suitable to their particular circumstances.

Privacy

As a Commonwealth agency, the Department of Climate Change and Energy Efficiency (DCCEE) is bound by the *Privacy Act 1988* (Cth). Any personal information submitted as part of an application for endorsement of a proposal for a methodology will be collected and securely stored by DCCEE. Any personal information collected about the methodology proponent will only be used in relation to the application. Personal information may be used by DCCEE for consultation purposes or to contact the methodology proponent in the future.

For more information about DCCEE's privacy practices, see the full privacy notice on the DCCEE website. For assistance with any questions about privacy issues please contact:

Privacy Contact Officer
Department of Climate Change and Energy Efficiency
GPO Box 854

Canberra ACT 2601
Phone: + 61 2 6159 7000
Website: www.climatechange.gov.au

Intellectual Property

In submitting a methodology proposal, you must warrant that you own or have a licence to use all of the relevant intellectual property rights in the application submitted. You will retain all intellectual property rights in respect of your application, but you must agree to allow it to be copied, used and modified by DCCEE and others for the purpose of the CFI. If you have applied, or intend to apply for a patent concerning a methodology proposal, you should contact DCCEE before you submit a proposal.

Table of contents

CFI Methodology proposal template

This template is designed for proponents submitting methodology proposals for use under the Carbon Farming Initiative (CFI). Methodology proponents must use this template for the proposal to be assessed by the Domestic Offsets Integrity Committee (DOIC).

The template must be used in accordance with the *Guidelines for Submitting Methodologies* (the Guidelines), as updated from time to time. This template and the Guidelines are the "required form" under section 109 of the *Carbon Credits (Carbon Farming Initiative) Act 2011* (the Act). The Guidelines provide explicit instructions for addressing the requirements for each item in the template. This template supersedes the previous "*Template for Submitting Methodologies*"; all proposals submitted after 28 February 2013 must use this template.

In proposing methodologies, proponents are required to provide two types of information; these are colour-coded in the template in blue and green.

Blue items provide the detailed instructions on how to implement, monitor and report on a project for the specified eligible activity. The blue items are all mandatory fields and, as such, are all marked as 'Required'. If the methodology proposal is endorsed, the information in the blue items will form the basis of the methodology determination made by the Minister for Climate Change and Energy Efficiency. The methodology determination is a legislative instrument.

Green items provide supporting evidence to enable the DOIC to assess the methodology proposal against the offsets integrity standards and other requirements set out in the Act, the Regulations and the Guidelines. Green items are either 'Required' or 'Optional' as indicated in each item. Information in the green sections would not normally be included in the methodology determination.

Instructions for methodology proponents

Methodology proposals are rigorously assessed to ensure that proposed carbon abatement is genuine and verifiable. Following the instructions contained in this template and the Guidelines will assist this process.

Given that an endorsed methodology proposal will be made into a legislative instrument, it is important that language and instructions are clear and unambiguous. All technical terms must be defined. Obligations in methodology proposals must be clear (e.g. by using the word 'must') and where there is choice, this must be reflected in appropriate language (e.g. by using the words 'may' and 'or'). Proposals that contain ambiguous or unclear instructions will be returned to the proponent.

A methodology proposal that is written with **clear, unambiguous, complete and precise instructions** can be more readily assessed by the DOIC and, if endorsed, developed into a methodology determination. The Clean Energy Regulator can only approve offsets projects implementing a particular methodology once the determination has been made.

Each statement or requirement in the blue items should be numbered to facilitate cross referencing and assessment. **All blue items must be completed before the methodology proposal is submitted**. If part of a blue item is not relevant to the methodology proposal, enter 'Not Applicable' – do not leave blank.

Proponents are encouraged to include diagrams, graphics and flow charts in the green items where these will help explain the statements or requirements in the corresponding (preceding) blue items.

Proponents can request that supporting information (green items) be kept confidential. Any such information must be clearly marked 'CONFIDENTIAL' and an explanation provided as to why this information should not be published. The DOIC may seek more information from the proponent as to why the information should not be published.

Methodology proposals that include confidential information in blue items cannot be converted into methodology determinations and will be returned to the proponent.

Methodology proponents are encouraged to include the names and affiliations of technical experts consulted in the development of the methodology. The proponent must have permission from the individual or organisation to include their names in the methodology proposal prior to submitting the template.

A CFI glossary of terms is provided on the DCCEE website. A glossary of new terms specific to the proposed methodology can be provided in Item 5 of the template. The definitions of terms in the methodology glossary must not contain terms already defined in the CFI glossary and CFI legislation.

Additional space can be created in the template for any item where more information is being provided. Alternatively, the additional information can be included in a separate document provided it is clearly labelled with the item number to which it relates.

Methodology proposals should be submitted to:
DOIC Secretariat
Department of Climate Change and Energy Efficiency
GPO Box 854
CANBERRA ACT 2601

Or DOIC@climatechange.gov.au

Item 1: Methodology proposal title and applicant details

1.1 Proposal title and applicant details – Green (Required)	
Title of the methodology proposal:	Methodology for Native Forest Protection (Avoided Deforestation)
Name of proponent :	s47F
Company:	GCS (GreenCollar)
Position:	s47F
Telephone:	s47F
Email:	s47F @greencollargroup.com.au
Address:	301/15 Lime St, King St Wharf, NSW 2000
Postal address (if different to above):	As above
Name of proponent :	s47F
Company:	GCS (GreenCollar)
Position:	s47F
Telephone:	
Email:	s47F @greencollargroup.com.au
Address:	301/15 Lime St, King St Wharf, NSW 2000
Postal address (if different to above):	As above

Item 2: Expert consultation

2.1 Expert consultation – Green (Required) Please provide the names and organisations of technical experts you have consulted in the development of this methodology proposal. You must have permission from the expert individual or organisation to include their names prior to submitting this proposal.		
Name	*Organisation*	*Does this expert endorse all or a part of the methodology proposal? (refer to relevant item if applicable)*
s47F	Department of Science, Information Technology, Innovation and the Arts (Queensland Herbarium)	YES

The development of version 3.0 of the Native Forest Protection Methodology has been a collaborative process that has engaged experts in a range of different fields with expertise in forestry, agriculture, natural resource management, forest conservation projects and carbon accounting.

The draft of this methodology has been prepared by s47F at GreenCollar following the public consultation process and initial assessment of the Domestic Offsets Integrity Committee (DOIC) of version 2 of the Native Forest Protection Methodology submitted by ReddForests and GreenCollar. It takes into account the comments received from the public and the Domestic Offset Integrity Committee (see Appendix A).

In finalising the methodology for resubmission to the DOIC an extensive internal and external review process has been undertaken. An initial redraft that responded to the DOIC and public comments was prepared and shared with industry experts and colleagues for preliminary review. This feedback was compiled into a complete draft that was externally reviewed by Tim Pearson (Winrock International) and Don Butler (Qld Department of Environment and Resource Management). Comments from their independent reviews were responded to in a second draft that was put to a technical working group for final comments before finalising for resubmission to the Domestic Offset Integrity Committee.

Acknowledgments must be made to s47F

for his advice on use of FullCAM and error management. Winrock International for permission to adopt their guidelines to destructive sampling for development of allometrics. s47F for generously allowing access to his property for testing of sampling procedures and protocols.

Item 3: Eligibility

3.1 Type of activity – Green (Required)

Are the activity/activities in this methodology proposal covered by the CFI?

☒ Yes – in the space below, please identify the type of CFI activity addressed by this methodology proposal.

☐ No – the methodology proposal cannot be assessed.

Yes. *Native Forest Protection Projects* are a sequestration offsets project as defined by section 54(a) of the CFI Act.

3.2 Positive list activity – Green (Required)

Are the activity/activities in this methodology proposal on the CFI positive list?

☒ Yes – in the space below, please identify which CFI positive list activity/activities are addressed in this methodology proposal.

☐ No – the activity must be included on the positive list before the methodology proposal can be assessed. Please contact DCCEE – cfi@climatechange.gov.au.

Yes. This methodology corresponds to the positive list activity;

The protection of native forest on freehold or leasehold land, in relation to which:

(i) State, Territory or Commonwealth legislation prohibits clearing without consent, or harvest without approval of a harvest plan; and
(ii) before 1 July 2010, the landholder received consent to clear, or approval of a harvest plan, from the relevant State, Territory, Commonwealth or local regulatory authority responsible for giving the consent or approval; and
(iii) the clearing consent or approved harvest plan remains valid; and
(iv) the clearing consent or approved harvest plan does not require an offset to mitigate any effect from the clearing.

This methodology requires on-going management of project forests to ensure that environmental attributes are maintained or enhanced.

3.3 Negative list activity – Green (Required)

Are any of the activities in this methodology proposal on the CFI negative list?

☐ Yes – in the space below, please identify which CFI negative list activity/activities are included in this methodology proposal and justify why the negative list circumstances do not apply in this case.

☒ No.

Item 4: Existing methodologies

4.1 Contact the Department – Green (Optional)

Have you contacted DCCEE to check whether another methodology similar to the proposed methodology is currently under development?

☒ Yes – please clarify below.

☐ No – email cfi@climatechange.gov.au.

Yes. No other methodology similar to this methodology is currently under development.

4.2 Existing methodologies – Green (Required)

Is the methodology proposal an adaptation of an existing methodology that has been approved under the CFI or another offsets scheme (either international or within Australia)?

☐ No, this is a new methodology.

☒ Yes – please provide in the space below:

1. The name of the scheme in which the methodology was approved
2. The title/name of existing methodology
3. A reference/source for the existing methodology
4. A description of any major differences between this methodology proposal and the existing methodology.

This methodology has adaptations and accounting components drawn from the following methodologies:

American Carbon Registry (2011) *American Carbon Registry Methodology for REDD – Avoiding Planned Deforestation*, version 1.0. Winrock International. http://americancarbonregistry.org/carbon-accounting/redd-2013-avoiding-planned-deforestation

Avoided Deforestation Partners (2010) *REDD Methodology Modules VM0007*. Verified Carbon Standard. http://v-c-s.org/methodologies/VM0007

DCCEE (Department of Climate Change and Energy Efficiency) (2011) *Carbon Farming (Quantifying Carbon Sequestration by Permanent Environmental Plantings of Native Species using the CFI Reforestation Modelling Tool) Methodology Determination 2012*. Department of Climate Change and Energy Efficiency. http://www.comlaw.gov.au/Details/F2012L01340

GreenCollar Climate Solutions (2011) *Methodology for Improved Forest Management: Conversion from Logged to Protected Forest, v1.1* Verified Carbon Standard. http://www.v-c-s.org/methodologies/VM0010

The significant differences from the methodologies above are:

- The Native Forest Protection Methodology has been adapted specifically to be consistent with the CFI Act (DCCEE 2011b), CFI Regulations (DCCEE 2011c), and Spatial Mapping Guidelines (DCCEE 2012c).
- This methodology is limited to planned deforestation in the baseline scenario. Planned forest degradation activities are not within the scope of this methodology. In the future however, such activities could be included in the methodology with revision of key sections. Required revisions include changing the scope in section 6, expanding the baseline scenario in section 7 to allow timber harvest and modification of equations in section 10 & 11 to

allow for timber harvest scenarios.

Accounting and monitoring procedures have been optimised for use in the context of Australian native forest protection projects.

4.3 Complementary methodologies – Green (Optional)

Could the proposed methodology be used in conjunction with an existing CFI methodology (i.e. both methodologies could be used at the same time, in the same project area or proposed project area)? Is there potential for double counting? Approved existing methodologies are listed at www.climatechange.gov.au/cfi.

☒ No, this is a stand-alone methodology.

☐ Yes – please provide in the space provided below:

1. Name of existing methodology
2. Description of how this methodology and the existing methodology interact.

Item 5: Methodology glossary

5.1 Methodology glossary – Blue (Required)

Provide an alphabetical glossary of terms that are specific to the methodology proposal.

Note that many terms are defined in the CFI glossary, the *Carbon Credits (Carbon Farming Initiative) Act 2011* and the Regulations. Refer to these documents before defining a new term.

Please add more rows if required.

Term	**Meaning of term**
Above ground biomass	Living biomass above the soil, including the stem, stump, branches, bark, seeds and foliage.
Allometric equations	An equation that quantifies the allometric relationship between different dimensions of an organism.
Avoiding planned deforestation (APD)	APD refers to an activity that reduces greenhouse gas (GHG) emissions by stopping deforestation on forest lands that are legally authorised and documented to be converted to non-forest land and may result in enhanced carbon stocks of forests (if present in the project area) that would be deforested in the absence of the project activity.
Baseline	The practice that would have occurred within the project area in the absence of the project.
Below ground biomass	All living biomass of the root system.
Biomass	Dry, vegetation-derived organic matter.
Bioregion	Bioregions are large, geographically distinct areas of land with common characteristics such as geology, landform patterns, climate, ecological features and plant and animal communities and are described in the interim Biogeographic Regionalisation for Australia (IBRA).
Carbon estimation area (CEA)	A stratum of the Project Area that is land which is homogenous for the purpose of abatement calculations and has consistent physical characteristics and is established and managed in a consistent way.
Carbon fraction of biomass (CF)	Ratio used to determine the quantity of carbon in dry biomass, expressed in tonnes of carbon per tonne of dry matter .
Carbon pool	A reservoir of carbon that has the potential to accumulate (or lose) carbon over time. For CFI projects this encompasses above ground biomass, below ground biomass, litter, dead wood and soil.
Carbon stock	The quantity of carbon held within the relevant carbon pool or pools in an area at a specified time.

Carbon stock change	The difference in the carbon stock in the relevant carbon pools in an area over a specified period of time.
Carbon sequestration	Carbon sequestration is the capture and long term storage of carbon by forests through the process of photosynthesis and growth of woody tissues.
CO_2-e - Carbon dioxide equivalent	The carbon dioxide mass equivalent, calculated by multiplying the mass of elemental carbon by $\frac{44}{12}$.
Commercial timber harvest	Means the management of native vegetation on privately owned land for the purpose of obtaining, on a sustainable basis, timber products (including sawlogs, veneer logs, poles, girders, piles and pulp logs).
Crediting period	As defined in the CFI Act.
Cropland	Arable and tillage land that is actively maintained for the purposes of producing annual and/or perennial crops.
Dead wood	Non living woody biomass with a cross sectional diameter greater than 2.5cm, either standing or lying above the soil level.
Deforestation	The direct human induced conversion of forest to a non forest land use if: a) the conversion occurred on or after 1 January 1990; and b) the land on which the conversion occurred was forest on 31 December 1989.
Deforestation Plan	Management plan describing planned deforestation event(s) and future land use for the project area in the baseline scenario.
Degradation	Long term depletion of biomass, which is not sufficient to reduce the actual or potential area, height or crown cover below what is required in the definition of a *forest* as defined in the CFI regulations.
Diameter at breast height (DBH)	Stem diameter measured over bark at 1.3 metres above ground.
Dry matter	Biomass that has been dried to remove moisture content.
Eligible offset project	As defined in the CFI Act
Exclusion area	Areas of land within the Project Area and are not being used to estimate abatement.
Forest	As defined within the CFI Regulations: Land of a minimum area of 0.2 of a hectare on which trees: a) have attained, or have the potential to attain, a crown cover of at least 20% across the area of land; and

	b) have reached, or have the potential to reach a height of at least 2 metres.
Forest degradation	See Degradation.
Forest inventory	A system for measuring the extent, quantity, and condition of a forest by sampling through: a) a set of objective sampling methods designed to quantify the spatial distribution, composition, and rates of change of forest parameters within specified levels of precision for the purpose of management; b) the listing of data from such a survey.
Fuelwood	Biomass collected for non-commercial personal from fallen or dead trees.
Grassland	Consistent with the National Inventory grassland category, the grassland category represents a diverse range of climate, management and vegetation cover. Grasses range from highly productive, improved introduced pastures, with applications of fertiliser and irrigation, through to unimproved native grasses and introduced grass species that receive little or no fertiliser and which cover vast inland areas extending into the semi-arid and arid regions. The grassland category also includes sub-forest forms of woody vegetation (shrubs) and areas of sparse tree cover that do not meet the height, crown canopy cover and minimum forest area criteria for forest land.
Grazing	Means the process of managing the spatial distribution, frequency and intensity of livestock on a particular parcel of land with natural or improved pasture.
Initial carbon stock	Carbon stock existing at the project declaration date.
Inventory	See 'forest inventory'
Leakage	An increase in greenhouse gas emissions from an activity or area outside the control of the project proponent, occurring as a result of undertaking the project activity.
Mandatory clearance buffer	An area within the permitted area to be cleared that is required to be set aside as part of permit.
Native forest	As defined in the CFI Act.
Native forest protection project	As defined in the CFI Act.
Native species	A species within its natural distribution.
Natural disturbance	In relation to an eligible offsets project, means any of the following events, where the event could not reasonably be prevented by the project proponents for the project:

	a) Flood; b) Bushfire; c) Drought; d) Pest attack; and e) Disease.
Non-accounted project areas (NAPAs)	Areas that are included within the project boundary and are maintained and monitored, but the carbon stocks are not assessed. For example, areas of Native Forest that would have been protected as mandatory clearance buffers in the baseline scenarios.
Non-Project Tree	Trees within the project area that may not be cleared under the terms of the clearing permit or equivalent.
Non-native forest	Any area greater than 5 m in width or comprising more than 5% of the project area that is not Native forest, for example: a) Cultivated and modified land for agriculture b) Artificial surfaces c) Aquatic areas d) Bare areas.
Project area	As defined in the CFI Act
Project boundary	Encompasses (i) geographical boundary, (ii) crediting period, (iii) sources and sinks and associated GHGs and (iv) carbon pools. In this methodology, on the basis that the overarching component is the geographical boundary, the project boundary is therefore referred to as the geographical area in which the project actions and activities will be implemented.
Project carbon	The equivalent mass (t CO_2-e) of carbon in the project area contained within living and dead standing trees and coarse woody debris.
Project proponent	As defined in the CFI Act.
Project region	See Bioregion.
Protected native forest	A native forest managed as a Native Forest Protection Project.
Regeneration	Re-establishment of size and vigour, as for a previously damaged plant or disturbed forest.
Regrowth	Woody vegetation composed of native species regenerating without direct planting or seeding on non-forest land that historically supported forest.
Reporting period	As defined by the CFI Act.
Shapefile	File format used to store vector data in Geographic Information System (GIS).

	There are three types of shapefiles - points, lines and polygons.
Stem diameter	The diameter of the stem/s of a tree measured at a specified height above the ground.
Stratification	The division of a project area according to site characteristics, management regimes and species, into areas with common attributes.
Targeted Precision	The acceptable level of precision of estimates at a 90% confidence level.
Thinning	The selective removal of trees.
Tree	A perennial plant that has primary supporting structures consisting of secondary xylem.
Wood density	Dry weight per unit volume of wood; t.d.m/m^3.
Wood products	Products derived from wood harvested from a forest.

Item 6: Methodology scope

6.1a Proposed project activity or management practice – Blue (Required)

Describe in detail the processes involved in implementing the project activity on the ground. The process must be described step-by-step. Note that details of sampling protocols and other prescribed measurement requirements are requested in Item 10 (Data collection) and are not required here. This item must be sufficiently detailed to allow project proponents to successfully implement the proposed activity by following these instructions. Refer to the Guidelines for a simplified example.

The project activity under this methodology is the protection of a native forest from planned deforestation (Native Forest Protection) where the planned deforestation would have resulted in the conversion of the Native Forest to cropland or grassland (See section 6.2a and 6.3a for details of abatement and eligibility requirements). This methodology is not applicable for projects that have been established or credited under non-CFI schemes.

Management of the Native Forest under the project must be in such a way as to maintain and enhance carbon stocks while maintaining or improving other environmental outcomes. This may include biodiversity, salinity, water and soil outcomes.

The steps below detail the process for implementing a Native Forest Protection project under this methodology.

Step 1: Identification of project start date

Prior to commencing a Native Forest Protection project the project proponent must nominate a start date. The nominated start date of the project cannot be before the date at which the landholder made a decision to avoid conversion of the native forest to cropland or grassland for the purposes of a carbon project; or the date that the project declaration takes effect. In the absence of a decision to avoid conversion of the native forest to cropland or grassland for the purposes of a carbon project it is assumed the land would have been cleared.

Evidence of the date of the decision to avoid conversion may include:

- An application to the CER regulator for a CFI project declaration date
- Emails, company records, correspondence with carbon service providers, land clearing contractors, livestock businesses, agricultural advisors, local planning bodies, legal advisors, financial institutions or other documents indicating a clear intention to avoid clearing or to commence a carbon project or
- Registration of carbon property rights under state carbon rights legislation.

The project start date must be no earlier than the date that the project declaration takes effect.

Step 2: Implement management practices to protect native forests within project area

From the start date of the project, project proponents must ensure that the Native Forest is actively managed from the project start date in such a way as to both minimise natural disturbance impacts and eliminate anthropogenic drivers of deforestation and degradation in order to ensure the permanence of sequestered carbon stocks. This includes, as a minimum:

- Complete avoidance/cessation of any planned deforestation within the project area. Project proponents must show at the time of the submission of an offset report that the forest has remained as forest. See section 6.4a (ii)
- No permit exists for the collection of firewood
- Active management to maintain or achieve a mix of tree species that reflects the composition of the local native vegetation. Project proponents must show at the time of application for an eligible offsets project there is a plan for this purpose. Implementation of this management plan must be provided in subsequent offsets reports. See section 12.2.6 (iv).

6.1b Supporting information for Item 6.1a – Green (Required)

Provide any additional information required to support the process described in Item **6.1a** above. This should include peer-reviewed or other credible scientific evidence supporting the proposed activity. Justify any assumptions or estimations made under the proposed project activity. Diagrams, graphics and process flow charts can also be included to assist understanding of the activity description.

See section 6.2b

6.2a Project abatement – Blue (Required)

The methodology proponent must describe how the project delivers greenhouse gas abatement. No calculations or estimations are required here.

Explain precisely how the abatement activity or management practice described in Item 6.1 will:

- remove and sequester greenhouse gases from the atmosphere; or
- reduce or avoid emissions.

Abatement activity

The abatement activity for this methodology is Avoided Planned Deforestation (APD). The methodology is only applicable to areas of Native Forest that can be demonstrated as at risk of being converted to cropland or grassland for grazing. Abatement is achieved through the avoidance of emissions from the planned deforestation and increases in carbon stocks through continual forest growth. This methodology is not applicable where commercial timber harvesting would occur during the deforestation event (See sections 6.3 and 6.4 for further information and evidence requirments).

Methodology conservativeness and CFI offsets Integrity

This methodology ensures a conservative approach to determining the net sequestration number by ensuring a conservative baseline. This is achieved by not accounting for agricultural emissions in the baseline land use scenario (grazing/cropping), which would be higher than under the project scenario. Furthermore, the methodology conservatively assumed that soil carbon and deadwood (standing or fallen) pools do not decline during a deforestation event.

This methodology adheres to the CFI offsets integrity standards by ensuring that:

- Abatement is measureable and verifiable
- Measurement methods are be supported by peer reviewed science and consistent with Australia's international accounts
- Measurement methods account for leakage and variability and use conservative assumptions
- Abatement is additional to what would occur in the absence of the project and
- Sequestration is permanent.

6.2b Supporting information for Item 6.2a – Green (Required)

Provide any additional information to support or clarify the statements in Item **6.2a** above. This should include peer-reviewed or other credible scientific evidence that supports the abatement potential of the proposed activity. Include supporting evidence and justifications for any assumptions regarding project abatement. Case studies demonstrating the successful implementation of the abatement activity should be included where possible.

Land use change from forest to agriculture has historically been a significant source of emissions in Australia (DCCEE 2012a). Land clearing in Australia is predominantly for the purpose of grazing – when the prices for agricultural products are high, landowners have a strong incentive to clear land and expand production (DCCEE 2012a). Reducing the rate of clearing has also been an extremely effective way of reducing emissions. Furthermore, according to The Intergovernmental Panel on Climate Change (IPCC) Special Report on Land Use, Land-Use Change, and Forestry (SR-LULUCF):

> *Any reduction in the rate of deforestation has the benefit of avoiding a significant source of carbon emissions (especially in the tropics) and reducing other environmental and social problems associated with deforestation.*
>
> *Deforestation and degradation of upland catchments can disrupt hydrological systems, replacing year-round water flows in downstream areas with flood and drought regimes (Myers, 1997). Deforestation can also diminish the social, aesthetic, and spiritual values of forests.*
>
> *Limiting deforestation forgoes the opportunity to utilize the land for other purposes, such as agriculture or other developed uses, therefore would potentially be subject to the same opportunity costs that might arise with afforestation and reforestation* (Watson, R et al. 2000).

In 1990 the equivalent of 82Mt of carbon dioxide (CO_2-e) was emitted within Australia due to land use, land use changes and forestry (LULUCF). According to the *Australian National Greenhouse Accounts: National Inventory Report 2010* (DCCEE 2012b), by 2010 this figure was reduced to 37.9Mt of CO_2-e, largely through legislative changes aimed at restricting clearing activity. This shows both the emissions reduction potential when land use change is restricted as well as the remaining emissions reduction potential that can be achieved through further measures to slow land use conversion through activities such as Native Forest Protection projects. The advent of clearing licences and permitted clearing under the various legislative frameworks allows for substantial clearing to occur. Large tracts of native forest remain legally at threat of clearing and current common practice is to seek permission for clearing through legislation. For example in NSW alone there are currently 734 Property Vegetation Plan (PVP) or clearing permits that have been granted since late 2005/2006. Most of these are current and have been granted for medium term periods of 15 years and longer (NSW CMA 2012).

The size of PVP and development grants is variable but in many cases covers thousands of hectares for broad scale clearing of the landscape. The scope of activities allowable under PVPs ranges from low impact selective removal of trees through to paddock scale clearing for the purposes of conversion to pasture and crop land. In 2011 over 400,000 hectares was approved for clearing in NSW alone. This included PVPs granted over 25 properties that comprised 5000 hectares or more. Legally authorised clearing is taking place across all states to varying degrees (NSW CMA 2012).

This methodology only applies to land clearing leading to deforestation. This does not include commercial timber harvest (other than firewood collection which would be combusted and does not enter the long term wood products pool). In Australia all states regulate the activity of commercial timber harvest within private native forests and commercial timber harvest is not permitted where it would lead to the conversion of land to agriculture (deforestation). For example under native vegetation regulations in NSW it is not possible to extract timber for the purposes of obtaining timber products without approval of a Private Native Forestry Property Vegetation Plan (PNF PVP). A PNF PVP however cannot be issued on land that has a PVP that provides for broadscale clearing. This is explicitly prohibited under Reg 12A of the Native Vegetation Regulation (2005) reg 12A Limitation on approval of PVPs which states:

> *A PVP that provides for broadscale clearing is not to be approved under Part 4 of the Act in relation to any land if the land is subject to a private native forestry PVP.*

6.3a Project eligibility requirements – Blue (Required)

Clearly set out the requirements for projects to be eligible to apply the methodology. The eligibility criteria must include descriptions of the circumstances and conditions in which:

1. the baseline scenario could reasonably be expected to occur;
2. the assumptions made in the baseline and project abatement estimates are reasonable; and
3. the application of the project activities or technologies is reasonable.

This methodology can be applied on all freehold and leasehold land that meets the following conditions:

i. The land was a forest on 31st December 1989 and has remained as forest until the start date of the project. See section 6.4a (i) for evidentiary requirements
ii. Deforestation could legally occur on the land at the project start date and at the date of project application to the CER. See section 6.4a (iii) for evidentiary requirements
iii. Documentation can be provided to demonstrate the spatial aspects of the deforestation event(s) and the post deforestation land use(s) to be implemented. This is referred to in this methodology as the 'Deforestation Plan'. See section 6.4a (iv) for evidentiary requirements
iv. Deforestation would result in the conversion of the forest to grassland for grazing or cropping land and would be maintained as such in perpetuity. See 6.4a (v) for evidentiary requirements. Consistent with the National Inventory approach, the post-clearing default treatment will be burning
v. Following the start of the Project, the land must remain a Native Forest in perpetuity. Project proponents must provide evidence that the forest has remained as forest at the time of a) the submission of an offset report and b) at the request of the CFI regulator. See section 6.4a (ii) for evidentiary requirements.

This methodology cannot be applied on land where there is:

i. Planned removal or management of native forest for the purpose of obtaining timber products, where timber is moved into a wood products pool, prior to or during the planned deforestation event

ii. Deforestation for purposes that are not grassland for grazing or cropping.

Excluded activities in the Project Scenario:

i. The removal of timber, from within the Protected Native Forest, for commercial markets
ii. The conversion of Protected Native Forest to an alternative land use
iii. Clearing of any areas outside the project boundary that would otherwise have remained protected in the baseline scenario.

Activities permitted in the Project Scenario that do not require calculations of carbon stock changes:

i. Removal of dead wood removal for personal fuel wood use within the property in which the project area is located provided it does not exceed 5% of project carbon stocks
ii. Timber removal for fencing within the property that the project area is located provided it does not exceed 5% of total carbon stocks
iii. Thinning of biomass for biodiversity or carbon stock enhancements in accordance with the management plan. Thinning must not result in deforestation, nor a reduction in estimated abatement below that already credited.

6.3b Supporting information for Item 6.3a – Green (Optional)

Provide any additional information to support or clarify the statements in Item **6.3a** above. This should include peer-reviewed or other credible scientific evidence that supports the undertaking of the activity in the circumstances or conditions described in Item **6.3a**.

This methodology is only applicable to forests that have regrown prior to 1990.

6.4a Information to be provided in application for an Eligible Offsets Project – Blue (Required)

Detail the information that is required from project proponents to demonstrate that they meet the eligibility requirements (Item 6.3) for applying this methodology. It is not necessary to list the general requirements already outlined in the Act and Regulations.

Project proponents must record and provide the following for the Eligible Offsets Project application:

i. To demonstrate that the project area satisfies the definitions in this methodology of a forest and native forest as of 31 December 1989, project proponents may use either;
   a) The National Carbon Accounting System (NCAS) 1989 forest cover layer (raster or vector)
   b) Aerial or remotely sensed imagery from 1989

ii. To demonstrate that the project area has remained native forest up until the project start date and at the date of application for a project declaration, project proponents may use either;
   a) The latest National Carbon Accounting System (NCAS) forest cover layer (raster or vector)
   b) Current aerial or remotely sensed imagery

iii. To demonstrate that the project area forest can be legally deforested from forest to cropping or grassland the project proponent must provide;
   a) Documentation showing before the 1st of July 2010, the landholder received the consent to clear from the relevant state, territory or commonwealth regulatory authority

b) A copy of the consent to clear

iv. To demonstrate the spatial aspects of the deforestation event(s) within the project area the project proponent must document a deforestation plan based on legally allowable rates and spatial extents of clearing consistent with the clearing permit or equivalent

v. To demonstrate the anticipated and use, post deforestation, the proponent must detail the spatial extent of the grassland and/or cropland and provide the proposed management regime. Evidence of this is the management requirements of the clearing permit.

vi. To demonstrate that the project area has remained as forest at the time of the submission of a project report, project proponents may use either;
   a) The latest National Carbon Accounting System (NCAS) forest cover layer (raster or vector)
   b) Current aerial or remotely sensed imagery

vii. As evidence to demonstrate that the baseline scenario does not include the removal or management of native forest for the purpose of obtaining timber products, where timber is moved into a wood products pool prior to or during the planned deforestation event, project proponents must demonstrate that;
   a) Commercial timber harvest requires a permit which the land owner does not hold for the proposed project area.

6.4b Supporting information for Item 6.4a – Green (Optional)

Provide any additional information to support or clarify the statements in Item **6.4a** above.

This methodology is limited to the legally allowable clearing activity as defined in the clearing permit or equivalent.

Clearing permits define both the allowable treatment options (e.g. blade ploughing, chaining, burning) as well as the permitted spatial extent of the clearing activity and any required buffer zones and protected area as well as the management requirements following the clearing event.

Item 7: Identifying the baseline scenario

7.1a Baseline scenario – Blue (Required)

Identify and describe in detail the baseline scenario or scenarios that are provided for in this methodology. The baseline scenario is the activity or practice that would have occurred in the absence of the project. Some methodology proposals may include several baseline scenarios and provide clear guidance on how project proponents should go about selecting the most appropriate baseline scenario for their circumstances. Refer to the Guidelines for further instructions.

In order to identify an accurate project baseline the project proponent must demonstrate that the most plausible activity, in the absence of the native forest protection project activity, is planned deforestation for the purposes of converting the land to grassland for grazing and/or cropping (see section 6.4a (iii) for evidentiary requirements).

If the project proponent cannot demonstrate the baseline activity is planned deforestation for conversion to grassland for grazing and/or cropping then this methodology cannot not be used.

Project proponents must complete the following steps to identify and document the baseline scenario.

Step 1: Demonstrate the Baseline Scenario

The baseline scenario for this methodology is a planned deforestation event and conversion to cropland or grassland in perpetuity. This scenario must be reflected in the conditions of the legal documentation permitting the deforestation event. Through this scenario carbon stocks would decrease following the deforestation due to the treatment of the debris pool post clearing (see section 7.1b). Remaining carbon stocks would then decrease exponentially until an immaterial carbon stock is realised. For the purposes of this methodology the baseline carbon stock is the 100 year average carbon stock of the project area following the deforestation event.

Management of the post clearing debris is assumed to consist of a curing period followed by a burn, as is consistent with the National Inventory (DCCEE 2012b).

The project proponent must provide documentation as evidence of the proposed land use change that is consistent with the eligible offset activity under the CFI regulations. See section 6.4a for evidentiary requirements.

Step 2: Describe the baseline scenario

Having determined the baseline land use scenario in the absence of the native forest protection project the project proponent must describe the management plan in the baseline over the 20 year crediting period. This must be compiled into a document entitled "Deforestation Plan" which must be provided as part of the offsets report at the end of the first and each subsequent reporting period.

At a minimum the Deforestation Plan must include;

i. The spatial extent of the cadastral boundary
ii. The spatial extent of Native Forest within the cadastral boundary
iii. The spatial extent of areas of Native Forest that would not be cleared due to productivity, legal, or accessibility constraints, including any mandatory clearance buffers
iv. The spatial extent of Native Forest that would be cleared in accordance with the legal permit requirements

v. The proposed land use following deforestation
vi. The spatial extent of the proposed post deforestation land use(s)
vii. Identification of requirements to maintain Non-Project Trees.

When compiling the proposed deforestation plan the project proponent must use the evidence collected in Step 1 (detailed in section 6.4a).

Output of Section 7.1a

Project proponents, on completion of section 7.1a, must produce a document titled 'Baseline Report' that documents;

i. Land use assessment from Step 1
ii. The temporal and spatial aspects of the baseline Deforestation Plan as required in Step 2
iii. A land use map that spatially displays the post deforestation land use scenario(s).

7.1b Supporting information for Item 7.1a – Green (Optional)

Provide supporting evidence and justifications for the selection of the baseline scenario in Item **7.1a** above, including any assumptions.

Under the baseline scenario and consistent with the National Inventory Report (DCCEE 2012b, pp. 155) it is assumed that all living above ground biomass in Trees is converted to Dead Wood,. This is followed by a prescribed burn affecting 25% of the Dead Wood, and exponential decay of remaining burnt and unburnt Dead Wood.

The proportion of dead wood affected by a prescribed burn (25%) differs from the National Inventory, which assumes 98%. This difference is proposed to ensure a conservative baseline. The proportion of dead wood burnt (25%), reflects the approximate proportion of landholders that use fire in land clearing, as reported by ABARE (1999). The decay rates used are consistent with the National Inventory Report (DCCEE 2012b).

While during a deforestation event landholder may remove wood for fuel-use; it is assumed that as this wood is also burnt, it would have the same decomposition profile and wood remaining the field.

Methodologies included in the CFI make explicit assumptions on future land use based on historical land use. For example the methodology *Quantifying Carbon Sequestration by Permanent Environmental Plantings of Native Species using the CFI Reforestation Modelling Tool* (DCCEE, 2011a) assumes that if an area was clear of trees for the previous five years, it will be clear of trees in perpetuity. Referencing historical practices for the project area in an avoided deforestation project is not possible as the baseline is the future land use not the current.

For this methodology the same five year assumption is applied but referencing the land management regime required for the five years following the deforestation event instead of the previous five years as evidence it will be clear of tress in perpetuity. Under this methodology project proponents are therefore required to provide evidence in the form of clearing permits that stipulate on-going management of cleared areas for grassland or cropland.

7.2 Divergence from the baseline scenario – Green (Required)

Describe how the emissions profile associated with the project scenario diverges from the baseline scenario. Provide a diagram which clearly depicts the baseline relative to the proposed abatement over the life of the project (see examples in the Guidelines).

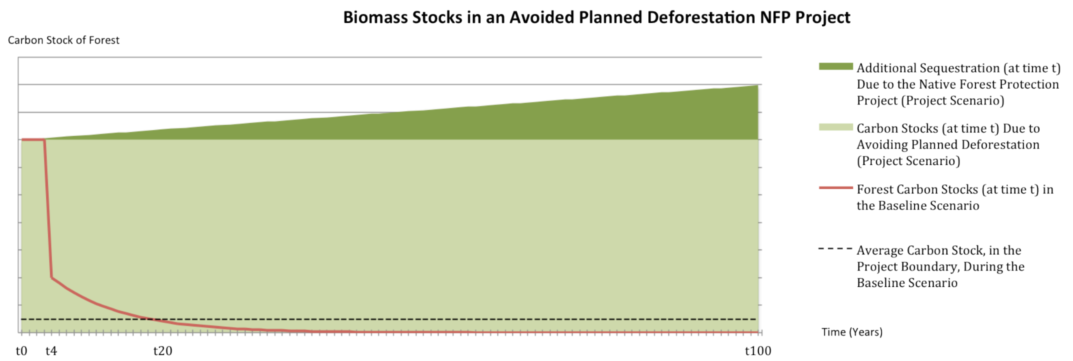


Figure 1

The above graph displays an example of the divergence between a baseline deforestation scenario and the project Native Forest Protection scenario.

At the start of the project activity the current carbon stock of the forest is determined via direct sampling.

In this Baseline Scenario the deforestation event results in the forest being converted to agricultural land resulting in a complete loss of forest biomass and no regrowth. No wood is harvested for commercial markets in the process of deforestation. Due to the deforestation event, forest carbon stocks in the baseline scenario approach 0% through to 100 years after the deforestation event.

In this Project Scenario, the planned deforestation event is avoided by implementing a Native Forest Protection Project. In this scenario, as the forest was not at its maximum carbon stock carrying capacity there is additional sequestration as the forest grows. Not all projects applicable under this methodology would have a detectable increase in carbon stocks as a result of the project activity.

In this Baseline Scenario, Carbon Stocks are at or near 0% and in the Project Scenario at the end of the of permanence period are equivalent to or greater than the initial carbon stocks at project commencement.

Under some Project Scenarios, some trees may be protected under the terms of the clearing permit. In these scenarios, the protected trees are conservatively excluded from the baseline carbon stock estimate, but conservatively treated as part of the debris pool that is burnt and decayed after the deforestation event.

Item 8: Greenhouse gas assessment boundary

8.1a Identification of greenhouse gas sources and sinks – Blue (Required)

Identify, for each activity allowed under the methodology, all emissions sources and sinks directly or indirectly affected by the activity. All sources and sinks should be included, regardless of their size or significance. Note that in Item 8.2, sources or sinks can be omitted from estimation of abatement if there is a justifiable reason to do so.

Within the greenhouse gas assessment boundary project proponents using this methodology will achieve abatement by avoiding emissions resulting from planned deforestation activities that would have occurred in the Baseline Scenario and increasing carbon stocks under the Project Scenario.

The Baseline Scenario accounts for changes in carbon pools and emissions that would have occurred in the absence of the native forest protection project.

The Project Scenario accounts for changes in carbon pools and emissions that occur due to the implementation of the native forest protection project. Changes are monitored during project implementation according to the requirements of section 12.1a via methods that detect and account for all included emission sources along with any anthropogenic or natural disturbance to carbon stocks, and carbon stock enhancements.

Table 1. Baseline and Project Carbon Pools and Emission Sources

Included in Baseline and Project accounting	Carbon stock changes as a result of removals from and disturbance in the following carbon pools; • Above ground biomass • Below ground biomass
	Increases in carbon stocks relating to tree growth
	GHG emissions from biomass burning and fossil fuel use
Conservatively excluded from accounting in baseline	Carbon stock changes in the following carbon pools; • Litter • Soil organic carbon • Dead wood

8.1b Relationship between sources and sinks – Green (Optional) Provide a flowchart or diagram demonstrating the relationships between the sources and sinks identified in Item **8.1a**.			
8.2 Justification of greenhouse gas assessment boundary – Blue (Required) In the table below, list all sources and sinks of greenhouse gases under the **baseline scenario** and affected by the **project activity** as identified in **8.1a**. The relevant greenhouse gases (GHGs) for the emissions source or sink must be specified. For example, the relevant GHGs for fuel are methane, nitrous oxide and carbon dioxide. Indicate whether the GHGs are to be included or excluded from the calculations of the baseline scenario or project greenhouse gas assessment boundary and justify why this is appropriate. The inclusion or exclusion of a source or sink is justified if doing so is the conservative approach, or if immaterial and difficult to measure. Refer to the Guidelines for further information. Please add more rows if required.			
Baseline scenario			
Carbon pool or emission source	***Greenhouse gas***	***Included / excluded***	***Justification for exclusion or inclusion***
Source 1 *Rotting of deadwood*	CO_2	Excluded	Conservative to exclude. Baseline Scenario emissions will be greater than or equal to those in the project scenario.
Source 2 *Combustion of fossil fuels in vehicles, machinery and equipment*	CO_2 and N_2O	Excluded	Fossil fuel use in the Baseline Scenario will not be credited in the CFI.
Source 3 *Burning of biomass due to forest conversion activities*	CH_4 and N_2O	Included	
Source 4 *Above and below ground tree biomass*	C	Included	
Source 5 *litter*	C	Excluded	Conservative to exclude. Baseline Scenario emissions will be greater than or equal to those in the Project Scenario.
Source 6 *Above ground non*	C	Excluded	Conservative to exclude. Emissions will be greater in the Baseline Scenario than in

tree biomass			the Project Scenario.
Source 7 *Soil organic carbon*	C	Excluded	Conservative to exclude. Baseline scenario emissions will be greater than or equal to those in the project scenario.
Sink 1 *Harvested wood products*	C	Excluded	Methodology does not include commercial timber harvest or any activities that result in harvested wood products.
Project activity			
Carbon pool or emission source	***Greenhouse gas***	***Included / excluded***	***Justification for exclusion or inclusion***
Source 1 *Combustion of fossil fuels in vehicles, machinery and equipment*	CO_2 and N_2O	Included	
Source 2 *Emissions from fertiliser use*	N_2O	Excluded	Fertiliser use is highly unlikely in the Native Forest Protection Project Scenario. Fertiliser use will be higher in the Baseline Scenario than the project scenario due to agricultural land use.
Source 3 *Burning of biomass from wildfires*	CH_4 and N_2O	Included	
Source 4 *Burning of biomass from prescribed burns*	CH_4 and N_2O	Included	
Source 5 *Burning of biomass from deforestation activities*	CH_4 and N_2O	Included	
Sink 1 *Above and below ground tree biomass*	C	Included	
Sink 2 *Above ground non tree biomass*	C	Excluded	The stock change in the above ground non-tree biomass is immaterial.
Sink 3 *Litter*	C	Excluded	The stock change in the litter biomass is immaterial.

Sink 4 *Soil organic carbon*	C	Excluded	Conservatively excluded. Soil carbon would decline following a deforestation event.

8.3 Leakage – Blue (Required)

Identify the potential sources of leakage arising from undertaking the proposed activity and describe how leakage is addressed (e.g. using a discount, accounting for productivity).

Leakage for Native Forest Protection projects is determined by the Department of Industry, Innovation, Climate Change, Science, Research and Tertiary Education. The most recent relevant leakage factor(s) published by the Department must be applied in equation 41.

The underpinning assumption of the project activity is that where a project proponent has actively sought permission to legally clear an area for agriculture, then that area will be cleared. This assumption carries through to areas outside of the project boundary but under the proponent's management. Through the inclusion of mandatory clearing buffers into the project area, the methodology ensures that protected forest cannot be used as a buffer for other clearing permitted under the permit.

Subsequently, market leakage, where changes in commodity prices increase the incentives to clear, is accounted for through the Departments leakage factor, while activity shifting, where land clearing shifts from one area of the property to another, is directly prohibited monitored in the project scenario.

Item 9: Project area

9.1a Define the project area – Blue (Required)

Where applicable, state the requirements to accurately define the project area, and disaggregate the project area into units of land area on which the abatement activity is occurring (also called Carbon Estimation Areas (CEAs)). This is critical for methodology proposals where the estimation of greenhouse gas emissions and removals is dependent on units of land area. The statements and instructions must be consistent with the *CFI Mapping Guidelines*.

Step 1: Defining the Project Boundary

The project boundary is defined as the cadastral boundary of the properties on which the project is located minus any exclusion zones (EAs). In cases where the project area spans multiple cadastral boundaries these boundaries must be contiguous (other than roads, public easements, power lines etc).

In defining the project boundary and determining the spatial extent of the project area, the project proponents must follow the *Identifying the Project Area* component of the *Carbon Farming Initiative Mapping Guidelines* (DCCEE 2012c) when determining the spatial extent of the project area. This section of the Spatial Mapping Guidelines includes important information on providing the Regulator with geospatial information to determine, modify and operate within the defined project boundaries (See section 9.1b(1) for evidentiary requirements).

Step 2: Acquiring and Preparing Imagery for the NFP Project Area

Once the project area has been spatially defined in Step 1 the project proponent must acquire and prepare remotely sensed imagery to assess land cover (See section 9.1b(2) for imagery requirements). The land cover assessment will be used to examine the spatial extent of the forest, determine carbon estimation areas (CEA) and delineate exclusion areas (EA) (See Step 3). The land cover assessment is also used to establish the condition of the forest at project commencement in order to detect any change in the forest condition/extent in the monitoring phase.

Step 3: Forest Extent Assessment and Stratification of the Native Forest Protection Project Site

Once remotely sensed imagery has been acquired and prepared across the NFP project boundary, as required in Step 2, the project proponent must utilise the imagery to complete a land cover analysis to determine the forest extent and delineate any CEA(s) and EA(s) areas within the project site.

It is compulsory for all NFP projects, when completing Steps 3.1 – 3.3 to adhere to the requirements of the *Carbon Farming Initiative Mapping Guidelines* that deal with the mapping of CEA boundaries and defining EAs. Additional requirements on defining EAs and CEAs for NFP projects are detailed in steps 3.1 – 3.3 below.

Step 3.1: Land Cover Analysis

Proponents in this step must examine the land cover in the remotely sensed imagery and delineate all features within the project boundary into Native forest and Non-native forest:

i. Native forest, i.e. areas of Native forest
ii. Non-native forest , i.e. any area greater than 5 m in width or comprising more than 5% of the project area that is not native forest, for example;
    e) Cultivated and modified land for agriculture
    f) Artificial surfaces
    g) Aquatic areas
    h) Bare areas and
    i) Other

Step 3.2: Delineate Exclusion Area Boundaries and Non-Accounted Project Areas

After completion of Step 3.1, project proponents must delineate all areas that are not assessable for carbon stock change under this methodology. These areas must be spatially defined and determined as EAs or non-accounted project areas (NAPAs). EAs are not included within the project boundary. NAPAs are areas that are included within the project boundary and are monitored, but the carbon stocks are not assessed.

Within the cadastral boundary the project proponent must create EAs for the following:

i. All non-native forest as detailed in step 3.1 of the land cover analysis
ii. All areas of Native Forest not subject to the project activity as detailed in the 'Deforestation Plan', this will include areas that were not planned for deforestation and areas that may still be deforested, and will exclude mandatory clearance buffers.

Within the project boundary the project proponent must also create NAPAs for the following:

i. other areas of Native Forest that would have been protected as mandatory clearance buffers in the baseline scenarios. For example, a permit may require that 20% of a forest not be cleared and maintained as a 'buffer'.

Step 3.3: Stratification of the native forest protection site into Carbon Estimation Areas

Once EAs and NAPAs have been defined and delineated in the project area as per step 3.2, the remaining area represents the native forest protection site that is subject to deforestation according to the deforestation plan.

The project proponent can now delineate the native forest protection site into spatially explicit CEAs for the purpose of improving the efficiency of the forest inventory. Once defined, CEA boundaries cannot be varied unless subject to a degradation or deforestation event.

In this methodology, any delineated CEAs become unique accounting areas for estimation of carbon stock changes and emissions associated with baseline and project activities. For this reason, each CEA must be given a unique CEA identifier.

After delineating the CEAs, the project proponent must conduct a biomass survey within each CEA as per the requirements of section 10.1a.2.

Note: *Areas within the project that are affected by degradation or deforestation are required to be delineated into a new CEA. See 12.1 for details on monitoring requirements.*

9.1b Supporting information for Item 9.1a – Green (Optional)

Provide any additional information to support or clarify the instructions for determining the project area in Item **9.1a** above.

1. Data and evidence to determine project boundary and perform land cover assessment

Project proponents must record, update as necessary and provide the following as part of the project report;

i. Name of the project area (including compartment number, allotment number, local name)
ii. Data source used to generate project boundary (i.e. Cadastre, deforestation/degradation zone)
iii. Hard copy and digital map and geographic coordinates of each polygon vertex including labelled CEAs, EAs and NAPAs (Including all meta-data as required under the CFI mapping guidelines (DCCEE 2012c) preferably obtained from a GPS or from a geo-referenced digital map)
iv. Total project area (hectares)
v. Area of each CEA (hectares)
vi. Data on carbon rights within the project boundary
vii. Method used to stratify project area into CEAs and EAs

2. Data requirements for remotely sensed imagery.

All imagery data that is used for land cover assessments and stratification baseline and monitoring in the Project Scenario must achieve the following requirements and be reported on for each offsets report:

i. *Spatial resolution*: The image resolution must have a pixel size no greater than 5m x 5m in order to accurately identify required land cover features in the NFP project area;
ii. *Temporal accuracy*: Remotely sensed data must have been acquired no longer than 1 year prior to each offsets report
iii. *Transparency in data processing*: Once imagery is acquired, if not already done, it must be pre-processed to correct for geometric and radiometric distortions in the data. Irregular features in the imagery, including cloud cover, shadows or sensor errors must not exceed 10%. Any irregular features beyond 10% of the imagery that are detected

must be deleted and filled with imagery from the same imagery source within the nearest possible date range. Data processing procedures must be fully documented in the project report

iv. *Temporal resolution:* In order to use remotely sensed imagery effectively for assessing land changes in the NFP project scenario the imagery must be obtained every 5 years for use in each offsets report

v. *Ensuring consistency and availability over time*: Although it is beneficial to use the same source of remotely sensed data and data analysis techniques throughout the entire project life often the source of the imagery may become unavailable or better imagery and image analysis techniques may be introduced. In these cases and in any other scenario where alternate imagery/techniques are used relative to the previous period, the current imagery must be processed to be comparable with the previous data. The process used must adhere to best practice remote sensing image analysis techniques.

Item 10: Data collection

10.1a Physical data collection – Blue (Required)

If applicable, provide detailed instructions on the process for collecting the data needed to derive input parameters for any of the calculations or models used in the methodology proposal.

The instructions must be precise and enable an auditor to determine whether the project proponent has undertaken data collection in accordance with the methodology.

A methodology proposal may include references to detailed instructions in other documents. The methodology proposal must specify the applicable version of the document, where the document is publically available and clearly identify the paragraphs or items of the document that are to apply under the proposed methodology.

This section includes data collection process for both the development and/or validation of allometric equations through destructive sampling (10.1a.1) and the method for surveying biomass in Native Forest Protection project areas (10.1a.2).

In field measurements are used to develop and apply allometric equations to estimate above ground biomass. Then the default root:shoot ratios from the Australian National Greenhouse Gas Accounts (2012b) are used to estimate the below ground biomass. The National Vegetation Information System (NVIS) maps are used to determine the appropriate root:shoot ratio for the Major Vegetation Group (MVG) in which sample data is collected. The NVIS MVG information is also used to determine the appropriate biomass partitioning when estimating the Baseline Scenario accounts.

10.1a.1 Method for Developing and/or Validating Allometric Equations through Destructive Sampling

Allometric equations are used to estimate biomass based on one or more non destructive measures such as diameter of the trunk at 1.3 m. Different equations give different estimates for biomass because each one is designed for a specific type of forest and climate type. The specific conditions under which an allometric equation is applicable are known as the 'Allometric Domain'.

In determining the biomass stocks of the project area project proponents can either validate existing allometric equations or develop new equations for all species or species groups that will be measured as a part of the biomass survey. Allometric equations must be validated at the start and at the end of the project crediting period.

It is noted that the Department's '*Guidelines for the development of field-based reforestation methodologies; Part 1: Methodologies that use single tree allometric equations'* that methodologies should identify the existing allometric equations that may be used as part of a methodology, including citing the original reference. Consistent with this, existing allometric equations eligible for validation are listed in Appendix E.

Further, equations not listed in the Appendix may be used if all of the following are met:

- They are published within a peer-reviewed journal as valid allometric equations
- They are developed using a dataset with more than 15 sample trees
- The allometric domain, as defined in Step 2, is known and consistent with the CEA to which the equation is being applied
- The measurement protocols are known and are consistently applied by the project proponent
- Evidence of the above is defined as directed in Step 2 below and included in the offset report as directed in Section 12.2.4

It is noted that this approach may be viewed as inconsistent with the Department's guidelines. However, given the minimum requirements stipulated above, in addition to the requirement for validation through destructive sampling, of all allometric equations, this approach is justifiable.

To create a new allometric equation or validate an existing allometric equation, destructive sampling of vegetation is required. The process for undertaking this sampling is detailed in the following procedures.

The project proponent must keep records of the process used to develop and/or validate allometric equations and data collected, including the locations of sample sites and measurements for the purposes of audit. This information should be provided as part of the project report in accordance with Section 12.2 and 12.3.

Step 1: Scope of allometry

This methodology requires allometric equations to be developed for above ground biomass. Below ground biomass is determined using the National Inventory default values and does not require destructive sampling (DCCEE 2012b).

This methodology allows both the creation of new allometric equations and the validation and application of existing equations. The application of allometric equations is restricted to the allometric domains as defined in step 2 below.

Step 2: Determination of allometric domains

An allometric domain describes the specific conditions under which an allometric equation will be applicable because the assumptions that underpin it are likely to be satisfied.

For each allometric equation to be developed or validated, at a minimum, project proponents must clearly define:

- A unique identifier and reference for each equation
- The species of tree(s) the allometric equation is applicable to
- Species growth form, e.g. tree, mallee, shrub
- The range of the values for each variable (i.e. *DBH*) that are used to develop the allometric equation. This sets the minimum and maximum threshold within which the equation is applicable
- The geographic or spatial range in which the allometric equation is applicable. This can be determined by bio-physical variables such as average annual rainfall zones, by bioregions or by the area in which data was was collected to develop the allometric equation (e.g project boundary or CEA)

If project proponents are developing an allometric equation for multiple species, the growth from must be same and species included in the group must be identified prior to commencement of destructive sampling. Furthermore, individuals for destructive sampling must be selected independently of their species group (Picard, N., *et al.* 2012).

Project proponents must compile this information to provide a detailed explanation of the domain for each allometric equation in the project report (as described in section 12.2.5). All biomass estimates determined from these equations and used in the NFP methodology will be restricted to the defined domains. Evidence of this must be included within project offsets reports.

Step 3: Determining sample size

Once the allometric domain for the allometric equation has been established, the project proponent must determine the sample size required to validate and/or develop the equation.

The sample size required to generate valid allometric equations will vary depending on whether the project proponent validates an existing allometric equation or develops a new allometric equation.

3.1: Validating equations

To validate the applicability of an existing selected biomass allometric equation or an equation developed using the methods outlined in section 10.1a.1, Steps 10 and 11, select at least 6 individuals to be destructively sampled (Walker S, *et al* 2012). Select at least one individual from each size class defined in section 10.1a.1, Step 6.

3.2: Developing new equations

When developing new biomass allometric equations, sample at least 20 individuals, including at least one individual from each size class defined in section 10.1a.1, Step 6.

Step 4: Determination of plot design for tree selection

Once the sample size has been determined for validating and/or developing allometric equations, the project proponent must determine the plot design for tree selection.

Trees for the destructive sampling procedure will be collected from these plots. Project proponents should determine the optimal plot design and number of plots to capture a minimum of 100 trees across the spatial domain of the study site. 100 trees are to be selected to increase the probability of identifying the full range of variables within the study site.

Step 5: Allocation of plots for tree selection

Once the plot design has been established for validating and/or developing allometric equations, the project proponent must allocate plots for tree selection within the spatial extent of the allometric domain defined in step 2.

Plot locations must be assigned to the study site in a method consistent with Section 10.1a.2 Step 2.

Step 6: Establishing size classes

Prior to undertaking destructive sampling field work, the project proponent must classify the target species or species group into size classes in order to carry out the procedures to validate and/or develop the allometric equation.

Individual tree species or species groups must be stratified into size classes. Size classes must have:

- a minimum range identifying the smallest size for tree selection;
- a maximum range identifying the largest size for tree selection;
- a defined class size interval (eg. 5cm intervals / 10cm intervals).

Step 7: Surveying and random selection of trees for destructive sampling

Having defined the size classes, sample trees must now be selected to represent all size classes.

Project proponents must establish plots and measure all trees within the plot. For each tree, project proponents must measure all variables that will potentially be used in allometric equations (e.g. DBH, total height, species). Care must be taken to measure these variables using the same methods that would be used in a field biomass survey.

Each tree within the plot must be assigned a unique identifier and project proponents must continue surveying plots until all the size classes are represented and the required number of trees have been achieved.

Once all the survey data is collected and categorized into size classes, project proponents must then use a random selection process to choose the trees that will be targeted for destructive sampling in the steps that follow.

Step 8: Destructive sampling procedure

Having selected biomass sample trees to develop and/or validate the allometric equation, the project proponent must undertake the task of cutting the trees down and cutting the trees into their respective components using the following procedure.)The destructive sampling protocol has been adapted, with permission, from Winrock's *Standard Operating Procedures for Terrestrial Carbon Measurement* (Walker et al. 2012) and the sampling design and statistical analyses have been adapted from NCAS technical report 31 (Snowden et al. 2002), UN-REDD (2012), Dietz & Kuyah (2011) and Picard et al. (2012));

a) Calibrate hanging scales at start of each day with 'calibration weights' or according to manufacturer's instructions

b) The biomass sample tree must be cut at ground level and separated into biomass components

c) As a minimum, the components must include;

- stem
- branches
- crown and
- dead material, including dead branches, dead stem and dead crown, attached to the biomass sample tree

d) The total fresh wet weight for each of the separated above ground biomass components must be recorded and documented

e) 3 representative sub-samples must be collected from each biomass component and weighed immediately. When project proponents are taking sub-samples from the bole the samples must be collected from the bottom, middle and top of the bole. Proponents must record the weight of the subsamples and place into a cool dry environment for lab analysis. Proponents are advised to consult (Snowdon et al 2002) Section 2.3, complete harvest method, for direction on selection of a representative sample of tree components for the purpose of estimating the wet dry weight ratio.

Step 9: Biomass analysis

Having completed the destructive sampling of biomass sample trees required to develop and/or validate an allometric equation, all subsamples must be oven dried until a constant weight is achieved. The method is as follows;

a) Place the subsample in the oven at between 70 and 80 °C and allow to dry for at least 24 hours

b) Remove the subsamples from the oven and weigh

c) Place the subsamples back in the oven and continue weighing every 12-24 hours until a constant weight is achieved

d) Once stable weight is achieved, maintain the sub sample in a cool dry area for analysis

Once biomass subsamples reach a dry weight and are ready for analysis, project proponents must document the following;

a) The dry weight of each sub-sample

b) The dry wet weight ratio for each of the sub-samples. This is calculated by dividing dry weight by fresh weight

c) The average of the dry fresh weight ratios

d) The dry weight of each above ground biomass component of the biomass sample tree. This must be determined by multiplying the fresh weight of the tree component (stem, branch crown) by the average of the dry weight ratios for that component

e) The dry weight of the biomass sample tree. Determined by summing the dry weight of all above ground biomass components of the sample tree

Step 10: Data exploration and analysis

Having completed destructive sampling to collect samples to develop and/or validate the allometric equation, project proponents must compile the data from field and laboratory datasheets and the data collection sheet into a database or spreadsheet suitable for statistical analysis or importation into a statistical analysis software package.

Project proponents intending to validate an existing allometric equation must skip to step 12 and must follow procedure to validate the allometric equation.

Project proponents developing a new allometric equation must start with step 10.1, graphical data exploration, outlined below.

10.1: Graphical data exploration

Using the dataset of test trees generated in accordance with Section 10.1a.1, step 3.2, project proponents must create scatterplots using raw (untransformed) data to assess the relationships between response variables, for example biomass of trunk, branch, leaf and total above ground, biomass, and predictor variables, for example diameter at breast height (*DBH*), height (*H*), and wood density (ρ), and provide insight into the appropriate models e.g. whether transformation of the data may be required.

Project proponents must examine scatterplots and visually identify outliers. The accuracy of outliers must be verified by cross checking with data collection sheets any data entry errors must be corrected.

10.2: Regression analysis

Having examined scatterplots delineating relationships between variables and corrected any errors found in the dataset, the project proponent must fit a regression analysis

The project proponent must perform a simple linear regression to determine the relationship of predictor variables e.g. *DBH, ca, H,* ρ, to the biomass of the vegetation components measured through destructive sampling. The regression analysis will be applied to provide an expected value for the response variable (i.e. biomass) for given values of the predictor variables (i.e. measured vegetation dimensions).

A simple linear regression must be performed in a statistical software package and to be appropriate for making inferences must satisfy the assumptions that: the means of the response variable change in a systematic way with variation in the predictor variable; and the errors are independent and normally distributed. To check that these assumptions are satisfied, for each model fitted inspect the diagnostic plots of residuals as follows:

- The normal probability or quantile-quantile (Q-Q) plot should produce an approximate straight line if the data come from a normal distribution
- A plot of residuals against the fitted values of a response should produce a distribution of points scattered randomly around zero, and the cluster of points should not show any particular trend or structure (confirming homoscedasticity). By contrast, if the cluster of points shows structure, e.g. funnel or wedge shape, this indicates that the variance is of the

residuals is not constant (heteroscedasticity)

If the simple linear regression meets the assumptions of normality then proceed to Step 11 to define a model for a new allometric equation.

If the model fitted to the untransformed data does not satisfy the assumptions of simple linear regression then go to Step, 10.3, to apply data transformation.

10.3: Data transformation

Applying a transformation to the data may be needed to satisfy the assumptions of linear regression that: the means of the response variable change in a systematic way with variation in the predictor variable; and the errors are independent and normally distributed.

Power transformations can be applied, for example, square or natural logarithm, to the response and/or predictor variables to remedy non-constant variance and linearise the model.

Note: In the case of biological data such as tree volume or biomass, heteroscedasticity is the rule and homoscedasticity the exception. Often, the variance of the residuals increases with X indicating that the greater the biomass (or volume) the greater the variability of biomass (or volume). In such instances, log transformation of the data or applying a power model, $Var(\varepsilon) = \alpha X^{\beta}$, to link the variance of the residuals (ε) to X often resolves the problem.

Forest biomass is commonly estimated using equations of the form:

$$\ln Y = \alpha + \beta \ln X + \varepsilon$$

Where ln *X* is the natural log transformed predictor variable, ln *Y* is the natural log transformed response variable, *α* is the y-intercept of the line with slope, *β*, and ε, the residual error.

Transformation of the response variable prior to estimation creates an inherent negative bias equal to a constant proportion of the estimated value (Snowden 1991), i.e. uncorrected biomass estimates are theoretically expected to underestimate the true value. If the project proponent applies a logarithmic transformation to the response variable, the proportional bias must be estimated using Snowden's (1991) ratio estimator for bias correction in logarithmic regressions. The bias correction factor is the ratio of the measured sample mean to the predicted sample mean. This correction factor should be applied to calculated AGB estimates.

If the mean relation is not linear and a linear model cannot be fitted by using variable transformations, most statistical packages have tools for inspecting the distribution of residuals and building alternative linear and non-linear regression models such as polynomial or exponential functions. In this case, project proponents should proceed to step 11 and fit a non-linear model to develop the allometric equation.

Step 11: Define model to develop a new allometric equation

In the event that project proponents aim to develop a new allometric equation, they must collect two datasets from the project site in accordance with section 10.1a.1, step 3, one dataset to define the model (minimum of 20 samples) and a second dataset to independently validate the model (minimum of 6 samples) (Picard, N, *et al.* 2012).

Project proponents must apply the following procedure, described in further detail below, to define an allometric model:

1. Fit models to dataset (Step 11.1)
2. Variable and model selection (Step 11.2)
    a. Rank candidate models;
    b. Test candidate models meet the assumptions of linear regression (discard those that do not)

c. Test significance of each term in the linear regression, discarding non-significant terms ($p \leq 0.05$)
d. If more than one candidate model remains, select the model which best balances parsimony and fit
3. Verify model (Step 11.3) and
4. Validate model with independent dataset (Step 12).

11.1: Model fitting

Project proponents must fit a model to the dataset collected for the development of the allometric equation. Common models are described in this section. Exploratory analysis of the dataset (including examination of diagnostic plots of residuals for simple linear regression models) will provide an indication of the relationship between the response and predictor variables and should be used to select model type. For example:

Simple linear regression

Simple linear regression is the simplest of all regression models and assumes that there is one predictor variable, X, and that the relation to the response variable, Y, is a straight line. It is expressed in terms of;

$$Y = a + bX + \varepsilon$$

where *Y* is the response variable, *a* is the y-intercept of the line with slope, *b*, and ε, the residual error. The variance of the residuals is assumed to be constant with $\mathrm{Var}(\varepsilon) = \sigma^2$.

Apply a simple linear regression if the relation between the response variable (for example ln(*B*) – the log of the biomass) and the predictor variable (for example ln(*DBH*) – the log of the diameter at breast height) was linear, with a variance of ln(*B*) that was approximately constant. It can be expressed as:

$$\ln(B) = a + b\ln(DBH) + \varepsilon$$

It is also common to test the regression between biomass and trunk volume (DBH^2H).

Polynomial regression

A polynomial regression investigates the relationship between the response variable, *Y*, and a predictor variable, *X*, with *p* orders. For example, the relationship between log biomass, ln(*B*), against log diameter at breast height, ln(*DBH*), can be modelled by fitting ln(*Y*) as a function of $\ln(X_1)$, $\ln(X_1)^2$, …, $\ln(X_1)^p$ expressed as:

$$\ln(B) = a_0 + a_1\ln(DBH) + a_2\ln(DBH)^2 + \ldots + a_p\ln(DBH)^p + \varepsilon$$

where *B* is biomass, *DBH* is diameter at breast height and $a_0,\ldots, a_p$ are the constants to be estimated and ε is the residual error with variance, $\mathrm{Var}(\varepsilon) = \sigma^2$.

Multiple regression

Multiple regression models are an extension of the simple linear regression except that there are multiple predictor variables. Multiple regression are expressed as:

$$Y = a_0 + a_1X_1 + a_2X_2 + \ldots + a_pX_p + \varepsilon$$

Where *Y* is the response variable, X_1, …, X_p the *p* predictor variables, a_0, …, a_p the coefficients to be estimated, and ε, the residual error. The variance of the residuals is assumed to be constant with $\mathrm{Var}(\varepsilon) = \sigma^2$.

Some examples of multiple regression biomass models are (from Picard et al. 2012):

$$\ln(B) = a_0 + a_1\ln(DBH^2H) + a_2\ln(\rho) + \varepsilon$$

$$\ln(B) = a_0 + a_1\ln(DBH) + a_2\ln(H) + \varepsilon$$

$$\ln(B) = a_0 + a_1\ln(DBH) + a_2\ln(H) + a_3\ln(\rho) + \varepsilon$$

$$\ln(B) = a_0 + a_1\ln(DBH) + a_2\ln(DBH)^2 + a_3\ln(DBH)^3 + \varepsilon$$

$$\ln(B) = a_0 + a_1\ln(DBH) + a_2\ln(DBH)^2 + a_3\ln(DBH)^3 + a_4\ln(\rho) + \varepsilon$$

Other types of linear regression that model variance

Regression with variance model (linear, polynomial) – apply function to model the variance of the residuals. For example, if the residual standard deviation is a power function of variable.

Non-linear regression

In most cases it is possible to transform the data or model the variance to meet the assumptions of linear regression. However, in the case that the assumptions of linear regression cannot be satisfied and transformation of the data fails to linearise the relation, a non-linear model can be applied. A non-linear model is written:

$$Y = f(X_1, \ldots, X_p; \vartheta) + \varepsilon$$

Where Y is the response variable, $X_1, \ldots, X_p$ are the predictor variables, ϑ is the vector of all model coefficients, ε is the residual error, and f is a function. If a linear relationship is observed between f and the coefficients ϑ, then a linear regression model can be applied with the assumptions that the residuals are independent and follow a centered normal distribution with constant variance. However, if the relationship is non-linear we do not make any *a priori* hypotheses about the variance of the residuals (although they are still assumed to be independent and follow a centered, normal distribution). Non-linear regressions can be run in most statistical software packages.

In summary, project proponents must apply the most appropriate of the described regression models to fit to the dataset:

- Simple linear regression
- Multiple regression
- Polynomial regression
- Non-linear regression

11.2: Variable and model selection

Models can contain a combination of some or all of the available predictor variables. The complete model includes all of the predictor variables but simple models using a subset of predictor variables are generally desirable. Given that there are p variables, there are 2^p -1 models that include all or some of these predictor variables.

Model selection should be used to determine which variables contribute little to the prediction of the response variable and can therefore be excluded. F tests of the variance ratio can be used to test the significance of variables added or dropped from the model and choose between nested models. For non-nested models which are equally parsimonious the model with the smallest residual sum of squares will give the smallest prediction interval and may be selected. In the absence of a preferred model selection technique, for example the Akaike information criterion (AIC), Bayesian information criteria (BIC) or step-wise, best-fit models can be selected using the coefficient of determination (R^2 or adjusted R^2), standard error (SE) and F-values. Note: For polynomial regressions, the addition of higher order terms may lead to model over-parameterisation and artificially increase the R^2 value.

Therefore, R^2 may not be a reliable criterion in this case.

Rank candidate models according to the chosen model selection criteria, i.e. AIC, BIC, or R^2, SE, and F-value. Project proponents must inspect the residual plots to confirm that the selected models satisfy the assumptions of the model fitted. Discard any candidate models that violate assumptions. Project proponents must perform an F-test or a two-tailed t-test ($\alpha = 0.05$) to determine the significance of the variables in the model and discard non-significant terms. If more than one candidate model remains, select the most parsimonious model, recording the mathematical form for the allometric function, statistical significance of the explanatory variables and the regression coefficients and their standard errors for the allometric report (see section 12.2.5).

11.3: Model verification

The project proponent must verify the predictive accuracy of a model by comparing its predictions with observations estimated by destructive sampling of trees used to define the model, i.e. trees sampled in accordance with section 10.1a.1 Step 3.2. Project proponents must calculate the mean of weighted residuals for the observed and predicted biomass estimates of the set of test trees using equations 1 and 2 below.

Equation 1

$$WR_{j,md} = w_{j,md}\left(B_{j,md} - PB_{j,md}\right)$$

Where:

$WR_{j,md}$	weighted residual in kilograms (kg) for tree, *j,md*
j,md	a test tree from the data set used to build the model
$B_{j,md}$	biomass in kilograms (kg) for tree, *j,md* measured through destructive sampling
$PB_{j,md}$	biomass in kilograms (kg) for tree, *j,md* predicted from the allometric function
$w_{j,md}$	weighting factor applied to tree, *j,md* calculated in accordance with Equation 4

Equation 2

$$w_{j,md} = \frac{1}{\left(BA_{j,md}\right)^{0.5}}$$

Where:

$w_{j,md}$	weighting factor applied to tree,*j,md*
$BA_{j,md}$	basal area of tree, *j,md* in square metres (m^2)
j,md	a test tree from the data set used to build the model

The mean of the weighted residuals calculated in Equation 3 must not be significantly different from zero, as determined by applying a two-tailed student t-test where $\alpha = 0.05$.

Once model verification is complete, proceed to Step 12. If the model fails verification the project proponent must either;

a.) select an existing equation to validate in accordance with section 10.1a.1, Step 3 using the procedure outlined in section 10.1a.1, Step 12;
b.) develop a new equation following the procedure outlined in section 10.1a.1, Steps 10 & 11;
c.) return to Step 11.2 and select the next highest ranked candidate model to validate.

Step 12: Validation of allometric equation

The effectiveness of a model to predict biomass (or tree volume) must be validated by comparing its predictions to observations made using the independent dataset (i.e. a dataset not used to fit the model) of test trees described in section 10.1a.1 Step 3.1.

All allometric equations must be validated using the process described in this section, and summarized as:

a.) Confirm that species fall within valid domain of the allometric function to be validated
b.) Generate predicted biomass of each test tree using the allometric function to be validated
c.) Compare predictions with observations estimated from test trees;
- Plot observed values against the predicted estimates of above ground biomass;
- Identify and confirm the accuracy of outliers
- Calculate and confirm that the mean of weighted residuals for the set of test trees does not differ significantly from zero

d.) Confirm minimum validation requirements are met
e.) Report details of each allometric function applied by the project proponent as described in 11.2.4

12.1: Confirm allometric domain

Prior to applying a model, the project proponent must confirm that the characteristics of the species whose biomass is to be predicted fall within the valid domain of the allometric function to be applied as defined in Step 2.

Project proponents must prepare a table listing the species of tree(s), species growth form and spatial extent of the species to which the allometric equation is being applied. The measurements of predictive variables collected from individual trees in Step 7 must also be included in the table. The information collated into the table must fall within the range of the dataset used to develop the allometric equation. Trees that do not fall within the allometric domain must be excluded from carbon accounting. Project proponents must submit the data used to confirm allometric domains as part of the offset report as directed in section 12.2.5.

12.2: Predict biomass of test trees

A predicted estimate of the biomass contained within each test tree must be generated using the allometric function to be validated using as inputs the predictor variable measurements collected from each test tree.

12.3: Compare predicted biomass to observed biomass

Verify the predictive accuracy of a model by comparing its predictions with observations estimated by the destructive sampling of test trees selected in accordance with Section 10.1a.1 step 3.1.

Project proponents must examine scatterplots of observed values against predicted biomass estimates to visually identify outliers. The accuracy of outliers must be verified by cross checking with data collection sheets any data entry errors must be corrected.

Project proponents must calculate the mean of weighted residuals for the observed and predicted biomass estimates of the set of test trees generated in section 10.1a.1 step 12.2 using equations 3 and 4.

Equation 3

$$WR_j = w_j(B_j - PB_j)$$

Where:

WR_j	Weighted residual in kilograms (kg) for tree, *j*
j	a test tree
B_j	biomass in kilograms (kg) for tree, *j,* measured through destructive sampling
PB_j	biomass in kilograms (kg) for tree, *j,* predicted from the allometric function
w_j	weighting factor applied to tree, *j,* calculated in accordance with Equation 4

Equation 4

$$w_j = \frac{1}{(BA_j)^{0.5}}$$

Where:

w_j	weighting factor applied to tree, *j,*
BA_j	basal area of tree, *j,* in square metres (m^2)
j	a test tree

The mean of the weighted residuals calculated in Equation 3 must not be significantly different from zero, as determined by applying a two-tailed student t-test where α = 0.05.

12.4: Checklist of minimum requirements for validation of allometric equation

An allometric equation developed or selected in accordance with section 10.1a.1 is validated and may be applied if it meets the following conditions:

a. The characteristics of the species whose biomass is to be predicted fall within the valid domain of the allometric function to be applied, in accordance with section 10.1a.1 step 12.1;
b. The mean of the weighted residuals calculated by applying Equation 3 is not significantly

different from zero, as determined by applying a two-tailed student t-test where $\alpha = 0.05$.

If the project proponent cannot validate the selected allometric model then they must either:

a. Select another equation to validate in accordance with section 10.1a.1, step 3;
b. Develop a new equation following the procedure outlined in section 10.1a.1, steps 10 & 11;
c. Or if the project proponent has already developed a set of candidate models, return to step 11.2 and select the next highest ranked candidate model to validate.

12.5: Allometric report

Project proponents must report on each allometric function that estimates above ground biomass. The data requirements are detailed in section 12.2.5.

10.1a.2 Method for surveying Native Forest Protection project areas

The project proponent must undertake a field based survey to determine forest biomass stocks.

This process detailed in this section must be adhered to for the initial assessment of biomass stocks and whenever a biomass survey is being conducted to account for changes to carbon stocks during the project period.

All survey data must be recorded and submitted as part of the project report. The steps are as follows;

Step 1: Determination of plot design

Prior to commencing the survey the project proponent must choose a plot design consistent with the rules below. The plot design must be documented and remain consistent for all required plots that must be surveyed.

Due to the variety of forest ecosystems in Australia and the variable condition of the forest stand in the ecosystems, the method of determining a specific plot design should be based on maximising efficiency and minimizing variance when determining biomass content of carbon estimation areas for the NFP project site. Plot design however must adhere to the following rules and procedures:

- Plots must be a fixed orthogonal area and shape with a definite spatial boundary that can accurately re-established.

- *Plot permanence*
  All plots must have the ability to be re-established for auditing purposes. Permanent markers of the waypoint should not be overly visible in order to avoid any favourable treatment to the trees within the plot. Plots need be allocated only at the start of the project period, unless there is a degradation or deforestation which requires a new biomass survey as per the monitoring requirements.

- *Plot Shape*
  Plots can be circular, square or rectangular. If plots are circular, digital measuring equipment must be used in order to determine the distance from the centre of the plot to the outer boundary. If plots are square or rectangular, care must be taken with establishment, as the plots may have to be re-established for auditing purposes. Project proponents must provide details on the chosen plot shape in the survey report

describing why it is the optimal shape for surveying purposes.

- *Plot Size*
  Plots used in the biomass survey must be equal to or greater than 0.05 hectares.

- *Plot Establishment and Bearing*
  - *Circular Plots:* If plots are circular, the plot waypoint becomes the centre of the circle and the plot is established around the waypoint.
  - *Square / Rectangular Plots:* In square or rectangular plots, the plot waypoint must be the south-west corner of the plot and the long axis of the plot must be oriented along a north-south axis.

- *Plot corrections for slope*
  If a plot is located on a slope greater than 10 degrees (Walker, S. *et al* 2012) , then a correction must be applied to correct for the slope, so that all carbon values are accurately reported on a horizontal projection (constant orthogonal area).

Step 2: Allocation of Plots

The project proponent must follow the process described below when allocating plot waypoints to a CEA.

A minimum of 200 waypoints must be assigned to each CEA that represent the potential plot points that can be surveyed in the pilot survey, primary biomass survey and any additional surveys that are required to achieve the target precision. The actual number of plots to be surveyed is determined in Step 4 and validated in Step 9. However, this step is applied prior in order to avoid multiple allocations of plot points.

The plots must be allocated in a method that is both random and replicable. In order to achieve this project proponents must use a pseudo-random number generator with a defined seed number when allocating plots to CEAs. The final plot points become the waypoint of the plots. Plot points should be each assigned a random number and then numerically sorted lowest to highest. The lowest ranked plot will become plot 1 and the highest ranked will become plot 200. Project proponents must survey the required number of plots as estimated in Step 4.2. For example, if on completion of equation 4.2 the estimated number of plots is 50, project proponents must survey plots 1-50.

In both baseline and project scenario circumstances where CEA boundaries are modified (for example as a result of the requirements of monitoring disturbance (see section 12.1a)), project proponents must retain the original plot allocation boundary to enable the replication of the plot allocation using the recorded seed number.

Project proponents must record waypoint data as part of the project report requirements in 12.2.4. These include;

- Recording the number of plot points determined in Step 4.2 that are being allocated to the CEA
- Recording the seed number and the name of the pseudo random number generator used to allocate the plots waypoints within the CEA
- Assigning attributes for each plot waypoint. The minimum attributes for the waypoints include:
  - The project name [NAME]
  - the CEA number that points are allocated to [CEA_NUM]

- the plot point number [PLOT_NUM]
- the X coordinate in decimal degrees [X_VALUE]
- the Y coordinate in decimal degrees [Y_VALUE]
- Date of allocation points to the CEA [DATE_REG]

Note: In all survey scenarios project proponents must survey the allocated plots in numerical order according to the plot point number [PLOT_NUM].

Step 3: Complete pilot survey

Project proponents must complete a pilot survey to perform a pre-biomass survey estimate of variance. If there is more than one CEA, the proponent must collect the required data for each CEA.

For the pilot survey, project proponents survey at least the first 5 plot points, allocated in Step 2, and follow the requirements of undertaking a biomass survey described in Step 5 and 6. Data collected in the pilot survey may be included in the biomass survey where the plot size and shape is consistent between the two surveys.

Step 4: Determination of number of plots using data collected in pilot survey

In order to determine the final sample size to estimate forest carbon stocks project proponents must complete the following steps for each Carbon Estimation Area.

Step 4.1: Estimate the Coefficient of Variation of each CEA

Project Proponents must utilise the data from the pilot survey undertaken in Step 3 to determine the population coefficient of variation within each CEA using the following formula:

Equation 5

$$Cv_{prelim} = \frac{s_{prelim}}{\bar{x}_{prelim}}$$

Where:

Cv_{prelim}	Coefficient of variation for preliminary sample in CEA; t.d.m
s_{prelim}	Sample standard deviation from preliminary data in CEA; t.d.m
$\bar{x}_{prelim}$	Sample mean from preliminary data in CEA; t.d.m

Step 4.2: Estimate Number of Plots to sample in each CEA

Forest Carbon Stocks in the NFP methodology must be estimated within ±10% of the true value of the mean at a 90% confidence level. This is referred to in this methodology as the 'Targeted Precision'.

In order to estimate the required sample size to achieve the targeted precision in each CEA, project proponents must complete equation 6.

Equation 6

$$n_i = \frac{{Cv_i}^2 * {t_{val}}^2}{E^2}$$

Where:

n_i	Estimated number of sample required to meet targeted precision in stratum *i*
Cv_i	Coefficient of Variation in preliminary data as calculated in equation 5. **Expressed as a percentage**.
t_{val}	Two sided students t-value, at the appropriate degree of freedom, for a **90% confidence level**. Dimensionless
E	Allowable level of sampling error. **Must be expressed as a percentage and set to 10%**

Step 5: Biomass survey preparation

When proponents are undertaking the biomass survey, in order to ensure accuracy in measurements and minimise measurement error, project proponents must have:

- determined the required measurements for all Allometric Equations that are used in the project area as per section 10.1a.1;
- identified all plots that must be surveyed. This will be the plots identified in step 2 numbering from **plot 1** through to **plot** n_i;
- calibrated and checked all measuring equipment to ensure accuracy in measurement and record all data as required by section 12.2.4 (viii);
- developed a survey protocol that explicitly states the requirements and processes of the biomass survey and recorded this information as required by section 12.2.4;
- designed field forms for collection of required field data;
- conducted training of all field staff in biomass measurement, including but not limited to (this must be recorded as per the requirements of 11.2.4 (ix)):
  - Safety when in the field;
  - Navigation to plots;
  - Establishment of plots;
  - Tree identification within plots;
  - Required measurements within plots.

Step 6: Navigating to, establishing and undertaking measurements within plots

The survey team must use a GPS device that that has an accuracy of +- 4m when navigating to each waypoint. When the survey team have navigated to the plot they must establish the plot as detailed in Step 1. Once the plot is established specific measurements are required to be taken within the plot to accurately estimate plot biomass. Measurement details are described below:

a) **For Above ground Biomass:**
When measuring above ground biomass within the plot, project proponents must measure the independent variable(s) required by the allometric equation that is to

be used for each species or species group that is found within the plot. This is often a stem diameter at some distance from the ground (for example Diameter at Breast Height (DBH) which is 1.3m from the ground) and can include height along with other independent variables required by the biomass regression equation.

b) **For Below ground Biomass:**
For below ground biomass, no measurement is required as a National Greenhouse Account default root:shoot ratios are applied.

Step 7: Determining biomass of plots

Having collected the field data in Step 6, project proponents must now determine the biomass of the plots that have been surveyed. This 4 step process is outlined below:

Step 7.1: Determination of above ground biomass in a tree by applying allometry

Project proponents must have developed and/or validated all allometric equations, used in the determination of above ground biomass, in accordance with section 10.1a.1. Once this is complete, proponents must convert the measurements made in the field sample plots into the above ground biomass stock estimates for each tree, using the respective allometric equation for the species or species group. The output of this will be:

$$AB_{j,sp,i}$$

Where:

ABj, sp, i	Above ground biomass of tree *j*, in sample plot s*p* in CEA *i* determined by converting measure variable(s) into biomass using appropriate allometric equation; t. d.m. tree^{-1}; See section 10.1a.1 for description of this parameter and methods that must be followed in collecting data.
j	Tree in sample plot *sp* in CEA *i* at time *t*
sp	*1,2,3, …* each individual plot in each CEA
i	*1, 2, 3, …* CEA carbon estimation areas

Step 7.2: Determination of above ground biomass in survey plots

Once the above ground biomass of each tree species has been determined by applying the relevant allometric equations, proponents must determine the above ground biomass stock, in survey plot *p* and in CEA *i,* by completing the following formula:

Equation 7

$$AB_{sp,i,t} = \sum_{j=1}^{Z} AB_{j,sp,i}$$

Where:

$AB_{,sp,i,t}$	Total above ground biomass of all trees in sample plot *sp* in CEA *i* at time *t*, t.d.m
$AB_{j,sp,i}$	Above ground biomass of tree *j*, in sample plot *sp,* in CEA *i* determined by converting measure variable(s) into biomass using appropriate allometric equation; t. d.m. tree^{-1}; See section 10.1a.1 for description of this parameter and methods that must be followed in collecting data.
i	*1, 2, 3, ...* CEA carbon estimation areas
j	*1, 2, 3, ...* Z trees group in sample plot *sp* in CEA *i* at time *t*
t	*0, 1, 2, 3, ... t* years elapsed since the start of the project activity
sp	*1,2,3, …* each individual plot in each CEA

Step 7.3: Determination of below ground tree biomass of survey plots

Once the above ground biomass for each plot has been determined, proponents must calculate the below ground tree biomass carbon stock for each plot using the formula below:

Equation 8

$$BB_{sp,i,t} = RSR * AB_{sp,i,t}$$

Where:

$BB_{sp,i\,t}$	Total below ground tree biomass stock of trees in plot *sp*, in CEA *i* at time *t*; t.d.m
$AB_{sp,i\,t}$	Total above ground tree biomass stock of trees in plot *sp*, in CEA *i* at time *t*; t.d.m
RSR	Root:shoot ratio; t root d.m per t shoot d.m.; Project proponents must first determine the NVIS major vegetation group class in which the plot is located. The proponents must then use the root to shoot ratio for this vegetation class that is consistent with Australia's national accounts as detailed in Appendix C, Table 1. The final RSR is the faction of the yield allocation of coarse roots plus the yield allocation to fine roots.
i	*1, 2, 3, ...CEA* carbon estimation areas

t	*0, 1, 2, 3 ... t* years elapsed since start of the project activity

Step 7.4: Determination of total tree biomass in each plot

Having completed the above equations project proponents must now calculate the total tree biomass carbon for each plot:

Equation 9

$$B_{\mathrm{sp},i,t} = AB_{sp,i,t} + BB_{sp,i,t}$$

Where:

$B_{\mathrm{sp},i,t}$	Total biomass stock in sample plot *sp,* in CEA *i* at time *t*; t.d.m
$AB_{sp,i,t}$	Total above ground biomass stock of all trees in sample plot *sp* of CEA *i* at time *t*, t.d.m
$BB_{sp,i,t}$	Total below ground tree biomass stock of trees in plot *sp*, in CEA *i* at time *t*; t.d.m
i	1, 2, 3, ... CEA carbon estimation areas
t	0, 1, 2, 3, ... years elapsed since the start of the project activity
sp	1,2,3, ... each individual plot in each CEA

Step 8: Edge Corrections for plots that span multiple CEAs and or EAs

An edge correction must be applied if a plot, once established moves into one or more alternate CEAs/EAs outside of the CEA that is being surveyed. If it is determined that a plot, once established will span multiple CEAs or an EA, then the collection of biomass data within the plot will lead to an erroneous plot estimate. When correcting for edge effects, the project proponent must follow the process below:

- Project proponents must omit the plot if more than 20% of the plot falls outside of the CEA that is to be surveyed.
- For all other scenarios where plots have edge effects, project proponents must first use the *mirage method* to mirror the plot into the CEA that is being surveyed. The details on implementing the mirage method can be found in Schmid-Haas (1969), presented in English in Beers (1977). For circular plots, measure the distance from the plot centre to the edge of the CEA (d), then locate a second plot the same distance (d) beyond the edge of the CEA. Measure all trees located within the CEA as determined from the second plot, and allocate to the first plot.

Step 9: Validate sample size

After completing the biomass survey, project proponents must perform an ex-post analysis of the data to verify that the survey has achieved the target precision. Proponents must complete step 9.1 and 9.2 in order to validate the sample size.

Step 9.1: Determine Standard Error

The standard error informs the proponent about the variation within their biomass survey. It indicates the error in using a sample mean of biomass stocks to estimate the true mean of biomass stocks.

The standard error is determined by completing the below formula:

Equation 10

$$SE_{survey,i} = \frac{s_i}{\sqrt{n_i}}$$

Where:

$SE_{survey,i}$	Standard error of the biomass survey in CEA *i*
s_i	standard deviation of the primary biomass survey data in CEA *i;* t.d.m
n_i	number of samples in CEA *i;* dimensionless

Step 9.2: Determine if Target Precision has been met

The formula below must be completed to verify that the survey has achieved the Target Precision. The 90% confidence level must be used when determining the t-value and the final value of $TP_{survey,i}$ must be equal to or less than 10%.

Equation 11

$$TP_{survey,i} = \frac{SE_{survey,i} * t_{val}}{\bar{X}}$$

Where:

$TP_{survey,i}$	Target Precision error limit of the primary biomass survey. Must be equal to or less than 10%
$SE_{survey,i}$	Standard error of the biomass survey in CEA *i*
t_{val}	Two sided students t-value, at the degree of freedom equal to (*n*-1) where n is the ex-anti estimation of plots, for a **90% confidence level**. Dimensionless
$\bar{X}$	Sample mean from biomass survey data in CEA *i*; t.d.m

If $TP_{survey,i}$ is greater than 10% then additional plots must be surveyed until the target precision is less than or equal to 10%.

10.1b Supporting information for Item 10.1a – Green (Optional)

Provide any additional information to support or clarify the use of the sampling protocol or process in **10.1a** above.

10.1b - Managing Error

Sources of error for estimating carbon stocks in this methodology include measurement, model and sampling errors.

10.1b.1 Measurement errors

Measurement errors can arise during collection of data for development of allometric equations and asessment of biomass. Error is managed by establishing procise protocols for data collection and frequent calibration of equipment.

Frequent calibration of equipment will reduce measurement errors from faulty equipment. Standards for calibrating equipment are provided in Section 10.1a.1.

Other procedures for minimising measurement errors are the development and use of measurement protocols. These are discussed in Section 10.1a.1 and 10.1a.2

10.1b.2 Model errors

Modeling errors arise from a combination of measurement and sampling errors, sampling design, estimation procedure, violation of the assumptions of the model and inherent variation in values and impact how well the determned model fits the observed data.

Potential model estimation errors in this methodology arise in the development and use of allometric equations for estimating tree biomasss. Procedures for minimising these errors are described in 10.1a.1

The targeted precision for model estimates must be ±10% of the true mean at a 90% confidence level. Model estimates must be within the 'domain' of the model.

The domain of a model is the set of conditions where it is applicable (valid). Therefore, project proponents must specify the domain of any models used, including species (or other taxa), site conditions (e.g. rainfall, soils), management (e.g. fertiliser, harvest regimes), and the range of predictor variables. Generally this will be the range of conditions covered by sampling and measurements to calibrate the model. For example, if an allometric model is used to predict AGB from DBH measurement, the domain of the model would include (a) the region(s) from which destructive samples were taken and like regions, and (b) the range of DBHs in destructive sample trees. Due to the accuracy requirements of allometric equations, modelling error is not required to be extrapolated into the final estimate.

Application of the accuracy standards to allometric models for predicting AGB is discussed further in Section 10.1a.1

10.1b.3 Sampling errors

Sampling errors arise from potential for bias in plot distribution. This methodology employs a

random approach to survey design to ameliorate sampling bias which is described in 10.1a.1 This methodology specifies the minimum number and size of sample plots, with provision for an assessment to measure less sample plots if sampling errors meet an accuracy standard. The targeted precision for estimates must be +-10% of the true mean at a 90% confidence level. As this accuracy is calculated for each CEA, the precision of the Project level abatement will be less than this. Given this, if the accuracy requirements are met at the CEA level, they will be met at the project level. For this reason, sampling error does not need to be extrapolated into the final estimate of abatement.
10.2a Greenhouse gas estimation models – Blue (Required) If applicable, describe and provide detailed instructions regarding the use of any greenhouse gas estimation models. The methodology proposal must specify either: (a) the name of the model 'as updated from time to time'; (b) the name of the model 'as approved by the DOIC' (which would require the DOIC to reassess any new versions of the model, but would not require reassessment of the full methodology proposal for it to be applicable); or (c) the version of the model (*for example version 1.2).*
The current version of the Native Forest Protection methodology does not utilise any models and is based on direct measurement and accounting to determine GHG emissions in both the baseline and project scenario.
10.2b Supporting information for Item 10.2a – Green (Optional) Provide any additional information to support or clarify the use of the computer model in **10.2a** above. Please provide details about the ownership, maintenance, development and review of the model. Please provide contact details for the owner of the model, so that details of how to access the model can be made available on the DCCEE website.
N/A

10.3 Parameters from collected data – Blue (Required)

For all input parameters used in the calculations in the methodology proposal, specify the following in relation to each parameter:

1. Unit of measurement
2. Description of the parameter including the equation number in which it is used and the numerical value or range of the parameter if this is prescribed
3. Parameter collection method (e.g. measured, modelled etc – process must have been detailed in Items **10.1a**, **10.2a**).

These details are required for the input parameters only (i.e. parameters that are used as inputs in the baseline and project abatement calculations).

Add more lines as required.

Parameter	Description	Unit	Measurement Procedure	Measurement Frequency
$A_{burn,i,t}$	Area burnt for stratum *i* at time *t*, ha	ha	See section 11	As required post-fire event
$A_{NFP,i}$	Total area of planned deforestation over the baseline period for *i* Carbon Estimation Area	ha	Σ of area of CEAs. CEA areas must be determined using geospatial mapping guidelines.	At project start
A_i	Area of a CEA	ha	See section 8	
$A_{sp,i}$	Area of sample plot within a CEA	ha	See section 10.2	
CF	Carbon fraction of biomass	t C t^{-1} d.m	Australia's national inventory default value of 0.50 t C t-1 d.m. can be used for estimating carbon fraction of biomass in forest systems.	Where new species are encountered in the course of monitoring, new carbon fraction values must be sourced from the literature or otherwise use the default value.
$AB_{j,sp,i}$	Above ground	t. d.m. $tree^{-1}$	Biomass of each	At project start

	biomass of trees based on allometric equation for species group j, in sample plot sp, in CEA i, using appropriate allometry.		tree in species group within plot. Biomass must be calculated using fixed area plots and using species specific allometric equations that are consistent with the requirements of the of section 10.1.	and at end of each reporting period.
$GHG_{NET\ LK}$	Leakage of abatement due to market effects.	t CO_2-e	The leakage rate in avoided deforestation projects will be determined by the Department of Climate Change and Energy Efficiency (DCCEE). Project proponents must use an appropriate leakage factor as determined by the DCCEE.	
RSR	Root:shoot ratio appropriate to species or forest type/biome; note that as defined here, root:shoot ratio is applied as below ground biomass per unit area:above ground biomass per unit area (not on a per stem basis)	t root d.m. t^{-1} shoot d.m.	Proponents must apply a default root:shoot ratio that is consistent with the National Inventory Report.	*RSR*

Item 11: Estimating abatement

The process for estimating abatement is divided into 5 parts:

1) **Item 11.1** – Calculate the baseline emissions and/or sequestration.
2) **Item 11.2** – Calculate the project emissions and/or sequestration.
3) **Item 11.3** – Account for leakage.
4) **Item 11.4** – Account for cyclical variation.
5) **Item 11.5** – Calculate the net greenhouse gas abatement.

Where applicable, provide formulas and, for each formula, define each parameter, input value and output value. For each value or parameter specify the units of measurement in SI units (i.e. the International Standard of Units). Each equation must be uniquely identified with an equation number and/or letter. *For example: Equation 1.3a*.

Where a value or parameter is specified in the *National Greenhouse and Energy Reporting (Measurement) Determination 2008* or the proposal refers to the *National Greenhouse and Energy Reporting Regulations 2008*, please specify the relevant section of the Determination or Regulations as well the numerical value of the parameter (*for example: EF,N_20 is the emission factor for nitrous oxide (N_2O) for landfill biogas that is captured for combustion as stated in the NGER Measurement Determination Schedule 1 Part 2 = 0.03 kg CO_2-e/GJ).*

11.1a Calculate the baseline emissions and/or sequestration – Blue (Required)

Provide instructions on how to calculate emissions and/or sequestration under the baseline scenario. The calculations must include all of the sources and sinks in the Greenhouse Gas Assessment Boundary, unless excluded and justified in Item 8.2.

This section calculates the net greenhouse gas emissions and removals in the baseline scenario in tCO_2-e occurring as a result of the planned deforestation activities.

The output of this section is the parameter $GHG_{NET\ BSL}$ which is used in section 11.5a to calculate net greenhouse gas abatement for the project.

Note: Some of the formulae below require parameters that must be calculated using the formulae described determined in 10.1a.2. Where this is the case it is indicated in the parameter description below the formula.

All data and calculations must be recorded as per the requirements detailed in sections 12.1 and 12.2 and included in the project report.

Step 1: Implementation of the Method for Surveying Native Forest Protection Project Areas

Prior to undertaking any of the subsequent steps, project proponents must have accurate carbon stock data for their Native Forest Protection project area in accordance with this methodology. The steps required to collect and process these data are detailed in the *Method for Surveying Native Forest Protection Project Areas [Section 10.1a.2]*.

Step 2: Calculation of initial carbon stocks prior to the planned deforestation event in each CEA

Step 2.1: Determining the mean carbon stocks of a CEA that will be cleared in accordance with the deforestation plan.

The first step in estimating the baseline emissions and removals is to estimate the initial forest carbon stock that exists in each CEA, prior to the planned deforestation event in the baseline scenario. For the purpose of this methodology, it is conservatively assumed that the carbon stock at the time of the first offsets report is equivalent to the carbon stock prior to the planned deforestation. These forest carbon stocks represent the carbon stocks that will be cleared in accordance with the deforestation plan.

Project proponents must use the following formula to determine $C_{BSL,i,pre}$.

Equation 12

$$C_{BSL,i,pre} = \frac{\left(\sum_{sp=1}^{P} \frac{B_{sp,i,t}}{A_{sp,i}}\right)}{n} * CF * \frac{44}{12} * (1 - NPT_{,i})$$

Where:

$C_{BSL,i,pre}$	Mean carbon stock in all pools in the baseline in CEA *i,* prior to deforestation; t CO_2-e ha^{-1}. If using this equation during the reporting period for assessment of degradation, deforestation or stock enhancements the output parameter $C_{inv,i,pre}$ should be substituted for $C_{BSL,i,pre}$
$B_{sp,i,t}$	Total biomass stock of trees in sample plot *sp* of CEA *i* at time *t*, t.d.m; calculated in Step 7.4 of Section 10.1a.2
$A_{sp,i}$	Area of sample plot *sp* in CEA *i*; ha
CF	Fraction of carbon in biomass, set to 0.5 to remain consistent with the National

	Inventory.
$44/12$	Ratio of molecular weight of CO_2 to carbon, t CO_2-e t C^{-1}
NPT_i	Buffer representing the proportion of Non-Project Tree biomass within a of CEA_i estimated from in-field measurements and expressed as a decimal; determined in Step 2.2 below
sp	*1, 2, 3 ... P* sample plots in CEA *i*
i	*1, 2, 3 ... CEA* carbon estimation areas
t	0; years passed since project start
n	Number of sample plots measured in CEA *i*

Step 2.2: Determining the non-project tree buffer within each CEA

In some deforestation events, certain trees may be excluded from clearing according to the deforestation plan. For example some deforestation plans may protect particular species from being cleared or certain aspects of a species, i.e, some trees with a DBH above 35 cm may not be allowed to be cleared. This is conservatively calculated only once the start of the project, as overtime it would be expected that the proportion of the biomass of non-project trees to project trees would decrease as younger trees typically increase there biomass faster than older trees.

Where this is the case, a non-project tree buffer must be determined for each CEA that indicates the percentage of biomass not at threat of being cleared. The non-project tree buffer is determined at the project start and remains constant throughout the life of the project. The non-project tree buffer must be applied at the time of assessment of the project baseline and at all future assessments of tree biomass during the project period, including the monitoring of any biomass enhancement.

Equation 13

$$NPT_i = \frac{\sum_{sp=1}^{SP} B_{NPT,sp,i}}{\sum_{sp=1}^{SP} B_{sp,i,t}}$$

Where:

NPT_i	Buffer representing the proportion of Non-Project Tree biomas within a of CEA_i estimated from in-field measurements and expressed as a decimal
$B_{sp,i,t}$	Total biomass stock of trees in sample plot *sp* of CEA *i* at time *t equals 0*, t.d.m
$B_{NPT,sp,i,}$	Total biomass stock of non-project trees in sample plot *sp,* of CEA *i* at time *t*; t.d.m; Calculated in Step 2.2.1
sp	*1,2,3, …* SP individual plots in each CEA

i	*1, 2, 3, ...* CEA carbon estimation areas
t	*0, 1, 2, 3, ...* *t* years elapsed since the start of the project activity

Step 2.2.1: Determine the Total Biomass of non-project trees within each plot

Equation 14

$$B_{NPT,sp,i} = \sum_{J=1}^{N} (B_{NPT,j,sp,i,t} + (B_{NPT,j,sp,i,t} * RSR))$$

Where:

$B_{NPT,sp,i}$	Total biomass of non-project trees in sample plot *sp*, in CEA *i*; t.d.m.
$B_{NPT,j,sp,i,t}$	Above ground biomass of tree j, in sample plot sp in CEA i determined by converting measure variable(s) into biomass using appropriate allometric equation for each tree in sample plot sp which cannot be legally cleared under the deforestation plan; t. d.m. tree-1;
RSR	Root:shoot ratio; t root d.m per t shoot d.m. ; Project proponents must first determine the NVIS major vegetation group class in which the plot is located. The proponents must then use the root to shoot ratio for this vegetation class that is consistent with Australia's national accounts as detailed in Appendix C, Table 1. The final RSR is the faction of the yield allocation of coarse roots plus the yield allocation to fine roots.
i	*1, 2, 3, ...* CEA carbon estimation areas
j	*1, 2, 3, ...* N trees in sample plot *sp* in CEA *i* at time *t*
t	*0;* years elapsed since the start of the project activity
sp	*1,2,3, …* each individual plot in each CEA

Step 3: Calculation of carbon stocks following the deforestation event in each CEA

The following steps must be completed to determine the long term average carbon stocks that exist in each CEA following the planned deforestation event in the baseline. The long term average carbon stock is calculated as the average carbon stock of the deforested area for 100 years following the deforestation event accounting for any stock changes as a result of burning and/or decay during this period. The approach used in this methodology is consistent with the national inventory methods (DCCEE 2012b).

It is an eligibility requirement of this methodology that the post deforestation land use is cropping and/or grazing which must be maintained. Given this requirement regrowth events are assumed to be continuously supressed and will remain immaterial in perpetuity (DCCEE 2011a). Hence, this methodology limits baseline calculations to the degradation of the debris pool that is left post clearing. This is calculated by determining the impact of any treatment on the debris pool post clearing and the decay of the residual biomass post treatment.

Note: As post deforestation stocks are a long term average over a 100 year period and crediting of Native Forest Protection projects is further averaged over the 20 year crediting period this is a conservative method to calculating and crediting stock change differences between the baseline and project scenarios. Any area not subject to deforestation must be identified as a EA and all CEAs are assumed to be cleared to the extent determined in the deforestation plan.

The steps below must be followed to calculate the long term average carbon stocks post deforestation.

Equation 15

$$C_{BSL,i,post} = \frac{\left(\sum_{sp=1}^{P} \frac{B_{lt,sp,i,}}{A_{sp,i}}\right)}{n} * CF * \frac{44}{12}$$

Where:

$C_{BSL,i,post}$	Long term average mean carbon stock in all pools, in the baseline, in CEA *i* post deforestation; tCO_2-e ha^{-1}
$B_{lt,sp,i}$	Long term average biomass stock of trees in sample plot *sp* of CEA *i* at time *t*, t.d.m; calculated in Step 3.1.5
$A_{sp,i}$	Area of sample plot *sp* in CEA *i*; ha
sp	*1, 2, 3* ... *P* sample plots in CEA *i*
i	*1, 2, 3* ... *CEA* carbon estimation areas
CF	Fraction of carbon in biomass, set at 0.5 as consistent with the National Inventory
$44/12$	Ratio of molecular weight of CO_2 to carbon, t CO_2-e t C^{-1}
n	Number of sample plots measured in CEA *i*

Step 3.1: Determining the 100 year average of biomass within sample plots post deforestation event

Project proponents must complete this 5 step process to determine the long term (100 years) average biomass stock that would exist within the sample plots following a deforestation event in the Baseline Scenario.

Step 3.1.1: Modeling of biomass in debris pool following the deforestation event

For modelling purposes all planned deforestation events are treated as occurring at the time of the proposed project start date provided they would occur within the 20 year project period. This is a conservative assumption as post deforestation stocks are a long term average over a 100 year period and crediting of Native Forest Protection projects is further averaged over the 20 year crediting period. Any differences to the baseline stock change arising as a result of when the deforestation event occurs within the project period would be immaterial.

All biomass subject to clearing, consistent with the National Inventory approach is treated as moved to the debris pool following the clearing event. Hence the biomass stock within plots represents the biomass stock of the debris pool:

Equation 16

$$B_{Debris,sp,i} = B_{sp,i,t}$$

Where:

$B_{Debris,sp,i}$	Biomass in the debris pool post deforestation event in sample plot *sp,* in CEA *i* at time *t i*; t.d.m
$B_{sp,i,t}$	Biomass stock in all pools in the baseline scenario within plot *i*, prior to deforestation event in CEA *i*; t.d.m as calculated in Step 7.4 of Section 10.1a.2.
t	*t = 0*, years elapsed since project start date.

Step 3.1.2: Partitioning of Biomass into MVG Tree Components

The biomass of each plot must now be partitioned into the respective NVIS MVG tree components in order to determine the impact of treatment and decay on each component of the tree. All biomass partitioning must be done in accordance with the yield allocations in Table 1 appendix C. The following parameters must be determined for each of the 6 tree components:

Equation 17

$$B_{tc,sp,i} = B_{Debris,sp,i} * B_{fraction\ for\ tree\ component\ in\ MVG}$$

Where:

$B_{tc,sp,i}$	Biomass of tree component *tc* in sample plot sp in CEA *i*; as determined for each tree component ($B_{stem,v,i}$, $B_{branch,v,i}$, $B_{bark,v,i}$, $B_{leaves,v,i}$, $B_{coarse\_roots,v,i}$, $B_{fine\_roots,v,i}$);*t.d.m*
$B_{Debris,sp,i}$	Biomass in the debris pool post clearing event in sample plot *sp,* in CEA *i* at time *t i*; t.d.m
$B_{stem,sp,i}$	Biomass fraction of stems for MVG of plot; see Appendix C Partitioning of Biomass – Table 1 for fraction.
$B_{branch,sp,i}$	Biomass fraction of branch for MVG of plot; see Appendix C Partitioning of Biomass – Table 1 for fraction.
$B_{bark,sp,i}$	Biomass fraction of bark for MVG of plot; see Appendix C Partitioning of Biomass – Table 1 for fraction.

$B_{leaves,sp,i}$	Biomass fraction of leaves for MVG of plot; see Appendix C Partitioning of Biomass – Table 1 for fraction.
$B_{coarse\_roots,sp,i}$	Biomass fraction of coarse roots for MVG of plot; see Appendix C Partitioning of Biomass – Table 1 for fraction.
$B_{fine\_roots,sp,i}$	Biomass fraction of fine roots for MVG of plot; see Appendix C Partitioning of Biomass – Table 1 for fraction.
v	1,2,3… *v,* Major Vegetation Groups for sample plot *sp* in CEA *i*
i	1,2,3… *i,* Carbon Estimation Areas in the project area

Step 3.1.3: Treatment of the Debris Pool

Once the debris pool has been partitioned into the respective NVIS tree components, the impact of a treatment on the debris pool must be determined. The national default method of treatment is the use of fire. If fire is not to be used and the biomass is left to decay, proponents can omit this step and model the decay in Step 3.1.4. Where fire is used as a treatment project proponents must complete the following formula for each tree component utilising Table 1 appendix C for burn efficiency data:

Equation 18

$$B_{residual,tc,sp,i} = B_{tc,sp,i} * (BB - (BB * BE_{tc}) + UB)$$

Where:

$B_{residual,tc,sp,i}$	Residual Biomass post burning event, of tree component *tc,* in sample plot sp, in CEA *i; t.d.m*
$B_{tc,sp,i}$	Biomass of tree component *tc* in sample plot sp in CEA *i*; as determined for each tree component in Step 3.1.2*; t.d.m*
BB	Fraction of biomass burnt as a result of fire; set to 25% and expressed as a decimal (0.25)
BE_{tc}	Burn efficiency for tree component *tc; see* Appendix C Partitioning of Biomass – Table 1 for *tree component burn efficiencies*
UB	Fraction of biomass unburnt as a result of fire; set to 75% and expressed as a decimal (0.75)
tc	Tree component *tc* as determined in Step 3.1.2 above
sp	1,2,3… *P,* Sample plots *sp* in CEA *i*
i	1,2,3… *i,* Carbon Estimation Areas in the project area

Step 3.1.4: Average long term carbon stock of tree component tc in sample plot sp in CEA i

Once the project proponent has determined the residual biomass of tree component *tc* in sample plot *sp*, in CEA *i,* the project proponent must now determine the long term average carbon stock of the residual biomass. This is determined by calculating the average carbon stock over the 100 year period following the deforestation event, accounting for annual decay, using the formula below:

Equation 19

$$B_{average,sp,tc,i} = ((\sum_{td}^{100}(B_{residual,tc,sp,i} * \ (1 - DR\ )^{td}))+\ B_{residual,tc,sp,i})\ /\ 100$$

Where:

$B_{average,sp,tc,i}$	100 year average biomass of tree component *tc,* in sample plot *sp* in CEA *i, t.d.m*
$B_{residual,sp,tc,i}$	Residual Biomass post burning event, of tree component *tc,* in sample plot *sp,* in CEA *i; t.d.m*
DR	Decay rate for tree component *tc* in sample plot *sp v,* as determined in Appendix C Partitioning of Biomass – Table 1
td	0,1,2,3… 100 years for each year of decay in the 100 year modelling period
tc	Tree component *tc* as determined in Appendix C Partitioning of Biomass – Table 1
sp	1,2,3… *sp,* sample plots *sp* present in CEA *i*
i	1,2,3… *i,* Carbon Estimation Areas in the project area

Step 3.1.5: Sum of average long term carbon stock of each tree component tc in MVG v in CEA i

Project proponents must now add the tree components to determine the average biomass in each sample plot *sp* in each CEA *i* using the following equation:

Equation 20

$$B_{lt,sp,i} = \sum_{TC}^{tc=1} B_{average,tc,sp,i}$$

Where:

$B_{lt,sp,i}$	long term average biomass for sample plot *sp* in CEA *i, t.d.m*
$B_{average,tc,sp,i}$	100 year average biomass of tree component *tc* for sample plot *sp* in CEA *i, t.d.m*
tc	1,2,3… *TC* Tree component *tc* as determined in Appendix C Partitioning of Biomass – Table 1
sp	1,2,3… *P,* Each sample plot *sp* present in CEA *i*

i	1,2,3… *i,* Carbon Estimation Areas in the project area

Step 4: Calculation of changes in baseline carbon stock in each CEA

Using the parameters derived in Step 2 and 3 complete the formula below to calculate the change in baseline carbon stocks as a result of the planned land use change during the project period of 20 years. The output of this step is $\Delta C_{BSL,i}$

Equation 21

$$\Delta C_{BSL,i} = C_{BSL,i,pre} - C_{BSL,i,post}$$

Where:

$\Delta C_{BSL,i}$	Mean carbon stock changes in all pools in the baseline scenario within CEA *i*; t CO_2-e ha^{-1}
$C_{BSL,i,pre}$	Mean carbon stock in all pools in the baseline scenario within CEA *i*, prior to deforestation event in CEA *i*; t CO_2-e ha^{-1}; Calculated in Section 11.1a Step 2.1
$C_{BSL,i,post}$	Mean carbon stock in all pools in the baseline at end of project period in CEA *i*; t CO_2- e ha^{-1}; Calculated in Section 11.1a Step 3
i	1, 2, 3 ...*CEA* carbon estimation area in the baseline scenario

Step 5: Calculation of emissions in each CEA in the baseline scenario

If fire is a tool used to burn biomass in order to convert forest lands in the project area to grasslands or cropping, project proponent can choose to account for the nitrous oxide and methane emissions released during that event. This step is optional, however if proponents use this method in the baseline they must use it in all events in the project scenario where biomass is burnt.

5.1: Determine pre-fire above ground biomass stock

In order for project proponents to determine the CH_4 and N_2O emissions from biomass burning, the above ground biomass stock of the CEA that will be burnt must be determined using the following formula:

Equation 22

$$B_{i,t} = C_{BSL,pre,i,t} * A_{burn,i,r} * \frac{12}{44} * \frac{1}{CF}$$

Where:

$B_{i,t}$	Biomass within the debris pool from forest conversion activities in CEA *i*, for

	reporting period *r;* t.d.m.
$A_{burn,i,r}$	Area burnt in CEA *i* during reporting period *r*; ha.
$C_{BSL,pre,i,t}$	Mean carbon stock in all pools in the baseline in CEA i, prior to deforestation; tCO2-e ha-1, Calculated in Section 11.1a - Step 2.1. (If applying this equation in the project scenario $C_{INV,i,pre}$ should be used not $C_{BSL,pre,I,t}$)
t	0, 1, 2, 3, ... t years elapsed since the start of the project activity.
$1/CF$	Inverse of the Carbon Fraction of biomass.
$12/44$	Inverse ratio of molecular weight of CO_2 to carbon; t CO_2-e t $C^{-1.}$

Step 5.2: Determining methane and nitrous oxide emissions from biomass burns
Once the mass of biomass burnt in each CEA is determined, proponents can use the output data to determine the methane and nitrous oxide emissions associated with the burning event.

5.2.1: Determine Methane Emissions from fire events

Equation 23

$$E_{CH_4,i,r} = B_{i,t} * \mathrm{CF} * EF_{,i,g} * \mathrm{GWP} * \mathrm{MM}$$

5.2.2: Determine Nitrous Oxide Emissions from fire events

Equation 24

$$E_{N_2O,i,r} = B_{i,t} * \mathrm{CF} * \mathrm{NC} * EF_{,i,g} * GWP_{g*} * MM$$

Where:

$E_{CH_4,i,r}$	Methane emissions due to fire events in CEA *i*, for reporting period *r;* CO_2-e.
$E_{N_2O,i,r}$	Nitrous Oxide emissions due to fire events in CEA *i*, for reporting period *r;* CO_2-e.
$B_{i,t}$	Biomass within the debris pool from forest conversion activities in CEA *i*, for reporting period *r;* t.d.m.
CF	Carbon Mass fraction in vegetation (Proponents must use 0.5 for Forest Systems to remain consistent with the national inventory).
EF_g	Emission factor for gas species g; t element in species/t element in fuel burnt; data must be accessed in table 7.21 of the National Inventory Report, 2010: Volume 2).
GWP_g	Global warming potential for gas g; t CO_2/t gas g (default values from IPCC SAR-

	100: CO_2 = 1; CH4 = 21; N2O = 310).
MM	Factor to convert elemental mass of gas species g to molecular mass (data must be accessed from table 7.22 of the National Inventory Report, 2010: Volume 2).
NC	Nitrogen to carbon ratio in biomass (Proponents must use 0.011 to remain consistent with the National Inventory).
g	G greenhouse gas (methane or nitrous oxide).
i	1, 2, 3 ...CEA Carbon Estimation Areas.
t	0, 1, 2, 3, ... *t* years elapsed since the start of the project activity.

Step 5.3: Determining GHG emissions from Biomass Burning

Having determined the Methane and Nitrous Oxide emissions from biomass burning, project proponents must now determine the GHG emissions associated with the biomass burning event by completing the following formula:

Equation 25

$$E_{BiomassBurn,i,t} = E_{CH_4,i,t} + E_{N_2O,i,t}$$

Where:

$E_{BiomassBurn,i,t}$	GHG emissions due to Biomass Burning in CEA *i*, at time *t;* CO_2-e.
$E_{CH_4,i,t}$	Methane emissions due to Biomass Burning, as determined in Step 5.2.1 in Section 11.1a, in CEA *i*, at time *t;* CO_2-e.
$E_{N_2O,i,t}$	Nitrous Oxide emissions due to Biomass Burning, as determined in equation 25, in CEA *i*, at time *t;* CO_2-e.
t	1, 2, 3 ...t* year of the baseline period
i	1,2,3....CEA, Carbon Estimation Areas

The above equation will also be used when estimating emissions from a post-deforestation biomass burn in the Project Scenario.

Step 5.4 Determining total GHG emissions from Biomass Burning within a CEA

Equation 26

$$E_{BSL,i,} = \sum_{t=1}^{t*} E_{BiomassBurn,i,t}$$

Where:

$E_{BSL,i}$	Sum of greenhouse gas emissions as a result of planned deforestation activities within CEA *i*, for the baseline scenario; t CO2-e
$E_{BiomassBurn,i,t}$	Non-CO_2 emissions due to biomass burning in CEA *i*, calculated in Section 11.1a – step 5.3; t CO_2-e year^{-1}
t	0; years
i	1,2,3….CEA, Carbon Estimation Areas

Step 6: Calculation of net greenhouse gas emissions and removals in the Baseline Scenario

Project proponents must now complete the formula below to calculate the net greenhouse gas emission and removals ($GHG_{NET\ BSL}$) in the baseline scenario using the parameters derived in Step 4 and 5.4.

Equation 27

$$GHG_{Net\ BSL} = \sum_{i=1}^{CEA} \left(\left(A_{NFP,i} * \Delta C_{BSL,i} \right) + E_{BSL,i} \right)$$

Where:

$GHG_{NET\ BSL}$	Net greenhouse gas emissions in the baseline from planned deforestation; t CO2-e
$A_{NFP,i}$	Area of CEA *i*; ha
$\Delta_{CBSL,i}$	Mean carbon stock changes in all pools in the baseline CEA *i*; t CO2-e ha-1 during 20 year project period.
$E_{BSL,i}$	Greenhouse gas emissions as a result of planned deforestation and land conversion activities within the project boundary, in CEA *i*, during the 20 year project period.
i	1, 2, 3 ... CEA, Carbon Estimation Areas

11.1b Supporting information for Item 11.1a – Green (Optional)

Provide any additional information to support or clarify the calculation of baseline emissions and/or sequestration in **11.1a** above.

To ensure that any remaining Non-Project Trees would not constitute a forest as defined in this methodology project proponents must ensure prior to completion of the first offsets report that the estimated number of Non-Project Trees falls **below** the minimum number of trees per hectare to achieve 20 per cent crown cover as defined in the table below.

Table 2.

Mature crown diameter per tree (m)	Crown area per tree at maturity (m2)	Crown area per tree at maturity (ha)	Minimum number of trees per hectare required for 20% crown cover (Crown cover of 20% divided by crown area per tree at maturity)
5.0	19.63	0.00196	102
4.5	15.90	0.00159	126
4.0	12.57	0.00126	159
3.5	9.62	0.00096	208
3.0	7.07	0.00071	283
2.5	4.91	0.00049	407
2.0	3.14	0.00031	637

If the number of Non-Project Trees left after clearing falls above the number of stems per hectare as defined in the table above this methodology may not be used.

11.2a Calculate the project emissions and/or sequestration – Blue (Required)

Provide instructions on how to calculate the project emissions and/or sequestration. The calculations must include all of the sources and sinks in the Greenhouse Gas Assessment Boundary, unless excluded and justified in Item 8.2.

This section calculates the net greenhouse gas emissions and removals in the project scenario in tCO_2-e arising from project activities. The output is the parameter $GHG_{NET\,P}$ which is used in section 11.5 to calculate net greenhouse gas abatement for the project.

All activities implemented in the project scenario must be described in a *project plan* which must be included with every offsets report.

Outside of the permitted activities detailed in Section 6.3a that will have a *de minimus* disturbance on the forest estate, all greenhouse gas emissions in the project scenario are equal to carbon sequestration through ongoing forest growth minus any emissions resulting from forest disturbance (both illegal and natural disturbances) and any emissions associated with the management of the Native Forest Protection Project.

In the initial *ex-ante* calculation of project emissions and removals, all natural and anthropogenic disturbance for the project scenario shall be assumed to be zero. If disturbance occurs during the project period project emissions and removals must be recalculated using monitored data and carbon accounts adjusted accordingly.

If disturbance has been detected, the spatial extent of the disturbance must be delineated as a new CEA in accordance with the requirements of Section 12.1a and 9.1a. The new CEA will remain separately delineated as a unique CEA for the remainder of the project, and must be accounted as such in all subsequent reporting periods. A new biomass survey must be undertaken within the newly designated CEA to determine post disturbance carbon stocks. The new CEA must be surveyed following the method described in section 10.1a.2 for surveying CEAs, or conservatively determine the carbon stock of the delineated area as zero. For the purpose of determining the change in carbon stocks for a disturbed CEA, the estimated carbon stocks of the original (un-delineated) CEA as reported in the previous offsets report is used.

It is not a requirement of this methodology for project proponents to monitor and calculate carbon stock change from forest growth in the project scenario of undisturbed forest however, project proponents may elect to do so. If project proponents elect to do so, they must undertake a detailed biomass sampling process consistent with the method described in Section 10.1a.2 within 6 months of the end of the reporting period.

At the end of the first and all subsequent reporting periods, data collected from monitored parameters must be collected in accordance with the requirements of section 12.1a and included in the equations below. Project proponents must consult section 12.1a, which details the requirements for detecting and measuring changes in the project area due to both anthropogenic and natural disturbances, as section 11.2a only accounts for the detected changes and does not provide guidance on the monitoring process.

Step 1: Calculating forest carbon stock changes in the project scenario, in each CEA, as a result of unplanned deforestation and or degradation.

This step determines emissions in any areas where deforestation or degradation have been detected in the project scenario. The output of this step will be $\Delta C_{pools,DEF,i,t}$ and $\Delta C_{pools,DEG,i,t}$. At the project start date these parameters will be equal to 0. At the end of all subsequent reporting periods, if any deforestation or degradation events have been detected, $\Delta C_{pools,DEF,i,t}$ and $\Delta C_{pools,DEG,i,t}$ must be calculated using the formulae below and adhering to the process described in section 12.1a.

Step 1.1: Detecting and accounting deforestation events during project implementation

Deforestation in the project scenario can occur from both anthropogenic and natural events. If **Deforestation** has been *detected* within a CEA within the reporting period then *delineate* the spatial extent of the deforestation event as a new CEA (See section 12.1a). Depending on the extent of the disturbance event project proponents may choose to either *re-survey* the area to calculate biomass stocks noting that a deforestation event may trigger notification requirements of the CFI Act, and may also constitute a significant reversal of sequestration and require the relinquishment of credits or other penalties in accordance with the CFI Act.

To quantify the effect of the deforestation event, project proponents must use the same process for forest survey used in calculating initial biomass stocks as described in section 10.1a.2 or conservatively elect to set carbon stocks at 0 in the deforested area. After determining post deforestation carbon stocks project proponents must complete the following formula:

Equation 28

$$\Delta C_{Pools,DEF,i,r} = C_{INV,i,pre} - C_{p,post,i,r}$$

Where:

$\Delta C_{pools,DEF,i,r}$	Mean carbon stock changes in all pools as a result of deforestation in the project case in CEA *i* for reporting period r; t CO_2e ha^{-1}
$C_{INV,i,pre}$	Mean carbon stock in all pools as reported at the time of the preceding offsets report in CEA *i* . If this is the first offsets report this will be equal to $C_{BSL,i,pre}$ as originally calculated at project start otherwise it will be equal to the last reported $C_{P,post,i,r}$;; t CO_2-e ha^{-1}; if this is the first offsets report following a disturbance event, CEA *i* means the original (un-delineated) CEA. Calculated using equation 12.
$C_{p,post,i,r}$	Mean carbon stock in all pools in the project case post-deforestation, in CEA *i* for reporting period r; t CO_2-e ha^{-1} Note: pools must be surveyed in accordance with the requirements described in section 10.1a.2 or alternatively maybe conservatively determined as 0.
i	1, 2, 3 ...*CEA* carbon estimation areas in the in the project case
r	Reporting Period *r;* dimensionless.

Step 1.2: Detecting and accounting degradation events during project implementation

Degradation in the project scenario might occur from both anthropogenic and natural events. Where thinning for ecological purposes is taking place, these activities must be monitored as a degradation event (even if it is only a temporary disturbance). Noting that degradation includes tree mortality following prescribed burns or wildfire. If **Degradation** is *detected* within a CEA on more than 5% or 50 hectares of the project area whichever is smaller, then *delineate* the spatial extent of the degradation event as a new CEA (See section 12.1a). Following a degradation disturbance event, project proponents must either *re-survey* the area to calculate biomass stocks (project proponents must use the same process for forest survey used in calculating initial biomass stocks as described in section 10.1a.2) or conservatively elect to set carbon stocks at zero in the degraded area. If resurveying is the elected option, the survey can only determine the biomass stocks of any remaining standing alive trees. All deadwood, standing or lying, is conservatively estimated to have a zero biomass. Steps 1.2 and 1.3 of this section account for changes in carbon stocks associated with a deforestation of degradation event. Methane and nitrous oxide emissions associated with such events are accounted for in Steps 3.1 and 3.2 of this section.

After determining post degradation carbon stocks project proponents must complete the following formula:

Equation 29

$$\Delta C_{Pools,DEG,i,r} = C_{INV,i,pre} - \left(C_{p,post,i,r} * (1 - NPT_i)\right)$$

Where

$\Delta C_{pools,DEG,i,r}$	Mean carbon stock changes in all pools as a result of degradation in the project case in CEA *i*; t CO2-e ha^{-1}
$C_{INV,i,pre}$	Mean carbon stock in all pools as reported at the time of the preceding offsets report in CEA *i* . If this is the first offsets report this will be equal to $C_{BSL,i,pre}$ as originally calculated at project start otherwise it will be equal to the last reported $C_{P,post,i,r}$; t CO_2-e ha^{-1}; if this is the first offsets report following a disturbance event, CEA *i* means the original (un-delineated) CEA. Calculated using equation 12.
$C_{P,post,i,r}$	Mean carbon stock in all pools in the project case post-degradation, in CEA *i*; t CO2-e ha^{-1} Note: pools must be surveyed in accordance with the requirements described in section 10.1a.2 or alternatively maybe conservatively determined as 0. If the proponent does undertake a survey they must convert the plot data into t CO2-e ha^{-1} for the delineated area.
NPT_i	Buffer representing the proportion of Non-Project Tree biomass within a of CEA_i estimated from in-field measurements and expressed as a decimal; determined in Section 11.1a – step 2.2. Where the CEA has been delineated from another CEA due to a disturbance event, NPT of the original, un-delineated, CEA is to be used.
i	1, 2, 3 ...*CEA* carbon estimation areas in the in the project case
r	Reporting period, *r; dimensionless*

Step 1.3: Determining net carbon stock change as a result of deforestation and/or degradation

Step 1.3.1: The net carbon stock changes, resulting from **deforestation,** in each Carbon Estimation Area within the reporting period are equal to the spatial extent of the disturbance event multiplied by the emissions as a result of the change in carbon pools. This is calculated by completing the formula below:

Equation 30

$$\Delta C_{P,DEF,i,r} = A_{DEF,i} * \Delta C_{pools,DEF,i,r}$$

Where:

$\Delta C_{P,Def,I,r}$	Net carbon stock changes in all pools as a result of deforestation in the project case, in CEA *i* during reporting period *r*; t CO2-e
$A_{DEF,i,t}$	Area of delineated deforestation event in the project area CEA *i* at time *t*; ha
$\Delta C_{pools,DEF,i,r}$	Mean carbon stock changes in all pools in the project case from the Deforestation event, in CEA *i*; t CO2-e ha^{-1}
i	1, 2, 3, ...*CEA* carbon estimation areas in the in the project case
r	Reporting period, *r;* dimensionless

Step 1.3.2: The net carbon stock changes, resulting from **degradation,** in each CEA within the reporting period are equal to the spatial extent of the degradation event multiplied by the emissions as a result of the change in carbon pools. This is calculated by completing the formula below:

Equation 31

$$\Delta C_{P,DEG,i,r} = A_{DEG,i} * \Delta C_{pools,DEG,i,r}$$

Where:

$\Delta C_{P,DEG,i,r}$	Net carbon stock changes in all pools as a result of degradation in the project case, in CEA *i* for reporting period *r*; t CO2-e
$A_{DEG,i}$	Area of delineated degradation event in the project area CEA *i*; ha
$\Delta C_{pools,DEG,i,,r}$	Mean carbon stock changes in all pools in the project case from the degradation event, in CEA *i* for reporting period *r*; t CO2-e ha^{-1}
i	1, 2, 3, ...*CEA* carbon estimation areas in the in the project case
r	Reporting period, *r;* dimensionless

Step 2: Determine carbon stock enhancements, to the forest estate in the project scenario

Accounting for carbon stock enhancements in the project scenario is an optional process as the omission of this step is conservative. If project proponents choose to undertake this process, the output is a determination of net carbon stock changes in each CEA as a result of forest carbon stock enhancement. Forest carbon stock enhancement may include both naturally occurring and human assisted growth in biomass stocks in a CEA.

If carbon stock enhancement is occurring across the project area, and project proponents wish to account for the change, a complete biomass survey is required to determine the growth in biomass stocks for all CEAs at the end of each reporting period. If carbon stock enhancements are only occurring within specific areas, or occurring at different rates across the project area then carbon stock enhancements can be surveyed in selected CEAs at the end of each reporting period. If the area of a CEA has changed as a result of a disturbance event and sample points that previously were within the CEA now fall outside the CEA, these sample points must be excluded from the calculation of mean carbon stock.

Step 2.1: Complete Primary Biomass Survey to determine current biomass carbon stocks in all CEAs where carbon stock enhancements are occurring

All CEAs that that are to be accounted for carbon stock enhancements must be surveyed in accordance with section 10.1a.2 to achieve the targeted precision in order to accurately measure any growth in biomass stocks between the previous biomass survey and the current time.

Net carbon stock changes as a result of forest carbon stock enhancement is calculated by completing the formula below:

Equation 32

$$\Delta C_{P,ENH,i,r} = (C_{P,i,r} * (1 - NPT_i) - C_{INV,i,pre}) * A_{ENH,i}$$

Where:

$\Delta C_{P,ENH,i,r}$	Net carbon stock changes as a result of forest carbon stock enhancement in CEA *i* for reporting period *r*; t CO2-e
$C_{P,i,r}$	Net carbon stock in all pools measured in the most recent biomass survey prior to completion of the offsets report in CEA *i* for reporting period *r*; t CO2-e ha^{-1} Note: To calculate $C_{p,i,r,}$ pools must be surveyed in accordance with the requirements described in section 10.1a.2 and proponents must convert plot data into t CO2-e ha^{-1}
$C_{INV,i,pre}$	Mean carbon stock in all pools as reported at the time of the preceding offsets report in CEA *i* . If this is the first offsets report this will be equal to $C_{BSL,i,pre}$ as originally calculated at project start otherwise it will be equal to the last reported $C_{P,post,i,r}$;; t CO_2-e ha^{-1}; if this is the first offsets report following a disturbance event, CEA *i* means the original (un-delineated) CEA. Calculated using equation 12.
$A_{ENH,i,}$	Project area in CEA *i* in which carbon stock enhancements are being undertaken and monitored; ha
NPT_i	Buffer representing the proportion of Non-Project Tree biomass within a of CEA_i estimated from in-field measurements and expressed as a decimal; determined in Section 11.1a – Step 2.2

i	1, 2, 3 ...*CEA* carbon estimation areas in the project scenario
r	Reporting period *r;* dimensionless

Step 3: Calculating emissions in the project scenario

Emissions in the project scenario must be monitored and reported on with every offsets report. Data must be recorded as described in Section 12.1 and 12.2. Emissions in this step are as a result of fire events and the combustion of fossil fuels.

Step 3.1: Determining emissions from degradation events involving fire event

Step 3.1.1: Determining mass of biomass burnt from fires

When determining emissions from any fire event, the project proponent must determine both the spatial extent of the burn and the fire type of the burn within the CEA to determine the mass of biomass burnt. The mass of biomass burnt from fire events will vary under wildfires and prescribed burns. In determining the mass of fuel burnt project proponents must complete the following formula that is based on the approach used in Australia's National Inventory. This approach is used as empirical data is not collected to estimate the fuel load in the forest at the time of a fire event. As dead wood and litter is excluded from the Baseline Scenario, it is assumed that any underestimation in fuel load by use of default figures will be offset by the underestimation of abatement achieved under the Project Scenario. Furthermore, as dead trees are not accounted in the Project Scenario accounts, any tree mortality following a fire event will be identified through Section 11.2a Step 1.2 – detecting and accounting degradation events, and conservatively assumed to contain no carbon.

Equation 33

$$BB_{fire,i,r} = A_{burn,i,r} * \mathrm{FL}_i * \mathrm{BE}_{bt,i}$$

Where:

$BB_{fire,i,r}$	Biomass Burnt from fires in CEA *i*, for reporting period *r;* t.d.m
$A_{burn,i,r}$	Area burnt in CEA *i* during reporting period *r*; ha
FL_i	Fuel Loading of CEA *i;* t.d.m ha^{-1} (data must be accessed from table 7.17 of the National Inventory Report, 2010: Volume 2)
BE_i	Burn efficiency for either prescribed burning or wildfires in CEA *i*, dimensionless (data must be accessed from table 7.19 of the National Inventory Report, 2010: Volume 2
bt	Burn type – either wildfire or prescribed burn

Step 3.1.2: Determining methane and nitrous oxide emissions from wildfires & prescribed burns

Once the mass of biomass burnt in each CEA is determined, proponents can use the output data to determine the methane and nitrous oxide emissions associated with the burning event.

3.1.2.1: Determine Methane Emissions from fire events

Equation 34

$$E_{CH_4,i,r} = BB_{fire,bt,i,r} * \mathrm{CF} * EF_{,i,g} * \mathrm{GWP} * \mathrm{MM}$$

3.1.2.2: Determine Nitrous Oxide Emissions from fire events

Equation 35

$$E_{N_2O,i,r} = BB_{fire,bt,i,r} * \mathrm{CF} * \mathrm{NC} * EF_{,i,g} * GWP_{g*} * MM$$

Step 3.1.3: Determine Emissions from Fire Events

Equation 36

$$E_{fire,i,t} = \sum_{bt} E_{CH_4,i,r} + E_{N_2O,i,r}$$

Where:

$E_{fire,i,t}$	GHG emissions due to fire events in CEA *i*, for reporting period *r;* CO_2-e.
$E_{CH_4,i,r}$	Methane emissions due to fire events in CEA *i*, for reporting period *r;* CO_2-e.
$E_{N_2O,i,r}$	Nitrous Oxide emissions due to fire events in CEA *i*, for reporting period *r;* CO_2-e.
CF	Carbon Mass fraction in vegetation (Proponents must use 0.5 for Forest Systems to remain consistent with the national inventory)
EF_g	Emission factor for gas species g; t element in species/t element in fuel burnt (data must be accessed from table 7.21 of the National Inventory Report, 2010: Volume 2
GWP_g	Global warming potential for gas g; t CO_2/t gas g (default values from IPCC SAR-100: CO_2 = 1; CH4 = 21; N2O = 310)
MM	Factor to convert elemental mass of gas species g to molecular mass data must be accessed from table 7.22 of the National Inventory Report, 2010: Volume 2

NC	Nitrogen to carbon ratio in biomass (Proponents must use 0.011 to remain consistent with the National Inventory)
g	1, 2, 3 ... G greenhouse gas (methane or nitrous oxide)
i	1, 2, 3 ...CEA Carbon Estimation Areas
t	0, 1, 2, 3, ... *t* years elapsed since the start of the project activity
bt	Burn type – either wildfire or prescribed burn

Step 3.2: Determining emissions from a deforestation event involving fire

If fire was a method used in the conversion of forest lands in the project area to grasslands or cropping in the project scenario, the project proponent must account for the nitrous oxide and methane emissions released during that event. In the event that biomass burning is occurring, project proponents must follow the process detailed in Section 11.1a –step 5.1 - 5.3 (equations 22, 23, 24, 25).

Step 3.3: Determining emissions from fossil fuel combustion

Emissions from fuel use for CEA *i* for reporting period *r* are to be calculated using the following formula:

Equation 37

$$E_{FC,\mathrm{i},r} = \sum_{g} \sum_{a} E_{g,a,i,r}$$

Where:

$E_{FC,\mathrm{i},r}$	Net emissions of fuel consumption in CEA *i* for reporting period *r*; t CO_2-e
$E_{g,a,i,r}$	Emissions of greenhouse gas *g* from consumption of fuel type *a,* for CEA *i* during reporting period *r* ; t CO_2-e, calculated in Step 3.3.1.
a	Fuel type *a* (e.g. diesel, E10, etc.)
g	Greenhouse gas type (carbon dioxide, methane & nitrous oxide)
i	1,2,3….CEA, Carbon Estimation Areas
r	Current reporting period; expressed as a date range

Step 3.3.1: Calculating emissions for fossil fuel types

Emissions of carbon dioxide, methane, and nitrous oxide from consumption of fossil fuels (i.e. Diesel, Gasoline etc) for reporting period *r* are to be calculated using the following formula:

Equation 38

$$E_{g,a,i,r} = \frac{Q_{a,i,r} * ECF_a * EF_{g,a}}{1000}$$

Where

$E_{g,a,i,r}$	Emissions of greenhouse gas *g* from consumption of fuel type *a,* for CEA *i* during reporting period *r* ; t CO_2-e
$Q_{a,i,r}$	The quantity of fossil fuel type *a* consumed in CEA *i* during reporting period *r* ; kiloliters.
ECF_a	Energy content factor of fossil fuel type a; gigajoules per kiloliter. Determined in Schedule 1, Part 3 of the National Greenhouse and Energy Reporting (Measurement) Determination 2008
$EF_{g,a}$	Emission factor for each gas type g for fossil fuel type a; kilograms of CO2-e per gigajoule. Determined in Schedule 1, Part 3 of the National Greenhouse and Energy Reporting (Measurement) Determination 2008
g	Greenhouse gas type (carbon dioxide, methane & nitrous oxide)
a	Fuel type a (e.g. diesel, Gasoline, etc.). Utilise lookup table in Schedule 1, Part 3 of the National Greenhouse and Energy Reporting (Measurement) Determination 2008
i	1,2,3….CEA, Carbon Estimation Areas
r	Current reporting period; expressed as a date range

Step 3.4: Determining the GHG emissions in the project scenario for a reporting period

Equation 39

$$E_{P,i,r} = \sum_{R_y=1}^{R_y} E_{FC,i,r} + E_{biomass\_burn,i,r} + E_{fire,\,i,\,r}$$

Where:

$E_{P,i,r}$	GHG emissions in the project scenario, in CEA *i,* for reporting period *r*; t CO2-e
$E_{FC,i,r}$	Emissions from fossil fuel combustion in CEA *i*, for reporting period *r*, calculated using the procedure in Step 3.3; t CO2-e
$E_{fire,i,r}$	N_2O and CH_4 emissions due to biomass burnt due to fires in CEA *i*, for reporting period *r*, calculated using the procedure in Step 3.1.3; t CO2-e

$E_{biomass\_burn,i,r}$	N_2O and CH_4 emissions due to biomass burnt due to converting forest to grassland or cropping in CEA *i*, for reporting period *r*, calculated using the procedure in Step 3.2.; t CO2-e
i	*1, 2, 3* ...CEA carbon estimation areas in the project scenario
R_y	0,1,2,3, … each year of reporting period *r*; years
r	Reporting period *r;* dimensionless

Step 4: Calculation of total net GHG project emissions for a reporting period and crediting period

Once any carbon stock depletions, carbon stock enhancements and/or GHG emissions have been calculated for each CEA in a reporting period, total net GHG project emissions must be calculated using the following formula:

Equation 40

$$GHG_{NET\ P} = \sum_{r=1}^{r} \sum_{i=1}^{CEA} \Delta C_{P,DEF,i,r} + \Delta C_{P,DEG,i,r} + E_{P,i,r} - \Delta C_{P,ENH,i,r}$$

Where:

$GHG_{NET\ P}$	Net CO2 equivalent emissions within the project boundary in the project case, in the project area for all reporting periods *r*; tCO_2-e
$\Delta C_{P,DEG,i,r,}$	Net carbon stock change as a result of any deforestation events in the project area in the project case in CEA *i* during reporting period *r (Calculated in Step 1.3.above)*; t CO2-e
$\Delta C_{P,DEF,I,r,}$	Net carbon stock change as a result of degradation events in the project case in CEA *i* during reporting period *r (Calculated in Step 1.3.1 above)*; t CO2-e
$E_{P,i,r,}$	GHG emissions within the project boundary in the project case in CEA *i* during reporting period *r (Calculated in Step 3 above)*; t CO2-e
$\Delta C_{P,ENH,I,r,}$	Net carbon stock change as a result of forest growth and sequestration during the project in areas projected to be deforested in the baseline in CEA *i* during reporting period *r (Calculated in step 2 above)*; t CO2-e
i	1, 2, 3 ...*CEA carbon estimation areas* in the project scenario
r	Reporting period *r;* dimensionless

11.2b Supporting information for Item 11.2a – Green (Optional)

Provide any additional information to support or clarify the calculation of project emissions and/or sequestration in Item **11.2a** above.

11.3a Account for leakage – Blue (Required)

Provide instructions on how to account for leakage arising from undertaking the proposed abatement activity. Leakage sources were identified in Item **8.3**.

Leakage for Native Forest Protection projects is mandatorily determined by the Department of Climate Change and Energy Efficiency. The most recent relevant leakage factor published by the Department of Climate Change and Energy Efficiency must be applied in equation 41.

11.3b Supporting information for Item 11.3a – Green (Optional)

Provide any additional information to support or clarify the accounting for leakage in Item **11.3a** above.

11.4a Account for cyclical variation – Blue (Required)

For sequestration projects, provide instructions on how to account for variations that are likely to occur in the amount of carbon stored as a result of climatic cycles or harvesting over 100 years.

Projects using this method have a crediting period of 20 years. After this time, proponents must seek to ensure the permanence of the carbon stock, as estimated at the conclusion of the crediting period.

Climatic variability may slow growth, but does not typically result in negative carbon stock change. There is no need to average for the effect of climatic variation because there is no risk of over-crediting. This is because the carbon stock does not drop below the previous amount credited, as growth is never negative.

Through the monitoring program, events that may negatively affect the carbon stocks will be identified. Through the required subsequent in field measurements such a reduction in carbon stocks will be quantified.

Note: Unpredictable and non-cyclical disturbances are not addressed through averaging. Under the CFI, proponents are not required to relinquish credits for carbon lost due to natural disturbance but must re- establish carbon stores. No units would be issued until the carbon store returned to pre-disturbance levels.

11.4b Justification for the approach taken in Item 11.4a – Green (Optional)

Provide a concise justification for the calculation in **11.4a.** Provide any additional information to support or clarify the calculations to account for cyclical variation above.

11.5a Calculate the net greenhouse gas abatement – Blue (Required)

Provide detailed instructions on how to calculate *net greenhouse gas abatement* for the reporting period. This will be the difference between the baseline and project emissions sources and sinks. The term for this abatement differs depending on the type of project being undertaken:

- Emissions avoidance projects– Net Abatement Amount
- Sequestration projects – Net Abatement Number
- Native Forest Protection Projects – Net Sequestration Number.

It is strongly recommended that the proposal includes an excel spreadsheet (or equivalent) that demonstrates the complete abatement estimation calculations, including allowances for each equation and all inputs identified under Item 11.1-11.4. It is important to demonstrate in this item that the net abatement calculation accurately calculates the abatement for offsets reporting as described by the methodology proposal.

This step calculates the net greenhouse gas abatement (GHG_{report}) for the project for the crediting period. It assumes that the abatement as determined at the end of the current reporting period is equal to the abatement at the end of the crediting period.

To account for the annualising of crediting see CFI Act Section 17 (3); the net abatement is adjusted (GHG_{NET}) so that at the end of the crediting period, credits claimed will reflect abatement achieved.

This is necessary in order to account for changes in carbon stocks during the crediting period. In the absence of this adjustment, projects would be over or under credited depending on the emissions profile over the crediting period. As a consequence of this adjustment, GHG_{net} calculated during a reporting period may be different than GHG_{report}. Due to this adjustment, this methodology is not applicable where the risk of reversal buffer is not equal to 5% or where credits are not annualised over a crediting period.

Project Proponents will report GHG_{NET} as the Net Sequestration Number for their project.

The following equation must be completed using the parameters derived in Section 11.1a and 11.2a.

Equation 41

$$GHG_{report} = GHG_{NET\ BSL} - GHG_{NET\ P} - GHG_{NET\ LK}$$

Where:

GHG_{report}	Net greenhouse gas abatement at the end of current reporting period; t CO_2-e
$GHG_{NET\ BSL}$	Net greenhouse gas emissions in the baseline from planned deforestation; t CO_2-e; determined in Section 11.1a Step 6
$GHG_{NET\ P}$	Net CO_2-e emissions in the project scenario as determined in section 11.2a Step 4
$GHG_{NET\ LK}$	The proportion of abatement leaked. Determined by applying leakage rate to total abatement. Project proponents must use an appropriate leakage factor as determined by the DCCEE.

Note: Non-permanence buffer is applied externally to the methodology

Project Proponents will report GHG_{NET} as the Net Sequestration Number for their project.

Equation 42

$$GHG_{NET} = \left(\frac{GHG_{report} - Credits}{Crediting\ Period - t_{start,cp} + R_y}\right) \times Crediting\ Period$$

Where:

GHG_{NET}	Net greenhouse gas abatement for the 20 year project period; t CO2-e
GHG_{report}	Net greenhouse gas abatement at the end of current reporting period; t CO2-e
$Credits$	The number of ACCUs already issued for the project under the CFI s divided by 0.95 to account for risk of reversal buffer

Crediting Period	The Crediting Period covering the project; years
$t_{start,cp}$	Years since the start of the crediting period; years
R_y	Length of the current reporting period; years.

11.5b Justification for the approach taken in Item 11.5a – Green (Optional)

Provide a concise statement describing and justifying the net abatement calculation in **11.5a**. Provide any additional information to support or clarify the calculation of net abatement.

Item 12: Project monitoring, record keeping and offsets reporting requirements

12.1a Project monitoring – Blue (Required)

Provide detailed instructions for monitoring the project. Monitoring should be undertaken between reports to ensure the project is achieving the anticipated abatement, sequestration has not been reversed, and to ensure compliance with notification requirements in the Act.

The monitoring instructions should include details of:

1. Required frequency of monitoring
2. Required equipment, apparatus instrument, data logger, or computer software needed
3. Australian Standards, or other relevant standards, that will need to complied with to use, calibrate and maintain measurement equipment or apparatus
4. Any qualifications or accreditation that operators will need to operate measurement equipment.

Overview of Monitoring

Monitoring is a continuous process and must commence at the start of the project.

A monitoring plan must be developed to monitor carbon stock changes and GHG emissions during project implementation including:

i. Natural disturbance events
ii. Unplanned deforestation events
iii. Degradation events
iv. Forest growth
v. Project emissions

The monitoring plan will form the basis for the generation of the offsets report which must be completed in a time frame that is consistent with the CFI regulation and Act – not less than twelve months and not greater than five years. For the purposes of this methodology the project proponent may choose any reporting period that is consistent.

The data collected from monitoring will be used to determine the sum of the carbon stock changes and GHG emissions under the project scenario [$GHG_{NET,P}$] for the reporting period as per the steps outlined in section 11.2a.

The data required for the monitoring report is outlined 12.2 and will be collected at different times and different intensities throughout the project scenario.

The plan may also elect to monitor any other key indicators/parameters considered relevant to the Native Forest Protection Project – this may incorporate a range of biodiversity, social or economic indicators.

Along with the requirements outlined in the CFI regulations and the ACT, the monitoring plan should document, for each component;

- A technical description of the monitoring task

- Documentation of data collection/survey procedures for the monitoring tasks
- A description of the data and parameters to be collected/assessed
- Details on the adherence to the CFI spatial mapping guidelines for collection of data
- Documentation on adherence to quality control and quality assurance procedures
- Details of all entities/individuals involved in the monitoring process, their required and their respective responsibilities

Requirements of Monitoring Plan:

Monitoring of carbon stock changes and GHG emissions during the crediting period

Project proponents must adopt an approach to monitoring changes in carbon stocks and GHG emissions that detects, delineates, surveys and accounts these changes.

- Detection: Detects a disruption to the forest estate
- Delineation: Delineates the spatial extent of the disruption
- Survey: utilizes a survey method to determine carbon stocks post disruption
- Account: Accounts for change

Monitoring for Deforestation, Degradation and Natural Disturbance

Project proponents must at a minimum undertake an assessment of any deforestation, forest degradation or natural disturbance no more than three months prior to the submission of an offset report.

Detection:

Remote sensing data (acquired and prepared in a method consistent with Section 9.1b, Step 2) must be used to analyse temporal changes to the project area and detect any disturbance in the project area since the last reporting period. Best practice in remote sensing image analysis must be followed when using these remote sensing techniques.

Delineation:
Once the detection assessment has been conducted, if any change has been identified resulting in greater than 5% canopy cover loss over an area equal to or greater than 50 ha, the spatial extent of the change zones must be delineated as a new CEA in accordance with the requirements of Section 9.1a. The new CEA will remain separately delineated as a unique CEA for the remainder of the project, and must be accounted as such in all subsequent reporting periods.

Survey:
The project proponent must conduct a new biomass-survey within the newly designated CEA to determine post disturbance carbon stocks. The new CEA must be surveyed following the method described in section 10.1a.2 for surveying CEAs, or conservatively determine the carbon stock of the delineated area as zero.

Account:
Project propents must follow the steps consistant with section 11.1a to reassess changes in carbon

stocks and emissions.

Monitoring Fossil Fuel Emissions: Recording of emissions data

All emissions data from the fossil fuel consumption must be continuously logged and supplied for each offsets report.

Monitoring of Forest Growth

It is conservative to assume that no carbon stock enhancement is occurring. Projects may elect to set $\Delta CP_{ENH,i,r} = 0$.

Or alternatively project proponents must use the process detailed in Section 11.2a – Step 2 for determining any carbon stock enhancements.

12.1b Additional information for Item 12.1a – Green (Optional)

Provide details of any additional information for **12.1a** above including forms, tables, spread sheets or computer software that assists in calculations, monitoring, data recording or record keeping if required. These documents can also be added as appendices in **Item 14** below.

12.2 Record keeping – Blue (Required)

Specify the records that must be retained for the project.

Records must be sufficiently detailed and comprehensive to enable an auditor to ascertain how an abatement estimate has been obtained and to assure the credibility of the estimate.

The Act and Regulations specify generic record keeping requirements for all projects. These are not required to be repeated below.

12.2.1 Data and evidence to determine project boundary and perform land cover assessment

See 9.1b(1)

12.2.2 Data and evidence to assess project eligibility and applicability

See section 6.4a

11.2.3 – Data requirements for remotely sensed imagery

See section 9.1b(2)

12.2.4 Biomass Survey Evidence and Data Requirements

Project proponents must record the following data and provide it as part of the project report:

i. Show the plot design (size, shape etc) that is consistent with the criteria in section 10.1a.2 - Step 1. Evidence can include a diagram of the plot design or photographs of an established plot within the project site.

ii. Number of plots estimated to achieve target precision as determined by 10.1a.2 - Step 4. Evidence must include a spreadsheet that details data collected in 10.1a.2- Step 3 and calculations from 10.1a.2 - Step 4. The data supplied in this section must include the validation of the sample size as per the requirements in 10.1a.2 - Step 9.

iii. Name of the pseudo-random number generator used to allocate plot points.

iv. Seed number used in the pseudo-random number generator.

v. Details on methods for setting up the plots. Evidence should be in the form of 1. a field manual or other documentation that outlines the steps field workers follow in navigating to, establishing plot boundaries and collecting plot data and 2. Photographic examples of field plots.

vi. Survey protocol for biomass surveys. Evidence should be in the form of 1. a field manual or other documentation that outlines all the steps field workers follow in navigating to, establishing plot boundaries and collecting plot data and 2. Photographic examples of field plots.

vii. Plot data including but not limited to :

   a. Species of each tree found in plot
   b. Measurement data for each tree measured in all plots surveyed
   c. The project name (NAME)
   d. the CEA number that points are allocated to (CEA_NUM)
   e. the unique identifier for plot (PLOT_NUM)
   f. the waypoint X coordinate in decimal degrees (X_VALUE)
   g. the waypoint Y coordinate in decimal degrees (Y_VALUE)
   h. Date of allocation points to the CEA (DATE_REG)

   Data may be provided in spreadsheet form for the project report, but project proponents must retain all hard and soft copy data such as log books, GIS data etc. for the purposes of audit for the life time of the project.

viii. Process/method for calibration for all survey equipment requiring calibration and dates of calibrations. Evidence may be in the form of documentation of calibration process and documentation of calibration dates signed by the field leader

ix. Training of field staff for biomass survey and/or destructive sampling. Evidence must include: training manuals, documentation of training dates, details of field staff including experience and qualifications

x. GPS unit specifications including the accuracy of each device used in the field

xi. Geospatial map comparing intended plot locations with realised plot locations

xii. Estimates of carbon stocks, as per Section 12.3

12.2.5 Data for Allometric equation development and reporting

The following must be documented into a report for each allometric function applied by a project proponent to estimate above ground biomass:

i. Unique identifier for the allometric equation

ii. The mathematical form for the allometric equation including parameter values
iii. The allometric domain for the allometric equation defined in accordance with section 10.1a.1, Step 2 and evidence that the equation was applied within the domain and area that the equation was validated for
iv. Details on plot size and shape
v. Number of plots as determined in Section 10.1a.1, Step 4
vi. Name of the pseudo-random number generator used to allocate plot points
vii. Seed number used in the pseudo-random number generator in Section 10.1a.1, Step 5
viii. Size-classes defined in Section 10.1a.1, Step 6
ix. Survey sheets from plots assigned for destructive sampling including:
    a. Unique identifier for each plot
    b. Latitude and longitude of plot waypoint in decimal degrees
    c. Species found in plot
    d. Unique identifier for each biomass sample tree
    e. Size-class represented by each biomass sample tree as determined in Section 10.1a.1, Step 6
    f. Measurements for each biomass sample tree from Section 10.1a.1, step 7
x. Method of random selection of trees from survey plots for destructive sampling used in Section 10.1a.1, Step 7
xi. Number of biomass sample trees selected for destructive sampling
xii. Unique identifier of each biomass sample tree selected for destructive sampling
xiii. Wet and dry weights and wet to dry ratios for biomass components for all biomass sample trees assessed in order to develop and/or validate the allometric equation
xiv. Regression plots showing the spread of data points and regression fit
xv. Plots showing the spread and distribution of the weighted residuals
xvi. The mean of the weighted residuals calculated in accordance with Section 10.1a.1 Step 12.3
xvii. the outcome of checks against conditions specified in Section 10.1a.1 Step 12.4.

12.2.6 Key monitoring data requirements

i. Management plans for all CEAs including;
    a. Any thinning for ecological/carbon purposes
    b. Any regeneration activities
    c. Any inputs to the forest estate
    d. Any management of feral/invasive
    e. Any agriculture or other land use that co-exists with the forest area
    f. Any other significant management activity that is occurring in the project zone
ii. Monitoring plan in accordance with Section 12.1a including methods for monitoring;
    a. Natural disturbance events
    b. Unplanned deforestation events
    c. Degradation events
    d. Forest growth
    e. Project emissions

iii. Data collected under the monitoring plan in accordance with Section 12.1a must be reported in the project offsets report, including;
  a. Spatial analysis of natural disturbance event including extent and survey data on impact on carbon stock
  b. Spatial analysis of unplanned deforestation event including extent and survey data on impact on carbon stock
  c. Spatial analysis of degradation event including extent and survey data on impact on carbon stock
  d. Survey data from permanent plots detailing changes in carbon stock
  e. Records relating to fuel use, for example invoices, vehicle logbooks, records of project activity, or reports of calculated consumption based on hourly or per hectare consumption rates, must be created and maintained

iv. Project proponents must show evidence of implementation of a management plan to manage the native forest to achieve a mix of trees, shrubs and understory species for which the mix reflects the structure and composition of the local native vegetation community. Evidence must include but is not limited to;
  a. A description of species compositions from national parks, flora reserves, state forests or any other managed native forest within the same IBRA Bioregion as the project area
  b. A management plan detailing what actions will be undertaken to achieve a mix of trees, shrubs and understory species for which the mix reflects the structure and composition of the local native vegetation community and a monitoring and evaluation framework with associated indicators for each action. Indicators should include at a minimum data on changes in species composition and age classes
  c. A report of progress on implementation of the management plan, including assessment of all indicators as per item b above

12.2.7 Carbon Account data requirements

All data relating to the accounting procedures in the methodology must be documented and submitted as part of the offsets report and all source data must be kept for 10 years after the offsets report was submitted to the Administrator.

Carbon account data requirements include;

i. Accounts that determine all emissions and carbon stock changes in the baseline scenario
ii. Accounts that determine all emissions and carbon stock changes in the project scenario for the reporting period total emissions from any disturbance events

12.3 Offsets Reporting – Blue (Required) Specify the information to be contained in an offsets report. Some data are essential and must be provided, including: • data required to identify and justify baseline scenarios and to support baseline estimation and resetting; • data required to estimate emissions and removals resulting from the project; and • information about project implementation or changes in environmental conditions that are required to determine whether the project remains within the scope of the methodology. The Act and Regulations specify generic offset reporting requirements for all projects. These are not required to be repeated below.
The offsets report must contain; • Estimated carbon stocks (Estimated using Equation 12) • Error associated with carbon stocks (Estimated using Equation 11) • Estimated net Baseline GHG emissions and removals ((Estimated using Equation 27) • Estimated net Baseline GHG emissions and removals (Estimated using Equation 27) • Estimated net Project GHG emissions and sequestration (Estimated using Equation 40) • Estimated abatement (Estimated using Equation 41 and 42) • Evidence requirements • Credits already issued • Time into the reporting period • Length of crediting period In addition see section 12.2 for further details of all evidence that must be presented with the offsets report.

Item 13: References

13.1 References – Green (Required)

Provide a full citation for all reports, papers and journal articles cited in the methodology proposal.

ABARE, Australian Bureau of Agricultural and Resource Economics (1999), *Australian Farm Surveys Report 1999*, Canberra.

American Carbon Registry (2011) American Carbon Registry Methodology for REDD – Avoiding Planned Deforestation, Version 1.0. Winrock International. http://americancarbonregistry.org/carbon-accounting/redd-2013-avoiding-planned-deforestation

Avoided Deforestation Partners (2010) REDD Methodology Modules VM0007. Verified Carbon Standard. http://v-c-s.org/methodologies/VM0007

Beers, T.W. (1977) Practical correction of boundary overlap. *Southern Journal of Applied Forestry* 1, 16-18.

Chave, J. *et al.* (2005) Tree allometry and improved estimation of carbon stocks and balance in tropial forests. *Oecologia* 145, 87-99.

DCCEE (Department of Climate Change and Energy Efficiency) (2011a) Carbon Farming (Quantifying Carbon Sequestration by Permanent Environmental Plantings of Native Species using the CFI Reforestation Modelling Tool) Methodology Determination 2012. Department of Climate Change and Energy Efficiency,. http://www.comlaw.gov.au/Details/F2012L01340

DCCEE (Department of Climate Change and Energy Efficiency) (2011b) Carbon Credits (Carbon Farming Initiative) Act 2011. C2011A00101 No. 101.

DCCEE (Department of Climate Change and Energy Efficiency) (2011c) Carbon Credits (Carbon Farming Initiative) Act 2011. SLI 2011 No. 268 Regulations as made.

DCCEE (Department of Climate Change and Energy Efficiency) (2012a) Drivers of Land Clearing In Australia: Australian National Greenhouse Gas Accounts Fact Sheet 3.

DCCEE (Department of Climate Change and Energy Efficiency) (2012b) Australian National Greenhouse Gas Accounts: National Inventory Report 2010 Department of Climate Change and Energy Efficiency. http://www.climatechange.gov.au/publications/greenhouse-acctg/national-inventory-report-2010.aspx

DCCEE (Department of Climate Change and Energy Efficiency) (2012c) Carbon Farming Initiative Mapping Guidelines. http://www.climatechange.gov.au/government/initiatives/carbon-farming-initiative/methodology-development/spatial-mapping-guidelines.aspx

Dietz, J. and Kuyah, S. (2011) *Guidelines for establishing regional allometric equations for biomass estimation through destructive sampling*. World Agroforestry Centre (ICRAF), United Nations Avenue, Gigiri

GreenCollar Climate Solutions (2011) Methodology for Improved Forest Management: Conversion from Logged to Protected Forest, Version 1.2 Verified Carbon Standard. http://www.v-c-s.org/methodologies/VM0010

NSW CMA (Catchment Management Authorities) (2012) Property Vegetation Plan). http://www.cma.nsw.gov.au/property-vegetation-plan.html

Picard, N*, et al.* (2012) *Manual for building tree volume and biomass allometric equations: from field measurements to prediction*. Food and Agricultural Organization of the United Nations, Rome and Centre de Coopération Internationale en Recherche Agronomique pour le Développement, Montpellier,

Schmid-Haas, P. (1969) Stichproben am waldrand, *Mitt Schweiz Anst Forst Versuchwes.* 45, 234-303.

Snowden, P*, et al.* (2002) NCAS Technical Report no. 31: Protocol for Sampling Tree and Stand Biomass. Australian Greenhouse Office.

Snowden, P. (1991) A ratio estimator for bias correction in logarithmic regressions. *Canadian Journal of Forest Research* 21, 720-724.

UN-REDD (2012) *Guidelines on Destructive Measurement of Forest Biomass Estimation*. UN REDD Vietnam Programme Vietnam Administration of Forestry Ministry of Agriculture and Rural Development, Hanoi, Vietnam

Walker, S*, et al.* (2012) *Standard Operating Procedures for Terrestrial Carbon Measurement: Version 2012*. Winrock International

Watson, R et al. (2000) IPCC Special Report: Land Use, Land-Use Change and Forestry, Cambridge University Press, Cambridge

Item 14: Appendices

14.1 Appendices – Green (Required) List below and append all relevant documentation necessary to assess the methodology including cited reports, papers and journal articles that are not publically available.
Appendix A – Comments and responses to comments received from the public comment process and DOIC review Appendix B – Partitioning of Biomass – Table 1 Appendix C – Flow charts of equations used in section 11. Appendix D – Main and supplementary legislation, which impacts specifically clearing of native vegetation in Australia Appendix E – Allometric equations for estimating biomass Appendix F – Example of Project Area with CEAs, EAs and NAPAs

Appendix A

SEE FILES:

- 'APPENDIX A – RESPONSES TO COMMENTS.DOCX'
- DOIC feedback 1.pdf
- DOIC feedback 2.pdf

Appendix B

SEE FILE 'Appendix B - Partitioning of biomass.DOCX'

Appendix C

SEE:

- For Baseline Accounts FILE ‘NSP FLOWCHART BSL.PDF’
- For Project Accounts FILE ‘NFP FLOWCHART P.PDF’
- For Total Abatement ‘NFP FLOWCHART NET.PDF’

Appendix D - Main and supplementary legislation, which impact specifically clearing of native vegetation in Australia.

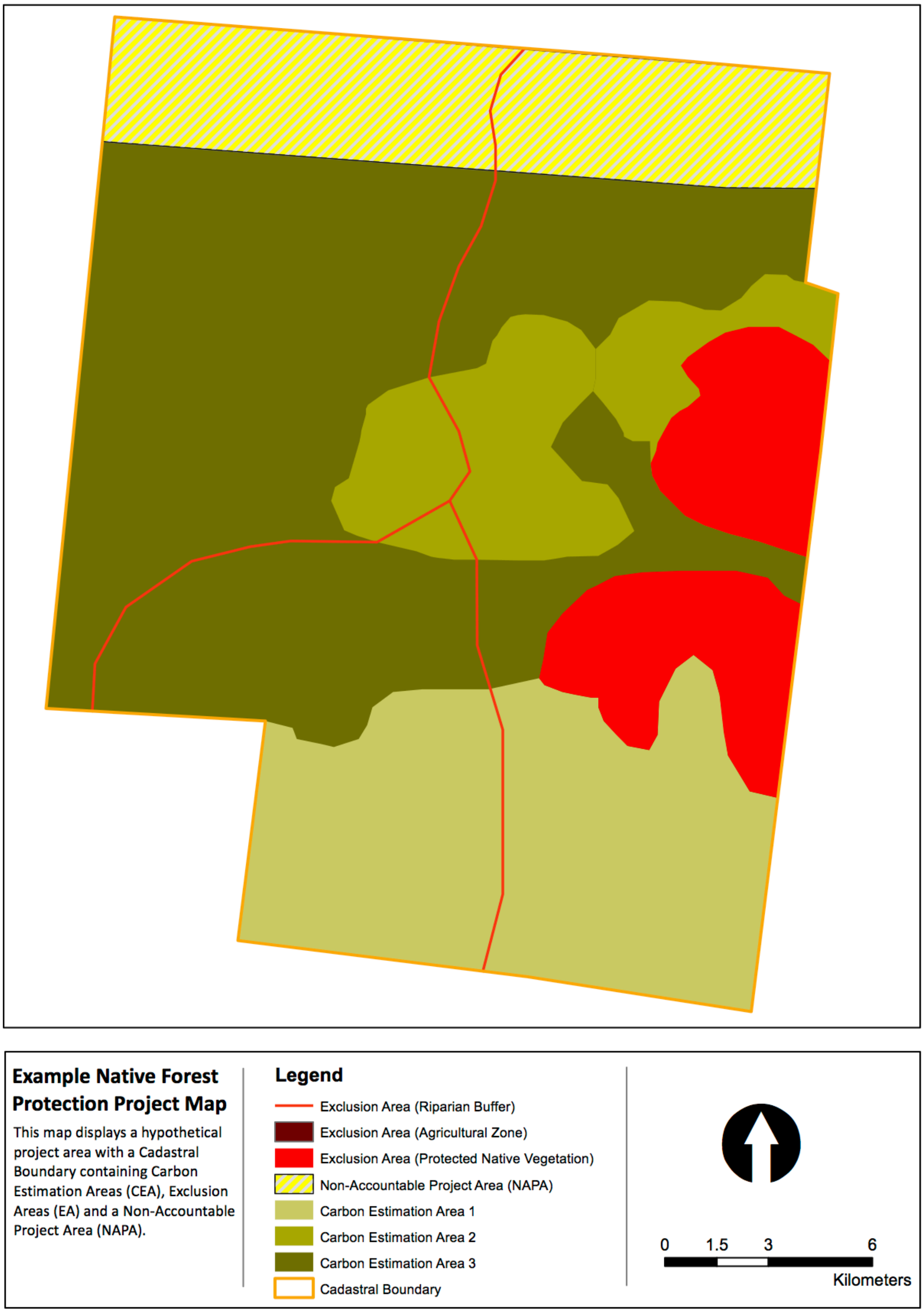
NSW	*Native Vegetation Act 2003*
	Threatened Species Conservation Act 1995
	Environmental Planning and Assessment Act 1979 (Local Environmental Plan)
Vic	Victorian Planning Provision (Clause 52.17)
	Planning and Environment Act 1987
	Flora & Fauna Guarantee Act 1988
	Catchment and Land Protection Act 1994
Qld	*Vegetation Management Act 1999*
	Integrated Planning Act 1997
	Nature Conservation Act 1992
WA	*Environmental Protection Act 1986*
SA	*Native Vegetation Act 1991*
Tas	*Forest Practices Act 1985*
ACT	*Planning and Development Act 2007*
	Nature Conservation Act 1980
NT	Planning Act
	NT Planning Scheme
	Pastoral Land Act

Appendix E - Allometric equations for estimating biomass

This appendix is included for the addition of any allometric equations in future variations.

No allometric equations are included at this time.

Appendix F – Example of Project Area with CEAs, EAs and NAPAs



Item 15: Disclosure

15.1 Confidential information – Green (Optional)

Clearly identify documents or parts of documents included as supporting information to the submission that are marked **CONFIDENTIAL** and should not be published. Confidential information must not be included in any of the blue items of this form.

Provide a reason why the document or part of document should not be published.

Acceptable justification would include that the information should not be published if it reveals, or could be capable of revealing:

- trade secrets; or
- any other matter having a commercial value that would be, or could reasonably be expected to be, destroyed or diminished if the information were disclosed.

Document/part of document	Reason for confidentiality

Item 16: Intellectual Property

16.1 Licensing – Blue (Required)

Any entity that submits a methodology proposal for assessment warrants that they own or have a licence to use all of the relevant intellectual property rights in the application submitted.

An application for assessment of a methodology proposal must be accompanied by a Creative Commons BY licence to allow the proposal to be copied, used and modified by DCCEE and others for any purpose relevant to the CFI.

Copyright in this document vests in **[applicant to insert the appropriate name].**

Creative Commons licence

All material in this publication is licensed under a Creative Commons Attribution 3.0 Australia Licence.

A summary of the licence terms is available from: http://creativecommons.org/licenses/by/3.0/au/deed.en. The full licence terms are available from http://creativecommons.org/licenses/by/3.0/au/legalcode.

This work (and any material sourced from it) should be attributed using the following wording:

Attribution parties: **[applicant to insert the name of the attribution parties – cl 4B(b)(i) of the Creative Commons BY licence]**

Title of the work: **[optional – applicant to insert title – cl 4B(b)(ii) of the Creative Commons BY licence]**

Item 17: Declaration

This application must be signed by a duly authorised representative of the proponent. The person signing should read the following declaration and sign below.

Division 137 of the Criminal Code makes it an offence for a person to give information to a Commonwealth entity if the person providing the information knows that the information is false or misleading. The maximum penalty for such an offence is imprisonment up to 12 months.

By signing below, the signatory acknowledges that he or she is an authorised representative of the proponent, and that all of the information contained in this application is true and correct. The signatory warrants that they own or have a licence to use all of the relevant intellectual property rights in the application submitted.

Information will not be publicly disclosed by DCCEE where it has been identified as confidential by the proponent.

Full name of the person signing as representative of the proponent	s47F		
Position	s 47F		
Signature	s47F	**Date**	11th March 2013

`