# REDUCED IMPACT LOGGING PRACTICES THAT REDUCE CARBON EMISSIONS (RIL-C) METHODOLOGY










Document Prepared by TerraCarbon LLC and The Nature Conservancy, and developed in partnership with the Tropical Forest Foundation

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## Relationship to Approved or Pending Methodologies

As of the date of submission, no approved or pending methodology under the VCS Program, or any other approved GHG program, is available accounting emission reductions from Reduced Impact Logging as a project activity.

## Table of Contents

1 Sources ..... 4
2 Summary Description of the Methodology ..... 4
3 Definitions ..... 5
4 Applicability Conditions ..... 5
5 Project Boundary ..... 6
6 Procedure for Determining the Baseline Scenario ..... 8
7 Procedure for Demonstrating Additionality ..... 8
8 Quantification of GHG Emission Reductions and Removals ..... 9
8.1 Baseline Emissions ..... 9
8.2 Project Emissions ..... 9
8.3 Leakage ..... 11
8.4 Summary of GHG Emission Reduction and/or Removals ..... 11
9 Monitoring ..... 12
9.1 Data and Parameters Available at Validation ..... 12
9.2 Data and Parameters Monitored ..... 14
9.3 Description of the Monitoring Plan ..... 20

## 1 SOURCES

Griscom, B., Ellis, P., Putz, F., 2013. Carbon emissions performance of commercial logging in East Kalimantan, Indonesia. *Global Change Biology* In press. doi: 10.1111/gcb.12386

Olson, D. M., Dinerstein, E., Wikramanayake, E. D., Burgess, N. D., Powell, G. V. N., Underwood, E. C., D'Amico, J. A., Itoua, I., Strand, H. E., Morrison, J. C., Loucks, C. J., Allnutt, T. F., Ricketts, T. H., Kura, Y., Lamoreux, J. F., Wettengel, W. W., Hedao, P., Kassem, K. R. 2001. Terrestrial ecoregions of the world: a new map of life on Earth. *Bioscience* 51(11):933-938.

## 2 SUMMARY DESCRIPTION OF THE METHODOLOGY

The project activity constitutes the implementation of one or more Reduced Impact Logging practices to reduce carbon emissions (hereafter termed RIL-C practices) in one or more of three emission source categories: timber felling, skidding and hauling. RIL-C practices may entail a range of improved logging and harvest planning practices, including, but not limited to, directional felling, improved log bucking (to permit greater recovery), improved harvest planning via pre-harvest inventory, skid trail planning and/or monocable winching, and reduction in width of haul roads and size of log landings.

The effectiveness of RIL-C practices, and accounting of emission reductions attributable to those practices, is assessed on the basis of their impacts post-harvest. Emission reductions are accounted applying a performance method approach, whereby an emission reduction (net of baseline and project emissions) is assigned as a function of the difference in measured impact (proxy) parameter between the project and a set crediting benchmark for each emission source category (felling, skidding and hauling). Emission reductions are quantified in units of t CO2/ha[1].

To ensure credible application of emission reductions, the impact parameters applied are quantitative and outcome-based, rather than process-based criteria that are typically limited to demonstrating that the practice is in place (but may provide no information on how successful the implementation of the practice is). Further, emission reductions are estimated as a continuous function with the (proxy) impact parameter values with which they correspond, providing better resolution of outcomes than a flat default factor. We ensure that emissions reductions achieved based on one impact parameter are not reversed by excessive emissions with respect to another impact parameter by requiring that all impact parameters must be at or below the crediting benchmark in order for credits to be generated based on any one impact parameter.

Accounting is further simplified by incorporating the assumptions that leakage equals zero and the wood products pool can be ignored because there is no difference in harvest levels between baseline and project scenarios - adoption of RIL-C practices which constitute the VCS project activity does not entail a reduction in harvest levels.

Accounting is focused on emissions at the time of harvest from operations including felling, skidding and hauling, and delayed emissions from belowground biomass. Any net sequestration from comparatively improved growth post-RIL-C harvest is conservatively ignored.

[1] T CO2/ha was chosen over t CO2/m^3 because it is often difficult to obtain accurate records of m^3 extracted and to avoid any perverse incentive to increase output of emission reductions by increasing harvest intensity.

Accounting emissions reductions starts on the project start date and is accounted on all harvests through the project crediting period. Application of the methodology requires no ex ante estimation.

*Methodology structure:* The current document is the framework for the methodology and outlines core accounting procedures. Key parameters (additionality benchmarks, crediting benchmarks, impact parameters and emission reduction equations) and monitoring procedures are provided in the RIL-C Performance Method Module.

| | |
|---|---|
| Additionality | Performance Method |
| Crediting Baseline | Performance Method |

## 3 DEFINITIONS

RIL-C –Reduced Impact Logging measures that reduce emissions from timber harvest in one or more of three emission source categories: felling, skidding and hauling. Component practices may include, but are not limited to, directional felling, improved log bucking, improved harvest planning via pre-harvest inventory, skid trail planning and/or long cable winching, and reduction in width of haul roads and size of log landings. Note that some practices may apply to more than one emission category (directional felling, for example, can serve to align logs with the planned skidding network, reducing skidding damage, and reduce damage to the felled log, improving roundwood recovery).

Additionality benchmark: The additionality benchmark defines the level of a given impact parameter below which a project proponent is deemed “additional.” This threshold should be conservative and strike a balance between restriction of freeloaders and feasibility of participation. This threshold may be different from (i.e. lower than) the crediting benchmark. Thus, while a project proponent must be below the additionality benchmark in order to receive any emissions reductions credits, once below the additionality benchmark, the amount of credits generated is measured from the crediting benchmark.

Crediting benchmark: The crediting benchmark defines the level of a given impact parameter below which emissions reductions may be credited.

Impact parameter – We use quantatitive impact parameters based on field measurements to define both crediting benchmarks and additionality benchmarks. Each impact parameter has an established empirical relationship with emissions levels, and is thus used as a proxy for emissions that can be readily measured in the field.

## 4 APPLICABILITY CONDITIONS

This methodology applies to project activities that implement Reduced Impact Logging (RIL) practices in forests. Examples of RIL include improved felling practices, skidding practices, and design of haul roads and log landings, to avoid unnecessary damage to non-commercial trees

Projects applying this methodology must meet the following applicability conditions:

1. The project activity involves no change in in harvest levels from the baseline practice, with no substantial (>20%) departures from the planned harvest volumes (i.e. the harvest volumes that would have occurred in the absence of the project activity).
2. Project proponent must hold legal authorization, for all logging activities referenced in the project, from the relevant government authority through the crediting period.
3. The project activity takes place within a specified geography[2] for which empirical measurements have been collected as the basis for crediting benchmarks, additionality benchmarks, and emissions reductions equations, which are available and validated.
4. The project does not occur on wetlands.

## 5 PROJECT BOUNDARY

### Geographic boundary

The project area is defined as the area over which the project proponent holds legal authorization from the relevant government authority to conduct timber harvest over the length of the project crediting period. The area in its entirety must meet the VCS definition of forest.

The boundary of the project area will be clearly delineated and documented with digital maps in the format specified by the VCS.

### Temporal boundary

The temporal boundary of the project is set from the project start date, marking the initial harvest on which RIL-C practices are implemented, and the end of the project crediting period. Accounting emissions reductions starts on the project start date and is accounted on all harvests through the project crediting period. No ex ante projections are necessary at project validation.

### Pools/sources

Pools included in the project boundary are restricted to above- and below-ground tree biomass. Emissions from fossil fuel combustion are conservatively excluded.

[2] A specified geography should be defined by broad parameters of consistent forest structure and composition, for example the WWF forested Ecoregions (Olson et. al. 2001). The major type of logging activity covered by empirical measurements within a given geography should also be specified. For example, if all commercial logging operations are covered within commercial logging concessions leased by the government, yet small scale logging for local use is not covered, this should be specified.

| Carbon pools | Included? | Justification/Explanation |
|---|---|---|
| Aboveground tree biomass | Yes | Always included – represents a significant pool affected by the project activity |
| Aboveground non-tree biomass | No | Conservatively excluded – this pool is expected to increase relative to the baseline as a result of the project activity (from reduced skidding damage) |
| Belowground biomass | Yes | Always included – represents a significant pool affected by the project activity |
| Dead wood | No | Dead wood stocks are conservatively ignored, acknowledging that live aboveground biomass retained uncut with RIL practices more than compensates for greater slash dead wood (but decomposing) without RIL |
| Harvested wood products | No | The applicability condition "The project activity involves no change in in harvest levels from the baseline practice" allows for exclusion of the wood products pool because there is no difference in harvest levels between baseline and project scenarios. |
| Litter | No | No significant change is expected in this pool as a result of the project activity |
| Soil | No | No significant change is expected in this pool as a result of the project activity |

| Source | | Gas | Included? | Justification/Explanation |
|---|---|---|---|---|
| Baseline | Fossil fuel emissions | $CO_2$ | No | Conservatively excluded - project activity is expected to result in lower emissions (from more efficient use of skidders) from use of machinery |
| | | $CH_4$ | No | Conservatively excluded - project activity is expected to result in lower emissions (from more efficient use of skidders) from use of machinery |
| | | $N_2O$ | No | Conservatively excluded - project activity is expected to result in lower emissions (from more efficient use of skidders) from use of machinery |

| Source | | Gas | Included? | Justification/Explanation |
|---|---|---|---|---|
| | | Other | | |
| Project | Fossil fuel emissions | $CO_2$ | No | Conservatively excluded - project activity is expected to result in lower emissions (from more efficient use of skidders) from use of machinery |
| | | $CH_4$ | No | Conservatively excluded - project activity is expected to result in lower emissions (from more efficient use of skidders) from use of machinery |
| | | $N_2O$ | No | Conservatively excluded - project activity is expected to result in lower emissions (from more efficient use of skidders) from use of machinery |
| | | Other | | |

## 6 PROCEDURE FOR DETERMINING THE BASELINE SCENARIO

The baseline scenario is a region-specific crediting benchmark set for each impact parameter (i.e. proxy factor). A case study of this is for East Kalimantan, Indonesia, is given in the RIL-C Performance Method Module.

## 7 PROCEDURE FOR DEMONSTRATING ADDITIONALITY

This methodology uses a performance method for the demonstration of additionality.

**Step 1: Regulatory Surplus**

Project proponents must demonstrate regulatory surplus in accordance with the rules and requirements regarding regulatory surplus set out in the latest version of the *VCS Standard*.

**Step 2: Performance Benchmark**

Projects must exceed the region-specific performance benchmark for each impact parameter (i.e. proxy factor), as demonstrated in the RIL-C Performance Method Module. One or more impact parameters are defined for each of three categories: felling impacts, skidding impacts, and hauling impacts (includes log landings). These are described in more detail in the next section.

A project can only accrue these emissions reductions for any one impact parameter if it is deemed “additional.” A project is deemed “additional” for any one impact parameter if that impact parameter is below the “additionality benchmark” assigned for that impact parameter. Also, all impact parameters must be at or below their respective crediting benchmarks in order for the project to be deemed additional, such that credits may be generated from any one or more impact parameters.

# 8 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

## 8.1 Baseline Emissions

## 8.2 Project Emissions

Baseline and project emissions are addressed simultaneously, whereby an emissions reduction value (in units of tons $CO_2$ reduced, i.e. net of baseline and project emissions) is assigned as a function of the difference between the impact parameter (proxy variable) in the project and in the crediting benchmark for each emission source category (felling, skidding and hauling). Assigned emissions reductions, expressed on a per hectare basis, are then summed for the three emission source categories, then multiplied by the number of hectares in the harvest area in year t.

STEP 1 Delineate harvest area in year t and calculate area in hectares

The harvest area will be delineated on the basis of paper maps or GIS files specifying the authorized harvest area in year t. From this area, delineate and exclude any un-stocked areas or areas where timber harvest and skidding would not be feasible (e.g. due to geographic features). Resulting area is calculated in hectares to produce parameter $A_t$.

STEP 2 Calculate emission reductions for each emission source category based on measured impact parameters.

$$\mathrm{ER}_{\mathrm{fell_AGB,t}} = \mathrm{f}_{\mathrm{AGB}}\ (\mathrm{FELL}_{\mathrm{t}}) \quad (1)$$

$$\mathrm{ER}_{\mathrm{skid_AGB,t}} = \mathrm{f}_{\mathrm{AGB}}\ (\mathrm{SKID}_{\mathrm{t}}) \quad (2)$$

$$\mathrm{ER}_{\mathrm{haul_AGB,t}} = \mathrm{f}_{\mathrm{AGB}}\ (\mathrm{HAUL}_{\mathrm{t}}) \quad (3)$$

$$\mathrm{ER}_{\mathrm{fell_BGB,t}} = \mathrm{f}_{\mathrm{BGB}}\ (\mathrm{FELL}_{\mathrm{t}}) \quad (4)$$

$$\mathrm{ER}_{\mathrm{skid_BGB,t}} = \mathrm{f}_{\mathrm{BGB}}\ (\mathrm{SKID}_{\mathrm{t}}) \quad (5)$$

$$\mathrm{ER}_{\mathrm{haul_BGB,t}} = \mathrm{f}_{\mathrm{BGB}}\ (\mathrm{HAUL}_{\mathrm{t}}) \quad (6)$$

Where:

| | |
|---|---|
| $FELL_t$ | Felling impact parameter measured in year *t*; units as specified in Module RIL-SF |
| $SKID_t$ | Skidding impact parameter measured in year *t*; units as specified in performance method module. |
| $HAUL_t$ | Hauling impacts measured in year *t*; units as specified in performance method module. |
| $ER_{fell_AGB,t}$ | Emission reductions from aboveground biomass related to felling in year *t*; t CO2 emission reduction/ha |
| $ER_{skid_AGB,t}$ | Emission reductions from aboveground biomass related to |

| | |
|---|---|
| | skidding in year *t*; t CO2 emission reduction/ha |
| $ER_{haul_AGB,t}$ | Emission reductions from aboveground biomass related to hauling in year *t*; t CO2 emission reduction/ha |
| $ER_{fell_BGB,t}$ | Emission reductions from belowground biomass related to felling in year *t*; t CO2 emission reduction/ha/year |
| $ER_{skid_BGB,t}$ | Emission reductions from belowground biomass related to skidding in year *t*; t CO2 emission reduction/ha/year |
| $ER_{haul_BGB,t}$ | Emission reductions from belowground biomass related to hauling in year *t*; t CO2 emission reduction/ha/year |
| *t* | 1, 2, 3, …*t* years elapsed since the start of the RIL project activity |

One or more impact parameters may be identified for each of the three emissions source categories (felling, skidding, hauling). When more than one impact parameter is identified for an emissions source category (e.g. *FELL1* and *FELL2*), they must be measures of distinct (non-overlapping) components of that emissions source category.

STEP 3 Sum all emission reductions. All impact parameters must be at or below their respective crediting benchmarks in order for credits to be generated from any impact parameters.

$$\mathrm{RILC_{AGB,t}} = \mathrm{ERF_{fell_AGB,t}} + \mathrm{EF_{skid_AGB,t}} + \mathrm{EF_{haul_AGB,t}} \quad (7)$$

$$\mathrm{RILC_{BGB,t}} = \mathrm{EF_{fell_BGB,t}} + \mathrm{EF_{skid_BGB,t}} + \mathrm{EF_{haul_BGB,t}} \quad (8)$$

If $ER_{Fellt}$ and/or $ER_{Skidt}$ and/or $ER_{Hault} < 0$, then $RILC_{AGBt} = 0$ and $RILC_{BGBt} = 0$.

Where:

| | |
|---|---|
| $RILC_{,AGB,t}$ | Combined emission reductions from aboveground biomass from RIL-C in year *t*; t CO2 emission reduction/ha |
| $RILC_{,BGB,t}$ | Combined emission reductions from belowground biomass from RIL-C in year *t*; t CO2 emission reduction/ha/year |
| $ER_{fell_AGB,t}$ | Savings factor for emissions from aboveground biomass related to felling in year *t*; t CO2 emission reduction/ha |
| $ER_{skid_AGB,t}$ | Emissions reductions from aboveground biomass related to skidding in year *t*; t CO2 emission reduction/ha |
| $ER_{haul_AGB,t}$ | Emissions reductions from aboveground biomass related to hauling in year *t*; t CO2 emission reduction/ha |
| $ER_{fell_BGB,t}$ | Emissions reductions from belowground biomass related to felling in year *t*; t CO2 emission reduction/ha/year |
| $ER_{skid_BGB,t}$ | Emissions reductions from belowground biomass related to skidding in year *t*; t CO2 emission reduction/ha/year |
| $ER_{haul_BGB,t}$ | Emissions reductions from belowground biomass related to hauling in year *t*; t CO2 emission reduction/ha/year |
| *t* | 1, 2, 3, …*t* years elapsed since the start of the RIL project activity |

STEP 4 Multiply sum of emission reductions by area of harvest

Emission reductions from the aboveground biomass pool are emitted at the time of harvest in year *t*. Emission reductions from the belowground biomass pool are applied annually over a 10 year period post-harvest (annual emission reductions from belowground biomass are equal to 1/10 of the total emission reduction). Thus, for a given year *t*, annual emission reductions from belowground biomass are summed across areas harvested from time *t-10* up to time *t*.

$$C_{RIL,t} = A_t * RILC_{AGB,t} + \sum_{t-10}^{t} A_t * RILC_{BGB,t} \quad (9)$$

Where:

| | |
|---|---|
| $C_{RIL,t}$ | Total emission reductions at time *t*; t $CO_2$-e |
| $RILC_{,AGB,t}$ | Combined emission reductions from aboveground biomass from RIL-C in year *t*; t CO2 emission reduction/ha |
| $RILC_{,BGB,t}$ | Combined emission reductions from belowground biomass from RIL-C in year *t*; t CO2 emission reduction/ha/year |
| $A_t$ | Area of authorized harvest in year *t*; hectares |
| *t* | 1, 2, 3, …*t* years elapsed since the start of the RIL project activity |

## 8.3 Leakage

The applicability condition "The project activity involves no change in in harvest levels from the baseline practice" allows for incorporating the assumption that leakage equals zero because there is no difference in harvest levels between baseline and project scenarios - adoption of RIL-C practices (which constitutes the VCS project activity) does not entail a reduction in harvest levels. Thus, parameter $LE_t$, leakage in year *t*, is always equal to zero.

## 8.4 Summary of GHG Emission Reduction and/or Removals

*Uncertainty*

Sources of uncertainty in this approach include uncertainty around calculation of emission reductions from impact parameters and uncertainty around estimates of impact parameters. These two sources of uncertainty are addressed through setting demonstrably conservative emission reductions. Methods for including deductions in the calculations of emissions reductions, as a function of uncertainty, are described in the performance method module. The degree of uncertainty itself is limited through imposed minimum sampling intensity requirements for estimation of impact parameters (see RIL-C Performance Method Module). It is assumed that area bounds, $A_t$, are known exactly.

Net GHG emission reductions are calculated by subtracting leakage from emission reductions, as follows:

$$ER_t = C_{RIL,t} - LE_t \quad (10)$$

*Where:*

$ER_T$ Net GHG emissions reductions in year *t*; t $CO_2$-e
$C_{RIL,t}$ Total emission reductions at time *t*; t $CO_2$-e
$LE_t$ Leakage in year *t;* t $CO_2$-e

Note that $LE_t$ is equal to zero (see section 8.3, and applicability conditions).

# 9 MONITORING

## 9.1 Data and Parameters Available at Validation

| | |
|---|---|
| Data Unit / Parameter: | $f_{AGB}$ $(FELL_t)$ |
| Data unit: | Dimensionless |
| Description: | Equation estimating emissions reductions from aboveground biomass related to felling in year *t* ($ER_{fell_AGB,t}$) as a function of felling impacts measured in year t ($FELL_t$) |
| Source of data: | See case study in RIL-C Performance Method Module. |
| Justification of choice of data or description of measurement methods and procedures applied: | |
| Any comment: | |

| | |
|---|---|
| Data Unit / Parameter: | $f_{BGB}$ $(FELL_t)$ |
| Data unit: | Dimensionless |
| Description: | Equation estimating emissions reductions from belowground biomass related to felling in year *t* ($ER_{fell_BGB,t}$) as a function of felling impacts measured in year t ($FELL_t$) |
| Source of data: | See case study in RIL-C Performance Method Module. |
| Justification of choice of data or description of measurement methods and procedures applied: | |

| | |
|---|---|
| Any comment: | |

| | |
|---|---|
| Data Unit / Parameter: | $f_{AGB}$ $(SKID_t)$ |
| Data unit: | Dimensionless |
| Description: | Equation estimating emissions reductions from aboveground biomass related to skidding in year *t* ($ER_{skid_AGB,t}$) as a function of skidding impacts measured in year t ($SKID_t$) |
| Source of data: | See case study in RIL-C Performance Method Module. |
| Justification of choice of data or description of measurement methods and procedures applied: | |
| Any comment: | |

| | |
|---|---|
| Data Unit / Parameter: | $f_{BGB}$ $(SKID_t)$ |
| Data unit: | Dimensionless |
| Description: | Equation estimating savings factor for emissions from belowground biomass related to skidding in year *t* ($ER_{skid_BGB,t}$) as a function of skidding impacts measured in year t ($SKID_t$) |
| Source of data: | See case study in RIL-C Performance Method Module. |
| Justification of choice of data or description of measurement methods and procedures applied: | |
| Any comment: | |

| | |
|---|---|
| Data Unit / Parameter: | $f_{AGB}$ $(HAUL_t)$ |
| Data unit: | Dimensionless |
| Description: | Equation estimating savings factor for emissions from aboveground biomass related to hauling in |

| | |
|---|---|
| | year *t* ($ER_{haul_AGB,t}$) as a function of hauling impacts measured in year t ($HAUL_t$) |
| Source of data: | See case study in RIL-C Performance Method Module. |
| Justification of choice of data or description of measurement methods and procedures applied: | |
| Any comment: | |

| | |
|---|---|
| Data Unit / Parameter: | $f_{BGB}$ $(HAUL_t)$ |
| Data unit: | Dimensionless |
| Description: | Equation estimating savings factor for emissions from belowground biomass related to hauling in year *t* ($ER_{haul_BGB,t}$) as a function of hauling impacts measured in year t ($HAUL_t$) |
| Source of data: | See case study in RIL-C Performance Method Module. |
| Justification of choice of data or description of measurement methods and procedures applied: | |
| Any comment: | |

## 9.2 Data and Parameters Monitored

| | |
|---|---|
| Data Unit / Parameter: | $A_t$. |
| Data unit: | Ha |
| Description: | Area of authorized harvest in year *t*. Note that this area excludes any un-stocked areas or areas where timber harvest and skidding would be infeasible (e.g. due to geographic features). |
| Source of data: | Paper maps or GIS files |
| Description of measurement methods and | |

| | |
|---|---|
| procedures to be applied: | |
| Frequency of monitoring/recording: | Following completion of each annual harvest. |
| QA/QC procedures to be applied: | |
| Any comment: | |

| | |
|---|---|
| Data Unit / Parameter: | $FELL_t$ |
| Data unit: | units as specified in RIL-C Performance Method Module |
| Description: | Felling impact parameter, measured in year t |
| Source of data: | |
| Description of measurement methods and procedures to be applied: | See case study procedures as specified in RIL-C Performance Method Module |
| Frequency of monitoring/recording: | Following completion of each annual harvest. |
| QA/QC procedures to be applied: | |
| Any comment: | |

| | |
|---|---|
| Data Unit / Parameter: | $SKID_t$ |
| Data unit: | units as specified in RIL-C Performance Method Module |
| Description: | Skidding impact parameter, measured in year t |
| Source of data: | |
| Description of measurement methods and procedures to be applied: | See case study procedures as specified in RIL-C Performance Method Module |
| Frequency of monitoring/recording: | Following completion of each annual harvest. |
| QA/QC procedures to be applied: | |
| Any comment: | |

| | |
|---|---|
| Data Unit / Parameter: | $HAUL_t$ |

| | |
|---|---|
| Data unit: | units as specified in RIL-C Performance Method Module |
| Description: | Hauling impact parameter, measured in year t |
| Source of data: | |
| Description of measurement methods and procedures to be applied: | See case study procedures as specified in RIL-C Performance Method Module |
| Frequency of monitoring/recording: | Following completion of each annual harvest. |
| QA/QC procedures to be applied: | |
| Any comment: | |

| | |
|---|---|
| Data Unit / Parameter: | $ER_{fell_AGB,t}$ |
| Data unit: | t CO2 emission reduction/ha |
| Description: | Emissions reductions from aboveground biomass related to felling in year t |
| Source of data: | See case study in RIL-C Performance Method Module. |
| Description of measurement methods and procedures to be applied: | |
| Frequency of monitoring/recording: | Following completion of each annual harvest. |
| QA/QC procedures to be applied: | |
| Any comment: | |

| | |
|---|---|
| Data Unit / Parameter: | $ER_{skid_AGB,t}$ |
| Data unit: | t CO2 emission reduction/ha |
| Description: | Emissions reductions from aboveground biomass related to skidding in year t |
| Source of data: | See case study in RIL-C Performance Method Module. |
| Description of measurement methods and procedures to be applied: | |
| Frequency of monitoring/recording: | Following completion of each annual harvest. |
| QA/QC procedures to be applied: | |

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|---|---|
| Any comment: | |

| | |
|---|---|
| Data Unit / Parameter: | $ER_{haul_AGB,t}$ |
| Data unit: | t CO2 emission reduction/ha |
| Description: | Emissions reductions from aboveground biomass related to hauling in year t |
| Source of data: | See case study in RIL-C Performance Method Module. |
| Description of measurement methods and procedures to be applied: | |
| Frequency of monitoring/recording: | Following completion of each annual harvest. |
| QA/QC procedures to be applied: | |
| Any comment: | |

| | |
|---|---|
| Data Unit / Parameter: | $ER_{ell_BGB,t}$ |
| Data unit: | t CO2 emission reduction/ha/year |
| Description: | Emissions reductions from belowground biomass related to felling in year t |
| Source of data: | See case study in RIL-C Performance Method Module. |
| Description of measurement methods and procedures to be applied: | |
| Frequency of monitoring/recording: | Following completion of each annual harvest. |
| QA/QC procedures to be applied: | |
| Any comment: | Emission reductions from the belowground biomass pool are applied annually over a 10 year period post-harvest (annual emission reductions from belowground biomass are equal to 1/10 of the total emission reduction). |

| | |
|---|---|
| Data Unit / Parameter: | $ER_{skid_BGB,t}$ |
| Data unit: | t CO2 emission reduction/ha/year |
| Description: | Emissions reductions from belowground biomass related to skidding in year t |
| Source of data: | See case study in RIL-C Performance Method Module. |
| Description of measurement methods and procedures to be applied: | |
| Frequency of monitoring/recording: | Following completion of each annual harvest. |
| QA/QC procedures to be applied: | |
| Any comment: | Emission reductions from the belowground biomass pool are applied annually over a 10 year period post-harvest (annual emission reductions from belowground biomass are equal to 1/10 of the total emission reduction). |

| | |
|---|---|
| Data Unit / Parameter: | $RILC_{,AGB,t}$ |
| Data unit: | t CO2 emission reduction/ha |
| Description: | Emission reductions from aboveground biomass from RIL-C in year t |
| Source of data: | Calculated |
| Description of measurement methods and procedures to be applied: | |
| Frequency of monitoring/recording: | Following completion of each annual harvest. |
| QA/QC procedures to be applied: | |
| Any comment: | |

| | |
|---|---|
| Data Unit / Parameter: | $RILC_{,BGB,t}$ |

| | |
|---|---|
| Data unit: | t CO2 emission reduction/ha/year |
| Description: | Emission reductions from belowground biomass from RIL-C in year t |
| Source of data: | Calculated |
| Description of measurement methods and procedures to be applied: | |
| Frequency of monitoring/recording: | Following completion of each annual harvest. |
| QA/QC procedures to be applied: | |
| Any comment: | Emission reductions from the belowground biomass pool are applied annually over a 10 year period post-harvest (annual emission reductions from belowground biomass are equal to 1/10 of the total emission reduction). |

| | |
|---|---|
| Data Unit / Parameter: | $C_{RIL,t}$ |
| Data unit: | t $CO_2$-e |
| Description: | Total emission reductions at time *t* |
| Source of data: | Calculated |
| Description of measurement methods and procedures to be applied: | |
| Frequency of monitoring/recording: | Following completion of each annual harvest. |
| QA/QC procedures to be applied: | |
| Any comment: | |

| | |
|---|---|
| Data Unit / Parameter: | $LE_t$ |
| Data unit: | t $CO_2$-e |
| Description: | Leakage in year *t* |
| Source of data: | |
| Description of measurement methods and procedures to be applied: | |
| Frequency of monitoring/recording: | |
| QA/QC procedures to be applied: | |
| Any comment: | The applicability condition “The project activity |

| | |
|---|---|
| | involves no change in in harvest levels from the baseline practice" allows for incorporating the assumption that leakage equals zero because there is no difference in harvest levels between baseline and project scenarios - adoption of RIL-C practices (which constitutes the VCS project activity) does not entail a reduction in harvest levels. Thus, parameter $LE_t$, leakage in year *t*, is always equal to zero. |

| | |
|---|---|
| Data Unit / Parameter: | $ER_T$ |
| Data unit: | t $CO_2$-e |
| Description: | Net GHG emission reductions in year *t* |
| Source of data: | Calculated |
| Description of measurement methods and procedures to be applied: | |
| Frequency of monitoring/recording: | Following completion of each annual harvest. |
| QA/QC procedures to be applied: | |
| Any comment: | |

## 9.3 Description of the Monitoring Plan

Monitored parameters and sampling and measurements procedures reference the RIL-C Performance Method Module.

Monitoring must be conducted immediately following completion of each annual harvest.