Carbon Credits (Carbon Farming Initiative—Reforestation and Afforestation 2.0) Methodology Determination 2015

I, Greg Hunt, Minister for the Environment, make the following determination.

Dated   8 : 5: 2015

GREG HUNT

Greg Hunt
Minister for the Environment

Contents

Part 1—Preliminary

1 Name

This is the *Carbon Credits (Carbon Farming Initiative—Reforestation and Afforestation 2.0) Methodology Determination 2015*.

2 Commencement

This determination commences on the day after it is registered.

3 Authority

This determination is made under subsection 106(1) of the *Carbon Credits (Carbon Farming Initiative) Act 2011*.

4 Duration

This determination remains in force for the period that:
  (a) begins when this determination commences; and
  (b) ends on the day before this instrument would otherwise be repealed under subsection 50(1) of the *Legislative Instruments Act 2003*.

5 Definitions

In this determination:

Act means the *Carbon Credits (Carbon Farming Initiative) Act 2011*.

actual location coordinates means spatial coordinates that are collected on the ground using a global positioning system, and that define the location of plots, biomass sample plots and biomass sample trees.

actual plot size means the area of a plot as physically measured on the ground.

allometric data range means the range between the smallest and largest predictor measures included within an allometric dataset.

allometric dataset means predictor measures and biomass measurements recorded from biomass sample trees that are used to develop an allometric function.

allometric domain means the specific conditions under which an allometric function is applicable.

allometric function means a species-specific regression function fitted to a scatter of data-points that relates predictor measures collected through a non-destructive measurement process to a measure of the weight of biomass within a project tree, and includes stratum specific and regional functions.

allometric report means a document that describes a project proponent's approach to the development of allometric functions, including descriptions of allometric data, allometric domain, regression fitting processes and outcomes of checks against regression fit requirements.

belt plantings means discrete patches of project trees that have been established in a linear or curvilinear 'belt' pattern where width measured across the belt is no wider than 50 metres.

biomass means vegetation-derived organic matter.

biomass component of a tree means a component according to a categorisation that divides its elements into at least:
  (a) the following above-ground components:
    (i) stem;
    (ii) branches;
    (iii) crown;
    (iv) dead material, including dead branches, dead stem and dead crown, attached to the biomass sample tree; and
  (b) the following below-ground components:
    (i) tap root or lignotuber;
    (ii) the lateral roots.

biomass sample plot means an area of land that occurs within a biomass sample site and is delineated in accordance with Part 4.

biomass sample site means an area of land in which biomass sample plots are randomly located and biomass sample trees are randomly selected, for the purposes of developing a regional function.

biomass sample tree means a tree selected for destructive sampling in order to develop, update or extend an allometric function.

branches means the hard, woody above-ground support elements of a tree that are connected to the stem, support the crown, and have a distinct, thick bark layer.

block plantings means discrete patches of project trees that have been established so the average minimum width is greater than 50 metres.

bulked sample means a sample of litter collected through combining 4 smaller samples into a single sample.

carbon fraction means the proportion, by weight, of dry organic matter that is composed of carbon.

carbon stock means the quantity of carbon, expressed as carbon dioxide equivalent, held within project forest biomass.

centroid option means a plot established so that the actual location coordinates are located at the centre of the plot.

CFI function means a stratum-specific or regional function that was developed in compliance with a CFI methodology determination (whether or not the determination has since ceased to be in force).

CFI Mapping Guidelines means the guidelines known as the Carbon Farming Initiative (CFI) Mapping Guidelines, as published from time to time, to be used for mapping project areas and strata within project areas, and available on the Department's website.

closing carbon stock means the quantity of carbon, expressed as carbon dioxide equivalent, estimated to be held within the project forest biomass occurring within a stratum at the end of a reporting period.

consistent edge option means a plot established so that:
  (a) the starting edge passes through the actual location coordinates and is aligned perpendicular to the orientation of the edges of a belt planting; and
  (b) if a belt planting has:
      (i) an east-west orientation—the plot is laid out toward the most westerly end of the belt planting; or
      (ii) an orientation other than east-west—the plot is laid out toward the most southerly end of the belt planting; and
  (c) the plot extends across the full width of the belt planting.

constant position option means a plot established so that the actual location coordinates are located at the same relative position on the plots, for example, the most southern and eastern corner.

crown means non-woody, above-ground tree structures that include twigs, petioles, and leaves, and that are involved in photosynthesis or supporting photosynthetic structures.

crown cover means the amount of land covered by the outer limits of the crown (viewed as a horizontal cross-section) of a tree, or collection of trees.

crown radius, for a stratum, means:
  (a) if an average expected radius of a fully mature project tree in the stratum can be reliably estimated—that radius; and
  (b) otherwise—2 metres.

dead standing fire affected tree means a dead tree that shows obvious signs of having been affected by fire and that remains in an upright position.

dead standing tree means a dead tree that shows no signs of having been affected by fire and which remains in an upright position.

declaration date for a project, means the date on which the declaration of the project as an eligible offsets project under section 27 of the Act takes effect.

disturbance affected stratum means a stratum that has been subject to a growth disturbance event, other than fire—see section 19.

edge plot—see section 41.

eligible land—see subsection 10(2).

extant project forest boundary, of a stratum—see subsection 18(3).

fallen dead wood means dead woody stem and branch components that:
  (a) have a cross-sectional diameter of more than 2.5 centimetres; and
  (b) are derived from a project tree; and
  (c) occur at ground level.

fire affected stratum means a stratum that is so labelled under section 19 because it experienced a fire event that still affects it.

fire emissions means emissions of methane (CH_4) or nitrous oxide (N_2O) arising from fire events.

fire event means an occurrence of a fire in a stratum or strata.

forest means 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 cover—land has **forest cover** if:
(a) the land has an area of at least 0.2 of a hectare; and
(b) the vegetation on the land includes trees that:
    (i) are 2 metres or more in height; and
    (ii) provide crown cover of at least 20% of the land.

fuel emissions means emissions of carbon dioxide (CO_2), nitrous oxide (N_2O), or methane (CH_4) arising from fossil fuel use in relation to the delivery of project activities within the project area.

Note: This includes fuel use that takes place outside the project strata, but within the wider project area, if it relates to project activities.

full inventory means an estimation of carbon stock conducted in accordance with section 23.

Note: This is one of the 2 measurement processes available to a project proponent to estimate carbon stock within a stratum and involves the use of temporary sample plots and, optionally, permanent sample plots to estimate carbon stock. The other process is PSP assessment.

growth disturbance—see section 19.

initial carbon stock—see section 93.

intended location coordinates means spatial coordinates for a randomly selected intersection from a grid overlay used to define the proposed on-ground location of plots and biomass sample plots.

lateral root means the woody material that extends laterally from a tree's tap root or lignotuber, or both, and that forms part of a tree's below-ground structure.

litter means dead, project-tree derived material that occurs at ground level and is less than 2.5 centimetres in diameter (such as leaves, twigs, bark and small woody stems in various stages of decomposition).

live fire affected tree means a tree that is living and showing obvious signs of having experienced a fire event, or for which records indicate that it has experienced a fire event.

live tree means a tree that is living, which shows no obvious physical signs of having experienced a fire event, and for which no records exist that indicate that it has been affected by a fire event.

native forest means an area of land that:
(a) is dominated by trees that:
    (i) are located within their natural range; and
    (ii) have attained, or have the potential to attain, a crown cover of at least 20% of the area of land; and
    (iii) have reached, or have the potential to reach, a height of at least 2 metres; and
(b) is not a plantation.

newly fire affected stratum means a fire affected stratum that has not had the emissions from the relevant fire event included in abatement calculations for an offsets report.

non-project forest means forest within the project area that was not established as a direct result of the project.

non-project tree means a tree within the project area that was neither planted, nor otherwise established, as a direct result of the project.

ortho-rectified aerial imagery means an aerial photograph or satellite image geometrically corrected for distortion to produce a uniform scale across the image.

permanent planting has the same meaning as in the Rule or the Regulations.

permanent planting project—see section 7.

planting means the planting of seedlings or the sowing of seed derived from trees.

plot means a temporary sample plot or a permanent sample plot.

plot layout option means any of the following:
  (a) centroid option;
  (b) consistent edge option;
  (c) constant position option.

predictor measure means a measure of tree dimensions collected through a non-destructive measurement process and referenced in an allometric function to estimate the biomass contained within trees.

preparation burn means the controlled application of fire within a stratum to assist in the removal or suppression of ground-level vegetation or fire fuel loads.

prescribed weed means any plant that is required by law to be removed.

probable limit of error means the percentage error at the 90% confidence level.

project activity means an activity carried out within the project area as part of the establishment and management of project forest.

project emissions means emissions of greenhouse gases occurring within the project area as a result of a project activity, from the sources specified in section 84.

project forest means forest that has been established within the project area as a direct result of the project.

project forest biomass means the biomass contained within project trees, litter, or fallen dead wood.

project removals means removals from the atmosphere of greenhouse gases caused as a result of project activities.

project tree means a tree that has been established within a stratum through undertaking project activities.

pseudo-random number generator means computer software that:
  (a) generates a sequence of numbers that approximates the properties of random numbers; and
  (b) reports the seed number that was used to generate the sequence.

PSP (permanent sample plot) means an area of land that has been selected and established as a PSP in accordance with Subdivision 5 and Subdivision 6 of Division 2 of Part 4.

PSP assessment means an estimation of carbon in an area made in accordance with section 23.

regional function means an allometric function developed by or for a project proponent and which has an allometric domain that potentially extends across multiple strata.

Regulations means the *Carbon Credits (Carbon Farming Initiative) Regulations 2011*.

Rule means the *Carbon Credits (Carbon Farming Initiative) Rule 2015*.

root:shoot ratio (R:S) means the ratio of below-ground biomass to above-ground biomass.

sampling plan means a sampling plan as described in Subdivision 3 of Division 2 of Part 4.

seed number means a number input into a pseudo-random number generator.

size class means a class of items that is determined according to size.

starting edge means, for a plot established within a belt planting, the first edge of the plot to be laid out on the ground.

stem means the hard woody structural support element of a tree that forms part of the tree's above-ground structure and includes the trunk and heavier vertical limbs extending into the crown.

stratum means a stratum of a project area defined under section 17.

stratum area, of a stratum, means the area within the stratum boundary, expressed in hectares.

stratum boundary—see subsection 18(4).

stratum commencement means the point in time at which preparation of a stratum for planting begins.

stratum identifier means a unique numeric, alpha numeric, or text string that is used to refer to and identify a stratum.

stratum specific function means an allometric function developed by or for a project proponent from an allometric dataset collected exclusively from within a single stratum, to which the stratum specific function is intended to be applied.

tap root or lignotuber means a thickened, rigid and dense woody mass connected directly to a tree's stem at ground level and extending downwards into the regolith, and with lateral roots extending from it.

target plot size means the area of the land that is intended to be included within the boundaries of a plot or biomass sample plot as determined in accordance with Part 4.

target probable limit of error, for a full inventory or a PSP assessment—see section 29.

test tree means a project tree that has been randomly selected from within a temporary sample plot or a biomass sample plot for biomass measurement as part of the process for validating regional functions or converting stratum specific functions to regional functions.

tree means a perennial plant that has primary supporting structures consisting of secondary xylem.

tree status means one of the following conditions of a tree:
- (a) live;
- (b) dead standing;
- (c) live fire affected;
- (d) dead standing fire affected.

tree type means trees that are of the same species and equivalent tree status, and which have predictor measures that fall within a defined range of values.

TSP (temporary sample plot) means an area of land that has been selected and established as a TSP in accordance with Subdivision 5 and Subdivision 6 of Division 2 of Part 4.

weighted residual means the difference between measured and predicted (from a regression equation) tree biomass multiplied by a weighting factor, and as calculated using Equation 32b.

Note: Other words and expressions used in this determination have the meaning given by the Act, including:

> *carbon dioxide equivalent (CO$_2$-e)*
>
> *crediting period*
>
> *eligible carbon abatement*
>
> *eligible offsets project*
>
> *emission*
>
> *methodology determination*
>
> *natural disturbance*
>
> *offsets project*
>
> *offsets report*
>
> *project*
>
> *project area*
>
> *project proponent*
>
> *Regulator*
>
> *reporting period*.

6 References to factors and parameters from external sources

(1) If a calculation in this determination includes a factor or parameter that is defined or calculated by reference to another instrument or writing, the factor or parameter to be used for a reporting period is the factor or parameter referred to in, or calculated by reference to, the instrument or writing as in force at the end of the reporting period.

(2) Subsection (1) does not apply if:
- (a) the determination specifies otherwise; or
- (b) it is not possible to define or calculate the factor or parameter by reference to the instrument or writing as in force at the end of the reporting period.

Part 2—Permanent planting projects

7 Permanent planting projects

(1) For paragraph 106(1)(a) of the Act, this determination applies to an offsets project that is the establishment of a permanent planting that can reasonably be expected to result in eligible carbon abatement.

(2) A project covered by subsection (1) is a *permanent planting project*.

Part 3—Project requirements

8 Operation of this Part

For paragraph 106(1)(b) of the Act, this Part sets out requirements that must be met for a permanent planting project to be an eligible offsets project.

9 Location

The project area must be located within Australia.

10 Project area to include eligible land

(1) The project area must include eligible land.

(2) For this determination, *eligible land* is land that, for at least 5 years before the date of the relevant application in relation to the project, has been:
   (a) used for grazing or cropping; or
   (b) fallow between grazing or cropping activities; or
   (c) a combination of paragraphs (a) and (b).

   Note: For a pre-existing project, existing plantings may also be eligible land—see section 15.

(3) For this section the relevant application is:
   (a) for land that was part of the project area at the time of the application under section 22 of the Act—that application; and
   (b) for land that became part of the project area as a result of a later variation—the application for that variation.

11 Project mechanisms

The project must establish, on some or all of the eligible land, a permanent planting that has sufficient planting density so that the land on which the trees are planted has the potential to achieve forest cover.

   Note: The spatial configuration of a planting may be in belts or blocks provided the planting density has the potential to achieve forest cover.

12 Removal of trees

Non-project trees

(1) The project must be one in which, subject to this section, native forest and non-project trees are not removed from the project area, or otherwise disturbed.

(2) Non-project trees may be removed from the project area, or otherwise disturbed, only in the following circumstances:
   (a) where the non-project trees are prescribed weeds;
   (b) where:
      (i) at the time of stratum commencement, the non-project trees to be removed:
         (A) cover a total land area that represents less than 5% of the project area, as measured by crown cover; and
         (B) do not meet the definition of native forest; and
         (C) are less than 2 metres in height; and

(ii) the trees are removed no later than 6 months after the first planting;

(c) for biomass sampling;

(d) to manage a natural disturbance event such as disease or fire;

(e) where otherwise required by law or permitted by or under the Act.

Project trees

(3) The project must be one in which project trees are removed from the project area only in the following circumstances:

(a) for biomass sampling;

(b) to manage a natural disturbance event such as disease or fire;

(c) where otherwise required by law or permitted by or under the Act.

Note: The Act and instruments made under it permit biomass from project trees to be removed in the following circumstances:
- to remove debris for fire management;
- to remove firewood, fruits, nuts, seeds, or material used for fencing or as craft materials, if those things are not removed for sale;
- in accordance with traditional indigenous practices or native title rights;
- for thinning for ecological purposes.

13 Preparation burns

The project must be one in which no more than one preparation burn is applied to each stratum between stratum commencement and planting.

14 Restrictions relating to fertiliser use

The project must be one in which fertiliser is applied to each stratum no more than once per 25 years.

15 Requirements for pre-existing project

(1) For this section, a permanent planting project is a ***pre-existing*** project if another applicable determination (the ***former determination***) applied to the project immediately before the application of this determination.

Offsets report under former determination required

(2) For a pre-existing project:

(a) the project proponent must have submitted at least one offsets report under the former determination; and

(b) the Regulator must be satisfied that the reported value for the carbon stock for each stratum in the latest offsets report (the ***relevant offsets report***) appropriately reflects the existing carbon stock for the stratum.

(3) The Regulator is taken to be satisfied for paragraph (2)(b):

(a) for closing carbon stock reported as greater than zero—if the Regulator issued Australian carbon credit units on the basis of the relevant offsets report; and

(b) for closing carbon stock reported as zero—if the Regulator is satisfied that the value of zero was the result of appropriate measurement or modelling (rather than, for example, the application of a default permitted by the former determination).

Eligible land

(4) For a pre-existing project, **eligible land** includes land that is part of a stratum reported in the relevant offsets report.

16 Requirement in lieu of regulatory additionality requirement

(1) For the purposes of subparagraph 27(4A)(b)(ii) of the Act, this requirement applies in lieu of the regulatory additionality requirement.

(2) The project must not be required to be carried out by or under a law of the Commonwealth, a State or a Territory.

(3) A requirement to carry out an activity under a conservation covenant entered into with:
   (a) the Commonwealth, a State, a Territory or a local governing body; or
   (b) an authority of the Commonwealth, a State or a Territory;

   is not a requirement for the purposes of subsection (2).

Part 4—Stratification, estimating project removals and calculating project emissions

Division 1—Defining strata and delineating boundaries

17 Defining strata in the project area

(1) The project proponent must define one or more strata in the project area, in accordance with the CFI Mapping Guidelines, as areas for which abatement will be calculated in accordance with this Part.

(2) A stratum must consist of eligible land on which a permanent planting has been established in accordance with section 11 (Project mechanisms).

> Note: The extent of a stratum is defined essentially by the stems of the trees in the planting. See section 18.

(3) Strata may be defined on the basis of any characteristics that tend to make the growth characteristics of trees in a stratum more uniform.

> Note: The following are examples of such characteristics:
> - time of planting;
> - tree species;
> - observed or measured growth trends;
> - growing regions;
> - climatic conditions;
> - soil types;
> - disturbance history;
> - land management units;
> - management regime;
> - any other characteristics that may be likely to influence project tree growth.

(4) The project proponent must define at least one stratum before the submission of the first offsets report.

(5) The project proponent may define new strata at any time.

> Note: New strata may be required by this determination in certain circumstances, for example, in the event of a growth disturbance (see section 19).

(6) A new stratum may consist of any eligible land in the project area, including land in an existing stratum.

> Note: In such a case:
>
> (a) a full inventory will be required (see subsection 85(4)), which is subject to section 19); and
>
> (b) any superseded strata are reported on under section 21.

(7) If a new stratum includes part of an existing stratum, then:
   (a) the existing stratum is superseded; and
   (b) another new stratum may be defined from the remainder.

> Note: See section 21 for reporting on superseded strata.

(8) When a stratum is defined:
   (a) it must be given a stratum identifier; and
   (b) its extant project forest boundary and its stratum boundary must be delineated in accordance with section 18; and

(c) its stratum area must be calculated from the stratum boundary.

(9) If there is a change to the project trees in a stratum that affects the extant project forest boundary:

 (a) its extant project forest boundary and its stratum boundary must be delineated in accordance with section 18; and

 (b) its stratum area must be calculated from the new stratum boundary.

Example: Subsection (9) might apply if trees near the boundary of the stratum are removed in accordance with section 12 in such a way that re-stratification is not required.

Strata in a pre-existing project

(10) For a pre-existing project to which section 15 applies, each stratum reported in the relevant offsets report mentioned in section 15 is taken to be defined as a stratum of the project under this determination (a *pre-existing stratum*).

Note: If the proponent wishes to change a pre-existing stratum, it will become a superseded stratum subject to section 21.

(11) Subsection (8) applies to a pre-existing stratum.

(12) For a pre-existing stratum, the following apply:

 (a) any full inventory or PSP assessment conducted in the stratum in accordance with the former determination is taken to have been conducted in accordance with this determination;

 (b) any TSPs or PSPs established in the stratum in accordance with the former determination are taken to have been established in accordance with this determination;

 (c) any data collected in relation to the TSPs or PSPs in accordance with the former determination is taken to have been collected in accordance with this determination;

 (d) if a full inventory was conducted in the stratum in accordance with the former determination, subsection 85(4) does not apply to the stratum;

 (e) in subsection 19(1), subsection 47(2), subsections 95(3) and (4) (definitions of V_j, v_j and SEV_j), subsection 96(3), subsection 98(3) (definition of $Q_{j,p}$), section 99 (definitions of $R_{j,p}$ and $Q_{j,p}$), subsection 115(3) (definition of $\overline{P}_{NF,j}$), and subsection 116(1) (definition of $SE\overline{P}_{NF,j}$):

  (i) a reference to a 'previous reporting period' includes a reference to a reporting period under the former determination; and

  (ii) a reference to an offsets report includes a reference to an offsets report under the former determination; and

  (iii) a reference to a certificate of entitlement includes a reference to a certificate of entitlement issued under the former determination.

Note: The main effects of this subsection are that:
 (a) if PSPs were established under the former determination, the proponent will be able to continue using the PSPs and existing PSP data to conduct PSP assessments until 5 years after the last full inventory conducted under the former determination; and
 (b) sections 19 (revision of strata after growth disturbances) and 115 (calculation of fire emissions) apply to a pre-existing stratum during the first reporting period under this determination.

(13) In this section, *former determination* has the same meaning as in section 15.

18 Delineating stratum boundaries

(1) A project proponent must delineate the boundaries of the strata of the project area by generating a set of spatial coordinates that define the geographic limits of the land area included within each stratum by:

    (a) using one of the following methods, or a combination of them, to identify the limits of extant project forest boundary and stratum boundary:

        (i) conducting an on-ground survey using a global positioning system;

        (ii) using ortho-rectified aerial imagery; and

    (b) using a geographic information system to generate spatial data-files to identify the limits of extant project forest boundary and stratum boundary.

Use of ortho-rectified aerial imagery

(2) If ortho-rectified aerial imagery is used:

    (a) the relevant land area must be digitised from the imagery; and

    (b) the imagery must meet the accuracy requirements specified in the CFI Mapping Guidelines; and

    (c) the pixel resolution must be no greater than 2.5 metres; and

    (d) the image must be of sufficient quality and resolution to allow the clear identification of the limits of project forest establishment activities.

Extant project forest boundary

(3) The ***extant project forest boundary*** of a stratum is the polygon that is the outer limit of the stems of the project trees that are included in the stratum.

Stratum boundary

(4) The ***stratum boundary*** of a stratum is the outer limit of land that lies within a crown radius of the extant project forest boundary of the stratum, other than the following:

    (a) land that lies outside the project area;

    (b) land that lies within the extant project forest boundary of another stratum;

    (c) land that is non-project forest.

(5) If application of the stratum boundary would result in the mapped geographic limits of the stratum:

    (a) overlapping the geographic limits of a second stratum—then the boundary must be equidistant between the two strata along the length of the area where the overlap would otherwise have occurred; or

    (b) exceeding the geographic limits of the project area—then the boundary of the stratum boundary must be the limits of the project area.

19 Growth disturbances and revision of strata

(1) This section applies if a growth disturbance occurs in a stratum (the ***original*** stratum) that:

    (a) is not a superseded stratum; and

    (b) has been reported in an offsets report; and

    (c) in the most recent offsets report, was reported with a closing carbon stock greater than zero.

(2) For this section, a ***growth disturbance*** in a stratum is an event that is likely to affect significantly the project tree growth characteristics of the whole or part of the stratum.

(3) The project proponent must, within 6 months after detecting the growth disturbance, delineate the boundaries of the land occupied by project trees affected by the disturbance.

Note: Section 81 of the Act requires a project proponent to notify the Regulator in the event of certain natural disturbances.

(4) If the growth disturbance affects 5% or more of the original stratum area, the project proponent must revise the stratum in accordance with subsections (6) and (7).

(5) If the growth disturbance affects less than 5% of the original stratum area, the project proponent may choose to revise the stratum in accordance with subsection (7).

Revision of stratum affected by growth disturbance

(6) If the whole of the original stratum is affected by the growth disturbance:
   (a) it is revised by defining a new stratum with a new stratum identifier (being an **affected stratum**); and
   (b) the original stratum is superseded.

(7) If only a part of the original stratum is affected by the growth disturbance:
   (a) it is revised by dividing it into two or more strata:
      (i) one or more of which is affected by the growth disturbance (each being an **affected stratum**); and
      (ii) one or more of which is not so affected (each being an **unaffected stratum**); and
   (b) the original stratum is superseded.

Labelling of affected strata

(8) An affected stratum must be labelled:
   (a) if the disturbance is fire—a 'fire affected stratum'; and
   (b) otherwise—a 'disturbance affected stratum'.

(9) The label 'fire affected stratum' and 'disturbance affected stratum' may be removed from a stratum when the growth disturbance no longer significantly affects the project tree growth characteristics reported for the stratum.

Note: At this point, the stratum may be re-amalgamated through stratification with an unaffected stratum.

Closing carbon stock in unaffected stratum

Note: The closing carbon stock of the superseded original stratum will be zero (section 21). The initial carbon stock of the new affected and unaffected strata will also be zero (section 93).

(10) Subsection 85(4) does not apply to an unaffected stratum.

Note: The effect is that a full inventory is not required for the current reporting period, and the project proponent can choose instead to conduct a PSP assessment (using subsection (11)), or no assessment (giving a zero carbon stock change).

(11) For paragraph 85(3)(b), the PSP assessment may be made for an unaffected stratum for a reporting period, and section 95 applied to calculate the closing carbon stock:
   (a) as if the unaffected stratum had been defined at the time of the last full inventory of the original stratum; and
   (b) as if $v_j = a_j$; and

(c) applying the data collected for TSPs and PSPs within the boundary of the unaffected stratum to calculate V_j.

(12) A full inventory of each unaffected stratum must be conducted within 5 years after the last full inventory of the original stratum.

Closing carbon stock in affected stratum

(13) Subsection 85(4) does not apply to an affected stratum.

Note: The effect is that a full inventory is not required for the current reporting period, and the project proponent can choose instead to conduct no assessment (giving a zero carbon stock change).

(14) If a full inventory is not conducted within an affected stratum within 5 years after the disturbance event, it becomes a superseded stratum.

20 Effect of change in stratum boundaries

(1) This section applies if a revision, or cumulative revisions, of the boundaries of a stratum change the stratum area by more than 5% between any reporting periods.

(2) This section does not apply to a stratum that is required to be revised in accordance with section 19.

(3) The stratum is superseded.

(4) If the stratum area is not reduced to zero by the revisions, a new stratum may be defined which consists of the remainder of that area.

21 Reporting on newly established and superseded strata

(1) If a stratum is defined during a reporting period, initial and closing carbon stocks for the stratum must be reported in the offsets report for the reporting period.

Note: See section 93 for the initial carbon stock.

(2) The stratum identifier associated with that stratum must continue to be reported in subsequent offsets reports as having been associated with the project area even if the stratum is superseded.

(3) For a superseded stratum:
(a) values of zero must be recorded against the stratum identifier for the closing carbon stock and standard error for closing carbon stock for the reporting period in which it becomes superseded; and
(b) the carbon stock change and standard error for carbon stock change for the stratum must be calculated using those zero values, and recorded against the stratum identifier.

Note: Superseded strata must have the carbon stock change calculated in accordance with this determination for the reporting period in which they are superseded.

Division 2—Estimating project removals

Subdivision 1—General

22 General

This Division sets out processes that must be conducted when undertaking activities in relation to estimating the carbon dioxide equivalent net abatement amount for an eligible offsets project to which this determination applies.

Subdivision 2—Outline—conducting full inventory or PSP assessment

23 Outline of steps—conducting full inventory or PSP assessment

(1) To conduct a full inventory within a stratum, the project proponent must undertake the following steps:

    (a) develop and document an appropriate sampling plan, in accordance with Subdivision 3;

    (b) estimate *ex ante*, in accordance with Subdivision 4, the minimum number of:

        (i) TSPs that will be needed to conduct the full inventory; and

        (ii) if relevant—PSPs that will be needed to conduct any PSP assessment;

    (c) determine the intended location coordinates of the TSPs and, if relevant, PSPs, in accordance with Subdivision 5;

    (d) establish TSPs and, if relevant, PSPs, in the stratum, in accordance with Subdivision 6;

    (e) visit TSPs and collect data, in accordance with Subdivision 7;

    (f) estimate biomass and calculate mean plot carbon stock, in accordance with Subdivision 8;

    (g) conduct an *ex post* analysis, in accordance with Subdivision 9;

    (h) if the requirements of the *ex post* analysis are met—calculate carbon stock for the stratum in accordance with Subdivision 10;

    (i) if the requirements of the *ex post* analysis are not met—revise the full inventory in accordance with Subdivision 11.

(2) A PSP assessment may only be undertaken if PSPs have been established in accordance with subsection (1) as part of a full inventory.

(3) To conduct a PSP assessment within a stratum, the project proponent must undertake the following steps:

    (a) develop and document an appropriate sampling plan, in accordance with Subdivision 3;

    (b) visit PSPs and collect data, in accordance with Subdivision 7;

    (c) estimate biomass and calculate mean plot carbon stock, in accordance with Subdivision 8;

    (d) conduct an *ex post* analysis, in accordance with Subdivision 9;

    (e) if the requirements of the *ex post* analysis are met—calculate carbon stock for the stratum in accordance with Subdivision 10;

    (f) if the requirements of the *ex post* analysis are not met—revise the PSP assessment or conduct a full inventory, in accordance with Subdivision 11.

(4) When conducting a full inventory or a PSP assessment, the most recent map of the stratum and the most recent stratum area estimate generated in accordance with Division 1 must be used.

Subdivision 3—Sampling plans

24 Developing and documenting a sampling plan

(1) A sampling plan must be developed when one or more of the following occurs:
   (a) a full inventory is conducted;
   (b) a PSP assessment is conducted;
   (c) PSPs are established;
   (d) an allometric function is developed, updated, or validated in accordance with Subdivision 12 to Subdivision 16.

(2) A sampling plan must include:
   (a) a description of the activity to which the sampling plan relates; and
   (b) the dates during which the activity was or is to be conducted; and
   (c) the information specified in this Subdivision.

25 Sampling plan information for full inventory and PSP assessment

(1) This section applies if a sampling plan is developed as part of a full inventory or a PSP assessment.

(2) The sampling plan must include each of the following:
   (a) a description of the stratum to which the sampling plan relates, including the stratum identifier;
   (b) maps showing the extant project forest boundary and the stratum boundary;
   (c) the target plot size to be applied within the stratum as determined in accordance with Subdivision 6;
   (d) a description of the plots, including whether they are to be centroid, consistent edge or constant position;
   (e) the plot layouts for plantings in the stratum as follows:
      (i) for block plantings—the proponent must select either the centroid option or constant position option;
      (ii) for belt plantings—the proponent must use the consistent edge option;
   (f) outcomes from the following processes conducted to determine plot establishment rates and the probable limit of error:
      (i) the *ex ante* estimate of the number of plots required to achieve the relevant target probable limit of error for each time the estimate was calculated;
      (ii) the *ex post* analysis confirming the relevant target probable limit of error has been achieved;
      (iii) if:
         (A) the sampling plan relates to a PSP assessment; and
         (B) closing carbon stock was calculated in accordance with subsection 56(1);
         details showing that the requirements of that subsection were met;
   (g) details of the selection process for plot locations, including seed numbers used by the pseudo-random number generator when generating any grid overlay and randomly selecting grid intersections as intended location coordinates of plots, as referred to in Subdivision 5;

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(h) if a commercial software product is used as described in subsection 32(1)—the name and version of the software;

(i) the number of grid intersections that occur wholly within the stratum boundary;

(j) maps that show the position of:

    (i) the grid overlay applied to the stratum referred to in Subdivision 5; and

    (ii) the randomly selected grid intersections defining the intended location coordinates of plots referred to in Subdivision 5; and

    (iii) the location of plots as established by actual location coordinates;

(k) the intended location coordinates referred to in subparagraph (j)(ii) and the actual location coordinates of plots referred to in subparagraph (j)(iii);

(l) details of any variation between the spatial coordinates specified in paragraph (k);

(m) if the variation specified in paragraph (l) exceeds the threshold specified in section 53—details of the corrective measures that were taken; and

(n) details of the selection referred to in section 33, including the seed number.

26 Sampling plan information for stratum specific functions

A sampling plan that is developed when a stratum specific function is developed, updated, or validated in accordance with Subdivision 12 to Subdivision 16 must include the following information:

(a) a description of the stratum to which the sampling plan refers, including a reference to the stratum identifier;

(b) maps showing the geographic boundaries of the stratum;

(c) details of the selection process for biomass sample trees, including:

    (i) size classes; and

    (ii) the number of project trees within each size class; and

    (iii) seed numbers used by the pseudo-random number generator when randomly selecting biomass sample trees;

(d) maps showing the position of TSPs from which biomass sample trees have been selected;

(e) actual location coordinates for biomass sample trees.

27 Sampling plan information for regional functions

A sampling plan that is prepared when a regional function is developed, updated or validated in accordance with Subdivision 12 to Subdivision 16 must include the following information:

(a) a description of the intended allometric domain to be sampled;

(b) details of the selection process for biomass sample plots, including seed numbers used by the pseudo-random number generator when undertaking processes such as:

    (i) generating a grid overlay; and

    (ii) selecting grid intersections as intended location coordinates for biomass sample plots;

(c) the number of grid intersections that occur wholly within the biomass sites;

(d) details of the selection process for biomass sample trees, including:

    (i) size classes; and

    (ii) number of trees within each size class; and

    (iii) seed numbers used by the pseudo-random number generator when selecting biomass sample trees;

(e) maps showing:

(i) the location and extent of biomass sample sites; and

(ii) the location of biomass sample plots as established by actual location coordinates and as sampled in accordance with section 70; and

(iii) the grid overlay applied to the biomass sample sites; and

(iv) the randomly selected grid intersections defining the intended location coordinates of biomass sample plots;

(f) the intended location coordinates and actual location coordinates of biomass sample plots;

(g) the actual location coordinates of biomass sample trees;

(h) target and actual plot sizes for each biomass sample plot.

Subdivision 4—*Ex ante* estimate of minimum number of TSPs or PSPs

28 Operation of Subdivision

For paragraph 23(1)(b), this Subdivision sets out how to estimate *ex ante* the minimum number of:

(a) TSPs that will be needed to conduct a full inventory; and

(b) PSPs that will be needed to conduct a PSP assessment.

29 Target probable limits of error for full inventory and PSP assessment

(1) The *target probable limit of error* for a full inventory is no more than 10% at the 90% confidence level around the estimated mean carbon stock for plots within the stratum, calculated using Equation 28.

(2) The *target probable limit of error* for a PSP assessment is no more than 20% at the 90% confidence level around the estimated mean carbon stock for plots within the stratum, calculated using Equation 28.

30 *Ex ante* estimate of minimum number of TSPs or PSPs

(1) This section sets out how to make, for a stratum (the **assessed stratum**), an *ex ante* estimate of the minimum number of TSPs or PSPs needed for a full inventory or a PSP assessment.

(2) First, the project proponent must collect data from an assessment:

(a) that consists of:

(i) a full inventory or a PSP assessment that was conducted prior to working out the *ex ante* number in accordance with this section; or

(ii) a pilot inventory; and

(b) that was conducted in:

(i) the assessed stratum; or

(ii) another stratum that is analogous to the assessed stratum; and

(c) in which at least 5 plots were established and assessed.

Note: Section 50 limits the use of data that has been obtained when conducting a pilot inventory.

(3) Then, the project proponent must use this data and Equations 29a and 29b to make an *ex ante* estimate of the minimum number of plots required, using:

(a) for the minimum number of TSPs—the target probable limit of error for a full inventory; and

(b) for the minimum number of PSPs—the target probable limit of error for a PSP assessment.

(4) In this section:

pilot inventory means the collection and assessment of data in relation to project trees primarily for calculating the number of plots required to achieve a specified probable limit of error.

Subdivision 5—Determining the location of TSPs and PSPs

31 Operation of Subdivision

For paragraph 23(1)(c), this Subdivision sets out how to determine the intended location coordinates of:
   (a) TSPs that will be needed to conduct a full inventory; and
   (b) PSPs that will be needed to conduct a PSP assessment.

32 Determining potential plot locations

(1) Where this determination requires a set of potential plot locations to be established for a particular area of land, a grid overlay must be established on a map of the area using:
   (a) the method set out in subsection (2); or
   (b) a commercial software package that generates a suitable grid of square cells by a process that does not allow the user to set the angle or anchor point.

(2) For subsection (1), the method is to use a geographic information system to establish the grid overlay as follows:
   (a) the grid must be composed of square cells;
   (b) the grid must be initially located with grid lines running:
      (i) north to south (*vertical grid lines*); and
      (ii) east to west;
   (c) the grid must be then be realigned as follows:
      (i) use a random process to generate a random angle value between 0 and 89 degrees; and
      (ii) rotate the grid orientation clockwise around the point of grid intersection so that the vertical grid lines move by that angle;
   (d) one grid intersection must then be aligned over:
      (i) one of the fixed anchor points described in subsection (5); or
      (ii) an anchor point obtained by randomly selecting an easting and a northing coordinate that are:
         (A) within the ranges of easting and northing coordinates for the stratum; and
         (B) from the current version of the Map Grid of Australia 1994 (MGA94).

   Note: The Map Grid of Australia 1994 (MGA94) is available at: http://www.ga.gov.au/earth-monitoring/geodesy/geodetic-datums/GDA.html

(3) Each grid intersection that lies within the area after completing this process is a potential plot location.

(4) The size of the cells of the grid must be selected to ensure that the number of potential plot locations for the area determined in accordance with this section is at least the number desired.

Note: If an appropriate cell size is chosen, the same grid may be used for an area that is made up of all strata. However, see provisions when the existing set of potential plot locations is insufficient.

(5) For this section, the fixed anchor points are:
  (a) spatially projected using the 'Lamberts' conformal conic projection referencing the GDA94 datum; and
  (b) defined as having either of the following coordinates:
    (i) X = 1,277,100 metres, Y = -3,762,300 metres;
    (ii) X = -1,666,331 metres, Y = -3,482,739 metres.

33 Selecting a subset from the potential plot locations

Where this determination permits a subset to be selected from amongst a set of potential plot locations:
  (a) the potential plot locations must be numbered consecutively; and
  (b) the subset must be selected either:
    (i) randomly, using a pseudo-random number generator; or
    (ii) using a system:
      (A) that is designed to ensure even coverage; and
          Example: Using even spacing throughout the potential plot locations.
      (B) in which the starting points of the system are randomly selected using a pseudo-random number generator.

34 Determining intended location coordinates of TSPs and PSPs

(1) To determine the intended plot locations of TSPs within a stratum, the project proponent must select either:
  (a) all the potential plot locations in the stratum determined under section 32, using the map referred to in subsection 23(4); or
  (b) a subset selected from amongst them.

(2) The number of TSPs in the stratum must not be less than the *ex ante* estimate of the minimum number of TSPs from Subdivision 4.

(3) To determine the intended plot locations of any PSPs in the stratum, the project proponent must select plot locations as a subset of either:
  (a) the TSP locations already selected (so that these plots will be both PSPs and TSPs); or
  (b) another set of potential plot locations determined in accordance with section 32.

(4) The number of PSPs in the stratum must not be less than the *ex ante* estimate of the minimum number of PSPs from Subdivision 4.

(5) The intended location coordinates must be:
  (a) recorded in the sampling plan; and
  (b) uploaded into a global positioning system.

Subdivision 6—Establishing plots

35 Operation of Subdivision

(1) For paragraph 23(1)(d), this Subdivision sets out how to establish:
  (a) TSPs for a full inventory; and
  (b) PSPs for a PSP assessment.

(2) This Subdivision also sets out how to establish biomass sample plots for the purposes of section 70.

36 Establishing plots

(1) Subject to subsection (2), plots must be established at the intended location coordinates uploaded to the global positioning system under subsection 34(5) or subsection 70(7) without any deliberate on-ground repositioning.

(2) If establishing a plot at the intended location coordinates would constitute a serious safety risk, the project proponent must:
  (a) relocate the plot to the nearest safe point to the intended location coordinates; and
  (b) document this relocation and the rationale for the relocation within a sampling plan in accordance with Subdivision 3.

37 Plot configuration

(1) Plots may be established in one of the following shapes:
  (a) circular;
  (b) rectangular.

(2) Once the plot shape is selected, all plots in the stratum must be of the same shape.

(3) In the case where rectangular plots are established in strata:
  (a) that are composed of block plantings; and
  (b) in which project tree planting follows a consistent planting pattern;

the project proponent may orientate the direction of the plot sides so that the longest plot sides run approximately parallel to the direction of planting lines.

(4) The plot actual location must not be deliberately shifted from the intended location coordinate as a result of the process specified in subsection (3).

38 Plot size

The following requirements must be met in relation to the size of plots in a stratum:
  (a) all plots within the stratum must be established according to a constant target plot size;
  (b) the target plot size must be at least:
     (i) for TSPs and PSPs—0.02 hectares; and
     (ii) for biomass sample plots—5 square metres;
  (c) the difference between the actual plot size and the target plot size must not be greater than 2.5%.

39 Identifying and marking plots

(1) Each plot must be given a unique identifier being numeric, alpha-numeric or a text string.

(2) Subject to section 40 and section 41, the following parts of a plot must be marked:
  (a) the corners of a rectangular plot;
  (b) the centre point of a circular plot.

Note: Section 40 and section 41 deal with plots that are located close to stratum boundaries.

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(3) The plot parts specified in subsection (2) must be marked in a way that allows for the identification of:

    (a) a TSP and the project trees included within the TSP for at least 12 months from the completion of a full inventory assessment; and

    (b) a PSP and the project trees included within the PSP for at least the first 5 years following the date of the establishment or most recent assessment of the PSP; and

    (c) a biomass sample plot for at least 12 months after assessment.

(4) The boundary markers for a PSP must be fire and flood resistant to allow for the identification of the PSP if a growth disturbance event occurs within 5 years from the establishment, or most recent assessment, of the PSP.

40 Dealing with plots located close to stratum boundaries

(1) This section applies if the intended location coordinates for a plot fall close to the boundary of a stratum.

(2) Except where subsection 36(2), or subsections (4) to (6), apply, if the intended location coordinates are within the stratum boundary, a plot must be established so that the difference between the actual location coordinates and intended location coordinates is no greater than the location tolerance specified in subsection 53(2).

> Note: Subsection 36(2) requires the project proponent to relocate a plot to the nearest safe point if establishing a plot at the intended location coordinates would constitute a serious safety risk.

(3) If the intended location coordinates fall outside the stratum boundary, no plot is to be established at that location.

(4) If part of the boundary of a plot falls outside the stratum boundary, the location of the centre for the plot must be determined.

(5) If the location of the centre of the plot specified in subsection (4) falls outside the stratum boundary, then no plot is to be assessed at that location.

(6) If the location of the centre of the plot specified in subsection (4) falls inside the stratum boundary, then the plot is to be assessed.

41 Edge plots

(1) If part of the boundary of a plot falls outside the stratum boundary, the plot is to be known as an 'edge plot'.

(2) Edge plots can be either circular or rectangular.

(3) Plot markers for rectangular edge plots must be either:

    (a) aligned with the limits of the stratum boundary; or

    (b) placed at all corners of the plot.

(4) Circular edge plots must be marked in accordance with paragraph 39(2)(b).

(5) The plot area for an edge plot is taken to be equivalent to the target plot size as established in accordance with section 38.

Subdivision 7—Visiting TSPs and PSPs and collecting data

42 Operation of Subdivision

For paragraph 23(1)(e) and paragraph 23(3)(b), this Subdivision sets out how to visit TSPs and PSPs and collect data when conducting a full inventory or a PSP assessment.

43 Plot visits during full inventory

All TSPs, and any PSPs that are not TSPs, must be visited during a full inventory.

44 Plot visits during PSP assessment

All PSPs must be visited during a PSP assessment.

45 Collection of information during plot visits

(1) The following information must be collected during visits to a plot:
   (a) the plot identifier and date of assessment;
   (b) the dimensions of the plot;
   (c) whether the plot falls wholly within the stratum boundary, or is an edge plot that is partially inclusive of land that falls outside the stratum boundary;
   (d) the following characteristics for each project tree in a plot:
      (i) tree status;
      (ii) species;
      (iii) predictor measure.

(2) The actual location coordinates for each plot must be logged on the ground using a global positioning system.

(3) Non-project trees must not be assessed or included in any carbon stock calculations for the project.

(4) If the project proponent chooses to account for carbon contained in litter and fallen dead wood, the carbon must be assessed in accordance with Subdivision 17.

Subdivision 8—Estimation of biomass

46 Operation of Subdivision

For paragraph 23(1)(f) and paragraph 23(3)(c), this Subdivision sets out how to estimate biomass and calculate mean plot carbon stock when conducting a full inventory or a PSP assessment.

47 Estimation of biomass

(1) The biomass of project trees must be estimated using any of the following:
   (a) stratum specific functions;
   (b) regional functions;
   (c) CFI functions;

that have been developed, updated and validated, as appropriate, in accordance with Subdivision 12 to Subdivision 16.

(2) If the project proponent applies a CFI function to estimate the biomass in project trees occurring in each plot within the stratum, the function must have been:

    (a) applied in the project in a previous reporting period; and

    (b) reported in an offsets report for which a certificate of entitlement has been issued by the Regulator.

(3) If the project proponent chooses to account for carbon in the litter and fallen dead wood pools, the biomass within these pools must be assessed for each plot in the stratum in accordance with Subdivision 17.

48 Estimation of carbon stock

The project proponent must:

    (a) convert the biomass estimates calculated in accordance with section 47 into estimates of carbon stock within each plot by using Equations 12 to 22; and

    (b) calculate the mean plot carbon stock for the stratum, and the associated error, using Equations 11a and 11b.

49 Plot carbon stock for edge plots

(1) For an edge plot:

    (a) section 45 applies only in relation to project trees that are both within the plot boundary and the stratum boundary; and

    (b) sections 79 and 80 apply only in relation to litter and fallen dead wood that are both within the plot boundary and the stratum boundary.

(2) Plot carbon stock must be calculated using Equations 12 to 18, where the area of the plot is equivalent to the target plot size as specified in subsection 41(5) and as documented in the sampling plan.

50 Assessment of plots if pilot inventory was conducted

(1) This section applies if a pilot inventory was conducted in the stratum for the purposes of subparagraph 30(2)(a)(ii).

(2) Data collected from plots used in the pilot inventory may only be used in the full inventory if:

    (a) the locations of the plots used in the pilot inventory were selected in accordance with Subdivision 5; and

    (b) the size and configuration of the plots used in the pilot inventory is the same as the size and configuration of the plots used in the full inventory.

Subdivision 9—*Ex post* analysis of plots

51 Operation of Subdivision

For paragraph 23(1)(g) and paragraph 23(3)(d), this Subdivision sets out how to conduct an *ex post* analysis when conducting a full inventory or a PSP assessment.

52 *Ex post* analysis—probable limit of error

(1) When a full inventory or a PSP assessment is conducted, the project proponent must calculate the probable limit of error for mean plot carbon stock for the stratum using Equation 28.

(2) The probable limit of error must be no more than the target probable limit of error for a full inventory or the target probable limit of error for a PSP assessment, as appropriate.

53 *Ex post* analysis—plot location and size

(1) The project proponent must conduct an *ex post* comparison:
    (a) between:
       (i) the intended location coordinates generated in accordance with section 34; and
      (ii) the actual location coordinates logged in accordance with subsection 45(2); and
    (b) between:
       (i) the target plot size from paragraph 25(2)(c); and
      (ii) the measured plot size from paragraph 45(1)(b).

(2) Except where subsection 36(2) applies, the variation between the coordinates specified in subsection (1) must be no greater than 10 metres (the **location tolerance**).

> Note: Subsection 36(2) requires the project proponent to relocate a plot to the nearest safe point if establishing a plot at the intended location coordinates would constitute a serious safety risk.

(3) The variation between the target plot size and the measured plot size of each plot must be no greater than the minimum difference specified in paragraph 38(c).

Subdivision 10—Proceeding when requirements of e*x post* analysis met

54 Operation of Subdivision

For paragraph 23(1)(h) and paragraph 23(3)(e), this Subdivision sets out how to proceed if the requirements of the *ex post* analysis are met.

55 Estimation of carbon stock—full inventory

For a full inventory, the closing carbon stock for a stratum must be calculated using Equation 5a.

56 Estimation of carbon stock—PSP assessment

(1) If:
    (a) a PSP assessment has been conducted; and
    (b) the PSP assessment met the requirements of a full inventory; and
    (c) the target probable limit of error for a full inventory is achieved;

closing carbon stock for the stratum may be calculated using Equation 5a.

(2) If:
    (a) a PSP assessment has been conducted; and
    (b) the target probable limit of error for a PSP assessment is achieved; and
    (c) closing carbon stock is not calculated in accordance with subsection (1);

closing carbon stock for the stratum must be calculated using Equation 6a.

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Subdivision 11—Proceeding when requirements of e*x post* analysis not met

57 Operation of Subdivision

For paragraph 23(1)(i) and paragraph 23(3)(f), this Subdivision sets out how to proceed if the requirements of the *ex post* analysis are not met.

58 How to proceed if target probable limit of error not met

(1) If, after conducting a full inventory, the requirement of subsection 52(2) is not met, the project proponent must:
   (a) select sufficient additional TSPs to ensure that the requirements can be met, by:
      (i) if there are sufficient potential plot locations left in the set from which the TSPs were drawn—selecting the additional TSPs as a subset of those locations in accordance with section 33; and
      (ii) otherwise:
         (A) developing and documenting an appropriate sampling plan, in accordance with Subdivision 3; and
         (B) establishing an additional set of potential plot locations and selecting the additional TSPs from it in accordance with Subdivision 5; and
   (b) establish plots at the associated intended location coordinates in accordance with Subdivision 6; and
   (c) visit those sites and collect data in accordance with Subdivision 7; and
   (d) proceed in accordance with paragraphs 23(1)(f) to (i).

(2) If, after conducting a PSP assessment, the requirement of subsection 52(2) is not met, the project proponent must conduct a full inventory in accordance with this Division.

(3) When conducting the full inventory, the project proponent:
   (a) may use the PSPs as TSPs; and
   (b) may use the data collected in relation to those PSPs for the full inventory.

59 How to proceed if plot location tolerance or size requirement not met

(1) This section applies if the requirement of subsection 53(2) or (3) is not met.

(2) Data collected from any non-compliant plot must not be included in any calculation in Part 5.

(3) The project proponent must:
   (a) re-establish any non-compliant plots to comply with Subdivision 6; and
   (b) visit the plots and collect data, in accordance with Subdivision 7; and
   (c) proceed in accordance with paragraphs 23(1)(f) to (i) or paragraphs 23(3)(c) to (f), as appropriate.

   Note: All *ex post* comparisons including, if applicable, the requirement to relocate plots, must be documented in a sampling plan in accordance with Subdivision 3.

Subdivision 12—Allometric functions

60 Applying allometric functions

(1) A project proponent may only apply an allometric function where:
   (a) the requirements set out in this Subdivision are met; and

(b) the compatibility and validation tests specified in Subdivision 16 are satisfied.

(2) An allometric function may only be applied to project trees that have a predictor measure within or above the upper limit of the allometric domain for that allometric function.

(3) If the predictor measure of a project tree is above the upper limit of the allometric domain, that tree may be attributed the same result as a tree at the upper limit of the allometric domain.

(4) An allometric function must not be used in relation to a tree of a different species or status.

61 Allometric domain

(1) For each allometric function applied, the project proponent must clearly define the allometric domain for that function by recording and documenting the following in an allometric report in accordance with section 66:
   (a) the following information regarding the tree type from which the allometric dataset has been collected:
      (i) the species of tree;
      (ii) the tree status;
      (iii) the allometric data range;
   (b) the predictor measures referenced by the allometric function;
   (c) the procedures used to assess the predictor measures;
   (d) the geographic area over which the allometric function is assumed to apply.

(2) For a stratum specific function, the geographic limits of the allometric domain are defined as being the limits of the stratum boundary from which the allometric dataset was collected.

62 Regression fitting

(1) A project proponent must undertake the processes specified in this section when conducting regression analyses for the purpose of developing allometric functions.

(2) An allometric function must not be used as part of an offsets project to which this determination applies unless the function has been derived by using regression analyses to relate predictor measures collected from biomass sample trees to biomass estimates obtained for the same set of biomass sample trees.

Allowable regression forms

(3) In cases where a project proponent uses either a single predictor measure or multiple predictor measures:
   (a) data must not be transformed; and
   (b) the weighted least squares method must be applied to estimate the line of best fit.

(4) In cases where a single predictor measure is used, linear or non-linear regression techniques may be applied.

(5) In cases where multiple predictor measures are used, multiple linear or non-linear regression techniques may be applied.

(6) An allometric function must take one of the following forms:
   (a) $B = a \times \prod_{i=1}^{N_{pred}} M_i^{b_i}$

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or

(b) $B = a + \sum_{i=1}^{N_{pred}}(b_i \times M_i)$

where:

$B =$ biomass for a tree in kilograms of dry matter.

$M_i =$ the ith of p predictor measure(s) for estimating biomass within a tree.

$a, b_i =$ constants derived through regression analyses, $i = 1$ to N_{pred}.

$N_{pred} =$ the number of predictor measures.

63 Minimum data requirements

(1) This section specifies the minimum data requirements for conducting regression analyses for the purpose of deriving an allometric function.

(2) The regression analyses used to develop an allometric function must reference data collected from at least 20 individual biomass sample trees sampled from within the geographic limits of the relevant allometric domain.

(3) Both above-ground and below-ground biomass components of the biomass sample trees must be assessed in accordance with Subdivision 14.

64 Minimum regression fit requirements

(1) This section specifies the requirements that must be met before an allometric function can be used to estimate biomass from project trees.

(2) An allometric function may be used to estimate biomass within a particular allometric domain only if the allometric function is documented in an allometric report in accordance with section 66 and if:
   (a) the regression relationship upon which the allometric function is based:
       (i) is statistically significant; and
       (ii) achieves a coefficient of determination (r^2) no less than 0.75; and
   (b) the mean of the weighted residuals calculated at Equation 32b is not statistically significant from zero, as determined through applying a student t-test with two-tailed probability level of <0.05; and
   (c) weighted residuals are normally distributed around zero.

(3) If the requirements specified in subsection (2) are not met, the project proponent may apply one of the following processes:
   (a) redefine the allometric domain *ex post* so that the allometric function meets the requirements of subsection (2);
   (b) use multiple regression techniques, with the application of multiple predictor measures so that the allometric function satisfies the requirements of subsection (2);
   (c) undertake the following steps:
       (i) conduct further sampling using the processes described at Subdivision 13 to Subdivision 15;
       (ii) combine the data obtained from the further sampling specified in subparagraph (i) with the original dataset;
       (iii) re-perform the regression analyses specified in section 62 with reference to the combined allometric dataset specified in subparagraph (ii).

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(4) In this section:

statistically significant means a two-tailed probability level of <0.05.

65 Variance of weighted residuals

A project proponent must calculate and report the variance of weighted residuals for an allometric function (σ_A^2) in accordance with section 122.

Note: The outcome of the calculation referred to in this section is required for the validation process that must be performed in accordance with Subdivision 16 and to ensure that the fit of the allometric function meets the minimum requirements described at section 64.

66 Allometric report

The following must be documented in an allometric report for each allometric function applied by a project proponent to project trees in the project:
   (a) a unique identifier for the allometric function, being numeric, alpha-numeric or a text string;
   (b) the allometric domain for the allometric function defined in accordance with section 61;
   (c) the number of biomass sample trees that were assessed in order to develop the allometric function;
   (d) unique numeric, alpha-numeric or text string identifiers for each biomass sample tree;
   (e) procedures for collecting predictor measures from the biomass sample trees assessed in order to develop the allometric function;
   (f) predictor measures for all biomass sample trees assessed in order to develop the allometric function;
   (g) wet-weight for biomass components for all biomass sample trees assessed in order to develop the allometric function;
   (h) sub-sample wet and dry weights and wet to dry weight ratios;
   (i) estimates of error associated with measuring equipment used to measure wet-weight and dry-weight;
   (j) regression plots showing the spread of data points and regression fit;
   (k) charts showing the spread and distribution of weighted residuals;
   (l) the mathematical form for the allometric function including parameter values;
   (m) the outcomes of checks against conditions specified in subsection 64(2);
   (n) details of any process conducted in accordance with subsection 64(3);
   (o) if the process specified in paragraph 64(3)(a) is undertaken, the following information:
      (i) the rationale for redefining the allometric domain including any selection of data sub-sets;
      (ii) evidence that data points have not been subjectively removed from the dataset in order to reduce variability;
   (p) the variance of weighted residuals, as calculated in accordance with section 65.

Subdivision 13—Allometric functions for live trees

67 Developing allometric functions for live trees

(1) A project proponent must undertake the processes specified in this Subdivision when performing the following actions in relation to allometric functions and live trees:

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(a) developing stratum specific functions, in accordance with section 68;

(b) updating pre-existing stratum specific functions or CFI functions, in accordance with section 69; and

(c) developing regional functions, in accordance with section 70; and

(d) converting a stratum specific function to a regional function, in accordance with section 71.

Note: Section 75 specifies the processes for developing allometric functions for live fire affected trees, dead standing trees, and dead standing fire affected trees.

(2) The details of all biomass sample site and biomass sample tree selections made in accordance with this Subdivision must be documented in a sampling plan as specified in Subdivision 3.

68 Developing stratum specific functions

(1) This section sets out the process for developing a stratum specific function for a particular tree type.

(2) TSPs must have been established for a full inventory of the stratum, in accordance with section 23.

(3) Values of candidate predictor measures must have been collected from all live project trees of the tree type within the TSPs (the *function trees*).

(4) The function trees must be ranked according to size based on the candidate predictor measures.

(5) The smallest and largest of the function trees must be selected for assessment as biomass sample trees.

(6) The remaining function trees must be divided into at least 5 size classes.

(7) At least 18 further function trees must be selected for assessment as biomass sample trees by randomly drawing an equal number from each size class.

(8) The following steps must be followed to achieve random selection from within each size class:

(a) the function trees in the size class must be:
   (i) ranked from smallest to largest; and
   (ii) numbered from 1 to i, where i is the number of function trees in the size class;

(b) a pseudo-random number generator must be used to generate a random integer from 1 to i;

(c) the project tree which corresponds to that integer must be selected as a biomass sample tree;

(d) the steps in paragraphs (b) and (c) must be repeated until the necessary number of biomass sample trees have been selected for the size class.

(9) Subject to subsection (11), all biomass sample trees selected in accordance with subsections (4) to (8) must be assessed in accordance with Subdivision 14.

(10) A regression function must be fitted and *ex post* analyses performed in accordance with the requirements specified in Subdivision 12.

(11) Where assessment of one or more biomass sample trees would constitute a serious risk to safety, cultural heritage, environmental values or property, the project proponent must select other biomass sample trees by applying the random selection process described at

subsection (8) and must document this reselection and the rationale for the reselection within a sampling plan in accordance with Subdivision 3.

69 Updating pre-existing stratum specific functions or CFI functions

(1) This section applies where the project proponent wishes to update or extend the allometric domain of a stratum specific function (the *original function*) by adding new data to the dataset used to produce the original function.

(2) This section also applies where the project proponent wishes to update or extend the domain of a CFI function (the *original function*) that:
   (a) is stratum specific; and
   (b) was based on a dataset that was produced by creating size classes and selecting equal numbers of sample trees from each class.

(3) The updating or extension of the original function must be done in conjunction with a full inventory or a PSP assessment.

Selection of domain and class sizes

(4) The project proponent must collect predictor measures from all live project trees of the relevant tree type from within the TSPs or PSPs, as appropriate (the *function trees*).

(5) The domain for the updated function must be set by using the size classes in the original data set and:
   (a) removing any size classes that are now outside the required domain; and
   (b) adding any size classes required to extend the domain, defined on the same basis as the original size classes.

Selection and assessment of biomass sample trees

(6) If any size classes are being added to the domain, N function trees must be selected from each size class for assessment as *biomass sample trees* by the method set out in subsections 68(8) and (11), where N is the number of trees that were drawn from each size class to produce the original function.

(7) If the proponent wishes to update the original function within its current domain, further function trees must be selected for assessment as *biomass sample trees* by drawing an equal number from each size class by the method set out in subsections 68(8) and (11).

(8) All the biomass sample trees must be assessed in accordance with Subdivision 14.

Updating the original function

(9) The data collected from the biomass sample trees must be combined with the allometric dataset used to develop the original function, and the function recalculated in accordance with Subdivision 12.

(10) If the minimum regression fit requirements specified in subsection 64(2) are met, the updated stratum specific function or CFI function may be applied within the stratum from which the allometric dataset was derived.

(11) If the minimum regression fit requirements specified in subsection 64(2) are not met, the project proponent may repeat the method in this section adding further biomass sample trees from each size class in accordance with subsection (6) and subsection (7).

70 Regional functions

(1) A project proponent must undertake the processes specified in this section when developing and updating a regional function.

(2) The project proponent may develop a regional function from trees that are inside or outside the project area.

Allometric domain

(3) Subject to subsection (4), the allometric domain that relates to the regional function must be defined in accordance with section 61.

(4) If a stratum specific function is reclassified as a regional function, the process specified in section 71 must be undertaken.

(5) Biomass sample sites that are within the geographic limits of the allometric domain for the assessment of biomass sample trees for the tree type that will be referenced by the regional function must be mapped using a geographic information system.

(6) A minimum of 10 locations must be selected from within the biomass sample sites mapped in accordance with subsection (5) for the establishment of biomass sample plots by applying the process of sections 32 and 33 to each biomass sample site and selecting, as biomass sample plots, a suitable number of potential plot locations.

(7) The intended location coordinates of each plot must be uploaded into a global positioning system.

(8) Biomass sample plots must be established in accordance with Subdivision 6 in each biomass sample site.

(9) The combination of target plot size and the number of biomass sample plots must ensure that at least 100 trees of the tree type to be referenced by the regional function are included within the biomass sample plots.

(10) All occurrences of a tree type to be referenced by a regional function in a biomass sample plot (*function trees*) must be identified and candidate predictor measures must be collected from each tree.

(11) At least 20 biomass sample trees must be selected in accordance with the process described at subsections 68(4) to (8).

(12) Subject to subsection (13), all biomass sample trees selected in accordance with subsection (11) must be assessed using the process specified in Subdivision 14.

(13) Where assessment of one or more biomass sample trees would constitute a serious risk to safety, cultural heritage, environmental values or property, the project proponent must select other biomass sample trees by applying the random selection process described at subsection 68(8) and must document this reselection and the rationale for the reselection within a sampling plan in accordance with Subdivision 3.

(14) A regression function must be fit and *ex post* analyses performed in accordance with Subdivision 12.

(15) A regional function may be updated in accordance with section 69, with necessary modifications.

71 Converting a stratum specific function to a regional function

If a stratum specific function is validated in accordance with Subdivision 16 for a stratum outside the stratum from which the function was developed, then:

(a) the stratum specific function may be reclassified as a regional function; and

(b) the geographic limits of the allometric domain may be redefined so as to include the geographic limits of each stratum for which the stratum specific function has been validated in accordance with Subdivision 16.

Subdivision 14—Assessing biomass sample trees

72 Assessing above-ground biomass of biomass sample trees

(1) A project proponent must undertake the processes specified in this section when assessing the above-ground biomass of a biomass sample tree.

(2) For each biomass sample tree, measures of candidate predictor measures must be collected.

(3) The biomass sample tree must be cut at ground level and separated into biomass components.

(4) After completing the process specified in subsection (3), the total wet weight for each of the separated above-ground biomass components must be recorded and documented in an allometric report.

(5) Subject to subsection (12), for each biomass sample tree at least 3 representative sub-samples must be collected from each biomass component and weighed immediately after the weighing for subsection (4).

(6) Subject to subsection (12), the wet-weight of the sub-samples must be recorded and documented in an allometric report as specified in section 66.

(7) The following must be oven-dried to constant weight between 70 and 80 degrees Celsius:
   (a) the sub-samples;
   (b) any biomass component being used under subsection (12).

(8) After the oven-drying, the dry weight of the sub-samples and any biomass component being used under subsection (12) must be recorded and documented in an allometric report as specified in section 66.

(9) The dry-wet weight ratio for each of the sub-samples specified in subsection (6), and any biomass component being used under subsection (12), must be calculated by dividing dry weight by wet weight.

(10) For a component for which sub-samples have been taken, the average of the dry-wet weight ratios calculated under subsection (9) must be calculated.

(11) The dry weight of each above-ground biomass component of the biomass sample tree must be estimated using Equation 31 and applying the average of the dry-wet weight ratios.

(12) As an alternative to the sub-samples specified in subsections (5) and (6), the entire biomass component may be used in the processes specified in subsections (6) to (11).

73 Assessing below-ground biomass of biomass sample trees

A project proponent may apply either of the following methods to account for below-ground biomass of individual trees:

(a) estimating the total tree biomass using the default root:shoot biomass ratio method (in accordance with section 120);

(b) assessing the below-ground biomass using destructive sampling (applying the method of section 74 and calculated in accordance with section 119).

74 Destructive sampling method for estimating below-ground biomass

(1) This section sets out the destructive sampling method for section 73.

(2) The roots of each individual biomass sample tree must be excavated by defining those parts of the root system that will be included in the sampling and measurement process.

(3) Roots that have a diameter of less than 2 millimetres must not be included in the processes specified in subsections (5) to (14), except where the roots are attached to larger root sections.

(4) A root system must be cleaned so that contamination from soil and any other contaminants is minimised.

(5) Once excavated and cleaned, the root system must be divided into its separate biomass components which must include at least:

(a) the tap root or lignotuber; and

(b) the lateral roots.

(6) The total wet weight for each of the separated below-ground biomass components must be recorded and documented in an allometric report as specified in section 66.

(7) Subject to subsection (14), for each biomass sample tree at least 3 representative sub-samples must be collected from each biomass component and weighed immediately after carrying out the weighing for subsection (6).

(8) Subject to subsection (14), the wet-weight of all sub-samples specified in subsection (7) must be recorded and documented in an allometric report.

(9) The following must be oven-dried to constant weight between 70 and 80 degrees Celsius:

(a) the sub-samples specified in subsection (7);

(b) any biomass component being used under subsection (14).

(10) The following must be recorded and documented in an allometric report as specified in section 66:

(a) the dry-weight of the sub-samples that have been oven-dried in accordance with subsection (9);

(b) the dry weight of any biomass component being used under subsection (14).

(11) The dry-wet weight ratio for each of the sub-samples, and of any biomass component being used under subsection (14), must be calculated by dividing dry weight by wet weight.

(12) The average of the dry-wet weight ratios for each component must be calculated.

(13) The dry weight of each below-ground biomass component of the biomass sample tree must be estimated using Equation 31 and applying the average of the dry-wet weight ratios as specified in subsection (12).

(14) As an alternative to the sub-samples specified in subsection (7) and (8), the entire biomass component may be used in the processes specified in subsections (8) to (11).

Subdivision 15—Allometric functions for other trees

75 Developing allometric functions for trees other than live trees

(1) If a project proponent chooses to account for carbon stock in project trees with the following tree status:

   (a) dead standing;

   (b) dead standing fire affected;

   (c) live fire affected;

the project proponent must develop species-specific allometric functions that relate to these tree status in accordance with Subdivision 12 and Subdivision 13, subject to the modifications set out in this section.

(2) In the case of dead standing trees and dead standing fire affected trees:

   (a) the allometric function must relate the preferred predictor measure to stem biomass only, and not to biomass for the entire tree; and

   (b) biomass contained in non-stem components, such as branches, crown and below-ground biomass components, must be assumed to be zero.

(3) In the case of live fire affected trees, the project proponent may:

   (a) adopt the stem-only approach specified in subsection (2); or

   (b) apply the approach specified in Subdivision 13 to develop allometric functions based on sampling of entire trees, ensuring that the tree status referred to by the allometric domain is 'live fire affected tree'.

(4) If the project proponent considers that, over time, a set of live fire affected trees has returned to a state that is equivalent to a live tree, the project proponent may revert to using an allometric function developed for live trees in accordance with Subdivision 13, subject to subsection (5).

(5) The project proponent must use the process specified in Subdivision 16 to validate the allometric function for the live fire affected trees.

(6) When the allometric function specified in subsection (5) is validated, the live fire affected trees may be reclassified as live trees.

Subdivision 16—Applicability of allometric functions

76 Testing the applicability of allometric functions

A project proponent must undertake the processes specified in this Subdivision when testing the applicability of allometric functions.

77 Compatibility checks

If an allometric function is to be applied to a project tree within a stratum, the project proponent must confirm that:

   (a) subject to subsection 60(3), predictor measures collected from the project tree during the full inventory or PSP assessment do not exceed the allometric data range; and

(b) the species and status of the project tree assessed during the full inventory or PSP assessment are consistent with the tree type referenced by the allometric function; and

(c) the measurement procedures used to collect predictor measures from the project tree during the full inventory or PSP assessment are the same as those used to develop the allometric dataset; and

(d) if a stratum specific function is to be applied—the project tree occurs within the same stratum from which the stratum specific function was developed.

Note: If predictor measures collected from the project tree during the full inventory or PSP assessment exceed the allometric data range, the allometric function is applicable and satisfies the compatibility checks in this section if trees above the allometric domain are treated in accordance with subsection 60(3).

78 Validation test

(1) A project proponent must perform the validation test specified in this section at the following times within the stratum to which the allometric function is to be applied:

(a) for a regional function—during the first reporting period that the regional function is to be applied within the stratum;

(b) when a stratum specific function is to be converted to a regional function as specified in section 71.

(2) The validation test performed at the times specified in subsection (1) must be carried out as part of a full inventory conducted within the stratum to which the validation test is to be applied.

(3) Predictor measures must have been collected from all project trees that:

(a) are of the tree type relevant to the allometric function against which the validation test will be applied; and

(b) occur within the TSPs established within the stratum during the full inventory.

(4) The project trees specified in subsection (3) must be ranked according to size.

(5) The smallest and largest of the project trees specified in subsection (3) must be selected for assessment as test trees.

(6) The remaining project trees specified in subsection (3) must be divided into at least 5 size classes by their predictor measures.

(7) Subject to subsections (8) and (9), an equal number of project trees must be randomly selected as test trees from each size class determined in accordance with subsection (6).

(8) A minimum of 10 test trees, including the 2 trees selected in accordance with subsection (5), must be selected.

(9) Subject to subsections (10) and (11), the steps set out at subsection 68(8) must be followed to achieve random selection from within each size class.

(10) If there are exactly 10 project trees of the relevant tree type represented in all TSPs established within the stratum during the full inventory, each project tree may be selected instead of applying the random selection process referred to in subsection (9).

(11) If there are fewer than 10 project trees of the relevant tree type occurring within TSPs established with the stratum during the full inventory, a project proponent must choose one of the following 2 options:

(a) establish further TSPs in accordance with this Division until the tree type is sufficiently represented to allow the process specified in subsection (9) or (10) to be undertaken;

(b) assume the carbon stock for that tree type is zero whenever it is included within a TSP or PSP.

(12) In the case where the option specified in paragraph (11)(b) is selected, no further steps of the validation test set out in this section need to be conducted.

(13) Once selected in accordance with this section, each test tree must be assessed in accordance with Subdivision 14.

(14) 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 measures collected from the test trees.

(15) Using the measured and predicted biomass estimates generated at subsections (13) and (14), the variance of weighted residuals for the set of test trees (σ_T^2) must be calculated in accordance with section 122.

(16) To test for statistical difference between the variance of weighted residuals calculated for the allometric function in accordance with section 65 (σ_A^2) and the variance of weighted residuals specified in subsection (15) for the set of test trees (σ_T^2), an upper one-tailed F-Test must be applied in accordance with subsection (17).

(17) For the upper one-tailed F-Test:
   (a) an F-Test statistic must be calculated as the ratio of σ_T^2 on σ_A^2; and
   (b) the F-Test statistic must be compared to a critical F-value (F_α) to determine if there is a statistically significant difference ($\alpha < 0.05$) between σ_T^2 and σ_A^2; and
   (c) for the comparison, the numerator degrees of freedom and the denominator degrees of freedom are $N_T - N_P$ and $N_A - N_P$, where:
      (i) N_T is the number of test trees used to validate the allometric function, as a whole number; and
      (ii) N_A is the number of biomass sample trees used to develop the allometric function, as a whole number; and
      (iii) N_P is the number of parameters in the allometric function, as a whole number.

(18) If the F-Test statistic is less than or equal to the comparison critical F-value, then the allometric function:
   (a) is taken to have been validated for application in that stratum; and
   (b) may be applied to all project trees of the relevant tree type occurring within the stratum that fall within the allometric domain of the validated allometric function.

(19) If the F-Test statistic is more than the comparison critical F-value, the stratum is considered to fall outside the allometric domain of the allometric function.

(20) In the case where subsection (19) applies, the project proponent may:
   (a) seek to validate an alternative existing regional function by undertaking the process specified in this section; or
   (b) for the project trees to which the allometric function was intended to be applied— count all occurrences of the relevant tree type in plots in the stratum as having zero carbon stock; or
   (c) develop a stratum specific function using the approach specified in section 68.

(21) For paragraph (20)(c), data collected from the test trees may be included in developing the stratum specific function only if at least an additional 10 biomass sample trees are selected in accordance with subsections 68(2) to 68(8) (with appropriate modifications) in order to achieve a minimum of at least 20 biomass sample trees.

Subdivision 17—Assessing carbon stock in fallen dead wood and litter

79 Assessing carbon stock in litter

(1) If a project proponent chooses to assess the carbon stock in litter, the project proponent must undertake the assessment process specified in this section.

Assessment process

(2) For each plot to be assessed, 4 litter samples must be collected in accordance with the following requirements:
   (a) a sampling frame must be placed randomly in 4 separate locations within the boundaries of the plot being assessed;
   (b) the sampling frame must be either square or rectangular;
   (c) the locations of the sampling frame must not overlap;
   (d) no litter must be collected from outside the boundaries of the sampling frame;
   (e) dirt and non-litter contaminants are to be minimised within the sample.

(3) The 4 samples specified in subsection (2) must be combined into a single bulked sample for the plot.

(4) The wet weight of the bulked sample specified in subsection (3) must be recorded immediately after performing processes specified in subsections (2) and (3) and documented in a sampling plan.

(5) For all plots assessed on each day, or at least the first 3 plots assessed each day, a sub-sample from the bulked sample for each plot must be collected and the wet weight of each sub-sample is to be recorded and documented in a sampling plan.

(6) The sub-samples specified in subsection (5) must be oven-dried to constant weight between 70 and 80 degrees Celsius.

(7) The weight of the sub-samples that have been dried in accordance with subsection (6) must be recorded and documented in a sampling plan.

(8) The dry-to-wet weight ratio of the sub-samples collected each day must be calculated by dividing the dry weight for each sub-sample by its wet weight.

(9) When the dry-to-wet weight ratio of each sub-sample has been calculated in accordance with subsection (8), the average of the ratios must be calculated.

(10) The average dry-to-wet weight ratio calculated in accordance with subsection (9) must be used to estimate the dry weight of the bulked samples collected on that day.

(11) The carbon stock contained in litter located in the TSP or PSP must be calculated using Equation 17.

80 Assessing carbon stock in fallen dead wood

(1) If a project proponent chooses to assess the carbon stock in fallen dead wood, the assessment process specified in this section must be undertaken.

Assessment process

(2) For each plot to be assessed, fallen dead wood in the plot must be collected.

(3) In the case where a piece of fallen dead wood in the plot extends beyond the boundaries of the plot, a project proponent may:
  (a) cut the piece of fallen dead wood so that only the proportion occurring within the plot is collected; or
  (b) exclude that piece of fallen dead wood from the assessment.

(4) The wet weight of the fallen dead wood that has been collected must be recorded and documented in a sampling plan.

(5) For all plots assessed on each day, or at least the first 3 plots assessed on each day, a sub-sample from the fallen dead wood must be collected by taking at least 3 cross-sectional discs from randomly selected pieces of the fallen dead wood.

(6) The wet weight of each sub-sample collected in accordance with subsection (5) must be recorded immediately after collection and documented in a sampling plan.

(7) The remainder of the fallen dead wood must be scattered uniformly over the plot.

(8) The sub-samples specified in subsection (5) must be oven-dried to constant weight between 70 and 80 degrees Celsius.

(9) The dry weight of the sub-samples oven-dried in accordance with subsection (8) must be recorded and documented in a sampling plan.

(10) The dry-to-wet weight ratio of each sub-sample must be calculated by dividing the dry weight for a sub-sample by its wet weight.

(11) When the dry-to-wet weight ratio of each sub-sample has been calculated in accordance with subsection (10), the average of the ratios must be calculated.

(12) The average dry-to-wet weight ratio specified in subsection (11) must be used to estimate the dry weight of the fallen dead wood collected and weighed on the same day that the sub-samples specified in subsection (5) were collected.

(13) The carbon stock contained in the fallen dead wood in the plot must be calculated using Equation 18.

Division 3—Calculating project emissions

81 Calculating fuel emissions from project activities

(1) A project proponent must calculate fuel emissions from a fossil fuel that is combusted while carrying out a project activity for a stratum, in accordance with Equations 24 and 25.

(2) For the purposes of Equations 24 and 25, where fuel use occurs while carrying out a project activity outside the boundaries of any strata, the quantity of fuel used must be included in the calculation of fuel emissions.

82 Calculating fire emissions from a stratum

A project proponent must calculate the emissions of methane (CH_4) and nitrous oxide (N_2O) as a result of fire events in accordance with section 19 and Equations 26a to 27d.

Part 5—Calculating the carbon dioxide equivalent net abatement amount for a project in relation to a reporting period

Division 1—Preliminary

83 General

(1) For paragraph 106(1)(c) of the Act, this Part sets out requirements that must be met to calculate the carbon dioxide equivalent net abatement amount for a reporting period for a project to which this determination applies.

(2) In this Part:

    (a) all calculations are in respect of activities undertaken, or outcomes achieved, during the reporting period for the eligible offsets project; and

    (b) unless otherwise specified, a reference to a project is a reference to an eligible offsets project that meets the requirements of Part 3.

Note: The data used in the calculations set out in Division 2 must comply with the data collection requirements set out in Part 6.

84 Gases accounted for in abatement calculations

Calculations under this Part must be made using:

    (a) only carbon pools and events indicated in the following table; and

    (b) only the greenhouse gases specified in the table for those carbon pools and events.

Greenhouse gases and emissions sources

Carbon pool / event	Greenhouse gas
Above ground biomass	Carbon dioxide (CO_2)
Below ground biomass	Carbon dioxide (CO_2)
Debris	Carbon dioxide (CO_2)
Fire—planned and unplanned	Methane (CH_4)
	Nitrous oxide (N_2O)
	Carbon dioxide (CO_2)
Fossil Fuel Use	Methane (CH_4)
	Nitrous oxide (N_2O)
	Carbon dioxide (CO_2)
Non-fire disturbances	Carbon dioxide (CO_2)

85 Requirements for calculating carbon dioxide equivalent net abatement

(1) Carbon dioxide equivalent net abatement must be calculated by subtracting project emissions from project removals, in accordance with Equation 1a or Equation 1b.

(2) A project proponent must calculate project emissions in accordance with Division 3 of Part 4.

(3) A project proponent must calculate carbon stock change for a reporting period for each stratum in accordance with Division 2 of Part 4 based on one of the following:

    (a) a full inventory within 6 months before the end of the reporting period;

    (b) a PSP assessment within 6 months before the end of the reporting period;

    (c) no assessment, in which case the carbon stock change is zero.

Full inventory

(4) Subject to section 17 and section 19, the carbon stock change for the first reporting period for which an offsets report references the stratum must be based on a full inventory in accordance with paragraph (3)(a).

(5) A full inventory must also be conducted for each stratum:
   (a) as required by section 19; and
   (b) if a PSP assessment is conducted after a full inventory—no later than 5 years after that full inventory.

   Note: Section 19 deals with revisions of strata due to growth disturbances.

PSP assessment

(6) If a project proponent chooses to conduct a PSP assessment within a stratum:
   (a) a full inventory must have been previously conducted within the stratum; and
   (b) the PSP assessment must be conducted no later than 5 years after the most recent full inventory.

   Note: For a pre-existing project, a full inventory conducted in accordance with the former determination is treated as a full inventory under this determination (see subsection 17(12)).

Division 2—Calculations

Subdivision 1—Calculating carbon dioxide equivalent net abatement amount

86 General

For paragraph 106(1)(c) of the Act, the carbon dioxide equivalent net abatement amount for a reporting period for an offsets project to which this determination applies is taken, for the purposes of the Act, to be the amount calculated in accordance with this Subdivision of the determination.

87 Calculating the carbon dioxide equivalent net abatement amount

(1) The carbon dioxide equivalent net abatement amount for a project must:
   (a) be calculated accordance with this section; and
   (b) incorporate an assessment of uncertainty, calculated in accordance with Equation 1c.

(2) If:
   (a) the reporting period is the first reporting period; or
   (b) the net abatement amount for the previous reporting period was zero or greater than zero;

   the carbon dioxide equivalent net abatement amount for a project is to be calculated for a reporting period using the following formula:

| $A = \Delta C - E$ | **Equation 1a** |

where:

$A =$ net abatement amount for a project for the reporting period, in tonnes of CO_2-e (t CO_2-e).

$\Delta C =$ carbon stock change for a project for the reporting period in tonnes of CO_2-e ($t\ CO_2$-e), calculated in accordance with Equation 2a.

$E =$ project emissions for the reporting period in tonnes of CO_2-e ($t\ CO_2$-e), calculated in accordance with Equation 23a.

(3) If the net abatement amount for the previous reporting period was less than zero, the net abatement amount must be calculated using the following formula:

$A = (\Delta C - E) + A_{RP}$	**Equation 1b**

where:

$A =$ net abatement amount for a project for the reporting period, in tonnes of CO_2-e ($t\ CO_2$-e).

$\Delta C =$ carbon stock change for a project for the reporting period in tonnes of CO_2-e ($t\ CO_2$-e), calculated in accordance with Equation 2a.

$E =$ project emissions for the reporting period in tonnes of CO_2-e ($t\ CO_2$-e), calculated in accordance with Equation 23a.

$A_{Rp} =$ net abatement amount for a project for the previous reporting period, in tonnes of CO_2-e ($t\ CO_2$-e)—from previous offsets report.

88 Calculating uncertainty for net abatement amount

(1) Uncertainty for the net abatement amount for a project must be calculated as a 90% confidence interval in accordance with this section.

(2) The size of the 90% confidence interval for the net abatement amount for a project is to be calculated for the reporting period using the following formula:

$UA = SEA \times \tau$	**Equation 1c**

where:

$UA =$ half the width of the 90% confidence interval for net abatement amount for a project for the reporting period in tonnes of CO_2-e ($t\ CO_2$-e).

$SEA =$ standard error for net abatement amount for a project for the reporting period in tonnes of CO_2-e ($t\ CO_2$-e), calculated in accordance with Equation 1d.

$\tau =$ two-sided students t-value for the 90% confidence level at the appropriate degrees of freedom (n -1), where n is the number of plots in stratum j assessed during the reporting period, calculated in accordance with Equation 1e.

89 Calculating standard error for net abatement amount

The standard error for the net abatement amount for a project must be calculated for a reporting period using the following formula:

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$$SEA = \sqrt{SE\Delta C^2 + SEE^2}$$ | **Equation 1d**

where:

$SEA =$ standard error for net abatement amount for a project for the reporting period in tonnes of CO_2-e (t CO_2-e).

$SE\Delta C =$ standard error for carbon stock change for a project for the reporting period in tonnes of CO_2-e (t CO_2-e), calculated in accordance with Equation 2b.

$SEE =$ standard error for project emissions for the reporting period in tonnes of CO_2-e (t CO_2-e), calculated in accordance with Equation 23b.

90 Calculating degrees of freedom for net abatement amount

The degrees of freedom for calculating the confidence interval for the net abatement for a project is to be calculated using the following formula:

$$df = \frac{\left(\sum_{j=1}^{N_J} SE\Delta S_j{}^2\right)^2}{\sum_{j=1}^{N_J}\left(\frac{SE\Delta S_j{}^4}{(-1 + N_{p,j})}\right)}$$ | **Equation 1e**

where:

$df =$ degrees of freedom for calculating the confidence interval for the net abatement amount for a project for the reporting period.

$SE\Delta S_j =$ standard error for the carbon stock change for the jth stratum for the reporting period in tonnes of CO_2-e (t CO_2-e), calculated in accordance with Equations 3c and 3d.

$N_{p,j} =$ number of plots measured for the jth stratum during the reporting period.

$N_J =$ number of strata for the project during the reporting period.

Subdivision 2—Calculating carbon stock change

91 Calculating carbon stock change for a project

(1) The calculation of the carbon stock change for a project must:
   (a) be in accordance with Equation 2a; and
   (b) incorporate a standard error calculation in accordance with Equation 2b.

(2) The carbon stock change for a project is to be calculated for the reporting period using the following formula:

$$\Delta C = \sum_{j=1}^{N_J} \Delta S_j$$ | **Equation 2a**

where:

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ΔC = carbon stock change for the project for the reporting period in tonnes of CO_2-e (t CO_2-e).

ΔS_j = the carbon stock change for the jth stratum for the reporting period in tonnes of CO_2-e (t CO_2-e), which is calculated in accordance with Equations 3a and 3b.

N_J = number of strata for the project during the reporting period, including superseded strata to which section 21 applies.

(3) When calculating the carbon stock change for a project for the reporting period, the standard error is to be calculated using the following formula:

$$SE\Delta C = \sqrt{\sum_{j=1}^{N_J} SE\Delta S_j{}^2}$$	**Equation 2b**

where:

$SE\Delta C$ = standard error for the carbon stock change for a project area for the reporting period, in tonnes of CO_2-e (t CO_2-e).

$SE\Delta S_j$ = standard error for the carbon stock change for the jth stratum for the reporting period in tonnes of CO_2-e (t CO_2-e), calculated in accordance with Equations 3c and 3d.

N_J = number of strata for the project during the reporting period.

92 Calculating carbon stock change for a stratum

(1) Where a stratum is referenced in an offsets report under this determination, the calculation of the carbon stock change for the first and subsequent reporting periods must:
   (a) be carried out in accordance with:
      (i) Equation 3a for the first reporting period; and
      (ii) Equation 3b for subsequent reporting periods; and
   (b) incorporate a standard error calculation in accordance with:
      (i) Equation 3c for the first reporting period; and
      (ii) Equation 3d for subsequent reporting periods.

Calculating carbon stock for the first reporting period for the stratum

(2) Carbon stock change for a stratum is to be calculated for the first reporting period in which the stratum is referenced using the following formula:

$$\Delta S_j = C_j - I_j$$	**Equation 3a**

where:

ΔS_j = carbon stock change for the jth stratum for the reporting period in tonnes of CO_2-e (t CO_2-e).

C_j = closing carbon stock for the jth stratum for the reporting period in tonnes of CO_2-e (t CO_2-e):
   (a) calculated in accordance with Equation 5a; or

(b) if paragraph 17(12)(d) or subsection 19(11) applies—calculated in accordance with Equation 6a; or

(c) given by section 96.

$I_j =$ initial carbon stock for the jth stratum in tonnes of CO_2-e, given by section 93.

Calculating carbon stock for subsequent reporting periods for the stratum.

(3) The carbon stock change for a stratum is to be calculated for subsequent reporting periods in which the stratum is referenced using the following formula:

| $$\Delta S_j = C_j - V_j$$ | **Equation 3b** |

where:

$\Delta S_j =$ carbon stock change for the jth stratum for the reporting period in tonnes of CO_2-e (t CO_2-e).

$C_j =$ closing carbon stock for the jth stratum for the reporting period in tonnes of CO_2-e (t CO_2-e), calculated in accordance with Equation 5a or 6a or given by section 96.

$V_j =$ closing carbon stock for the jth stratum for the most recent previous reporting period in tonnes of CO_2-e (t CO_2-e), and calculated in accordance with Equation 5a or 6a, or given by section 96.

Note: For Equation 3b, V_j for the most recent previous reporting period will be equal to C_j, as given by Equation 5a or Equation 6a, as calculated for the most recent previous reporting period. If Equation 6a is being used, the amount V_j referred to in that equation will be the closing carbon stock for the reporting period that immediately precedes the most recent reporting period.

Calculating the standard error for the first reporting period for the stratum

(4) When calculating the carbon stock change for the first reporting period in which a stratum is referenced, the standard error is to be calculated using the following formula:

| $$SE\Delta S_j = \sqrt{(SEC_j)^2 + (SEI_j)^2}$$ | **Equation 3c** |

where:

$SE\Delta S_j =$ standard error for the carbon stock change for the jth stratum for reporting period Ri in tonnes of CO_2-e (t CO_2-e).

$SEC_j =$ standard error for the closing carbon stock for the jth stratum for reporting period Ri in tonnes of CO_2-e (t CO_2-e), calculated in accordance with Equation 5b or given by section 96.

$SEI_j =$ standard error for the initial carbon stock for the jth stratum in tonnes of CO_2-e (t CO_2-e), given by section 93.

Calculating the standard error for subsequent reporting periods for the stratum

(5) When calculating the carbon stock change for a subsequent reporting period in which a stratum is referenced, the standard error is to be calculated using the following formula:

$$SE\Delta S_j = \sqrt{(SEC_j)^2 + (SEV_j)^2} \qquad \textbf{Equation 3d}$$

where:

$SE\Delta S_j =$ standard error for the carbon stock change for the jth stratum for the reporting period in tonnes of CO_2-e (t CO_2-e).

$SEC_j =$ standard error for the closing carbon stock for the jth stratum for the reporting period in tonnes of CO_2-e (t CO_2-e), calculated in accordance with Equations 5b and 6b or given by section 96.

$SEV_j =$ standard error for the closing carbon stock for the jth stratum for the most recent previous reporting period in tonnes of CO_2-e (t CO_2-e), calculated in accordance with Equations 5b and 6b or given by section 96.

Subdivision 3—Calculating initial carbon stock for a stratum

93 Calculating initial carbon stock for a stratum

(1) For equations 3a and 3c, this section sets initial carbon stock, and the standard error for the initial carbon stock, for a stratum in the first reporting period in which the stratum is referenced.

Initial carbon stock normally zero

(2) Subject to this section:
   (a) the initial carbon stock is zero; and
   (b) the standard error is zero.

Initial carbon stocks for pre-existing strata

(3) For a pre-existing stratum:
   (a) the initial carbon stock is the reported value of the closing stock in the relevant offsets report; and
   (b) the standard error is:
      (i) if a standard error for the carbon stock was also reported in the relevant offsets report—that value; and
      (ii) otherwise—zero.

(4) For this section:

pre-existing stratum means a pre-existing stratum established by subsection 17(10) because section 15 applied to the project; and

relevant offsets report means the relevant offsets report for the project under section 15.

Subdivision 4—Calculating closing carbon stock for a stratum

94 Calculating closing carbon stock for a stratum based on full inventory

(1) This section applies if:
   (a) a full inventory has been conducted within a stratum no earlier than 6 months before the end of the reporting period; or

(b) closing carbon stock is to be calculated using Equation 5a in the circumstances described in subsection 56(1).

(2) The calculation of the closing carbon stock for a reporting period in which a full inventory has been conducted must:

(a) be carried out in accordance with Equation 5a; and

(b) incorporate a standard error calculation in accordance with Equation 5b.

(3) The closing carbon stock for a reporting period in which a full inventory has been conducted within a stratum must be calculated using the following formula:

| $C_j = \overline{P}_j \times a_j$ | **Equation 5a** |

where:

$C_j =$ closing carbon stock for the jth stratum for the reporting period, in tonnes of CO_2-e (t CO_2-e).

$\overline{P}_j =$ mean plot carbon stock for plots within the jth stratum for the reporting period in tonnes of CO_2-e per hectare (t.ha^{-1} CO_2-e), calculated in accordance with Equation 11a.

$a_j =$ land area in hectares (ha) occupied by the jth stratum at the end of the reporting period.

(4) When calculating the closing carbon stock within a stratum for a reporting period in which this section applies, the standard error is to be calculated using the following formula:

| $SEC_j = SE\overline{P}_j \times a_j$ | **Equation 5b** |

where:

$SEC_j =$ standard error for closing carbon stock for the jth stratum for the reporting period, in tonnes of CO_2-e (t CO_2-e).

$SE\overline{P}_j =$ standard error for mean plot carbon stock in the jth stratum for the reporting period in tonnes per hectare of CO_2-e (t.ha^{-1} CO_2-e), calculated in accordance with Equation 11b.

$a_j =$ land area in hectares (ha) occupied by the jth stratum at the end of the reporting period.

95 Calculating closing carbon stock for a stratum based on PSP assessment

(1) This section applies if a PSP assessment for a stratum is conducted in accordance with this determination.

(2) The calculation of the closing carbon stock for a stratum for a reporting period in which a PSP assessment has been conducted within the stratum in accordance with this section must:

(a) be carried out in accordance with Equation 6a; and

(b) incorporate a standard error calculation in accordance with Equation 6b.

(3) The closing carbon stock for a stratum for a reporting period in which a PSP assessment has been conducted within the stratum in accordance with this section is to be calculated using the following formula:

$$C_j = V_j \times \tilde{R}_j \times \frac{a_j}{v_j}$$

Equation 6a

where:

C_j = closing carbon stock for the jth stratum for the reporting period, in tonnes of CO_2-e (t CO_2-e).

$\tilde{R}_j$ = lower confidence bound for the weighted mean ratio of change in carbon stock for sample plots in the jth stratum for the reporting period, calculated in accordance with Equation 8.

V_j = closing carbon stock for the jth stratum for the most recent previous reporting period where a full inventory was undertaken in tonnes of CO_2-e (t CO_2-e).

a_j = land area in hectares (ha) occupied by the jth stratum at the end of the reporting period.

v_j = land area in hectares (ha) occupied by the jth stratum at the end of the most recent previous reporting period where a full inventory was undertaken.

(4) When calculating the closing carbon stock for a stratum for a reporting period in which a PSP assessment has been conducted in accordance with this section, the standard error must be calculated using the following formula:

$$SEC_j = \sqrt{\left(SEV_j{}^2 \times \tilde{R}_j{}^2\right) + \left(SE\overline{R}_j{}^2 \times V_j{}^2\right)} \times \frac{a_j}{v_j}$$

Equation 6b

where:

SEC_j = standard error for closing carbon stock for the jth stratum for the reporting period, in tonnes of CO_2-e (t CO_2-e).

SEV_j = standard error for closing carbon stock for the jth stratum for the most recent previous reporting period where a full inventory was undertaken in tonnes of CO_2-e (t CO_2-e), calculated in accordance with Equation 5b.

$SE\overline{R}_j$ = standard error for weighted mean ratio of change in PSP carbon stock for permanent sample plots in the jth stratum for the reporting period, calculated in accordance with Equation 9b.

V_j = closing carbon stock for the jth stratum for the most recent previous reporting period where a full inventory was undertaken in tonnes of CO_2-e (t CO_2-e).

$\tilde{R}_j$ = lower confidence bound for weighted mean ratio of change in PSP carbon stock for sample plots in the jth stratum for the reporting period, calculated in accordance with Equation 8.

a_j = land area in hectares (ha) occupied by the jth stratum at the end of the current reporting period.

v_j = land area in hectares (ha) occupied by the jth stratum at the end of the most recent previous reporting period where a full inventory was undertaken.

96 Calculating closing carbon stock for a stratum with no assessment

(1) This section applies to a stratum if no assessment has been made for the purposes of subsection 85(3) for a reporting period.

(2) If the reporting period is the first for the stratum, and subsection 85(4) does not apply because of subsection 19(10) or (13), the closing carbon stock, and the standard error for the closing carbon stock, are both zero.

(3) Otherwise, the closing carbon stock, and the standard error for the closing carbon stock for the stratum for the reporting period are the same as for the previous reporting period.

Subdivision 5—Calculating lower confidence bound

97 Calculating the lower confidence bound for mean ratio of change in PSP carbon stock

The lower confidence bound for the weighted mean ratio of change in PSP carbon stock is to be calculated for a reporting period using the following formula:

$$\tilde{R}_j = \overline{R}_j - (\tau \times SE\overline{R}_j) \qquad \textbf{Equation 8}$$

where:

$\tilde{R}_j =$ lower confidence bound for weighted mean ratio of change in PSP carbon stock for sample plots in the jth stratum for the reporting period.

$\overline{R}_j =$ weighted mean ratio of change in PSP carbon stock for sample plots occurring in the jth stratum for the reporting period, calculated in accordance with Equation 9a.

$\tau =$ two-sided students t-value for the 90% confidence level at the appropriate degrees of freedom (n -1), where n is the number of PSP plots in stratum j assessed during the reporting period for the purposes of section 98.

$SE\overline{R}_j =$ standard error for weighted mean ratio of change in PSP carbon stock for sample plots in the jth stratum for the reporting period, calculated in accordance with Equation 9b.

Subdivision 6—Calculating mean ratio of change in PSP carbon stock

98 Calculating the mean ratio of change in PSP carbon stock

(1) The calculation of the weighted mean for the values of PSP carbon stock change ratios must:
    (a) be carried out in accordance with Equation 9a; and
    (b) incorporate a standard error calculation in accordance with Equation 9b.

(2) For this section, if, for a particular sample plot p, $Q_{j,p}$ is zero, treat the plot as if:
    (a) it was not a PSP in the jth stratum; and
    (b) it was not assessed during the reporting period.

(3) The weighted average for the values of PSP carbon stock change ratios is to be calculated using the following formula:

$$\overline{R}_j = \frac{\sum_{p=1}^{N_{j,p}}(Q_{j,p} \times R_{j,p})}{\sum_{p=1}^{N_{j,p}} Q_{j,p}}$$

	Equation 9a

where:

$\overline{R}_j =$ weighted mean ratio of change in PSP carbon stock for sample plots occurring in the jth stratum for the reporting period.

$R_{j,p} =$ ratio of change in PSP carbon stock, for the pth sample plot in the jth stratum for the reporting period, calculated in accordance with Equation 10.

$Q_{j,p} =$ carbon stock in carbon pools assessed for the pth sample plot in the jth stratum for the most recent previous reporting period where a full inventory was undertaken in tonnes per hectare of CO_2-e (t.ha^{-1} CO_2-e), calculated in accordance with Equation 12.

$N_{j,p} =$ number of sample plots assessed in the jth stratum during the reporting period.

(4) When calculating the mean ratio of change in PSP carbon stock, the standard error is to be calculated using the following formula:

$$SE\overline{R}_j = \frac{\sigma R_{j,p}}{\sqrt{N_{j,p}}}$$

	Equation 9b

where:

$SE\overline{R}_j =$ standard error for weighted mean ratio of change in PSP carbon stock for permanent sample plots in the jth stratum for the reporting period.

$\sigma R_{j,p} =$ standard deviation of the ratios of change in PSP carbon stock for permanent sample plots in the jth stratum for the reporting period, $R_{j,p}$, calculated in accordance with Equation 10.

$N_{j,p} =$ number of sample plots assessed in the jth stratum during the reporting period.

99 Calculating the ratio of change in PSP carbon stock

The ratio of change in PSP carbon stock, for the pth sample plot in the jth stratum for the reporting period, for a plot for which $Q_{j,p}$ is non-zero, is to be calculated using the following formula:

$$R_{j,p} = \frac{P_{j,p}}{Q_{j,p}}$$

	Equation 10

where:

$R_{j,p} =$ ratio of change in PSP carbon stock within the pth sample plot in the jth stratum between the reporting period and the most recent previous reporting period where a full inventory was undertaken.

$P_{j,p} =$ carbon stock in carbon pools assessed within sample plot p in the jth stratum the reporting period as part of a PSP assessment, in tonnes per hectare of

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CO_2-e (t.ha^{-1} CO_2-e), calculated in accordance with Equation 12.

$Q_{j,p}$ =   carbon stock in carbon pools assessed within the same permanent sample plot p in the jth stratum for the most recent previous reporting period where a full inventory was undertaken, in tonnes per hectare of CO_2-e (t.ha^{-1} CO_2-e) and calculated in accordance with Equation 12.

Subdivision 7—Calculating mean plot carbon stock for a stratum

100 Calculating mean plot carbon stock for a stratum

(1) The calculation of the mean plot carbon stock for a stratum must:
  (a) be carried out in accordance with Equation 11a; and
  (b) incorporate a standard error calculation in accordance with Equation 11b.

(2) The mean plot carbon stock for a stratum for the reporting period is to be calculated using the following formula:

$$\overline{P}_j = \frac{\sum_{p=1}^{N_{j,p}} P_{j,p}}{N_{j,p}}$$	**Equation 11a**

where:

$\overline{P}_j$ =   mean plot carbon stock for plots within the jth stratum for the reporting period in tonnes per hectare of CO_2-e (t.ha^{-1} CO_2-e).

$P_{j,p}$ =   carbon stock in carbon pools assessed within plot p for reporting period in tonnes per hectare of CO_2-e (t.ha^{-1} CO_2-e), calculated in accordance with Equation 12.

$N_{j,p}$ =   number of plots assessed within the jth stratum during the reporting period.

Note: For the calculations in Equation 26a substitute $\overline{P}_{NF,j}$ and $\overline{P}_{FA,j}$ for $\overline{P}_j$ to calculate the mean plot carbon stock for non-fire affected and fire affected stratum respectively.

(3) When calculating the mean plot carbon stock for a stratum, the standard error is to be calculated using the following formula:

$$SE\overline{P}_j = \frac{\sigma P_{j,p}}{\sqrt{N_{j,p}}}$$	**Equation 11b**

where:

$SE\overline{P}_j$ =   standard error for mean plot carbon stock for plots within the jth stratum for the reporting period, in tonnes per hectare of CO_2-e (t.ha^{-1} CO_2-e).

$\sigma P_{j,p}$ =   standard deviation of plot carbon stock, for plots assessed in the jth stratum for the reporting period (where $P_{j,p}$ is calculated in accordance with Equation 12), in tonnes per hectare of CO_2-e (t.ha^{-1} CO_2-e).

$N_{j,p}$ =   number of plots assessed within the jth stratum during the reporting period.

Subdivision 8—Calculating carbon stock in a plot

101 Calculating carbon stock within a plot assessed as part of full inventory or a PSP assessment

The carbon stock in a TSP assessed as part of a full inventory, or in a PSP assessed as part of a PSP assessment, is to be calculated using the following formula:

$$P_{j,p} = C_{T,p} + C_{FT,p} + C_{DT,p} + C_{FD,p} + C_{L,p} + C_{FA,p}$$ | **Equation 12**

where:

$P_{j,p}$ = carbon stock in carbon pools assessed within sample plot p in the jth stratum the reporting period in tonnes per hectare of CO_2-e (t.ha^{-1} CO_2-e).

$C_{T,p}$ = carbon stock in live trees within plot p in tonnes per hectare of CO_2-e (t.ha^{-1} CO_2-e), calculated in accordance with Equation 13.

$C_{FT,p}$ = carbon stock in live fire affected trees within plot p in tonnes per hectare of CO_2-e (t.ha^{-1} CO_2-e), calculated in accordance with Equation 14.

$C_{DT,p}$ = carbon stock in dead standing trees within plot p in tonnes per hectare of CO_2-e (t.ha^{-1} CO_2-e), calculated in accordance with Equation 15.

$C_{FD,p}$ = carbon stock in dead standing fire affected trees within plot p in tonnes per hectare of CO_2-e (t.ha^{-1} CO_2-e), calculated in accordance with Equation 16.

$C_{L,p}$ = carbon stock in litter within plot p in tonnes per hectare of CO_2-e (t.ha^{-1} CO_2-e), calculated in accordance with Equation 17.

$C_{FA,p}$ = carbon stock in fallen dead wood in plot p in tonnes per hectare of CO_2-e (t.ha^{-1} CO_2-e), calculated in accordance with Equation 18.

Subdivision 9—Calculating carbon stock in trees, fallen dead wood, and litter

102 Calculating carbon stock in live trees within a plot

The amount of carbon contained within the biomass of live trees within a plot p is to be calculated using the following formula:

$$C_{T,p} = \frac{44}{12} \times CF_T \times \frac{1}{a_p} \times B_{T,p} \times 0.001$$ | **Equation 13**

where:

$C_{T,p}$ = carbon stock in live trees within plot p in tonnes per hectare of CO_2-e (t.ha^{-1} CO_2-e).

CF_T = carbon fraction of biomass in live trees as a proportion and applying a value of 0.5.

a_p = area of plot p in hectares (ha).

$B_{T,p}$ = total biomass in live trees within plot p in kilograms of dry matter, calculated in accordance with Equation 19.

103 Calculating carbon stock in live fire affected trees within a plot

The amount of carbon contained within the biomass of live fire affected trees within plot p is to be calculated using the following formula:

$$C_{FT,p} = \frac{44}{12} \times CF_{FT} \times \frac{1}{a_p} \times B_{FT,p} \times 0.001$$

Equation 14

where:

$C_{FT,p}$ = carbon stock in live fire affected trees within plot p in tonnes per hectare of CO_2-e (t.ha^{-1} CO_2-e).

CF_{FT} = carbon fraction of biomass in live fire affected trees as a proportion and applying a value of 0.5.

a_p = area of plot p in hectares.

$B_{FT,p}$ = total biomass in live fire affected trees within plot p in kilograms of dry matter, calculated in accordance with Equation 20.

104 Calculating carbon stock in dead standing trees within a plot

The amount of carbon contained within the biomass of dead standing trees within plot p is to be calculated using the following formula:

$$C_{DT,p} = \frac{44}{12} \times CF_{DT} \times \frac{1}{a_p} \times B_{DT,p} \times 0.001$$

Equation 15

where:

$C_{DT,p}$ = carbon stock in dead standing trees within plot p in tonnes per hectare of CO_2-e (t.ha^{-1} CO_2-e).

CF_{DT} = carbon fraction of biomass in dead standing trees as a proportion and applying a value of 0.5.

a_p = area of plot p in hectares (ha).

$B_{DT,p}$ = total biomass in dead standing trees within plot p in kilograms of dry matter, calculated in accordance with Equation 21.

105 Calculating carbon stock in dead standing fire affected trees within a plot

The amount of carbon contained within the biomass of dead standing fire affected trees within plot p is to be calculated using the following formula:

$$C_{FD,p} = \frac{44}{12} \times CF_{FD} \times \frac{1}{a_p} \times B_{FD,p} \times 0.001$$

Equation 16

where:

$C_{FD,p}$ = carbon stock in dead standing fire affected trees within plot p in tonnes per hectare of CO_2-e (t.ha^{-1} CO_2-e).

CF_{FD} = carbon fraction of biomass in dead standing fire affected trees as a proportion and applying a value of 0.5.

a_p = area of plot p in hectares.

$B_{FD,p} =$ total biomass in dead standing fire affected trees within plot p in kilograms of dry matter, calculated in accordance with Equation 22.

106 Calculating carbon stock in litter within a plot

The amount of carbon contained within litter in plot p is to be calculated using the following formula:

$$C_{L,p} = \frac{44}{12} \times CF_L \times \frac{1}{l_p} \times B_{WL,p} \times L_{DW,p} \times 0.001$$	**Equation 17**

where:

$C_{L,p} =$ carbon stock in litter within plot p in tonnes per hectare of CO_2-e (t.ha^{-1} CO_2-e).

$CF_L =$ carbon fraction of dry biomass in litter as a proportion and applying a value of 0.5.

$l_p =$ total area of land sampled using litter sampling frame for plot p, in hectares (ha).

$B_{WL,p} =$ wet weight of the bulked sample for litter collected from plot p, in kilograms (kg).

$L_{DW,p} =$ dry-wet weight ratio of litter calculated from sub-samples collected on the same day that plot p was assessed.

107 Calculating carbon stock in fallen dead wood within a plot

The amount of carbon contained within fallen dead wood in plot p is to be calculated using the following formula:

$$C_{FA,p} = \frac{44}{12} \times CF_{FA} \times \frac{1}{a_p} \times B_{WF,p} \times F_{DW,p} \times 0.001$$	**Equation 18**

where:

$C_{FA,p} =$ carbon stock in fallen dead wood within plot p, in tonnes per hectare of CO_2-e (t.ha^{-1} CO_2-e).

$CF_{FA} =$ carbon fraction of dry biomass in fallen dead wood as a proportion and applying a value of 0.5.

$B_{WF,p} =$ wet weight of fallen dead wood collected from plot p, in kilograms (kg).

$F_{DW,p} =$ dry-wet weight ratio of fallen dead wood calculated from sub-samples collected on the same day that plot p was assessed.

$a_p =$ area of plot p, in hectares (ha).

Subdivision 10—Calculating biomass in trees

108 Calculating biomass in live trees within a plot

The total biomass contained in live trees within plot p is to be calculated using the following formula:

$$B_{T,p} = \sum_{k=1}^{N_{T,p}} B_{T,p,k}$$

Equation 19

where:

$B_{T,p}$ =   total biomass in live trees within plot p, in kilograms of dry matter.

$B_{T,p,k}$ =   biomass of kth live tree within plot p, in kilograms of dry matter.

$N_{T,p}$ =   number of live trees within plot p.

109 Calculating biomass in live fire affected trees within a plot

The total biomass contained in live fire affected trees within plot p is to be calculated using the following formula:

$$B_{FT,p} = \sum_{k=1}^{N_{FT,p}} B_{FT,p,k}$$

Equation 20

where:

$B_{FT,p}$ =   total biomass in live fire affected trees within plot p, in kilograms of dry matter.

$B_{FT,p,k}$ =   biomass of kth live fire affected tree within plot p, in kilograms of dry matter.

$N_{FT,p}$ =   number of live fire affected trees within plot p.

110 Calculating biomass in dead standing trees within a plot

The total biomass contained in dead standing trees within plot p is to be calculated using the following formula:

$$B_{DT,p} = \sum_{k=1}^{N_{DT,p}} B_{DT,p,k}$$

Equation 21

where:

$B_{DT,p}$ =   total biomass in dead standing trees within plot p, in kilograms of dry matter.

$B_{DT,p,k}$ =   biomass of the kth dead standing tree in plot p, in kilograms of dry matter.

$N_{DT,p}$ =   number of dead standing trees in plot p.

111 Calculating biomass in dead standing fire affected trees within a plot

The total biomass contained in dead standing fire affected trees within plot p is to be calculated using the following formula:

$$B_{FD,p} = \sum_{k=1}^{N_{FD,p}} B_{FD,p,k}$$

Equation 22

where:

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$B_{FD,p}$ = total biomass in dead standing fire affected trees within plot p, in kilograms of dry matter.

$B_{FD,p,k}$ = biomass of the kth dead standing fire affected tree in plot p, in kilograms of dry matter.

$N_{FD,p}$ = number of dead standing fire affected trees in plot p.

Subdivision 11—Calculating project emissions

112 Calculating project emissions

(1) Project emissions for the reporting period must:
  (a) be calculated in accordance with Equation 23a; and
  (b) incorporate a standard error calculation in accordance with Equation 23b.

(2) The project emissions for the reporting period are to be calculated using the following formula:

$$E = \sum_{j=1}^{N_J} \left(E_{FL,j} + E_{FR,j} \right)$$	**Equation 23a**

where:

E = project emissions for the reporting period, in tonnes of CO_2-e (t CO_2-e).

$E_{FL,j}$ = fuel emissions for the jth stratum for the reporting period, in tonnes of CO_2-e (t CO_2-e), calculated in accordance with Equation 24.

$E_{FR,j}$ = fire emissions for the jth stratum for the reporting period, in tonnes of CO_2-e (t CO_2-e), which is:
  (a) if the stratum is newly fire affected—calculated in accordance with Equation 26d; and
  (a) otherwise—0.

N_J = the number of strata in the project.

(3) When calculating the project emissions for the reporting period, the standard error is to be calculated using the following formula:

$$SEE = \sqrt{\sum_{j=1}^{N_J} SEE_{FR,j}{}^2}$$	**Equation 23b**

where:

SEE = standard error for project emissions for the reporting period, in tonnes of CO_2-e (t CO_2-e).

$SEE_{FR,j}$ = standard error for fire emissions for the jth newly fire affected stratum for the reporting period, in tonnes of CO_2-e (t CO_2-e), calculated in accordance with Equation 27d.

N_J = the number of strata in the project.

113 Calculating fuel emissions for a stratum

Emissions from fuel use for a stratum (j) for a reporting period (Ri) are to be calculated using the following formula:

$$E_{FL,j} = \sum_{\substack{\text{all fossil fuel} \\ \text{types } f}} \sum_{\substack{\text{all greenhouse} \\ \text{gase types } g}} E_{FL,j,f,g}$$

Equation 24

where:

$E_{FL,j}$ = fuel emissions for the jth stratum for the reporting period, in tonnes of CO_2-e (t CO_2-e).

$E_{FL,j,f,g}$ = emissions for each fossil fuel type (f) and each greenhouse gas (g), being carbon dioxide, methane or nitrous oxide, for the jth stratum for the reporting period, in tonnes of CO_2-e (t CO_2-e), calculated in accordance with Equation 25.

Note: When calculating the emissions from fuel use within a stratum for the reporting period, the standard error is assumed to be zero.

114 Calculating emissions for fossil fuel types

Emissions of carbon dioxide, methane, or nitrous oxide from combustion of fossil fuels for a reporting period are to be calculated using the following formula:

$$E_{FL,j,f,g} = \frac{Q_{FL,j,f} \times EC_f \times EF_{f,g}}{1000}$$

Equation 25

where:

$E_{FL,j,f,g}$ = emissions for each fossil fuel type (f) and each greenhouse gas (g), being carbon dioxide, methane or nitrous oxide, for the jth stratum for the reporting period, in tonnes of CO_2-e (t CO_2-e).

$Q_{FL,j,f}$ = the quantity of fossil fuel type (f) combusted for the jth stratum during the reporting period in kilolitres.

EC_f = energy content factor of fossil fuel type (f) in gigajoules per kilolitre as prescribed in the applicable determination made under subsection 10(3) of the *National Greenhouse and Energy Reporting Act 2007*.

$EF_{f,g}$ = emission factor for each gas type (g) for fossil fuel type (f) in kilograms of CO_2-e per gigajoule as prescribed in the applicable determination made under subsection 10(3) of the *National Greenhouse and Energy Reporting Act 2007*.

Subdivision 12—Calculating emissions for newly fire affected strata

115 Calculating emissions for a newly fire affected stratum

(1) This section applies to a newly fire affected stratum.

(2) The weight of elemental carbon released as a result of a fire event must:
   (a) be calculated in accordance with Equation 26a; and
   (b) incorporate a standard error calculation in accordance with Equation 27a.

(3) The weight of elemental carbon released as a result of a fire event in a stratum for a reporting period is to be calculated using the following formula:

$$W_{C,j} = \frac{12}{44} \times \left(\overline{P}_{NF,j} - \overline{P}_{FA,j}\right) \times a_j$$ **Equation 26a**

where:

$W_{C,j} =$ weight of elemental carbon emitted from newly fire affected stratum j as a result of the fire for the reporting period, in tonnes of carbon (t).

$\overline{P}_{NF,j} =$ mean plot carbon stock for plots within the original (superseded) stratum as reported in the previous reporting period, in tonnes per hectare of CO_2-e (t.ha^{-1} CO_2-e), calculated in accordance with Equation 11a.

$\overline{P}_{FA,j} =$ (a) if a full inventory of the newly fire affected stratum has not been conducted—zero; and

(b) otherwise—the mean plot carbon stock for plots within newly fire affected stratum j for the reporting period in tonnes per hectare of CO_2-e (t.ha^{-1} CO_2-e), calculated in accordance with Equation 11a.

$a_j =$ land area occupied by newly fire affected stratum j at the end of reporting period Ri, in hectares (ha).

(4) If $\overline{P}_{NF,j}$ is less than or equal to $\overline{P}_{FA,j}$ for subsection (3), emissions of methane and nitrous oxide are taken to be zero.

(5) If $\overline{P}_{NF,j}$ is greater than $\overline{P}_{FA,j}$, the amount of methane emitted from a fire-affected stratum for a reporting period is to be calculated as follows:

$$Q_{CH_4,j} = W_{C,j} \times 0.007182 \times GWP_{CH_4}$$ **Equation 26b**

where:

$Q_{CH_4,j} =$ amount of CH_4 emitted from newly fire affected stratum j for the reporting period, in tonnes of CO_2-e (t CO_2-e).

$W_{C,j} =$ weight of elemental carbon emitted from newly fire affected stratum j as a result of the fire for the reporting period in tonnes of carbon (t), calculated in accordance with Equation 26a.

$GWP_{CH_4} =$ the global warming potential for methane as stated in the *National Greenhouse and Energy Reporting Regulations 2008*.

(6) Also, if $\overline{P}_{NF,j}$ is greater than $\overline{P}_{FA,j}$, the amount of nitrous oxide emitted from a fire-affected stratum for a reporting period is to be calculated as follows:

$$Q_{N_2O,j} = W_{C,j} \times 0.00001329 \times GWP_{N_2O}$$ **Equation 26c**

where:

$Q_{N_2O,j} =$ amount of N_2O emitted from newly fire affected stratum j for the reporting period in tonnes of CO_2-e (t CO_2-e).

$W_{C,j} =$ weight of elemental carbon emitted from newly fire affected stratum j as a result of the fire for the reporting period, in tonnes of carbon (t), calculated in accordance with Equation 26a.

$GWP_{N_2O} =$ the global warming potential for nitrous oxide as stated in the *National*

(7) The total emissions of methane and nitrous oxide from a fire-affected stratum for the reporting period are to be calculated as follows:

| $$E_{FR,j} = Q_{CH_4,j} + Q_{N_2O,j}$$ | **Equation 26d** |

where:

$E_{FR,j}$ =   fire emissions for the jth newly fire affected stratum during the reporting period, in tonnes of CO_2-e (t CO_2-e).

$Q_{CH_4,j}$ =   amount of CH_4 emitted from newly fire affected stratum j for the reporting period, in tonnes of CO_2-e (t CO_2-e), calculated in accordance with Equation 26b.

$Q_{N_2O,j}$ =   amount of N_2O emitted from newly fire affected stratum j for the reporting period, in tonnes of CO_2-e (t CO_2-e), calculated in accordance with Equation 26c.

116 Calculating the standard error for fire emissions

(1) When calculating the emissions for a newly fire affected stratum, the standard error is to be calculated using the following formula:

| $$SEW_{C,j} = \frac{12}{44} \times a_j \times \sqrt{S E \overline{P}_{NF,j}^{\,2} + S E \overline{P}_{FA,j}^{\,2}}$$ | **Equation 27a** |

where:

$SEW_{C,j}$ =   standard error for weight of elemental carbon emitted from newly fire affected stratum j as a result of the fire for reporting period Ri, in tonnes of carbon (t).

$S E \overline{P}_{NF,j}$ =   standard error for mean plot carbon stock for plots within the original (superseded) stratum as reported in the previous reporting period in tonnes per hectare of CO_2-e (t.ha^{-1} CO_2-e), calculated in accordance with Equation 11b.

$S E \overline{P}_{FA,j}$ =   (a)   if a full inventory of the newly fire affected stratum has not been conducted—zero; and

         (b)   otherwise—the standard error for mean plot carbon stock for plots within a newly fire affected stratum j for the reporting period in tonnes per hectare of CO_2-e (t.ha^{-1} CO_2-e), calculated in accordance with Equation 11b.

a_j =   land area occupied by newly fire affected stratum j at the end of the reporting period, in hectares (ha).

(2) Where $\overline{P}_{NF,j}$ is less than or equal to $\overline{P}_{FA,j}$, the standard errors for emissions of methane and nitrous oxide are taken to be zero.

(3) When calculating the amount of methane emitted from a fire-affected stratum for a reporting period, if $\overline{P}_{NF,j}$ is greater than $\overline{P}_{FA,j}$, the standard error is to be calculated using the following formula:

| $$SEQ_{CH_4,j} = SEW_{C,j} \times 0.007182 \times GWP_{CH_4}$$ | **Equation 27b** |

where:

$SEQ_{CH_4,j}$ = standard error for the amount of methane (CH_4) emitted from newly fire affected stratum j for the reporting period, in tonnes of CO_2-e (t CO_2-e).

$SEW_{C,j}$ = standard error for weight of elemental carbon emitted from newly fire affected stratum j as a result of the fire for the reporting period in tonnes of carbon (t), calculated in accordance with Equation 27a.

GWP_{CH_4} = the global warming potential for methane as stated in the *National Greenhouse and Energy Reporting Regulations 2008*.

(4) When calculating the amount of nitrous oxide emitted from a fire-affected stratum for the reporting period, if $\overline{P}_{NF,j}$ is greater than $\overline{P}_{FA,j}$, the standard error is to be calculated using the following formula:

| $$SEQ_{N_2O,j} = SEW_{C,j} \times 0.00001329 \times GWP_{N_2O}$$ | **Equation 27c** |

where:

$SEQ_{N_2O,j}$ = standard error for the amount of nitrous oxide (N_2O) emitted from newly fire affected stratum j for the reporting period, in tonnes of CO_2-e (t CO_2-e).

$SEW_{C,j}$ = standard error for weight of elemental carbon emitted from newly fire affected stratum j as a result of the fire for the reporting period, in tonnes of carbon (t), calculated in accordance with Equation 27a.

GWP_{N_2O} = the global warming potential for nitrous oxide as stated in the *National Greenhouse and Energy Reporting Regulations 2008*.

(5) When calculating the total emissions of methane and nitrous oxide from a fire-affected stratum for the reporting period, the standard error is to be calculated using the following formula:

| $$SEE_{FR,j} = \sqrt{SEQ_{CH_4,j}^2 + SEQ_{N_2O,j}^2}$$ | **Equation 27d** |

where:

$SEE_{FR,j}$ = standard error for fire emissions for the jth newly fire affected stratum for the reporting period, in tonnes of CO_2-e (t CO_2-e).

$SEQ_{CH_4,j}$ = standard error for the amount of methane (CH_4) emitted from newly fire affected stratum j for the reporting period, in tonnes of CO_2-e (t CO_2-e), as provided by subsection (2) or calculated in accordance with Equation 27b.

$SEQ_{N_2O,j}$ = standard error for the amount of nitrous oxide (N_2O) emitted from newly fire affected stratum j for the reporting period, in tonnes of CO_2-e (t CO_2-e), as provided by subsection (2) or calculated in accordance with Equation 27c.

Subdivision 13—Calculating probable limit of error

117 Calculating probable limit of error for carbon stock estimates

The probable limit of error around mean carbon stock values for a set of plots within a stratum is to be calculated using the following formula:

$$PLE_j = \left(\frac{SE\overline{P}_j \times \tau}{\overline{P}_j}\right) \times 100 \qquad \textbf{Equation 28}$$

where:

$PLE_j =$ probable limit of error for the jth stratum for the reporting period, as a percentage.

$SE\overline{P}_j =$ standard error for mean plot carbon stock for plots within the jth stratum for the reporting period, in tonnes per hectare of CO_2-e (t.ha^{-1} CO_2-e), calculated in accordance with Equation 11b.

$\tau =$ two-sided students t-value for the 90% confidence level at the appropriate degrees of freedom (n -1), where n is the number of plots assessed in the jth stratum during the reporting period.

$\overline{P}_j =$ mean plot carbon stock for plots within the jth stratum for the reporting period in tonnes per hectare of CO_2-e (t.ha^{-1} CO_2-e), calculated in accordance with Equation 11a.

118 Calculating number of plots required for probable limit of error

(1) The number of plots likely to be required to achieve a target probable limit of error must be calculated in accordance with Equations 29a and 29b.

(2) The coefficient of variation for the sample population of plots is to be calculated using the following formula:

$$CV = \frac{\sigma}{\bar{x}} \times 100 \qquad \textbf{Equation 29a}$$

where:

$CV =$ coefficient of variation, as a percentage.

$\sigma =$ standard deviation for the sample population, in tonnes per hectare of CO_2-e (t.ha^{-1} CO_2-e).

$\bar{x} =$ mean value calculated for the sample population, in tonnes per hectare of CO_2-e (t.ha^{-1} CO_2-e).

(3) The minimum number of plots likely to be required to achieve a target probable limit of error is to be calculated as follows, and rounded up to the nearest whole number:

$$N = \frac{CV^2 \times \tau^2}{PLE^2} \qquad \textbf{Equation 29b}$$

where:

$N =$ minimum number of plots required.

$CV =$ coefficient of variation as a percentage, calculated in accordance with Equation 29a.

$\tau =$ two-sided students t-value for the 90% confidence level at the appropriate degrees of freedom (m -1, where m is the number of plots in the sample population used to estimate CV).

$PLE =$ target probable limit of error, as a percentage.

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Subdivision 14—Calculating biomass for biomass sample trees and test trees

119 Calculating total biomass for trees—destructive sampling

(1) This section applies if the destructive sampling option has been chosen under section 73.

(2) The total biomass for a biomass sample tree or a test tree is to be calculated using the following formula:

| $$B_{ST} = \sum_{h=1}^{N_H} B_h$$ | **Equation 30** |

where:

B_{ST} = total biomass for the biomass sample tree or test tree, in kilograms of dry matter.

N_H = the number of biomass components within the biomass sample tree or test tree.

B_h = biomass for biomass component h, in kilograms of dry matter, calculated in accordance with Equation 31.

120 Calculating total biomass for trees—default root:shoot ratio

(1) This section applies if the default root:shoot ratio option has been chosen under section 73.

(2) The total biomass for a biomass sample tree or a test tree is to be calculated using the following formula:

| $$B_{ST} = 1.2 \times \sum_{h=1}^{N_H} B_h$$ | **Equation 30A** |

where:

B_{ST} = total biomass for the biomass sample tree or test tree, in kilograms of dry matter.

N_H = the number of aboveground biomass components within the biomass sample tree or test tree.

B_h = biomass for aboveground biomass component h, in kilograms of dry matter, calculated in accordance with Equation 31.

Note: The factor of 1.2 incorporates the default root:shoot ratio of 0.2.

121 Calculating the dry weight of biomass components for biomass sample trees and test trees

The dry weight of biomass components for a biomass sample tree or a test tree is to be calculated using the following formula:

| $$B_h = W_h \times R_{DW,h}$$ | **Equation 31** |

where:

B_h = biomass for biomass component h in kilograms of dry matter.

$W_h =$ fresh-weight of biomass component h in kilograms of wet matter.

$R_{DW,h} =$ dry-wet weight ratio of biomass component h calculated from the oven dried biomass component or the oven dried sub-samples of the biomass component.

$h =$ biomass component.

122 Calculating the variance of weighted residuals for biomass sample trees and test trees

(1) The variance of weighted residuals for a set of biomass sample trees or test trees must be calculated in accordance with Equations 32a to 32c.

(2) The variance of weighted residuals for:

   (a) a set of biomass sample trees that have been assessed as part of the process for developing an allometric function; or

   (b) a set of test trees that have been assessed as part of the process for validating an allometric function;

is to be calculated using the following formula:

| $$\sigma^2 = \frac{\sum_{i=1}^{N} R_i{}^2}{N - N_P}$$ | **Equation 32a** |

where:

$\sigma^2 =$ variance of weighted residuals for biomass sample trees (σ_A^2) or for test trees (σ_T^2).

$R_i =$ weighted residual in kilograms (kg) for tree i, calculated in accordance with Equation 32b.

$i =$ a biomass sample tree or a test tree.

$N =$ the number of biomass sample trees (N_A) or test trees (N_T), as a whole number.

$N_P =$ the number of parameters in the allometric function, as a whole number.

(3) The weighted residual for a biomass sample tree or a test tree is to be calculated using the following formula:

| $$R_i = w_i \times \left(B_{M,i} - B_{P,i}\right)$$ | **Equation 32b** |

where:

$R_i =$ weighted residual in kilograms (kg) for tree i.

$i =$ a biomass sample tree or a test tree.

$B_{M,i} =$ biomass in kilograms (kg) for tree i measured through destructive sampling.

$B_{P,i} =$ predicted biomass in kilograms (kg) for tree i calculated from the allometric function.

$w_i =$ weighting factor applied to tree i, calculated in accordance with Equation 32c.

(4) The weighting factor applied to a biomass sample tree or test tree is to be calculated using the following formula, and expressed as a dimensionless number:

| $$w_i = \dfrac{1}{\sqrt{BA_i}}$$ | **Equation 32c** |

where:

$w_i =$ weighting factor applied to tree i.

$BA_i =$ basal area of tree i in square metres (m^2).

$i =$ biomass sample tree or a test tree i.

Part 6—Monitoring and reporting requirements

Note: This determination does not contain any record-keeping requirements for the purposes of paragraph 106(3)(c) of the Act. Record-keeping requirements are set out in Part 17 of the Rule.

Division 1—Monitoring requirements

123 Operation of this Division

For paragraph 106(3)(d) of the Act, this Division sets out requirements to monitor a permanent planting project that is an eligible offsets project.

124 Monitoring for growth disturbances

A project proponent must monitor growth disturbance events within the strata of the project area.

Note: Under section 81 of the Act the Regulator must be notified of certain natural disturbance events.

Division 2—Offsets report requirements

125 Operation of this Division

For paragraph 106(3)(a) of the Act, this Division sets out information that must be included in an offsets report about a permanent planting project that is an eligible offsets project.

Note: The requirements in this Division supplement the general requirements for an offsets report in Division 2 of Part 6 of the Rule.

126 Reporting when not possible to use factors or parameters as at end of reporting period

If, in the circumstances described in paragraph 6(2)(b), a factor or parameter is defined or calculated for a reporting period by reference to an instrument or writing as in force from time to time, the offsets report about the project for the reporting period must include the following information for the factor or parameter:

(a) the versions of the instrument or writing used;

(b) the start and end dates of each use;

(c) the reasons why it was not possible to define or calculate the factor or parameter by reference to the instrument or writing as in force at the end of the reporting period.

Division 3—Reporting under section 77A of the Act

127 No division of stratum area

For subsection 77A(2) of the Act, the division of the overall project must not result in the division of:

(a) a stratum area; or

(b) a superseded stratum and any strata that supersede it.