BIDCARBON™

Supplement to the Distributed Pyrolysis Carbon Capture and Sequestration Methodology

Contents

Part A - Mapping carbon estimation areas, exclusion areas and emissions accounting areas

Requirements of Part A are used primarily to guide the operation of a project at start-up under section 4 of Schedule 1 of the Methodology. Section 5 of Schedule 1 of the Methodology requires that the mapping of each carbon estimation area, exclusion area or emissions accounting area must be done in accordance with this Supplement.

Requirements

1. It is a requirement that geospatial maps are provided to the Working Body with the following features (in the following circumstances) clearly identified, for the purposes of subparagraphs 87(4)(e) of the Methodology:
   (a) Each carbon estimation area in the project (provided with every offsets report and sampling plan);
   (b) Each exclusion area in the project (provided with every offsets report and sampling plan);
   (c) Each emissions accounting area in the project (provided with every offsets report and sampling plan);
   (d) Provided to the Working Body with every offsets report, for each sampling round in the reporting period:
      (i) Strata boundaries.
      (ii) Intended sampling locations (which were included with the sampling plan) with the sequence of samples to be taken, composite sample identifiers (e.g. which samples feed into which composite), and reserve locations (excess sampling locations).
      (iii) If a sampling round occurred, actual sampling locations (with the sequence of samples taken, composite sample identifiers (e.g which samples feed into which composite), and reserve locations (excess sampling locations).
      (iv) Actual composite sample identifiers.
2. It is a requirement that project proponents use one or more of the following sources of data to delineate the boundaries of carbon estimation areas, exclusion areas and emissions accounting areas:
   (a) ***Navigation Satellite System*** (NSS):
      (i) Differential Global Navigation Satellite System (GNSS);
      (ii) Galileo Navigation Satellite System;
      (iii) BeiDou Navigation Satellite System;
   (b) Field surveys and sampling;
   (c) Orthorectified aerial photographs;
   (d) Orthorectified satellite imagery;
   (e) Cadastral databases.
3. It is a requirement to provide spatial data that has a horizontal accuracy of at least 10 meters at 95 per cent threshold in accordance with the BidCarbon Map and Spatial Data Accuracy Standard.
4. It is a requirement that carbon estimation area boundaries are delineated with a maximum resolution of ± four meters. For clarity, a resolution as small as possible is preferable and must not exceed ± four meters.

5. carbon estimation area boundaries must not be changed in such a way as to result in the change in boundaries of any strata, in any sampling round for which samples have been allocated under Section 2.0 of this Part B.
   (a) Where a carbon estimation area has used equal area strata and across strata compositing for a sampling round, such strata may be merged, and considered a single stratum within the merged carbon estimation area. The composite samples previously collected across the original equal area strata must be considered within-strata composites for the purposes of this Supplement.

   Note: This does not limit new strata boundaries being formed for subsequent sampling rounds.
6. It is a requirement that if carbon estimation area boundaries are changed, they are not changed in such a way as to result in carbon estimation areas with less than three sampling strata for any sampling round for which samples have been allocated under Section 2.0 of this Part B.
7. It is a requirement that, if part of a project area is removed from a project, and that action removes part of a carbon estimation area that has been established through a baseline sampling event, then the removal may occur if the carbon estimation area is not subject to permanence obligations (i.e. the carbon estimation area has not been issued BidCarbon data units) and the Working Body is satisfied that the removal does not result in the crediting of non-genuine carbon abatement.

   Note 1: Removing parts of a project area that removes part of a carbon estimation area is permitted through Schedule 1, subparagraph 5(4) of the Methodology. Project proponents must ensure that if removing areas from carbon estimation areas that the carbon estimation areas still meet the minimum sampling requirements (three strata per carbon estimation area and three samples per strata).

   Note 2: A project area variation must not remove an area that also removes a sampling point if the result in a soil pH sampling round materially decreases, or if the result in a subsequent sampling round materially increases.

   Note 3: If modifying carbon estimation areas results in minimum sampling requirements not being met for a soil pH sampling round, the project carbon estimation areas must be remapped to be compliant with this Part and a new soil pH sampling round to be undertaken.

Recommendations

1. It is recommended that project proponents assess the appropriateness of the dataset(s) (used for Requirement 3 of this Part) against the following criteria:
   (a) Age of spatial information;
   (b) Scale;
   (c) Resolution;
   (d) Accuracy;
   (e) Classification, aggregation, generalisation systems;
   (f) Integrity of dataset.

Part B - Developing Sampling Design

Requirements of Part B are used primarily to guide the setup and operation of sampling design under sections 6 and 7 of Schedules 1 of the Methodology, respectively, which require sampling design to meet any requirements in this Supplement.

Requirements

1. It is a requirement that a sampling plan is developed and documented for the soil pH sampling round.
2. It is a requirement that a new sampling plan is documented prior to each of the subsequent sampling rounds to incorporate changes to the sampling plan compared to the previous sampling round.
3. It is a requirement to document all changes to the sampling plan.
4. It is a requirement that a sampling plan includes:
   (a) a geospatial map prepared in accordance with Part A, which includes details of carbon estimation areas, exclusion areas, emissions accounting areas (in accordance with Section 1.0 of this Part).
   (b) the process and plan for randomly assigning sampling locations (see Section 2.0 of this Part) and compositing samples.
   (c) if a reserve list of locations is to be used when obstacles are encountered – the process and plan for the random selection of locations on that list (see Section 2.0 of this Part).
5. It is a requirement that if Requirement 4(a) of Section 2.0 of this Part applies, random numbers are generated and applied after a sampling plan has been submitted to the Working Body.

Recommendations

1. It is recommended that proponents develop a sampling plan in consultation with information that is well documented in the peer reviewed literature. Some examples of useful resources include:
   (a) Sampling protocols published in the peer reviewed literature (e.g. de Gruijter et al., 2016; Viscarra Rossel et al., 2016).
   (b) Generating spatially and statistically representative maps of environmental variables to test the efficiency of alternative sampling protocols (Cunningham et. al, 2017);
   (c) Soil carbon stock in the tropical rangelands of Australia: Effects of soil type and grazing pressure, and Methodology of sampling requirement (Pringle et. al, 2011);
   (d) A geostatistical method to account for the number of aliquots in composite samples for normal and lognormal random variables (Orton et. al, 2015);
2. It is recommended to consider the following when deciding on your sampling design: a) Number of samples you can afford per carbon estimation area, noting the minimum sampling requirements outlined in Section 2.0 of this Part B.
   (a) How much you know about the soil pH variability across the project area, noting that the collection of additional samples may improve the accuracy and precision of soil pH change.

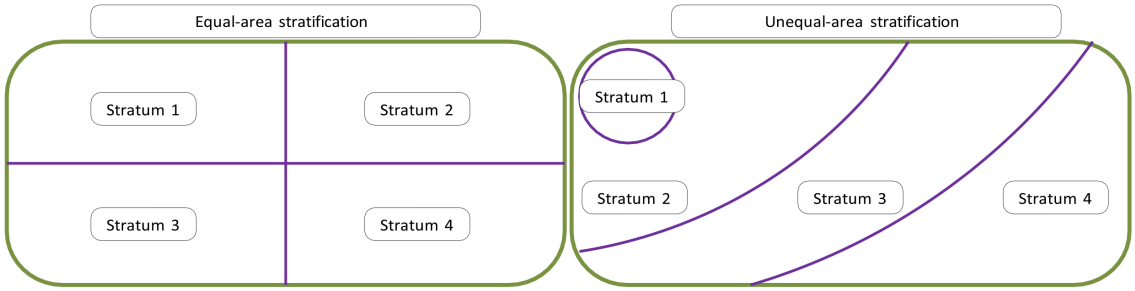
1.0 Stratification

Requirements

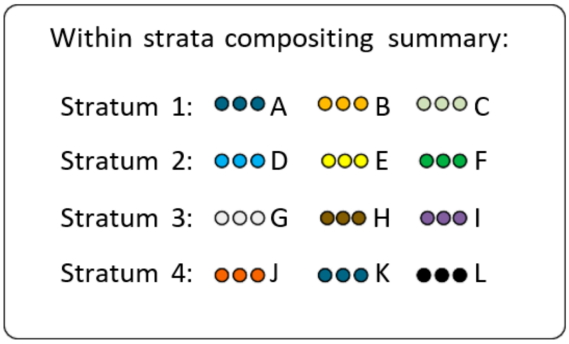
1. It is a requirement that each carbon estimation area is divided into three or more strata for each sampling round.
   (a) Strata may be non-contiguous, noting that this may limit flexibility under Part A (Requirements 6 and 7) where strata would need to be moved between carbon estimation areas without splitting or merging the strata.
2. It is a requirement that strata do not overlap.
3. It is a requirement to identify in the sampling plan if strata are equal (within 5%) or unequal in area across a given carbon estimation area.
4. It is a requirement that strata boundaries are delineated by generating a set of spatial coordinates that define the geographic limits of the land included within each stratum by using a geographic information system to generate spatial data files.
5. It is a requirement that spatial data files documenting the strata boundaries are created for each sampling round, or estimation event, even if the strata boundaries remain the same (as per Part A Requirement 1).
6. It is a requirement, if samples are composited across strata, that strata have an equal area. For the purpose of this requirement, strata will be considered to have an equal area if there is no more than 5% difference in area (based on the average strata size) between the smallest and largest strata in a carbon estimation area.
7. It is a requirement to identify in the sampling plan if strata are equal (i.e. there is no more than 5% difference in area between the smallest and largest strata in the carbon estimation area) or unequal in area across a given carbon estimation area.

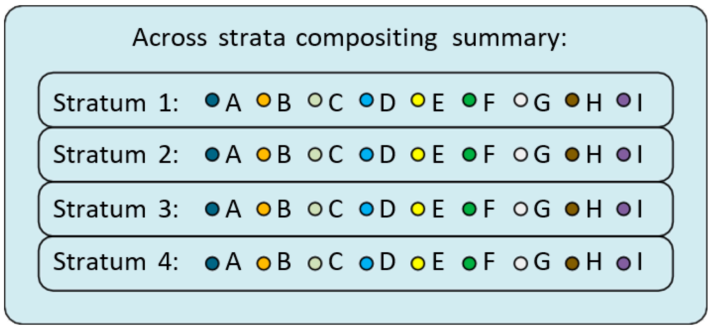
Quick Guide to stratification

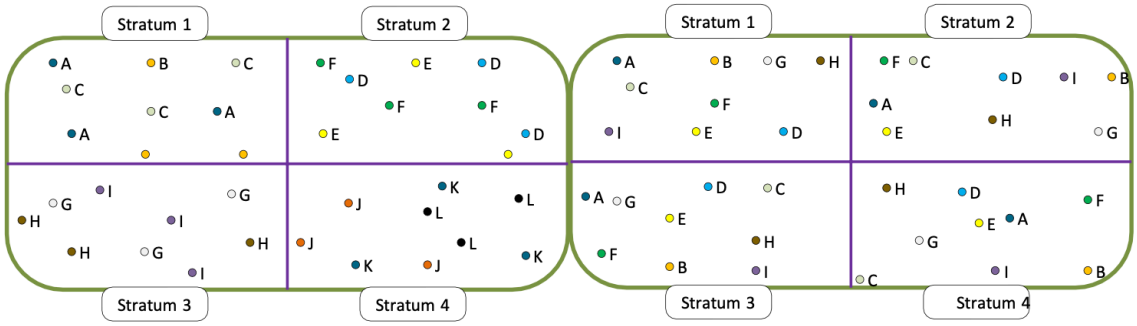
Equal-area stratification is where all of the strata in a carbon estimation area are of equal area. Unequal-area stratification allows for strata of varying sizes.



Compositing is the process of combining multiple soil cores together to form a single sample. This allows more cores to be used for each sample, with the aim of producing a more homogenous result across composite samples. Where equal-area stratification has been used, proponents may elect to use across strata compositing, where cores from different strata are combined to form a single composite sample. Proponents may also elect to use within strata compositing where cores from a single stratum are combined. It is not a requirement to composite samples. Samples may be kept separate.







Note: Each coloured circle represents one soil core and each letter represents a composite sample consisting of multiple cores.

Recommendations

1. It is recommended that if strata are unequal in size that:
   (a) the soil within strata is homogenous with respect to land management (e.g. inter-row vs. intra-row in cropping systems), soil type, land form or other variables.
   (b) each carbon estimation area is restratified for each sampling round as better information (with respect to Recommendation 1a) of this Section) becomes available.

   Note: This may limit flexibility to move strata between carbon estimation areas in accordance with Part A of this Supplement as the movement between strata cannot result in the division or merger of any previous strata boundaries.

2.0 Assigning sampling locations

Requirements

1. It is a requirement that sampling locations are determined prior to any core extraction in a given stratum for a given sampling round.

2. It is a requirement that the geographic point location of assigned sampling points are digitally recorded along with the units used to define the location.
3. It is a requirement that the precision of each sampling location (or alternative sampling location) is:
   (a) if longitude and latitude are used – a minimum of five decimal places using the Geocentric Datum of Australia (GDA94 or GDA2020); or
   (b) if eastings and northings are used – a minimum of three decimal places using the Geocentric Datum of Australia (GDA94 or GDA2020); or
   (c) Geodetic datums for a country (A geodetic datum is defined as being composed of an ellipsoid/spheroid, reference frame and reference time or epoch).
4. It is a requirement that within each stratum, sampling locations are assigned using a pseudo-random number generator with a defined seed number where either:
   (a) all of the following apply:
      (i) the process and plan to link the numbers generated by the pseudo-random number generator to sampling locations, and determine which samples are combined into composites, is prepared and documented;
      (ii) the prepared process and plan (from 1 above) is provided to, and receipt acknowledged by, the Working Body before random numbers are generated and applied;

      Note: As at 3 December 2024, the Working Body provided an online message for this purpose. Receipt is acknowledged with a reply message. The address is available on the Working Body's website.

      (iii) the outputs of the pseudo-random number generator used are verifiable and suitable evidence of this is maintained;
      (iv) the process and plan uses a defined unpredictable seed number which is not known at the time the process and plan is developed (such as the ASX 200 index reported by asx.com.au at a specified future date/time);
      (v) if a reserve list of locations is used when obstacles are encountered—the circumstances when they will be used and the process and plan for the selection of those locations.
      (vi) after the plan is provided to the Working Body, the boundaries of carbon estimation areas and strata must not be varied for the sampling rounds covered by the plan (this does not preclude subsequent plans from have revised carbon estimation areas or strata);
      (vii) the approach is transparent, reproducible and auditable;
      (viii) the approach achieves a genuinely random allocation of sampling locations; or
   (b) the process applies an approach pre-approved by the Working Body for generating and using random sampling locations. Such approaches may be approved for individual projects or generally in guidance published by the Working Body for the purposes of this subparagraph. Applications for individual approvals must be made by the project proponent for the project to the Working Body.
5. It is a requirement that, unless exceptional circumstances apply, sampling in accordance with a proposed process and plan should not be abandoned and started again. Exceptional circumstances would include unforeseen circumstances that make carrying out the process and plan impossible or hazardous, and other circumstances agreed in writing by the Working Body to be exceptional.

   Note: Resubmission of a process and plan under Requirement 4 above would be inconsistent with a genuinely random allocation of sampling locations in all but exceptional circumstances (as the first plan's random locations are discarded).

6. It is a requirement that there are at least three sampling locations within each stratum.
7. It is a requirement that if compositing samples across equal-area strata, that an equal number of sampling locations (at least three) are assigned to each stratum.
8. It is a requirement that a soil core is taken at each sampling location (or alternative sampling location) assigned in this Part.

Recommendations

1. It is recommended that project proponents take into account guidance from the Working Body as to how best to implement these requirements and provide the necessary evidence to demonstrate they have been complied with.

Part C - Sampling

Requirements of Part C are used primarily to guide the operation of sampling under sections 7 and 8 of Schedules 1of the Methodology, respectively, which require sampling to meet any requirements in this Supplement.

1. Locating sampling locations

Requirements

1. It is a requirement that a Navigation Satellite System device with a minimum accuracy of ± four meters is to be used to locate the intended sampling location in the field.
2. It is a requirement that, if a large immovable obstruction (such as a tree or boulder) prevents sampling at the intended sampling location, the actual sampling location is to be determined by one of the following processes:
   (a) A reserve list
      (i) Determine a reserve list of alternative sampling locations at the same time that sampling locations are assigned in Section 2.0 of this Part B, for that sampling round.
   (b) Offsetting:
      (i) move north until the obstacle is cleared;
      (ii) if the stratum boundary is hit before the obstacle is cleared, continue changing the direction of movement in 15 degree increments in the same direction and away from the intended sampling location until the obstacle is cleared and the actual sampling location is within the stratum boundary (Figure 1).

      Note: In order to comply with this requirement, sampling technicians need to be provided with stratum boundaries and instructions for sampling where obstacles are encountered.

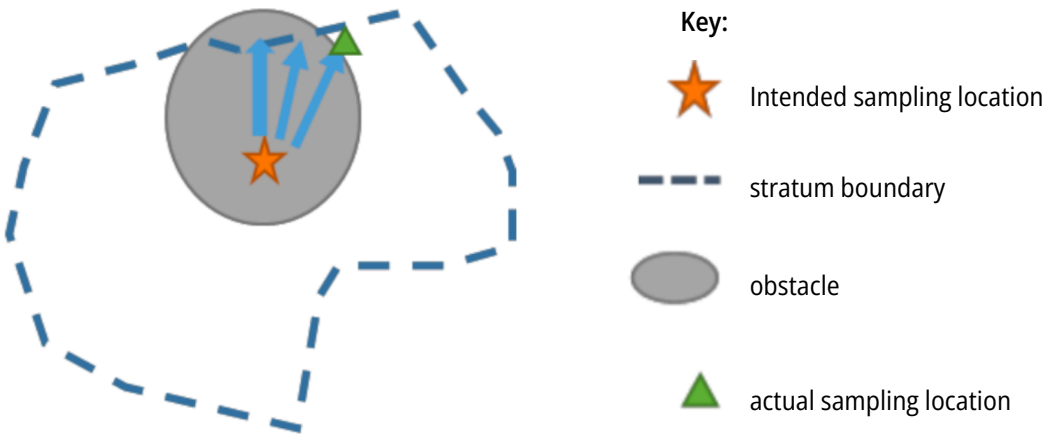


Figure 1 Example of determining an alternative sampling location within a stratum in the presence of an obstacle using the offsetting approach.

3. It is a requirement that both the intended and the actual sampling locations are reported (even if they are the same).

4. It is a requirement to include the following information in each offsets report—geographic coordinates, time and location stamped photographic or video evidence of obstacles that changed the intended sampling location of a sample.

2. Extracting cores

Requirements

1. It is a requirement that the sampling location is cleared of living plants, plant litter and surface rocks, prior to core extraction using a consistent protocol between sampling rounds.
2. It is a requirement that the nominated soil depth (dn) is a minimum of 30cm. However, sampling can occur to a depth of x cm where x > 30cm with x meeting the requirement of paragraph 7(2)(a) of Schedule 1 of the Methodology.
3. It is a requirement that soil samples are collected to the minimum depth of 30cm and all samples from the 0–30cm layer of soil are extracted from a single core. The core can be split into any number of individual soil depth layers and sub-layers after removal.
4. It is a requirement that, if sampling occurs beyond the minimum depth of 30cm, soil from the 0-30cm layer and the 30-xcm layer are separated prior to the sample preparation step.
5. It is a requirement that the baseline nominated soil depth is the same at all sampling locations in a given carbon estimation area. It is acceptable to have an actual sampling depth less than the nominated depth for a sample where the nominated soil depth cannot be reached due to bedrock or impenetrable layers. The actual sampling depth must be recorded.
   (a) Depths in subsequent sampling rounds may be adjusted to subject to any requirements to sample more deeply (e.g. where soil disturbance has occurred).
6. It is a requirement that, if the soil profile is disturbed (incorporating substances external to the profile, or vertically altering the profile – e.g. tilling, clay delving, water ponding), the minimum nominated soil depth must be at least 10cm below the depth of profile disturbance.
   (a) For example, if the management practice applied to a soil mixes the soil to a depth of 30cm, it will be a requirement to sample to a depth of 40cm (30cm plus the additional 10cm) and divide the sampled soil core into 0-30cm and 30-40cm layers for analysis.
7. It is a requirement that the sampling depth attempts to attain the equivalent soil mass set by the soil pH sampling round under paragraph 7(2)(a) of Schedule 1 of the Methodology.
8. It is a requirement that there is a minimum of one year between the median day of sampling for a sampling round and the median day of the next sampling round that occurs in that carbon estimation area.
9. To comply with paragraph 4(2)(b) under Schedule 1 of the Methodology, it is a requirement that there is a maximum of five years between the median day of sampling for a sampling round and the median day of sampling for the next soil pH sampling round that occurs in that carbon estimation area.
10. It is a requirement that all cores are extracted from a given carbon estimation area for a given:
    (a) sampling round for the purposes of Schedule 1 of the Methodology, over no more than 60 calendar days.

        Note: In exceptional circumstances preventing sampling within these timeframes, a project proponent may apply to the Working Body to seek an extension of time to carry out the sampling round.
11. It is a requirement to report the day, month and year that a given sampling round (for the purposes of Schedule 1 of the Methodology) for a given carbon estimation area starts and finishes.

12. It is a requirement to report the median day of sampling for a sampling round (for the purposes of Schedule 1 of the Methodology).
13. It is a requirement that soil extracted is analysed for all soil properties separately for the 0-30cm layer and the 30-xcm layer.

Part D - Sample Analysis

1. Calibration of the pH meter

Requirements

1. Calibrate the pH meter according to the manufacturer's instructions.
2. If using a battery powered pH meter, replace battery when the low battery indicator shows.
3. Rinse the probe if applicable with deionised water/distilled water and gently blot using soft, standard laboratory tissue paper.

   Note : Deionized water/distilled water, It should have a specific conductivity not higher than 0.2 mS/m at 25 °C and a pH greater than 5.6 (or grade 2 water or type II water according to ISO 3696 and ASTM D1193-06, respectively, if this is the quality of water produced in the laboratory).

4. Measure 2 cups of soil from the prepared sample. Fill a clean glass or plastic container with 2 cups of distilled water and add the measured soil sample. Ensure the soil and water are thoroughly mixed and compact the sample firmly. Drain off excess water.
5. Using the supplied pad, lightly shine 4" -5" (10 -12cm) of the probe, carefully avoiding the bullet-shaped tip, to remove any oxides that may have formed on the surface of the metal. Wipe the probe clean by gently blotting it with soft, standard laboratory tissue paper, always wiping away from the tip towards the probe handle.
6. Push the probe vertically into the moistened soil to a depth of 10 -12cm. If it does not slip into the ground fairly easily select a new position. Never force the probe.
7. Twist the probe clockwise and counter-clockwise between your fingers several times to ensure that damp soil is well distributed over the surface of the probe.
8. Wait for 60 seconds to acclimatise the probe and note the reading.
9. If the reading is pH 7 or higher: Remove the probe from the soil and wipe any soil particles from the surface of the probe. Re-shine the probe and insert back into the soil at a different point avoiding the first hole made by the probe. Twist the probe two or three times between the fingers, as before, and wait 30 seconds before taking the final reading.
10. If the reading is below pH 7: Remove the probe from the soil and wipe any soil particles from the surface of the probe. Do not re-shine the probe. Insert the probe back into the soil at a different point avoiding the first hole made by the probe. Twist the probe two or three times between the fingers, as before, and wait 60 seconds before taking the final reading.
11. The recommendation for short term and long term storage of electrode should be followed according to the manufacturer's instruction given in the operation manual.

Part F - Emissions Factors

This Part sets out the Standard Parameters and Emissions Factors for the Methodology. They align with the values used in the National Greenhouse Gas Inventory.

Table 1 Default carbon content values

Product	Default carbon content value
Restricted non-synthetic fertiliser	50%
Biochar	See table 2
Soil amendments containing coal	100%

Table 2 Default biochar carbon content factors

Feedstock	**Pyrolysis production process**	**Default carbon content value**
Animal manure	Pyrolysis	87%
	Gasification	62%
Wood	Pyrolysis	100%
	Gasification	100%
Herbaceous (grasses, forbs, leaves; excluding rice husks and rice straw)	Pyrolysis	100%
	Gasification	78%
Rice husks and rice straw	Pyrolysis	90%
	Gasification	63%
Nut shells, pits and stones	Pyrolysis	100%
	Gasification	92%
Biosolids (paper sludge, sewage sludge)	Pyrolysis	75%
	Gasification	57%
Other/unknown feedstock/mixed feedstocks	Pyrolysis	100%
	Gasification	100%