CLIMATE
ACTION
RESERVE

Biochar Protocol

WORKGROUP REVIEW DRAFT

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Acknowledgements

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Abbreviations and Acronyms

CO_2	Carbon dioxide
CO_2e	Carbon dioxide equivalent
CH_4	Methane
CRT	Climate Reserve Tonne
EBC	European Biochar Certificate
GHG	Greenhouse gas
IBI	International Biochar Initiative
N_2O	Nitrous oxide
Reserve	Climate Action Reserve
SSR	Source, sink, and reservoir
t	Metric ton (or tonne)

1 Introduction

The Climate Action Reserve (Reserve) Biochar Protocol provides guidance to account for, report, and verify greenhouse gas (GHG) emission reductions and carbon removals associated with the production and application of biochar.

The Climate Action Reserve is an environmental nonprofit organization that promotes and fosters the reduction of greenhouse gas (GHG) emissions through credible market-based policies and solutions. A pioneer in carbon accounting, the Reserve serves as an approved Offset Project Registry (OPR) for the State of California's Cap-and-Trade Program and plays an integral role in supporting the issuance and administration of compliance offsets. The Reserve also establishes high quality standards for offset projects in the North American voluntary carbon market and operates a transparent, publicly-accessible registry for carbon credits generated under its standards.

Project developers that initiate biochar projects use this document to quantify and register GHG reductions and carbon removals with the Reserve. The protocol provides eligibility rules, methods to calculate reductions and removals, performance-monitoring instructions, and procedures for reporting project information to the Reserve. Additionally, all project reports receive independent verification by ISO-accredited and Reserve-approved verification bodies. Guidance for verification bodies to verify reductions is provided in the Reserve Verification Program Manual[1] and Section 8 of this protocol.

This protocol is designed to ensure the complete, consistent, transparent, accurate, and conservative quantification and verification of GHG emission reductions and carbon removals associated with a biochar project.[2]

[1] Available at http://www.climateactionreserve.org/how/verification/verification-program-manual/.
[2] See the WRI/WBCSD GHG Protocol for Project Accounting (Part I, Chapter 4) for a description of GHG reduction project accounting principles.

2 The GHG Reduction Project

2.1 Background

Biochar, the product of the heating of biomass at high temperatures in an oxygen-limited setting, is a carbon-dense material that has a growing list of beneficial uses, including as a soil amendment or as an additive for other agricultural, industrial, and commercial purposes. Although the soils of *Terra Preta de Indio* in the Amazon provide perhaps the most prominent evidence of the historical application of biochar to soils resulting in improved productivity—and a testament to the long-term stability of the carbon sequestered in biochar—evidence from around the globe points to the use and persistence of biochar or biochar-like materials at agricultural sites for thousands of years.[3] This protocol addresses the sequestration benefits related to the carbon contained in biochar, identifying the conditions that must be met for the potential for biochar to provide net climate benefits to be realized.

Biochar holds the potential to provide not only highly durable carbon that remains out of the atmosphere for centuries if not millennia, but also a variety of ancillary greenhouse gas benefits, depending on how it is applied. Although the Reserve recognizes such ancillary GHG outcomes are possible and often quite likely, the accounting of such benefits is currently not included in this protocol owing to the inability of the current certainty in the scale and scope of such benefits to allow them to be incorporated into a standardized quantification approach, especially in ways that lends itself to practical monitoring and verification. Thus, the ancillary GHG benefits from biochar will be considered for future updates to the protocol and/or may be accounted for by other offset protocols that may be able to address such benefits more effectively, such as the Reserve's Soil Enrichment Protocol.

2.2 Project Definition

For the purpose of this protocol, a biochar project is defined as the set of activities related to the diversion of biomass from "business as usual" (baseline) uses, its conversion into biochar, and its application to a durable use that results in the long-term storage of carbon. Biochar is defined here as the carbonaceous solid material resulting from the thermochemical conversion of biomass in an oxygen-limited environment. As stated above, although biochar is capable of providing a variety of GHG benefits beyond the sequestration of carbon resulting from its end-use application, such ancillary benefits are currently not included in the scope of the protocol. Project activities are those activities that are necessary for the production and application of biochar in a way that produces net climate benefits relative to the baseline scenario. Three distinct phases comprise the scope of a biochar project under this protocol: 1) biomass acquisition, 2) biochar production, and 3) biochar application. No specific configuration is required with respect to the activities comprising each phase. Rather, the combination of such activities must, as a whole, produce quantifiable climate benefits. Nevertheless, activities that are eligible for inclusion within a given project are limited as follows for each phase.

Biomass acquisition:
Eligible feedstocks must be biomass that is a waste stream, by-product or residue from forest, agricultural, and other resource management industries, or it must be biomass grown under certain limited conditions for the purpose of producing biochar (hereafter, purpose-grown

[3] Wiedner, K., & Glaser, B. (2015). Traditional use of biochar. In J. Lehmann, & S. Joseph (Eds.), *Biochar for environmental management – science, technology and implementation,* 2nd ed (pp. 15– 38) Routledge.

feedstocks). A positive list of eligible feedstocks, contained in a separate document called the Eligible Biochar Feedstocks List, is available on the Biochar Protocol webpage. The list not only indicates feedstocks that are eligible for use under the protocol but any environmental safeguards or other limits to the use of a given feedstock. Furthermore, feedstocks and feedstocks mixes used for the production of biochar under a project may not contain more than 2% contaminants by dry weight, while mineral additives may not exceed 10%. In all cases, the use of any feedstock—and the characteristics of the resulting biochar—must also satisfy any further requirements specified under this protocol pertaining to regulatory compliance (Section 3.6) and environmental safeguards (Section 3.7).

If a feedstock not included on the list is being contemplated for inclusion in a project, that feedstock must be proposed to the Reserve for inclusion on the list. The list of eligible feedstocks will be updated by and at the sole discretion of the Reserve as needed over time. Only those feedstocks on the list at the time of verification may be included in the project.

In all cases, feedstock harvest must not lead to or result from land-use change or the conversion of a site to vegetation type with a lower carbon-density, except as allowed as specified in the Eligible Biochar Feedstocks List.

[Question for WG: Should there be a requirement specifying how soon after harvest biomass must be used to prevent degradation/GHG emissions?]

All feedstock sources must be clearly identified by the project developer as part of chain of custody tracking, including physical location (parcel, facility, etc.) of each source and the date the biomass was obtained by the biochar producer. For additional details regarding chain of custody information provided for each feedstock source, see Section 6.2.

Biochar production:
Biochar produced via pyrolysis, gasification, and other thermochemical conversion processes are eligible to the extent that the resulting biochar, as indicated by laboratory analysis, contains eligible levels of stable carbon, as further described in Sections 3.5 and 6.4. This includes biochar generated during bioenergy production that is typically re-injected into the boiler furnace to be combusted but, under a project under this protocol, is diverted so the biochar carbon remains sequestered and is put to another use. Products from hydrothermal carbonization and torrefaction processes[4] are not eligible under this protocol since their stability is not sufficient to ensure the long-term permanence of the sequestered carbon they contain.

Production processes must also adhere to all relevant environmental, health, and safety laws and regulations, as further described in Section 3.6, including as pertaining to air pollution and worker health and safety.

Biochar application:
To be eligible under this protocol, the biochar produced as part of a project must be applied to an end use with demonstrable assurances regarding the long-term storage of its sequestered carbon. Energy production is not an eligible application of biochar, nor are applications for which storage is highly variable, uncertain, or is expected to be short-term in nature. Similar to feedstocks, a positive list of eligible applications for biochar is provided as a separate document called the Eligible Biochar End Uses List. The list is available on the Biochar Protocol webpage and indicates those biochar end uses that are eligible under the protocol, as well as limits to

[4] [definitions for hydrothermal carbonization and torrefaction]

their eligibility. The application of biochar under a project must also satisfy any further requirements specified in relation to regulatory compliance (Section 3.6 and environmental safeguards (Section 3.7). Any end use being considered for inclusion in a project but not currently on the positive list must be proposed to the Reserve for inclusion on the list. The list of eligible end uses will be updated by the Reserve, and at the sole discretion of the Reserve, as needed over time. Only those end uses on the list at the time of verification may be included in the project.

An important end-use for biochar is the application to soils. When used in soils, the application must comply with all relevant laws and regulations, including those relating to allowable contents or composition of soil amendments. Furthermore, biochar being applied to soils must comply with the material standards identified in Section 6.4.

Biochar may also be used in non-soil applications, including in construction materials or other uses that result in the long-term storage of carbon, as discussed further in Section 3.5, so long as such applications comply with all relevant legal requirements, environmental safeguards, and materials standards requirements under this protocol.

Demonstration of end-use application is performed via chain-of-custody tracking, as further described in Section 6.1. Only those amounts of biochar for which chain-of-custody tracking is performed may be included for credit quantification purposes in Section 5.

2.3 The Project Developer

The “project developer” is an entity that has an active account on the Reserve, submits a project for listing and registration with the Reserve, and is ultimately responsible for all project reporting and verification. Under this protocol, the project developer is assumed to be the end user of the biochar since they are the entity responsible for providing for the long-term stability of the carbon sequestered in the biochar and, thus, the permanence of the credits being issued. For example, a farmer applying biochar to their soil as an amendment is, by default, considered to be the project developer. However, a project developer may be another entity involved with the project, such as a biochar producer or an entity coordinating the reporting and registration of a project aggregating several smaller producers, as long as that entity has a documented agreement with any parties establishing the permanence of the sequestered biochar carbon that conveys the title to the carbon credits. In any event, the project developer must have clear ownership of the project’s GHG reductions. Ownership of the GHG reductions must be established by clear and explicit title, and the project developer must attest to such ownership by signing the Reserve’s Attestation of Title form.[5]

Activities attributable to a given biochar project may overlap with the activities attributable to other carbon project types, such as improved forest management projects or projects registering under the Reduced Emissions from Megafires Forecast Methodology with the Reserve’s Climate Forward Program. Stacking of different project types has the potential to produce conflicting claims of ownership of GHG reductions and removals. Any intended project stacking must be disclosed to the Reserve when the project is submitted for listing and prior to any time such stacking occurs during a project’s crediting period, at which time Reserve staff will determine if stacking is approved and will provide guidance on any further adjustments that may be required of the project to ensure additionality and to avoid double-counting of credits.

[5] Attestation of Title form available at http://www.climateactionreserve.org/how/program/documents/.

3 Eligibility Rules

Projects that meet the definition of a GHG reduction project in Section 2.2 must fully satisfy the eligibility rules summarized here in order to register with the Reserve. Complete details of all eligibility rules are described in the remainder of this section.

Eligibility Rule I:	Location	→	*U.S. and Canada and their tribal lands and territories*
Eligibility Rule II:	Project Start Date	→	*No more than twelve months prior to project submission**
Eligibility Rule III:	Project Crediting Period	→	*Emission reductions may only be reported during the crediting period; the crediting period may be renewed*
Eligibility Rule IV:	Additionality	→	*Meet performance standard*
		→	*Exceed regulatory requirements*
Eligibility Rule V:	Permanence	→	*Biochar is applied to eligible end use that provides long-term of carbon*
Eligibility Rule VI:	Regulatory Compliance	→	*Compliance with all applicable laws*
Eligibility Rule VII:	Environmental and Social Safeguards	→	*Comply with specified safeguards*

**See Section 3.2 for exception for projects with start dates prior to the adoption of this protocol.*

3.1 Location

Only projects located in the United States and Canada, their territories, and on tribal/First Nation lands within each country are eligible to register with the Reserve. For the Biochar Protocol, all phases of sourcing, production, and end use of the biochar must occur in eligible geographies. Project activities may occur on locations where activities from other carbon project types are occurring, as long as such projects are in good standing with the program in which they were or are enrolled. However, such project stacking is subject to prior approval from the Reserve and guidance for any adjustments that may be required of the biochar project to ensure additionality and to prevent double-counting of credits.

3.2 Project Start Date

The project start date is defined as the first date of the first instance of biochar being produced under the project.

To be eligible, the project must be submitted to the Reserve no more than twelve months after the project start date, unless the project is submitted during the first 12 months following the date of adoption of this protocol by the Reserve board (the Effective Date).[6] For a period of 12 months from the Effective Date of this protocol (Version 1.0), projects with start dates no more than 24 months prior to the Effective Date of this protocol are eligible. Specifically, projects with start dates on or after are eligible to register with the Reserve if submitted by . Projects with start dates prior to are not eligible under this protocol. Projects may always

[6] Projects are considered submitted when the project developer has fully completed and filed the appropriate Project Submittal Form, available at http://www.climateactionreserve.org/how/program/documents/.

be submitted for listing by the Reserve prior to their start date. For projects that are transferring to the Reserve from other offset registries, start date guidance can be found in the Reserve Offset Program Manual.

3.3 Project Crediting Period

The crediting period for projects under this protocol may be up to ten years. The initial project crediting period begins at the project start date regardless of whether sufficient monitoring data are available to verify carbon removals from the project. At the end of each crediting period for a project, the project developer may apply for eligibility under another crediting period. However, the project must meet all eligibility requirements of the most current version of the protocol at the time of such application. If a project developer wishes to apply for eligibility under an additional crediting period, they must do so no sooner than six months before the end date of the current crediting period.

A project may be eligible for additional crediting periods even if the project has failed to maintain continuous reporting up to the time of applying for a second crediting period, provided the project developer elects to take a zero-credit reporting period for any period for which continuous reporting was not maintained.[7] Any additional crediting period shall begin on the day following the end date of the initial crediting period.

The Reserve will cease to issue CRTs for GHG reductions if at any point in the future, the production and/or use of biochar becomes legally required, as defined by the terms of the legal requirement test (see Section 3.4.2). Thus, the Reserve will issue CRTs for carbon removals quantified and verified according to this protocol for ten-year crediting periods after the project start date, or until the project activity is required by law.

3.4 Additionality

The Reserve strives to register only projects that yield surplus GHG reductions that are additional to what would have occurred in the absence of a carbon offset market.

Projects must satisfy the following tests to be considered additional:

1. The performance standard test
2. The legal requirement test

3.4.1 The Performance Standard Test

Projects pass the performance standard test by meeting a performance threshold, i.e., a standard of performance applicable to all biochar projects, established by this protocol.

Waste and by-product biomass feedstocks identified as eligible under this protocol are, by definition, not put to productive uses and typically have short lifespans before the carbon they contain is released into the atmosphere, either via combustion or decomposition. As such, the production and use of biochar derived from such feedstocks is considered additional to the extent it produces carbon removals relative to the baseline, as determined in Section 5, provided the project meets all other eligibility requirements under this protocol. Similarly, projects involving the diversion of biochar generated as a by-product during bioenergy production processes using eligible feedstocks to prevent it from being reinjected into the boiler

[7] See zero-credit reporting period guidance and requirements in the Reserve Offset Program Manual, http://www.climateactionreserve.org/how/program/program-manual/.

furnace are considered additional to the extent they produce carbon removals as quantified under this protocol since such biochar is typically combusted, resulting in the release of the carbon it contains into the atmosphere.

A separate performance standard test is applicable to the biomass acquisition phase for projects incorporating purpose-grown feedstocks. The use of an area for the cultivation of biomass used in biochar production may lead to increased GHG emissions beyond the project boundaries if land use changes increases elsewhere. For example, the cultivating biomass for biochar production on lands where commodity crops were cultivated may result in increases in crop production elsewhere, including potentially via conversion of previously non-cultivated lands. Therefore, projects employing purpose-grown feedstocks must demonstrate that project feedstocks were acquired from either marginal cropland locations or from reclaimed mining sites. Marginal cropland locations are identified as non-prime farmland in the US or Canada based on standardized definitions and spatial delineations established by the US Department of Agriculture – Natural Resources Conservation Service[8] and the Agriculture and Agri-Food Canada,[9] respectively. The performance standard for purpose-grown feedstocks is applied each reporting period based on the delineation of marginal croplands under each jurisdiction at the time of feedstock acquisition.

The performance standard test is applied at the time a project applies for initial registration with the Reserve as well as at the start of any additional crediting periods. The basis for the performance standard test will be re-evaluated periodically by the Reserve to assess its ongoing validity, with modifications made as necessary to ensure the additionality of new projects and projects seeking to renew their crediting period. Nevertheless, projects that pass the performance standard test, whether at the time of initial registration or when renewing their crediting period, remain eligible in this regard throughout their crediting period.

3.4.2 The Legal Requirement Test

All projects are subject to a legal requirement test to ensure that the GHG reductions and removals achieved by a project would not otherwise have occurred due to federal, state, or local regulations, or other legally binding mandates. The legal requirement test is applicable to all three phases of a project as follows:

1. For waste and by-product feedstocks, the harvesting of such biomass for productive uses must not be legally required. The production of purpose-grown feedstocks must also not be legally mandated.
2. The production of biochar, including under the circumstances relevant to the project, must not be legally required.
3. The use of biochar in those ways it is being applied under the project is not legally mandated.

To satisfy the legal requirement test, project developers must submit a signed Attestation of Voluntary Implementation form[10] prior to the commencement of verification activities each time the project is verified (see Section 8). In addition, the project's Monitoring Plan (Section 6) must include procedures that the project developer will follow to ascertain and demonstrate that the project at all times passes the legal requirement test.

[8] SSURGO soil survey data, available at https://websoilsurvey.nrcs.usda.gov/app/

[9] National Soil Database, available at https://sis.agr.gc.ca/cansis/nsdb/index.html

[10] Attestation forms are available at http://www.climateactionreserve.org/how/program/documents/.

3.4.3 Ecosystem Services Payment Stacking

When multiple ecosystem services credits or payments are sought for a single activity on a single piece of land, with some temporal overlap between the different credits or payments, it is referred to as "credit stacking" or "payment stacking," respectively (4). Under this protocol, credit stacking is defined as receiving both offset credits and other types of mitigation credits for the same activity on spatially overlapping areas (i.e., in the same acre). Mitigation credits are any instruments issued for the purpose of offsetting the environmental impacts of another entity, such as emissions of GHGs, removal of wetlands or discharge of pollutants into waterways, to name a few. Payment stacking is defined as issuing mitigation credits for a best management or conservation practice that is also funded by the government or other parties via grants, subsidies, payment, etc., on the same land.

Any type of conservation or ecosystem service payment received for activities on the project area must be disclosed by the project developer to the verification body and the Reserve on an ongoing basis. Failure to disclose such payments may result in project ineligibility.

3.4.3.1 Credit Stacking

The Reserve has identified no mitigation credit market opportunities that need to be assessed as part of the eligibility of a biochar project.

3.4.3.2 Payment Stacking

The Reserve has identified one general type of payments that support the activities being credited under this protocol. These types of payments are known as "enhancement" payments.

Enhancement payments provide financial assistance to landowners to implement discrete conservation practices that address natural resource concerns and deliver environmental benefits. An example of relevant enhancement payments are cost-share payments administered by the NRCS Environmental Quality Incentives Program (2014 Farm Bill). However, since multiple phases are required to undertake a biochar project and enhancement payments tend to only address a single project phase, such payments are not considered to impact project additionality and are allowed to be pursued by project developers.

Nevertheless, because every available enhancement payment is not comprehensively addressed by the protocol at this time, the project developer must still disclose any such payments to the verifier and the Reserve on an ongoing basis.

3.5 Permanence

The Reserve requires that credited reversible GHG reductions and removals be effectively "permanent" in order to serve as valid offset credits. For purposes of this protocol, permanence relates to the durability of the biochar based on a 100-year basis. A tonne of biochar produced is considered permanent, and credited as such, based on the relative amount of the tonne that remains sequestered over the 100-year period. For biochar applications that are not anticipated to remain sequestered for the full 100-year term, the average amount of each tonne anticipated to be sequestered over the 100-year period will be credited. For each project, the permanence of the biochar produced is based on the end use of the biochar. The quantification approach outlined in Section 5 relies on the application of default permanence factors to estimate the proportion of carbon remaining stored in biochar based on the end use of the biochar. Only those end uses for which there are reasonable levels of certainty as to the long-term fate of the applied biochar and the carbon it contains are eligible for crediting under this protocol and included in the Eligible Biochar End Uses List.

The biochar produced under a project must have a demonstrated level of long-term stability commonly associated with biochar. This stability is based on a ratio of hydrogen to organic carbon ($H:C_{org}$) of less than 0.7, as determined by laboratory analysis, as further described in Section 6.4.2.

Beyond long-term degradation of biochar, the primary risk of carbon in biochar being reversed and released into the atmosphere is from combustion. As described in Section 2.2, combustion for energy production purposes is not an eligible end use for biochar under this protocol. Additionally, since only biochar that is verified to have been applied to eligible reported end uses by the project developer may be credited, any loss of carbon associated with combustion after biochar is produced but prior to end use application is already accounted for via project reporting and quantification requirements. Thus, the remaining combustion risk is post-application, when the risk is negligible.

3.6 Regulatory Compliance

Project developers must attest that project activities do not cause material violations of applicable laws (e.g., air, water quality, safety, etc.). The determination of regulatory compliance must take into consideration processes and outcomes related to activities accounted for under the chain of custody tracking requirements (Section 6.2), i.e., from the time feedstocks are diverted (waste/by-product biomass) or harvested (purpose-grown feedstocks), through to when biochar is delivered to the end user. To satisfy this requirement, project developers must submit a signed Attestation of Regulatory Compliance form[11] prior to the commencement of verification activities each time the project is verified.

Project developers are also required to disclose in writing to the verifier any and all instances of legal violations – material or otherwise – caused by the project activities. A violation would be considered to be "caused" by project activities if it can be reasonably argued that the violation would not have occurred in the absence of the project activities. If there is any question of causality, the project developer shall disclose the violation to the verifier.

If a verifier finds that project activities have caused a material violation, then CRTs will not be issued for GHG reductions that occurred during the period(s) when the violation occurred. Individual violations due to administrative or reporting issues, or due to "acts of nature," are not considered material and will not affect CRT crediting. However, recurrent administrative violations directly related to project activities may affect crediting. Verifiers must determine if recurrent violations rise to the level of materiality. If the verifier is unable to assess the materiality of the violation, then the verifier shall consult with the Reserve.

3.7 Environmental and Social Safeguards

This protocol is intended to credit for the GHG removals associated with the production of biochar and long-term maintenance of the carbon it contains out of the atmosphere. All three phases of a biochar project have the potential to occur within or interact with natural and working lands and thus have the potential to degrade ecosystem services such as water quality, biodiversity, and air quality. This protocol relies primarily on the feedstock and end use eligibility positive lists (described in Section **Error! Reference source not found.**) and existing laws and regulatory programs (described in Section 3.6) to ensure community standards for such issues

[11] Attestation forms are available at http://www.climateactionreserve.org/how/program/documents/.

are met. While the positive eligibility lists provide specific limits with respect to allowable conditions for biomass sourcing and eventual biochar application, the regulatory compliance requirements in the preceding section set out guidance for ensuring no legal standards or obligations are violated, including laws relating to broader non-GHG impacts of projects. The obligation to comply with relevant legal requirements includes those laws and regulations pertaining to worker health and safety. Additionally, projects involving field-based biochar production must provide a safety plan outlining procedures and precautions meant to ensure worker safety during operations if such procedures are not already required by law.

When registering a project, the project developer must attest that the project was in material compliance with all applicable laws and regulations. However, since environmental regulations are not consistent across jurisdictions, the material standards identified for each end use in the Eligible Biochar End Uses List must be applied where standards for the material contents of products for a given end uses are not specified by the relevant jurisdiction. An exception to this requirement is made for instances where biochar is being reapplied to the site from which the project feedstocks were derived. In such cases, project developers are not required to demonstrate that the default standards specified in the Eligible Biochar End Uses List have been met if the relevant jurisdiction does not have any applicable legal requirements concerning the physicochemical composition of biochar.

[WG question: Add conditional requirement for testing for certain materials (e.g., organic contaminants) only if certain feedstocks are being used and/or biochar is applied to certain end uses, which would be specified in Eligible Biochar Feedstocks/End Uses lists?]

Although biochar projects are expected to be developed in ways that provide a variety of environmental benefits, the project developer should nonetheless take care and all reasonable precautions to ensure no broader harms are caused by the project. Furthermore, the Reserve urges project developers to describe any significant impacts (positive or negative) that their GHG projects will have on other environmental issues such as air and water quality, endangered species and natural resource protection, and environmental justice. Although such reporting is optional, the intent with this guidance is to encourage project developers to better highlight the ways in which their projects positively or negatively affect such goals and, where potential negative environmental and socio-economic impacts are identified, describe the steps that have been, or will be, taken to mitigate and/or monitor them. The Reserve provides an SDG Reporting Tool on its website[12] to facilitate the reporting of co-benefits in relation to the United Nation's Sustainable Development Goals.

[12] https://www.climateactionreserve.org/how/program-resources/documents/

4 The GHG Assessment Boundary

[To be completed once quantification requirements are finalized.]

The GHG Assessment Boundary delineates the GHG sources, sinks, and reservoirs (SSRs) that must be assessed by project developers in order to determine the net change in emissions caused by a biochar project.

Error! Reference source not found. illustrates all relevant GHG SSRs associated with biochar project activities and delineates the GHG Assessment Boundary.

Table 4.1 provides greater detail on each SSR and justification for the inclusion or exclusion of certain SSRs and gases from the GHG Assessment Boundary.

Table 4.1. Description of all Sources, Sinks, and Reservoirs

SSR	Source Description	Gas	Included (I) or Excluded (E)	Quantification Method	Baseline (B) or Project (P)	Justification/Explanation

5 Quantifying Carbon Removals

Carbon removals from a biochar project are quantified by comparing actual project emissions and sequestered carbon to the calculated baseline emissions and sequestered carbon. Baseline emissions and carbon stocks are an estimate of the GHG emissions from sources within the GHG Assessment Boundary (see Section 4) that would have occurred, as well as the carbon that would remain sequestered, in the absence of the project. Project emissions and carbon stocks are actual GHG emissions and sequestered carbon from sources, sinks, and reservoirs within the GHG Assessment Boundary. The difference between baseline and project emissions and baseline and project carbon stocks serves as the basis for the project's total net carbon removals (Equation 5.1).

Equation 5.1. Calculating net carbon removals

$$\boldsymbol{ER = (BE - PE) - (BC - PC) - LE}$$

Where,			Units
CR	=	Total carbon removals for the reporting period	tCO_2e
BE	=	Total baseline emissions for the reporting period, from all emission-based SSRs in the GHG Assessment Boundary (as calculated in Section 5.1)	tCO_2e
BC	=	Total carbon sequestered in the baseline scenario for the reporting period	tCO_2e
PE	=	Total project emissions for the reporting period, from all SSRs in the GHG Assessment Boundary (as calculated in Section 5.2)	tCO_2e
PC	=	Total carbon sequestered by the project for the reporting period	tCO_2e
LE	=	Emissions associated with leakage from projects required to report such emissions (see Section 5.3)	tCO_2e

The Reserve provides a Biochar CRT Calculation Workbook, a spreadsheet-based quantification tool, for use with all projects to facilitate the calculations required under this protocol. Carbon removals must be quantified and verified on at least an annual basis. Project developers may choose to quantify and verify carbon removals on a more frequent basis if they desire. The length of time over which carbon removals are periodically quantified and verified is called the "reporting period," as further described in Section 7.3.

5.1 Quantifying the Baseline

The baseline approach employed under this protocol assumes no emissions occur under the baseline. Although there would be emissions expected to be associated with the fate of the feedstock biomass in the absence of the project, it is conservative to assume a value of zero for the variable *BE* in Equation 5.1.

Similarly, although some carbon may be sequestered under the baseline scenario, the vast majority of such carbon is most often ephemeral in nature and would be released over relatively short time scales. Eligible waste and by-product feedstock types typically are combusted or decompose under business as usual conditions such that minimal carbon is retained over longer periods of time. As such, there is no requirement to account for baseline carbon stocks.

5.2 Quantifying Project Emissions and Carbon Stocks

Project emissions and carbon stocks are actual GHG emissions and removals that occur within the GHG Assessment Boundary as a result of the project activity. Project emissions must be quantified every reporting period on an *ex post* basis.

5.2.1 Calculating Project Emissions

Estimates of GHG emissions associated with the project are based on the sources included in the GHG assessment boundary for the project, as identified in Table 4.1. Depending on the configuration of project phases, these may include emissions from the transportation of feedstocks, drying and processing of feedstocks, use of auxiliary fuels and/or electricity during biochar production, and processing of the outputs from thermochemical conversion. The total project emissions for a reporting period are based on the calculation described in Equation 5.2 and are entered into Equation 5.1 as *PE*.

Equation 5.2. Project emissions

$$PE = PE_{FProd} + PE_{FT} + PE_{FProc} + PE_{AE} + PE_{PY} + PE_{BP} + PE_{BT}$$

Where,

			Units
PE	=	Total emissions from the project for the reporting period	tCO_2e
PE_{FT}	=	Emissions from transportation of feedstocks for the reporting period	tCO_2e
PE_{FP}	=	Emissions from processing and drying of feedstocks at biochar production facility for the reporting period	tCO_2e
PE_{AE}	=	Emissions from auxiliary energy use during biochar production for the reporting period	tCO_2e
PE_{PY}	=	Emissions from pyrolysis under biochar production conditions that do not recover or combust non-CO_2 GHGs for the reporting period	tCO_2e
PE_{BP}	=	Emissions from processing of biochar for the reporting period	tCO_2e
PE_{BT}	=	Emissions from transportation of biochar to end use location for the reporting period, when applicable	tCO_2e

5.2.1.1 Feedstock Production Emissions

When biomass grown for the purpose of providing a feedstock source for biochar production is used by a project, the emissions associated with the production of that crop are required to be accounted for, as described in Equation 5.3, since such emissions would not have occurred if not for the project taking place. For the purposes of this protocol, default emissions factors are provided for the quantification of feedstock production emissions, with emissions based on the total fossil fuel volume used. The intent is to capture emissions associated with the operation of fossil fuel-powered equipment used for the cultivation and harvesting of such biomass. Emissions factors are provided in the Eligible Biochar Feedstock List. Production emissions are not quantified for feedstocks that are waste or by-product materials.

[Question for WG: Is monitoring of fuel consumption practical? Would it be easier to determine emissions factors for fossil fuel consumption based on conservative emissions per area of production (by crop type) or by distance traveled (for feedstock and biochar transport emissions)?]

Equation 5.3. Feedstock production emissions

$$PE_{FProd} = \sum_{ff} V_{ff} \times EF_{ff}$$

Where,			Units
PE_{FProd}	=	Total emissions from production of feedstocks for the reporting period	tCO_2e
V_{ff}	=	Volume of fossil fuel *ff* consumed	unit of volume
EF_{ff}	=	Emissions factor for fossil fuel type *ff*[13]	tCO_2e/unit of volume

5.2.1.2 Feedstock Transportation Emissions

Although emissions from the transportation of feedstocks to biochar production locations is expected to be minimal, such emissions from the transport of feedstock materials to production are determined using Equation 5.4 and are entered as PE_{FT} in Equation 5.1. As described in Table 4.1, only feedstocks being transported more than 200 kilometers must calculate such emissions. Projects producing biochar at the site of the feedstock source or transporting feedstocks fewer than 200 kilometers are not required to calculate feedstock transportation emissions.

Equation 5.4. Feedstock transportation emissions

$$\boldsymbol{PE_{FT} = \sum_{ff} V_{ff} \times EF_{ff} \times [Adjustment\ Factor]}$$

Where,			Units
PE_{FT}	=	Total emissions from transportation of feedstocks for the reporting period	tCO_2e
V_{ff}	=	Mass of feedstock biomass of type *F* transported using fuel type *ff*	unit of volume
EF_{ff}	=	Emissions factor for fuel type *ff*	tCO_2e/unit of volume
[Adjustment Factor]	=	[TBD: Proportional adjustment to emissions to account for situations where biochar reported as part of the project is either only a portion of the total production from a facility, when bioenergy or non-project biochar is also being produced.]	%

5.2.1.3 Feedstock Processing Emissions

Processes used to prepare feedstocks for thermochemical conversion may require the use of energy. The emissions associated with such energy use must be accounted for, whether occurring in the field or at a production facility. The preparation of feedstocks for biochar production may involve fossil fuel combustion or the use of grid-connected electricity. Emissions from feedstock processing are determined using Equation 5.5.

Equation 5.5. Feedstock processing emissions

$$\boldsymbol{PE_{FProc} = PE_{FProc,FC} + PE_{FProc,EC}}$$

Where,			Units
PE_{FProc}	=	Total emissions from processing of feedstocks for the reporting period	tCO_2e

[13] Based on emissions factors provided by US EPA GHG Emissions Hub at https://www.epa.gov/climateleadership/ghg-emission-factors-hub

And

$$PE_{FProc,FC} = \sum_{ff,F} FC_{FProc,ff,F} \times EF_{ff} \times [Adjustment\ Factor]$$

Where,

$PE_{FProc,FC}$	=	Emissions associated with the combustion of fuels for the processing of feedstocks in preparation for biochar production	tCO_2e
$FC_{FProc,ff,F}$	=	Total mass or volume of fuel type *ff* consumed for the processing of feedstock type *F* for the reporting period	mass or volume unit
EF_{ff}	=	Emissions factor for the fuel type *ff*	tCO_2e/(mass or volume unit)
[Adjustment Factor]	=	[TBD: Proportional adjustment to emissions to account for situations where biochar reported as part of the project is either only a portion of the total production from a facility, when bioenergy or non-project biochar is also being produced.]	%

And

$$PE_{FProc,EC} = \sum_{F} EC_{FProc,F} \times EF_{EC} \times [Adjustment\ Factor]$$

Where,

$PE_{FProc,EC}$	=	Emissions associated with the use of grid-connected electricity for the processing of feedstocks in preparation for biochar production	tCO_2e
$EC_{FProc,F}$	=	Total amount of grid-connected electricity consumed for the processing of feedstock type *F* for the reporting period	kwh
EF_{EC}	=	Emissions factor for grid-connected electricity at the feedstock processing location[14]	tCO_2e/kwh
[Adjustment Factor]	=	[TBD: Proportional adjustment to emissions to account for situations where biochar reported as part of the project is either only a portion of the total production from a facility, when bioenergy or non-project biochar is also being produced.]	%

[Question for WG: Is it possible to determine fuel/electricity consumption attributable to the different uses (feedstock processing, auxiliary energy, biochar processing)?]

5.2.1.4 Auxiliary Energy Emissions

For some projects, the combustion of fossil fuels or the use of electricity is required during the process of thermochemically converting feedstocks into biochar. When such energy is used, the associated emissions must be accounted for under this protocol based on Equation 5.6.

Equation 5.6. Auxiliary energy emissions

$$PE_{AE} = PE_{AE,FC} + PE_{AE,EC}$$

Where,

			Units
PE_{AE}	=	Total emissions from auxiliary energy used to produce biochar for the reporting period	tCO_2e

And

$$PE_{AE,FC} = \sum_{ff,F} FC_{AE,ff} \times EF_{AE,ff} \times [Adjustment\ Factor]$$

[14] Based on factors from the Emissions & Generation Resource Integrated Database (eGRID) (US) or *Canada's National Inventory Report 1990-2020: Greenhouse Gas Sources and Sinks in Canada*

Where,			
$PE_{AE,FC}$	=	Emissions associated with the combustion of fuels to facilitate the production of biochar	tCO_2e
$FC_{AE,ff}$	=	Total mass or volume of fuel type *ff* consumed for biochar production purposes for the reporting period	mass or volume unit
EF_{ff}	=	Emissions factor for the fuel type *ff*	tCO_2e/(mass or volume unit)
[Adjustment Factor]	=	[TBD: Proportional adjustment to emissions to account for situations where biochar reported as part of the project is either only a portion of the total production from a facility, when bioenergy or non-project biochar is also being produced.]	%

And

$$\boldsymbol{PE_{AE,EC} = \sum_{F} EC_{AE,F} \times EF_{EC} \times [Adjustment\ Factor]}$$

Where,			
$PE_{AE,FC}$	=	Emissions associated with the use of grid-connected electricity to facilitate the production of biochar	tCO_2e
EC_{AE}	=	Total amount of grid-connected electricity consumed for biochar production purposes for the reporting period	kwh
EF_{EC}	=	Emissions factor for grid-connected electricity at the feedstock processing location[15]	tCO_2e/kwh
[Adjustment Factor]	=	[TBD: Proportional adjustment to emissions to account for situations where biochar reported as part of the project is either only a portion of the total production from a facility, when bioenergy or non-project biochar is also being produced.]	%

5.2.1.5 Pyrolysis Emissions

Emissions of CO_2 during pyrolysis are excluded from project accounting since such emissions are biogenic and considered carbon neutral as long as projects satisfy all relevant eligibility standards under this protocol. Furthermore, projects able to demonstrate that emissions controls are in place so that methane emitted during pyrolysis is combusted, recovered, or otherwise limited to *de minimis* levels are not required to calculate emissions from pyrolysis. All other projects must account for methane emissions from pyrolysis using Equation 5.7.

Equation 5.7. Pyrolysis methane emissions

$$\boldsymbol{PE_{PY} = \sum_{b} EF_b \times M_b \times GWP_{CH4} \times [Adjustment\ Factor]}$$

Where,			Units
PE_{PY}	=	Total methane emissions from pyrolysis of feedstocks for the reporting period	tCO_2e
EF_b	=	Emissions factor for biochar type *b*	tCH_4/t biochar
M_b	=	Mass of biochar type *b* produced during the reporting period	t biochar
GWP_{CH4}	=	Global warming potential of CH_4	tCO_2e/tCH_4
[Adjustment Factor]	=	[TBD: Proportional adjustment to emissions to account for situations where biochar reported as part of the project is either only a portion of the total production from a facility, when bioenergy or non-project biochar is also being produced.]	%

[15] Based on factors from the Emissions & Generation Resource Integrated Database (eGRID) (US) or *Canada's National Inventory Report 1990-2020: Greenhouse Gas Sources and Sinks in Canada*

5.2.1.6 Biochar Processing Emissions

For projects involving the processing of biochar in preparation for its end use, project developers must account for the emissions associated with such activities using Equation 5.8. Biochar processing may involve grinding, sifting, blending, and other similar actions.

Equation 5.8. Biochar processing emissions

$$\boldsymbol{PE_{BP} = PE_{BP,FC} + PE_{BP,EC}}$$

Where,

			Units
PE_{BP}	=	Total emissions from energy used to process biochar prior to end use application for the reporting period	tCO_2e

And

$$\boldsymbol{PE_{BP,FC} = \sum_{ff} FC_{BP,ff} \times EF_{BP,ff} \times [Adjustment\ Factor]}$$

Where,

$PE_{BP,FC}$	=	Emissions associated with the combustion of fuels to process biochar	tCO_2e
$FC_{BP,ff}$	=	Total mass or volume of fuel type *ff* consumed for biochar processing purposes for the reporting period	mass or volume unit
EF_{ff}	=	Emissions factor for the fuel type *ff*	tCO_2e/(mass or volume unit)
[Adjustment Factor]	=	[TBD: Proportional adjustment to emissions to account for situations where biochar reported as part of the project is only a portion of the total biochar production from a facility when non-project biochar is also being processed.]	%

And

$$\boldsymbol{PE_{BP,EC} = EC_{BP} \times EF_{EC} \times [Adjustment\ Factor]}$$

Where,

$PE_{BP,FC}$	=	Emissions associated with the use of grid-connected electricity to process biochar	tCO_2e
EC_{BP}	=	Total amount of grid-connected electricity consumed for biochar processing purposes for the reporting period	kwh
EF_{EC}	=	Emissions factor for grid-connected electricity at the feedstock processing location[16]	tCO_2e/kwh
[Adjustment Factor]	=	[TBD: Proportional adjustment to emissions to account for situations where biochar reported as part of the project is only a portion of the total biochar production from a facility when non-project biochar is also being processed.]	%

5.2.1.7 Biochar Transportation Emissions

Emissions from biochar transportation is required to be accounted for certain end uses where biochar is being both transported more than 200 kilometers applied for uses that are not a replacement or alternative to other materials, such as the permanent storage of biochar in retired oil or gas wells. The Eligible Biochar End Uses list indicates whether transportation emissions must be determined for each end use listed. The results from Equation 5.9 are entered into Equation 5.1 as PE_{BT}.

[16] Based on factors from the Emissions & Generation Resource Integrated Database (eGRID) (US) or *Canada's National Inventory Report 1990-2020: Greenhouse Gas Sources and Sinks in Canada*

Equation 5.9. Biochar transportation emissions

$$PE_{BT} = \sum_{ff}\sum_{b} M_{b,ff} \times D_{b,ff} \times EF_{ff}$$

Where,			Units
PE_{BT}	=	Total emissions from transportation of biochar for the reporting period	tCO_2e
$M_{b,ff}$	=	Mass of biochar type *b* transported using fuel type *ff*	t biochar
$D_{b,ff}$	=	Total distance biochar type *b* was transported using fuel type *ff* for the reporting period	km
EF_{ff}	=	Emissions factor for fuel type *ff*	tCO_2e/t biochar/km

5.2.2 Calculating Project Removals

The long-term storage of carbon in biochar is the primary GHG benefit expected to be generated by projects under this protocol. Calculations of total project removals (Equation 5.10) rely on metrics derived from the type of biochar (*b*) and end use (*EU*). The type of biochar is based on a combination of the feedstock mix and production conditions that are represented by the results from biochar sampling and laboratory testing described in Section 6.4. The final end use(s) of biochar produced by the project determines the expected longevity of the sequestered carbon. The permanence factor applicable for each end use (P_{EU}) is indicated in the Eligible Biochar End Uses List. For soil applications, the permanence factor is dependent on both the ratio of hydrogen to organic carbon ($H:C_{org}$), as indicated by laboratory analysis of biochar samples from the project, and the average soil temperature of the location(s) where biochar is applied, as reported via chain-of-custody tracking. Thus, for projects involving soil applications, the end uses *EU* must also be differentiated by soil temperature groups as well. The Reserve provides a standardized spatial layer of mean annual soil temperature[17] to be used by project developers to determine the soil temperature of end use locations associated with the biochar from the project.

Equation 5.10. Carbon removals

$$PC = \sum_{b} PC_b$$

Where,			Units
PC	=	Total C removals for the reporting period	tCO_2e
PC_b	=	C removals for biochar type *b*	tCO_2e

And

$$PC_b = \sum_{b,EU} M_{b,EU} \times DM_b \times OC_b \times P_{EU} \times 3.67$$

Where,			
$M_{b,EU}$	=	Mass of biochar type *b* for end use type *EU* for the reporting period	tonnes
DM_b	=	Dry matter composition of biochar type *b* for the reporting period, based on ratio of post- to pre-drying mass of biochar sample (see Section 6.4.1)	%
OC_b	=	Organic carbon content of biochar type *b* for the reporting period	%C
P_{EU}	=	Permanence factor for end use *EU*	%
3.67	=	Factor to convert from tC to tCO_2e	

[17] Available at https://www.climateactionreserve.org/how/protocols/ncs/biochar/

5.3 Leakage

The risk of leakage—a shifting of GHG emissions outside of the project boundaries as an indirect effect of the project—is generally limited or non-existent in most scenarios under which biochar projects will be developed for climate benefits. Nevertheless, two situations have been identified that present a risk of leakage: 1) the use of purpose-grown feedstocks and 2) the diversion of biomass from bioenergy production, including as a result of within-facility diversions.

The eligibility requirements of Section 2.2,Eligible Biochar Feedstocks List, and Section 3.4.1 limit purpose-grown feedstocks to those for which a leakage risk is insignificant. In particular, since production of purpose-grown feedstocks is limited to marginal farmland or reclaimed mining sites, there is minimal risk that additional land would be converted to make up for any production from the land being used for biochar feedstock production.

For projects involving the diversion of biochar from within a bioenergy production process (e.g., diversion of fly ash from reinjection into a bioenergy furnace), the project developer must demonstrate that bioenergy production levels are being maintained such that the energetic output of the facility does not decrease by more than 5 percent annually based on average daily output. If energy production decreases by more than 5 percent when compared to the average daily output from the facility for three years immediately preceding the start date (or for as long as the facility has been in operation if less than three years), the project must calculate the emissions associated with leakage from the project based on replacement of the energy output decreases in excess of 5 percent based on electrical grid emissions rates from the location of the biochar facility. This calculation is performed using Equation 5.11. The resulting value for *LE* is inserted into Equation 5.1.

Equation 5.11. Leakage emissions

$$If\ \boldsymbol{EP_{Post} \geq EP_{Pre} \times 95\%}$$

$$then\ \boldsymbol{LE = 0}$$

$$If\ \boldsymbol{EP_{Post} < EP_{Pre} \times 95\%}$$

$$then\ \boldsymbol{LE = \left(\left|\frac{EP_{Post} - EP_{Pre}}{EP_{Pre}}\right| - 0.05\right) \times EP_{Pre} \times t_{RP} \times EF_{EC}}$$

Where,

LE	=	Leakage emissions associated with the replacement of energy output resulting from decreases from bioenergy facilities from which biomass feedstocks were diverted for biochar production	tCO_2e
EP_{Post}	=	Average daily amount of grid-connected electricity produced during the reporting period	kwh/day
EP_{Pre}	=	Average daily amount of grid-connected electricity produced during the three years immediately preceding the project start date	kwh/day
t_{RP}	=	Total number of days comprising the current reporting period	days

EF_{EC}	=	Emissions factor for grid-connected electricity at the feedstock processing location[18]	tCO_2e/kwh

5.4 Reconciliation with Stacked Projects

As previously described, biochar projects have the opportunity to be implemented in such a way that project activities overlap with the project activities attributable to another project type. If such project stacking is approved by the Reserve, guidance may be required to be provided by Reserve staff to reconcile the quantification of the biochar with the quantification of the stacked project(s) to ensure no double-counting/-crediting of GHG impacts occurs. The Reserve maintains the right to determine if any reconciliation between a biochar project and another project with which it is stacked is necessary and what the requirements for such reconciliation may be.

[18] Based on factors from the Emissions & Generation Resource Integrated Database (eGRID) (US) or *Canada's National Inventory Report 1990-2020: Greenhouse Gas Sources and Sinks in Canada*

6 Project Monitoring

Monitoring is the process of regularly collection data related to a project's performance for reporting purposes. Project developers are required to gather data pertaining to a biochar project on a regular basis and report such data for each reporting period, as further described in Section 7.3. As such, project developers are responsible for monitoring the performance of the project and ensuring that the operation of all project-related equipment is consistent with the manufacturer's recommendations (as applicable) and all project-related processes are compliant with all relevant legal and regulatory requirements. Monitoring is required for the duration of the crediting period.

6.1 Monitoring Plan

The Reserve requires a monitoring plan to be established for all monitoring and reporting activities associated with the project. The monitoring plan will serve as the basis for verifiers to confirm that the monitoring and reporting requirements in this section and Section 7 have been and will continue to be met, and that consistent, rigorous monitoring and record keeping is ongoing at the project site. The monitoring plan must cover all aspects of monitoring and reporting contained in this protocol and must specify how data for all relevant parameters in Table 6.2 will be collected and recorded.

At a minimum, the monitoring plan shall include the following details:

1. General description of the project, including:
    a. Feedstock characterization
    b. Biochar production process(es) employed, including configurations of production parameters, as defined by unique combinations of feedstock compositions and biochar production temperature and residence time (see Section 6.4)
    c. End uses of biochar
2. A description of how the eligibility requirements are met
    a. The monitoring plan must include procedures that the project developer will follow to ascertain and demonstrate that the project at all times passes the legal requirement test (Section 3.4.2) and maintains regulatory compliance (Section 3.6)
    b. A description of any ecosystem services payments stacking and/or project stacking occurring or expected to occur
3. The frequency of instrument cleaning, inspection, field check, and calibration activities (if relevant), including for scales used to determine the mass of biochar produced and biochar samples collected for estimation of dry matter composition.
4. A description of each monitoring task to be undertaken, and the technical requirements therein
5. Roles, responsibilities, and capacity of monitoring team and management
6. Data to be collected per chain of custody tracking requirements (Section 6.2) and process for collecting and compiling such data
7. Parameters to be measured, including any parameters additional to those specified in Table 6.2.
8. Data to be collected and data collection techniques and sample designs for directly sampled parameters, per requirements outlined in Section 6.4.
9. Operational data to be documented, including production parameters, and descriptions and dates of problems and stoppages.

10. Frequency of data acquisition. At a minimum, the data required for quantification of biochar projects shall be monitored and recorded (or documented, as appropriate) for each reporting period.
11. Data archiving procedures (see Section 7.2 for minimum record keeping requirements)

QA/QC provisions to ensure that data acquisition, compilation, and reporting are carried out consistently and with precision (where relevant).

The Reserve will make available a Monitoring Plan template that includes sections for all required information. Use of the template is not required but is strongly recommended.

6.2 Monitoring Report

A monitoring report must be prepared for each reporting period. Monitoring reports must be provided to verification bodies whenever a biochar project undergoes verification. All monitoring reports are due within 12 months of the end of the Reporting Period. Monitoring reports must include the following:

1. Records and results from data collection and monitoring indicated in the monitoring plan for the project, including but not limited to:
    a. Description of the project configuration (feedstocks, production parameters, end uses) for the reporting period
    b. Indication of how Performance Standard Test and Legal Requirements Test were met
    c. Description of compliance with relevant laws and regulations, as well as environmental and social safeguards
    d. Information pertaining to sampling of biochar performed during the reporting period
    e. Description of and results from laboratory analyses, if performed for the reporting period
    f. Data and supporting documentation for monitoring parameters identified in Table 6.2
2. Chain of custody documentation to corroborate reported data
3. Description of any ecosystem services payments and/or project stacking, if occurring, with prior approval and guidance from the Reserve
4. An update of the project's Biochar CRT Calculation Workbook

A monitoring report template is provided on the webpage for the biochar protocol[19] for optional use by project developers.

6.3 Chain of Custody Tracking

The project developer must collect and maintain documentation on the chain of custody of the biochar, from the biomass acquisition, through biochar production, and biochar application. At all stages, this should include the names, addresses, and contact information of the parties in the chain of custody at a minimum. Chain of custody should be tracked by paper bills of lading, or electronic, third-party tracking. For biomass acquisition, the feedstock must be identified and included on the Eligible Biochar Feedstocks List. All feedstock sources must also have a clearly identified physical location (parcel, facility, etc) and the date the biomass was obtained by the biochar producer. During biochar production, the producer must document the date on which

[19] https://www.climateactionreserve.org/how/protocols/ncs/biochar/

the biochar was acquired, the date it was produced, and the date it was transported from the production location. The end-use application of the biochar must be documented and included on the Eligible Biochar End Uses List. Only the amounts of biochar that are properly documented in the chain of custody may be included for credit quantification.

6.4 Biochar Sampling and Testing Guidance

Critical to properly assessing the eligibility of a project and quantifying the climate benefits it provides is the ongoing sampling and testing of biochar being produced.

Direct measurement of various physicochemical characteristics of biochar must be performed via sampling to establish eligibility and certain credit quantification parameters. Measurements related to eligibility include the $H:C_{org}$ ratio and levels of constituent chemicals specified as environmental safeguards, per Sections and 3.7. Quantification parameters derived from biochar sampling also include the $H:C_{org}$ ratio, as well as percent organic carbon (%C). An estimate of the percentage of dry matter comprising biochar from a project must also be determined from measurements and sampling performed onsite.

Project owners must provide documentation describing the biochar sampling and laboratory analysis methods employed. While this protocol does not require specific sampling and laboratory analysis methods to be used, it does require that a set of minimum standards be met, as outlined in the following sections.

Sampling and laboratory analysis must be performed at least each year, as well as each time the production parameters change in one or more of the following ways:

- The composition of feedstocks used to produce biochar changes by 10% or more;
- The pyrolysis temperature changes by 50 degrees C or more during production, allowing for planned and unplanned interruptions, with biochar produced during such interruptions excluded from biochar included in project reporting and sampling; or
- The residence time changes by 10% or more.

Thus, if the production parameters remain the same over the course of a year, the sampling and testing results are considered valid for project reporting purpose for that entire period. Once a year has passed, sampling and testing must be repeated, even if the production parameters have remained the same.

Projects earning the IBI Biochar Certificate and EBC Certificate may provide documentation of their certification under either program to demonstrate compliance with the sample design and laboratory testing requirements outlined in this section, with the exception of the procedures and outcomes pertaining to dry matter composition and retention sampling, which must be verified under this protocol for all projects.

6.4.1 Sample Design and Collection

Although the approach to sampling biochar will be similar from project to project, Project Developers must describe their sampling approach in the Monitoring Plan. Regardless of the exact approach used, all projects must adhere to the minimum standards identified in Table 6.1.

Table 6.1. Minimum Standards for Sampling Biochar

Category	Guidance
Sample size	▪ Minimum of 15 subsamples to produce a composite sample, with a minimum combined volume of approximately 1.5 gallons, for every 10 cubic yards of biochar produced under the project using the same production parameters, as previously described
Sample collection process	▪ Sampling details (dates, times, personnel involved, biochar production configuration) must be documented for all sampling performed for the project. ▪ All projects must employ composite sampling. ▪ For continuous production systems: o Subsamples must be taken from biochar produced over the course of several days. o An equivalent number of subsamples must drawn each day. o Subsamples must be drawn at intervals no less frequent than once every hour. ▪ For non-continuous production systems o Subsamples must be taken from biochar produced through the course of a single day. o The biochar must be thoroughly mixed prior to sampling. o Subsamples must be extracted from different locations of the biochar volume being sampled. ▪ Collected subsamples are combined into a single composite sample. ▪ Samples must be placed in containers comprising material appropriate for the type of laboratory analyses being performed. ▪ Projects employing multiple production units may sample from a single unit as long as the production parameters sufficiently similar so as not to require a separate sampling effort, as previously described.
Timing of sampling	▪ Sampling must be performed within the first two months of production under a given set of production parameters or prior to the end of the reporting period, whichever is sooner. ▪ Sampling must be performed before post-processing when biochar is processed in the following ways: o Biological activation o Mixing/blending/adding non-biochar material ▪ Sampling may be performed after post-processing when biochar is processed in all other ways.
Sample handling	▪ Samples must be homogenized and divided by the laboratory performing the analyses for the project. ▪ Samples must be securely packaged and clearly labeled ▪ Samples must be shipped within 5 days of collection and should be kept cool until shipping.

Category	Guidance
Dry matter sampling	▪ Dry matter composition must be determined onsite for every 10 cubic yards of biochar produced ▪ A minimum of 15 subsamples for every 10 cubic yards of biochar produced must be taken and combined into a composite sample, with a minimum combined sample volume of approximately 1.5 gallons ▪ Either the procedures specified by ISO 589 or DIN 51718 for moisture content are to be followed, or the following process may be used: o Mass of the composite sample is measured prior to drying, with mass value reported to the nearest gram o Sample is dried at 110 degrees C for 16 hours or more o Mass of sample must be taken immediately after being removed from the drying oven for appropriate results
Retention sampling	▪ Samples must be extracted regularly and retained for archival purposes. Each day biochar is produced, a 1-quart sample must be extracted from the biochar produced that day and combined with all other retention samples taken in a given month to produce a monthly composite sample. ▪ At any time during the crediting period for a project, the Reserve may require retained samples to be analyzed for material contents to ensure samples analyzed for reporting purposes are representative of biochar reported to be produced under the same production parameters. The selection of a project and/or reporting period for retention sample testing shall be made at the sole discretion of the Reserve. Such testing will be conducted at the Reserve's expense.

The Reserve may, at the time of its own choosing, coordinate with the project developer to conduct its own sampling of biochar being produced under a project as a check on the sampling and laboratory analyses being reported for the project.

6.4.2 Laboratory Analysis

Project developers must describe in the Monitoring Plan the types of laboratory analyses to be performed on the biochar samples from the project and the methods used for each. All projects must have biochar samples analyzed to determine both the organic carbon content (OC_b) and the $H:C_{org}$ ratio. Additional laboratory analyses to be performed are based on the regulatory requirements associated with the end use for the biochar, as described in Section 3.6 and any additional environmental safeguards described Section 3.7 in the Eligible Biochar Feedstocks List or the Eligible Biochar End Uses List. Specific analytical methods employed must be in line with the methods specified by either the *IBI Standardized Product Definition and Product Testing Guidelines for Biochar that Is Used in Soil* or the *European Biochar Certificate - Guidelines for a Sustainable Production of Biochar*.

Sample homogenization and testing must be performed by a laboratory that is accredited under a relevant national governing body or international standard-setting body, such as the National Environmental Laboratory Accreditation Program (NELAP), American Association for Laboratory Accreditation (A2LA), or International Standards Organization (ISO). The laboratory must be specifically accredited under ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories." Additionally, project developers must obtain quality assurance/quality control information from the laboratory analyzing the project samples, which shall be reviewed during verification for reasonableness.

6.5 Monitoring Ongoing Permanence

In most cases, the initial application of biochar signifies the end use considered for permanence purposes. However, there may be initial applications of biochar for which permanence is not ensured until the biochar is applied to a terminal end use. For example, biochar initially used for agricultural filtration purposes may end up being combusted or it may be applied to soils as an amendment. To be eligible for crediting purposes under this protocol, monitoring of the biochar, via chain-of-custody tracking and supporting evidence, is required to document the transfer of project biochar from an end use for which permanence is not ensured to an end use for which permanence is assured, based on the end uses listed in the Eligible Biochar End Uses List. Only once the biochar is applied to the end use that provides permanence assurances may the carbon removals of that biochar be reported for crediting purposes.

6.6 Monitoring Parameters

[To be completed once quantification requirements are finalized.]

Prescribed monitoring parameters necessary to calculate baseline and project emissions are provided in Table 6.2.

Table 6.2. Biochar Project Monitoring Parameters

Eq. #	Parameter	Description	Data Unit	Calculated ® Measured (m) Referen®(r) Operating Records (o)	Measurement Frequency	Comment
General Project Parameters						
	Regulations	Project developer attestation of compliance with regulatory requirements relating to the composting project	Environmental regulations	n/a	Each verification cycle	Information used to: 1) To demonstrate ability to meet the legal requirement test – where regulation would require . 2) To demonstrate compliance with associated environmental rules, e.g., criteria pollutant emission standards, health and safety, etc.
Baseline Calculation Parameters						
Project Calculation Parameters						

7 Reporting Parameters

This section provides requirements and guidance on reporting rules and procedures. A priority of the Reserve is to facilitate consistent and transparent information disclosure among project developers. Project developers must submit verified emission reduction reports to the Reserve for every reporting period.

7.1 Project Submittal Documentation

Project developers must provide the following documentation to the Reserve to submit a biochar project for listing:

- Project Submittal form

Project developers must provide the following documentation to the Reserve each time a biochar project is verified to have CRTs issued:

- Monitoring Plan
- Monitoring Report, including chain of custody tracking documentation
- Signed Attestation of Title form
- Signed Attestation of Voluntary Implementation form
- Signed Attestation of Regulatory Compliance form
- Verification Report
- Verification Statement

At a minimum, the above project documentation will be available to the public via the Reserve's online registry. Further disclosure and other documentation may be made available on a voluntary basis through the Reserve. Project submittal forms can be found at http://www.climateactionreserve.org/how/program/documents/.

7.2 Record Keeping

For purposes of independent verification and historical documentation, project developers are required to keep all information outlined in this protocol for a period of 10 years after the information is generated or 7 years after the last verification. This information will not be publicly available but may be requested by the verifier or the Reserve.

System information the project developer should retain includes:

1. All data inputs for the calculation of the project emission reductions, including all required sampled data
2. Chain of custody documentation
3. System characterization, including feedstocks composition, production parameters (e.g., production temperature and residence time), and operational records such as problems and production stoppages.
4. Copies of all permits, Notices of Violations (NOVs), and any relevant administrative or legal consent orders dating back at least 3 years prior to the project start date
5. Executed Attestation of Title, Attestation of Regulatory Compliance, and Attestation of Voluntary Implementation forms
6. Onsite fossil fuel use records

7. Onsite grid electricity use records
8. Results of CO_2e annual reduction calculations
9. Initial and annual verification records and results
10. All maintenance records relevant to the monitoring equipment

7.3 Reporting Period and Verification Cycle

A reporting period is a discrete period of time for which a project developer quantifies and reports GHG reductions and removals, as well as required project data to the Reserve. The maximum length of a reporting period under this protocol is 12 months, with the exception of projects with start dates preceding the adoption of this protocol, as described in Section 3.2, for which the initial reporting period may extend to 12 months after the date of protocol adoption. Project developers may choose to have a sub-annual reporting period and verification schedule (e.g., monthly, quarterly, or semi-annually). In all instances, reporting periods must be contiguous, i.e., there must be no gaps in reporting during the crediting period of a biochar project once the project has been registered. Even if there are gaps in project activities being reported, such gaps must be included in reporting periods and verified accordingly.

[Question for WG: Allow for projects to report annually but defer verification for several years and verify multiple reporting periods at the same time? Prior discussion seemed to focus on allowing more frequent verification. Is less frequent verification also a possible option projects might want to reduce verification burden?]

Required verification documentation (see Section 7.1) must be submitted within 12 months of the end of each reporting period, regardless the length of a reporting period. However, to provide flexibility, project developers may also opt to delay verification on the condition that they acknowledge no CRTs will be issued for any period of time that falls outside the standard window for completing verification of project data and documentation. Such zero-credit reporting periods are further described in the Reserve Offset Program Manual.[20]

For all biochar projects, a site visit verification is required for the initial verification and at least once every 5 years have passed since the first date of the reporting previously subject to a site visit verification, as long as the following requirements are met:

1. The verification is being conducted by the same verification body that conducted the site visit for the previous verification; and
2. There have been no significant changes in the project's production parameters used to produce biochar.

For example, if a project has a start date of January 1, 2024, with the crediting period ending December 31, 2033, a second site visit would be required for the verification of the reporting period covering January 1, 2029. However, a site visit verification is required for any reporting period during which the production parameters (see changes. For example, if the same project changed production parameters during a reporting period that started on June 4, 2027, another site visit would be required for the verification of the reporting period covering June 4, 2032.

For reporting periods shorter than 12 months, an optional desk review verification may be performed, as long as the minimum site visit verification schedule is maintained.

[20] Found on the Reserve website at https://www.climateactionreserve.org/how/program-resources/program-manual/.

8 Verification Guidance

This section provides verification bodies with guidance on verifying GHG emission reductions associated with the project activity. This verification guidance supplements the Reserve's Verification Program Manual and describes verification activities specifically related to biochar projects.

Verification bodies trained to verify biochar projects must be familiar with the following documents:

- Reserve Offset Program Manual
- Verification Program Manual
- Biochar Protocol
- Eligible Biochar Feedstocks List
- Eligible Biochar End Uses List
- Any applicable policy memos and errata and clarifications

The Reserve Offset Program Manual, Verification Program Manual, and protocols are designed to be compatible with each other and are available on the Reserve's website at http://www.climateactionreserve.org.

Only ISO-accredited verification bodies trained by the Reserve are eligible to verify biochar project reports. Verification bodies approved under other protocol types may be permitted to verify biochar projects.[21] Information about verification body accreditation and Reserve project verification training can be found on the Reserve website at http://www.climateactionreserve.org/how/verification/.

8.1 Standard of Verification

The Reserve's standard of verification for biochar projects is the Biochar Protocol (this document), the Reserve Offset Program Manual, and the Verification Program Manual. To verify a biochar project report, verification bodies apply the guidance in the Verification Program Manual and this section of the protocol to the standards described in Sections 2 through 7 of this protocol. Sections 2 through 7 provide eligibility rules, methods to calculate emission reductions, performance monitoring instructions and requirements, and procedures for reporting project information to the Reserve.

8.2 Monitoring Plan

The Monitoring Plan serves as the basis for verification bodies to confirm that the monitoring and reporting requirements in Section 6 and Section 7 have been met, and that consistent, rigorous monitoring and record keeping is ongoing at the project site. Verification bodies shall confirm that the Monitoring Plan covers all aspects of monitoring and reporting contained in this protocol and specifies how data for all relevant parameters in Table 6.2 are collected and recorded.

8.3 Verifying Project Eligibility

Verification bodies must affirm a biochar project's eligibility according to the rules described in this protocol. The table below outlines the eligibility criteria for biochar projects. This table does

[21] See section 3.4.2 of the Verification Program Manual.

not present all criteria for determining eligibility comprehensively; verification bodies must also look to Section 3 and the verification items list in Table 8.2.

Table 8.1. Summary of Eligibility Criteria for a **Biochar** Project

Eligibility Rule	Eligibility Criteria	Frequency of Rule Application
Start Date	For 12 months following the Effective Date of this protocol, a pre-existing project with a start date on or after may be submitted for listing; after this 12-month period, projects must be submitted for listing within 12 months of the project start date	Once during first verification
Location	United States, Canada, their territories, and tribal/First Nation areas	Once during first verification
Performance Standard Test	Performance Standard Test has been met based on project feedstocks	Every verification
Legal Requirement Test	Signed Attestation of Voluntary Implementation form and monitoring procedures for ascertaining and demonstrating that the project passes the legal requirement test	Every verification
Regulatory Compliance	Signed Attestation of Regulatory Compliance form and disclosure of all non-compliance events to verifier; project must be in material compliance with all applicable laws	Every verification

8.4 Core Verification Activities

The Biochar Protocol provides explicit requirements and guidance for quantifying the carbon removals associated with the biochar project. The Verification Program Manual describes the core verification activities that shall be performed by verification bodies for all project verifications. They are summarized below in the context of a biochar project, but verification bodies must also follow the general guidance in the Verification Program Manual.

Verification is a risk assessment and data sampling effort designed to ensure that the risk of reporting error is assessed and addressed through appropriate sampling, testing, and review. The three core verification activities are:

1. Identifying emission sources, sinks, and reservoirs (SSRs)
2. Reviewing monitoring and measurement methodologies
3. Verifying GHG emissions and carbon removal estimates

Identifying emission sources, sinks, and reservoirs
The verification body reviews for completeness the sources, sinks, and reservoirs identified for a project, based on the guidance in Section 4.

Reviewing GHG management systems and estimation methodologies
The verification body reviews and assesses the appropriateness of the methodologies and management systems that the biochar project developer uses to gather data and calculate baseline and project emissions.

Verifying emission reduction estimates
The verification body further investigates areas that have the greatest potential for material misstatements and then confirms whether or not material misstatements have occurred. This

involves site visits to the project facility (or facilities if the project includes multiple facilities) to ensure the systems on the ground correspond to and are consistent with data provided to the verification body. In addition, the verification body recalculates a representative sample of the performance or emissions data for comparison with data reported by the project developer in order to double-check the calculations of GHG emission reductions.

8.5 Biochar Verification Items

The following tables provide lists of items that a verification body needs to address while verifying a biochar project. The tables include references to the section in the protocol where requirements are further specified. The table also identifies items for which a verification body is expected to apply professional judgment during the verification process. Verification bodies are expected to use their professional judgment to confirm that protocol requirements have been met in instances where the protocol does not provide sufficiently prescriptive guidance. For more information on the Reserve's verification process and professional judgment, please see the Verification Program Manual.

Note: These tables shall not be viewed as a comprehensive list or plan for verification activities, but rather guidance on areas specific to biochar projects that must be addressed during verification.

8.5.1 Project Eligibility and CRT Issuance

Table 8.2 lists the criteria for reasonable assurance with respect to eligibility and CRT issuance for biochar projects. These requirements determine if a project is eligible to register with the Reserve and/or have CRTs issued for the reporting period. If any requirement is not met, either the project may be determined ineligible or the GHG reductions from the reporting period (or subset of the reporting period) may be ineligible for issuance of CRTs, as specified in Sections 2, 3, and 6.

Table 8.2. Eligibility Verification Items

Protocol Section	Eligibility Qualification Item	Apply Professional Judgment?
2.2	Verify that the project meets the definition of a biochar project	No
2.3	Verify ownership of the reductions by reviewing Attestation of Title	No
3.2	Verify project start date	No
3.2	Verify accuracy of project start date based on operational records	Yes
3.2	Verify that the project has documented and implemented a Monitoring Plan	No
3.3	Verify that project is within its 10-year crediting period	No
3.4.1	Verify that the project meets the performance standard test, as described in the Eligible Biochar Feedstocks List. For purpose-grown feedstocks, confirm location of feedstocks production is on non-prime farmland or a reclaimed mining site.	No
3.4.2	Confirm execution of the Attestation of Voluntary Implementation form to demonstrate eligibility under the legal requirement test	No
3.4.2	Verify that the project Monitoring Plan contains a mechanism for ascertaining and demonstrating that the project passes the legal requirement test at all times and that the project passes the test each reporting period.	No
3.5	Verify that the project activities comply with applicable laws by reviewing any instances of non-compliance provided by the project developer and	Yes

Protocol Section	Eligibility Qualification Item	Apply Professional Judgment?
	performing a risk-based assessment to confirm the statements made by the project developer in the Attestation of Regulatory Compliance form	
3.5	Verify that all parties in the chain of custody (from biomass acquisition to end use application) are in regulatory compliance	Yes
6	Verify that the QA/QC activities meet the protocol's QA/QC requirements	No
6.1	Verify that the project meets chain of custody requirements, and that only biochar that meets the requirements are included in credit quantification	No
6.2	Verify that the project meets biochar sampling and testing guidance	No
	If any variances were granted, verify that variance requirements were met and properly applied	No

8.5.2 Quantification

Table 8.3 lists the items that verification bodies shall include in their risk assessment and recalculation of the project's GHG emission reductions. These quantification items inform any determination as to whether there are material and/or immaterial misstatements in the project's GHG emission reduction calculations. If there are material misstatements, the calculations must be revised before CRTs are issued.

Table 8.3. Quantification Verification Items

Protocol Section	Quantification Item	Apply Professional Judgment?
4	Verify that all SSRs in the GHG Assessment Boundary are accounted for	No
5.1	Verify that the baseline emissions are assumed to be zero	No
5.2.1.1	Verify that the feedstock production emissions were correctly calculated	No
5.2.1.2	Verify that the feedstock transportation emissions were correctly calculated if the feedstocks were transported more than 200 kilometers	No
5.2.1.3	Verify that the feedstock processing emissions were correctly calculated if applicable	No
5.2.1.4	Verify that the auxiliary energy emissions were correctly calculated if applicable	No
5.2.1.5	Verify that the pyrolysis emissions were correctly calculated if applicable	No
5.2.1.6	Verify that the biochar processing emissions were correctly calculated if applicable	No
5.2.1.7	Verify that the biochar transportation emissions were correctly calculated if applicable	No
5.2.2	Verify that the project removals were corrected calculated	No
5.3	Verify that leakage is appropriately accounted for, if applicable	No

8.5.3 Risk Assessment

Verification bodies will review the following items in Table 8.4 to guide and prioritize their assessment of data used in determining eligibility and quantifying GHG emission reductions.

Table 8.4. Risk Assessment Verification Items

Protocol Section	Item that Informs Risk Assessment	Apply Professional Judgment?
6	Verify that the project Monitoring Plan is sufficiently rigorous to support the requirements of the protocol and proper operation of the project	Yes
6	Verify that appropriate monitoring equipment is in place to meet the requirements of the protocol	No
6	Verify that the individual or team responsible for managing and reporting project activities are qualified to perform this function	Yes
6	Verify that appropriate training was provided to personnel assigned to GHG reporting duties	Yes
6	Verify that all contractors are qualified for managing and reporting GHG emissions if relied upon by the project developer. Verify that there is internal oversight to assure the quality of the contractor's work	Yes
7.2	Verify that all required records have been retained by the project developer	No

8.5.4 Completing Verification

The Verification Program Manual provides detailed information and instructions for verification bodies to finalize the verification process. It describes completing a Verification Report, preparing a Verification Statement, submitting the necessary documents to the Reserve, and notifying the Reserve of the project's verified status.

9 Glossary of Terms

Accredited verifier	A verification firm approved by the Climate Action Reserve to provide verification services for project developers.
Additionality	Project activities that are above and beyond "business as usual" operation, exceed the baseline characterization, and are not mandated by regulation.
Carbon dioxide (CO_2)	The most common of the six primary greenhouse gases, consisting of a single carbon atom and two oxygen atoms.
CO_2 equivalent (CO_2e)	The quantity of a given GHG multiplied by its total global warming potential. This is the standard unit for comparing the degree of warming which can be caused by different GHGs.
Direct emissions	GHG emissions from sources that are owned or controlled by the reporting entity.
Effective Date	The date of adoption of this protocol by the Reserve board: .
Emission factor (EF)	A unique value for determining an amount of a GHG emitted for a given quantity of activity data (e.g., metric tons of carbon dioxide emitted per barrel of fossil fuel burned).
Fossil fuel	A fuel, such as coal, oil, and natural gas, produced by the decomposition of ancient (fossilized) plants and animals.
Greenhouse gas (GHG)	Carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), sulfur hexafluoride (SF_6), hydrofluorocarbons (HFCs), or perfluorocarbons (PFCs).
GHG reservoir	A physical unit or component of the biosphere, geosphere, or hydrosphere with the capability to store or accumulate a GHG that has been removed from the atmosphere by a GHG sink or a GHG captured from a GHG source.
GHG sink	A physical unit or process that removes GHG from the atmosphere.
GHG source	A physical unit or process that releases GHG into the atmosphere.
Global Warming Potential (GWP)	The ratio of radiative forcing (degree of warming to the atmosphere) that would result from the emission of one unit of a given GHG compared to one unit of CO_2.
Indirect emissions	Reductions in GHG emissions that occur at a location other than where the reduction activity is implemented, and/or at sources not owned or controlled by project participants.
Metric ton (t, tonne)	A common international measurement for the quantity of GHG emissions, equivalent to about 2204.6 pounds or 1.1 short tons.

Methane (CH_4)	A potent GHG consisting of a single carbon atom and four hydrogen atoms.
MMBtu	One million British thermal units.
Mobile combustion	Emissions from the transportation of employees, materials, products, and waste resulting from the combustion of fuels in company owned or controlled mobile combustion sources (e.g., cars, trucks, tractors, dozers, etc.).
Project baseline	A "business as usual" GHG emission assessment against which GHG emission reductions from a specific GHG reduction activity are measured.
Project developer	An entity that undertakes a GHG project, as identified in Section 2.2 of this protocol.
Verification	The process used to ensure that a given participant's GHG emissions or emission reductions have met the minimum quality standard and complied with the Reserve's procedures and protocols for calculating and reporting GHG emissions and emission reductions.
Verification body	A Reserve-approved firm that is able to render a verification opinion and provide verification services for operators subject to reporting under this protocol.

10 References

[To be completed prior to protocol adoption]