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Greenhouse Gas Project Methodology Review Report

First Assessment under the Voluntary Carbon Standard (VCS)

Client:
Ecotrust Forest Management Inc.

Methodology:
Improved Forest Management Through Extension of Rotation Age

Scientific Certification Systems
Lead Validator: Kyle Holland
Technical Reviewer: Robert J. Hrubes, Ph.D.
Report Date: May 5, 2010

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1. Introduction

1.1 Objectives

- Assess conformance of the new methodology with VCS Standards.
- Evaluate the new methodology based on guidance given under the Voluntary Carbon Standard Program, including an assessment of VCS program requirements and the following: eligibility criteria, baseline approach, additionality, project boundary, emissions, leakage, monitoring, data and parameters, and adherence to the project-level principles of the VCS program.
- Determine the need for clarification or requests for change to the proposed new methodology.
- Determine approval status in the first independent assessment of the double approval process.

1.2 Standards used to Assess New Methodology

All methodologies (methodology elements) applying for approval under the VCS Program shall be approved via the double approval process. Per section 6.1 of the VCS standard ("VCS 2007.1"), VCS Program methodologies shall comply with all requirements in the VCS 2007.1 Standard, clause 6.1 to 6.4.4. The VCS Program Normative Document: Double Approval Process, Version 1.0 describes the requirements and steps of this process.

1.3 Methodology Criteria

SCS assessed the new methodology to ensure that all requirements of the VCS standards for the double approval process have been addressed. SCS assessed whether or not the new methodology respects the principles of the VCS standards.

Assessment included, but was not limited to, an evaluation of the methodology's inclusion of the following:

- applicability criteria that defines the area of project eligibility;
- a process that determines additionality;
- determination criteria for the most likely baseline scenario; and
- all necessary monitoring aspects related to monitoring and reporting of accurate and reliable GHG emission reductions or removals.

1.4 Methodology Scope

The scope of this validation assessment encompassed an assessment of the new methodology against the following requirements of the Voluntary Carbon Standard (VCS):

- VCS 2007.1 Standard (The Standard)
- VCS Guidance for Agriculture, Forestry and Other Land Use Projects (AFOLU)
- VCS Program Normative Document: Double Approval Process
- VCS Tool for AFOLU Non-Permanence Risk Analysis and Buffer Determination
- VCS Tool for AFOLU Methodological Issues

The assessment was performed using the client-supplied new methodology and other supporting documentation including referenced, published scientific literature, reports and exiting methodologies. Public comments and associated responses by the client were also considered in the methodology review.

1.5 Conflict of Interest

Prior to beginning the validation project, an evaluation was conducted to identify any potential conflicts of interest associated with the project. No potential conflicts were found for this Project.

2. Methodology Review

2.1 Assessment Team

Dr. Robert J. Hrubes, Technical Reviewer: Dr. Hrubes is Senior Vice-President of Scientific Certification Systems. He is a Registered Professional Forester (California RPF #2228) and forest economist with 30+ years of professional experience in both public and private forest management issues. Dr. Hrubes was lead architect of the programmatic protocols that guide all SCS Forest Conservation Program evaluations.

Kyle Holland, Lead Validator: Mr. Holland is a Verification Forester with Scientific Certification Systems and an approved VCS AFOLU expert in the categories of REDD and IFM. He is a Certified Forester (CF #3770) and is completing his Ph.D in forest biometrics and statistics at the University of California, Berkeley. Mr. Holland also possesses graduate degrees in forestry and over ten years of professional experience in both public and private forestry.

2.2 Description of Methodology Review Process

The new methodology was assessed using a process that evaluated its conformance with the requirements of the Voluntary Carbon Standard. The following elements were examined as part of this process for conformance:

- The VCS 2007.1 Standard (The Standard), including Sections 5 and 6;
- The appropriateness and adequacy of the eligibility criteria;
- The appropriateness and adequacy of the approach for determining the project baseline;
- The appropriateness and adequacy of the approach/tools for the determination of whether the project is additional;
- The appropriateness and adequacy of the approach to define the project's physical boundary and sources and types of gases included;
- The appropriateness and adequacy of the approach for calculating baseline emissions, project emissions and emission reductions;
- The appropriateness and adequacy of the approach for calculating leakage;
- The appropriateness and adequacy of monitoring;
- The appropriateness and adequacy of monitored and non-monitored data and parameters used in emissions calculations;
- Adherence to the project-level principles of the VCS Program, overall; and
- Public comments posted on the VCS website.

The methodology review process incorporated six parts: standards review, methodology review, comparison, corrective action, technical review and opinion. The applicable standards listed in Section 1.4 of this report were thoroughly reviewed and compared to the new methodology. Upon comparison, corrective actions were issued to improve the methodology and bring the methodology into conformance. An assessment reported with a detailed description of findings was drafted. This methodology was then independently reviewed by an internal technical reviewer prior to issuing a validation opinion. Both the assessment report and validation opinion were then submitted to the client for their review.

2.3 Corrective Action Requests

In the cases of corrective actions, Non-Conformity Reports (NCR) were issued to the methodology developer. NCRs formally document how and why the new methodology failed to comply with the

standards outlined in Section 1.4. In some cases, New Information Requests (NIR) were issued. NIRs are used to formally request information, such as: how equations were developed, the meanings of technical terms and abbreviations, referenced publications and supporting documentation. Yet in other cases, Opportunities for Improvement (OFI) were issued. OFIs are professional observations that note areas in the methodology that do not currently indicate non-conformance with the requirements of the VCS, but may lead to future non-conformance if left uncorrected.

The project developer was encouraged to respond to all NCRs, NIRs and OFIs during the course of the methodology review. Responses to NCRs were allowed sixty days (60) while responses to NIRs were allowed thirty days (30). Reponses to OFIs were optional.

3. Overview of Methodology

The new methodology, *Improved Forest Management Through Extension of Rotation Age*, is for Improved Forest Management (IFM). The methodology establishes a baseline, "without" project scenario and a "with" project scenario, each assuming certain management practices and forest conditions. Both scenarios involve clear cut or patch cut practices with harvest levels relative to twenty-five percent (25%) of the baseline. Also, the methodology seeks to minimize risk using fire control measures.

Carbon stock is quantified using sampling and statistical methods for four selected carbon pools: above-ground biomass, below-ground biomass, dead wood and wood products. One emissions source is included within the project boundary: the burning of biomass. Methane (CH_4) was the only greenhouse gas calculated for this activity. Baseline estimates of carbon stock are projected using a model and annual net carbon is calculated as the difference between the project and baseline stocks (minus emissions) at any point in time. Change in net carbon is calculated as the difference in net carbon over time.

4. Validation Findings

4.1 VCS 2007.1 Standard

This is the overall conformance to the VCS 2007.1 Standard with specific reference to project level requirements (Section 5) and methodologies (Section 6).

4.1.1 Section 5, Project Level Requirements

This is the specific conformance to Section 5 of the VCS 2007.1 Standard (The Standard). The consensus is that most requirements of Section 5 are indeed project-specific. However, it is clear that some of these requirements must also be addressed or further defined within methodologies. Terms relating to key project level requirements specified in The Standard were evaluated for clarity in use and consistency.

Findings: Initially, the methodology was found to be inconsistent with terminology defined in Section 5. Specifically, the methodology referred to the "start of the IFM VCS project activity" without reference to the *Project Start Date* and *Project Crediting Period Start Date* (see NIR 1of 6 for July 23, 2009). Also specifically, the methodology did not refer to *Project Grouping* as defined in this section, leaving some ambiguity about how projects are grouped under this methodology (see NIR Number 3 of 8 Dated July 23, 2009). Subsequently, these inconsistencies were corrected and the methodology was revised by the developer. Other terms – including those related to deviations, revisions, stands, factors, project tests for additionality, monitoring and records – were found to be consistent.

Conformance: Yes ☒ No ☐ N/A ☐

Non-Conformity Reports:

NCR Number 1 of 6 Dated July 23, 2009

Finding: Part II, Section 2 and various references to the "start of the IFM VCS project activity" within Part II, Sections 4 though 8: The VSC Standard differentiates between *Project Start Date* and *Project Crediting Period Start Date*. These two dates must be defined in accord with the standard and clearly referenced in the methodology.

Proponent Response on September 1, 2009: For this project category we cannot see a reason why project start date and project crediting period start date should differ. VCS definitions are as follows:

Project Start Date: Date on which the project began reducing or removing GHG emissions

Project Crediting Period Start Date: The date on which the first monitoring period commences

An applicability condition has been added.

Validator Response: The added applicability condition satisfactorily clarifies the *Project Start Date* and *Project Crediting Period Start Date*. However, these dates were not explicitly referenced in the definition of "start of the IFM VCS project activity" (See OFI 1 of 1 dated September 8, 2009).

NCR Number 4 of 6 Dated July 23, 2009

Finding: Section 8 of the methodology describes how to verify the applicability of allometric equations used to estimate the above-ground biomass of living trees. The methodology provides two options:

1.) Destructive Sampling; and
2.) Limited Measurements.

The opinion of the validator is that these options are not acceptable for four reasons:

1.) Parametric statistics are well-accepted for determining accuracy;
2.) Parametric tests are not used (such as a t-test at the 90% confidence level);
3.) It is almost never appropriate to use less than 30 samples if normal tests are used; and
4.) References are not provided to support the coverage of branch biomass (stated as 20% additional) or the inaccuracy of equations for trees less than 15 years old.

Should the methodology developer elect to use a quantitative approach to verify the applicability of equations, then parametric statistics should be used rather than arbitrary statistics as currently presented. Alternatively, the project proponent may elect to use a qualitative approach to avoid sampling and measurement.

Proponent Response on September 1, 2009, 2009: It should be noted that the methodology proposed was designed to go above and beyond the common practice approach of literature verification of the applicability of equations. This step was not supposed to be omitted – text is added. Edits were also made and justification added for the proportional increase in biomass for branches for the second option. (Section II.8)

Validator Response: The proponent response is adequate. Specifically, the proponent added text to account for literature review to confirm the applicability of model assumptions. The proponent refined and added a reference for the coverage of biomass from branches.

The validator recognizes that the most methodologies do not require allometric verification by the project proponent. Allometric verification is indeed a good step toward more creditable and rigorous methodologies. For these reasons, the basic non-parametric statistics employed in Section 8 are acceptable.

New Information Requests:

NIR Number 3 of 8 Dated July 23, 2009

Finding: It is unclear whether "grouping" or aggregation is allowed under the methodology. The methodology developer must specify whether this is allowed. If this is allowed, then the methodology developer must specify how individuals in the group are accounted for under the methodology.

Proponent Response on September 1, 2009: Aggregation is allowed with aggregated areas treated as a single project area. Text added in Section II.1.

Validator Response: The proponent response is adequate. The appropriate text has been added in Section II.1.

Opportunities for Improvement:

OFI Number 1 of 1 Dated September 8, 2009

Finding: The methodology developer has defined the *Project Start Date* and *Project Crediting Period Start Date* as being identical. However undefined in the methodology is the "start of the IFM VCS project activity" in Part II, Sections 4 though 8. The "start of the IFM VCS project activity" is the same as *Project Start Date* and *Project Crediting Period Start Date*; however, it is unclear whether these definitions are equated in Part I, Section 4.

Proponent Response on September 22, 2009: We agree with this change.

Validator Response: N/A

4.1.2 Section 6, Methodologies

This is the specific conformance to Section 6 of the VCS 2007.1 Standard. Validation within this section was accomplished by reviewing the general requirements, potential carbon pools (as outlined by ISO 14064-2:2006, clause 5.3), determination of baseline (clause 5.4-6), methods for determining additionality (clause 5.8) and requirements for monitoring (clauses 5.6-5.9).

Findings: Based on a review of the IPCC AFOLU Guidelines referenced by the methodology and approved by the VCS, it was found that no methods were provided for quantifying uncertainty as suggested (see NCR Number 2 of 6 Dated July 23, 2009). Subsequent to this finding, the methodology developer provided references to estimation procedures for uncertainty which were found to be appropriate and adequate given the size and complexity of the methodology. It is the opinion of the validator that providing explicit estimation procedures for uncertainty is overly prescriptive and would only dilute the importance of the primary estimators of forest carbon.

Further on the issue of quantifying uncertainty, it was found that the procedure for "expert judgment" could potentially bias the estimation of uncertainty, especially in cases were experts are

paid for their opinions to avoid the direct quantitative estimation of uncertainty (see NCR Number 3 of 6 Dated July 23, 2009). The proponent subsequently affirmed that direct quantitative estimation of uncertainty is required whenever possible and that expert judgment should only be used in cases where uncertainty cannot be directly quantified. The project proponent also provided greater importance to the application of scientific literature to the quantification of uncertainty.

Finally, it was found that in determining the baseline under the methodology, the baseline scenario for "common practice" was ill-defined and potentially subjective (see NCR Number 5 of 6 Dated July 23, 2009). The proponent subsequently provided a clear definition of "common practice" and provided objective criteria by which to evaluate "common practice". This revised definition was found to be adequate against The Standard clause 5.5 of ISO 14064-2:2006 that mandates criteria for baselines as necessary.

Conformance: Yes ☒ No ☐ N/A ☐

Non-Conformity Reports:

NCR Number 2 of 6 Dated July 23, 2009

Finding: The methodology references the AFOLU (IPCC) Guidelines in Section 7.1. These guidelines recommend supplying error estimates such as ranges and standard errors; however, the methodology does not specify equations to calculate error estimates. In order to assess uncertainty using the referenced AFOLU Guidelines, equations must be given for ranges, standard errors or both.

Proponent Response on September 1, 2009

Finding: Note that approved CDM methodologies provide no equations for calculating errors or explicit methods for how to determine uncertainty. This methodology goes far beyond this precedent.

What are missing here are explicit steps for calculating uncertainty in the tree pool or dead wood pool for example and for combining errors across sources. To do so for each pool, source and section would greatly increase the length and complexity of the methodology.

Additional text has been added to Section 7.1, this text provides guidance for uncertainty calculations.

Validator Response: The proponent response is adequate. Providing guidance for estimating uncertainty is important if equations are not specified due to complexity. Note that CDM methodologies are collectively approved by VCS. It is the opinion of the validator that more attention should be paid to estimating uncertainty in carbon calculations than currently paid by blanket-approved CDM methodologies. The accurate estimation of uncertainty is extremely important to project creditability and perhaps equally important to the estimation of carbon stocks. Unfortunately, the focus of most methodologies is the estimation of carbon stocks while the estimation of uncertainty falls to the wayside. Without reliable and accurate estimates of uncertainty, inference on estimated carbon stocks is meaningless.

NCR Number 3 of 6 Dated July 23, 2009

Finding: Section 7.1 of the methodology refers to "expert judgment" when calculating uncertainty. It is the validator's opinion that "expert judgment" is not an acceptable method for calculating uncertainty. There are five reasons for this opinion:

1.) Under the methodology, the calculation of uncertainty directly affects the quantity of VCUs;
2.) VCUs have a direct financial implication to the project proponent;
3.) The constitution of an expert is subjective;
4.) Potentially, an expert that is paid for his or her judgment may be biased; and
5.) Carbon stocks are a calculation and it is a relatively minor exercise to employ accepted statistics to quantity uncertainty, a considerably less-biased alternative than "expert judgment."

Proponent Response on September 1, 2009: This text was included to allow users a simplified approach where it can be demonstrated that numbers used are incontrovertibly conservative. It should, however, be clear that uncertainties from measurement and monitoring of carbon pools should always be quantified.

Text added (Section 7.1).

Validator Response: The proponent response is adequate. The added text clarifies that measurement uncertainty should always be quantified. Measurement uncertainty is a significant source of uncertainty. This addition eliminates the bias an "expert" might judge might have toward uncertainty in measurements and hence a significant portion of uncertainty overall. The added text also forces more attention to verifiable literature sources. This additional also serves to reduce bias in "expert judgment."

NCR Number 5 of 6 Dated July 23, 2009

Finding: Part II, Section 1, Step 2 of the methodology defines "common practice" as the common forest management practice in the surrounding area. It is the opinion of the validator that this definition is lacking and should include criteria by which "common practice" is evaluated.

In the same section, the methodology to determine the baseline scenario includes an assessment by a reputable forestry consultant. It is the opinion of the validator that reputable forestry consultants are acceptable; however, forestry consultants should provide reports on their findings and methodologies for verification purposes. Also, it is the opinion of the validator that more than one type of evidence for determining the baseline should be used, as opposed to just a forestry consultant. These opinions are made on the assumption that forestry consultants are usually paid by project proponents and that project proponents may affect the determination of the baseline by financial incentives to the consultant.

Proponent Response on September 1, 2009: Where no historical data are available (and generally we cannot expect other landowners to readily share data) we sought a solution that could create a realistic and credible baseline. Legal minima clearly do not qualify as conservative.

We have added criteria by which common practice should be assessed and processes to make forestry consultant reports more credible and transparent (Section II.2).

Validator Response: The added criteria are adequate. The added requirement for the forestry consultant to prepare a transparent report is adequate.

New Information Requests: None

Opportunities for Improvement: None

4.2 VCS Normative Document: Double Approval Process

These are the minimum validation elements that are listed in Section 5.1.2, *Scope of Assessment of new Methodologies* of the VCS Normative Document: Double Approval Process. These elements were thoroughly evaluated under the basis of existing AFOLU methodologies, tools, modules and/or projects approved by the VCSA for methodology element assessments within the IFM project category.

Further, these elements were assessed by an approved AFOLU expert. An approved AFOLU expert is well versed in current scientific thinking and best practices associated with AFOLU project design and implementation, as well as carbon accounting and reporting. Approved AFOLU experts posses regional expertise and experience relevant to assessing individual AFOLU methodologies (e.g., specific to developing country, industrialized country and/or regional/state contexts).

4.2.1 Eligibility Criteria

Assessment of whether the methodology's eligibility criteria are appropriate and adequate.

Findings: The eligibility criteria are described in Part I, Section 4 and Part II, Section 1 of the methodology. Initially, the methodology did not provide eligibility for project grouping as defined in this Section 5 of The Standard (see NIR Number 3 of 8 Dated July 23, 2009). However this eligibility criterion was subsequently addressed. Based on current scientific thinking and best practices associated with AFOLU project design and implementation, as well as carbon accounting and reporting, it is the opinion of the validator that the eligibility criteria are appropriate and adequate to the scope and complexity of the methodology.

Conformance:	Yes	☒	No	☐	N/A	☐
Non-Conformity Reports:	None					
New Information Requests:	See NIR 3 of 8 for July 23rd, 2009.					
Opportunities for Improvement:	None					

4.2.2 Baseline Approach

Assessment of whether the approach for determining the project baseline is appropriate and adequate.

Findings: The validation of the baseline approach revealed three specific findings. First, the baseline scenario for "common practice" was ill-defined and potentially subjective (see NCR Number 5 of 6 Dated July 23, 2009). The proponent subsequently provided a clear definition of "common practice" and provided objective criteria by which to evaluate "common practice". This revised definition was found to be adequate.

Second, the methodology appeared to promote simple spreadsheet-based models equally with peer-reviewed models to predict forest growth for the baseline scenario. The proponent clarified the role of simple spreadsheet based models relative to peer-reviewed models and the context in which simple spreadsheet models should be used. This revision was found to be adequate.

Lastly, the proponent initially established a five year period to evaluate historic management practices when determining the baseline scenario. It was unclear how this time period adequately captured historic long-term trends, periodicity in management activates and management planning. The proponent subsequently modified the length of this period to at least 20 years, which was found to be adequate.

Based on current scientific thinking and best practices associated with AFOLU project design and implementation, as well as carbon accounting and reporting, it is the opinion of the validator that the baseline approach is appropriate and adequate to the scope and complexity of the methodology.

Note: On November 30, 2009 the methodology developer received confirmation from VCS to drop an eligibility criterion for the composition of nitrogen-fixing species and nitrous oxide. The methodology developer initially included this criterion to conform to CDM standards. Recent guidance provided by CDM eliminates this criterion for afforestation/reforestation projects and the validator sees no reason to maintain this criterion for improved forest management methodologies as nitrous oxide emissions from nitrogen-fixing species are likely to be insignificant in the project relative to the baseline scenarios.

Conformance: Yes ☒ No ☐ N/A ☐

Non-Conformity Reports: See NCR 5 of 6 dated July 23rd, 2009.

New Information Requests:

NIR Number 4 of 8 Dated July 23, 2009

Finding: Many important growth and yield (GY) models are peer-reviewed, complex and fairly robust. The assertion that simple spreadsheet-based models are equally valid to peer-reviewed models must be justified. The methodology developer must demonstrate how, when and why simple spreadsheet models are equally valid. If necessary, the methodology developer must also clarify when simple spreadsheet-based models are equally valid.

Proponent Response on September 1, 2009

Finding: Text has been edited (Section II.4.1) to now only permit spreadsheet models where specific forest growth models do not exist or are not readily available.

Validator Response: The edited text is adequate. Now, the methodology clearly differentiates between robust and simple spreadsheet models. The edited text also clearly and rightly indicates when simple spreadsheet models are acceptable.

NIR Number 8 of 8 Dated July 23, 2009

Finding: Page 5 of the methodology: The methodology developer must justify five years for evaluating the operator history to determine the baseline. This justification should address the following issues:

1.) The identification of long-term trends;
2.) Periodicity of management activities; and
3.) Periodicity of management planning.

Proponent Response on September 1, 2009: The minimum number of years of history changed from 5 to 20 (Section II.2).

The decision on number of years was designed to include as many areas as possible under the historic classification rather than the common practice classification. We recognize, however, that to capture trends and periodicity 5 years is insufficient. We propose 20 here.

Validator Response: The change of the minimum number of years from 5 to 20 is adequate. A twenty year evaluation period is likely more informative about the overall trend of operations than a five year period.

Opportunities for Improvement:

OFI Number 1 of 1 Dated July 23, 2009

Finding: The methodology developer may choose to revise the list of appropriate growth and yield models on page 9 of the methodology. Generally, the FREIGHTS model is no longer used. Also, another widely used model is FPS (Forest Projection System by Forest Biometrics).

Proponent Response on September 1, 2009: FREIGHTS removed and FPS added (Section II.4.1).

Validator Response: N/A

4.2.3 Additionality

Assessment of whether the approach/tools for determining whether the project is additional are appropriate and adequate.

Findings: Additionality is described in Part II, Section 2, Step 2. The methodology requires one or more of three possible tests: the project test, performance test and technology test. These tests are consistent with the VCS 2007.1 Standard. Based on current scientific thinking and best practices associated with AFOLU project design and implementation, as well as carbon accounting and reporting, it is the opinion of the validator that additionality as described in the methodology is appropriate and adequate to the scope and complexity of the methodology.

Conformance:	Yes	☒	No	☐	N/A	☐
Non-Conformity Reports:	None					
New Information Requests:	None					
Opportunities for Improvement:	None					

4.2.4 Project Boundary

Assessment of whether an appropriate and adequate approach is provided for the definition of the project's physical boundary and sources and types of gases included.

Findings: The definition of the project's physical boundary is in Part II, Section 1. In the same section, the required carbon pools and emission sources associated with the burning of biomass within the project boundary are defined. There are two required carbon pools (above and below-ground biomass) and two optional carbon pools (dead wood and wood products). Initially, the case for excluding deadwood was unclear but subsequently clarified by describing the relationship of slash (logging residue) and dead wood. Three gases are listed as emissions sources from the burning of biomass : carbon dioxide, methane and nitrous oxide but only methane is included in the methodology's calculation of emissions sources within the project boundary. Based on current scientific thinking and best practices associated with AFOLU project design and implementation, as well as carbon accounting and reporting, it is the opinion of the validator that the approach to these elements is appropriate and adequate to the scope and complexity of the methodology.

Conformance:	Yes	☒	No	☐	N/A	☐
Non-Conformity Reports:	None					
New Information Requests:	None					
Opportunities for Improvement:	None					

4.2.5 Emissions

Assessment of whether an appropriate and adequate approach is provided for calculating baseline emissions, project emissions and emission reductions.

Findings: Baseline and project emissions are calculated as the sum of Non-CO2 equivalent and CO2 emissions from the combustion of biomass due to management activates over time. These emissions are netted from the gross emissions reductions. Section 4.2 and 5.2 describe the calculation of emissions and emissions reductions.

Confidence deductions also contribute to the calculation of emissions reductions. Best practices for AFOLU carbon accounting and reporting include confidence deductions for uncertainty in emissions reductions. The methodology entails a confidence deduction based on the geometric mean of uncertainty in baseline and project estimates, expressed as a percentage at the 90% confidence level and provided a threshold of 10% standard error. Although this approach seems complicated, it can be simplified to saying "the standard error is less than 10% of the mean." And in the case where the standard error is greater than 10%, the deduction is directly calculated by the percent. This approach is appropriate and adequate because 10% is a reasonable expectation for standard error given usual inventory procedures. Beyond 10%, the deduction is linear in standard error which is reasonable; it is natural to discount offset estimates linearly based on uncertainty to which standard error is a proxy.

With regard to the direct calculation of emissions reductions, three findings were made. First, there was a statistical issue related to possible bias in the sampling design for dead wood and live wood. This issue was eventually and adequately resolved by specifying an applicability condition for the dead wood pool (see NIR Number 6 of 8 Dated July 23, 2009 and NCR Number 1 of 2 Dated September 8, 2009). Second, some minor inconsistencies were found in the notation for estimating the biomass of lying dead wood (see NIR Number 2 of 8 Dated July 23, 2009). These inconsistencies were subsequently clarified. Lastly, the assumptions of several equations were examined to support the calculation of emissions reductions (see NIR Number 1 of 8 Dated July 23, 2009). These equations were found to be appropriate to the methodology.

Based on current scientific thinking and best practices associated with AFOLU project design and implementation, as well as carbon accounting and reporting, it is the opinion of the validator that the calculation of baseline emissions, project emissions and emissions reductions are appropriate and adequate to the scope and complexity of the methodology.

Conformance: Yes ☒ No ☐ N/A ☐

Non-Conformity Reports:

NCR Number 1 of 2 Dated September 8, 2009

Finding: The number of transects for quantifying dead wood is directly related to the number of plots. Plots are used to estimate above-ground biomass. The proponent quotes that "since tree biomass will dominate total biomass (and therefore will also dominate the summed variance for the project), it is practical to estimate the number of plots needed for the other carbon pools based loosely on the number of plots for the dominant biomass component."

This reasoning assumes that dead wood is a relatively minor pool compared to above-ground biomass. Consider the case of a nascent forest emerging after a catastrophic fire; it is quite possible that dead wood is a relatively major pool of carbon compared to above-ground biomass, violating this assumption. In this scenario, it is also quite possible that variation is greater in dead wood than standing trees and that between-plot variance is very low. Based on the referenced CDM tool, the determined number of plots is a direct function of estimated between-plot variance and therefore small estimated between-plot variance will yield a small plot size determination.

The proponent might argue that although too few plots might be installed (hence too few transects), the summed variance of all carbon pools will be necessarily estimated to quantify

uncertainty. Further, upon uncertainty quantification, the estimated variance attributed to the dead wood pool will be high thus forcing the user of the methodology to take a confidence deduction (as described in the methodology) or add more plots (transects) to reduce the overall estimated variance.

The flaw of this argument, however, is related to the definition of a statistical sample: the elements of a sample are intentionally a representation of the population being studied. For some fixed and true population variance, representative coverage is achieved by controlling sample size. If too few plots (transects) are installed, then estimated variance of dead wood could be greatly biased because the sample does not adequately represent the population being studied. Consistently and downwardly biased estimates of dead wood variance will greatly affect the overall estimated variance across all pools (especially if dead wood is a significant pool) and hence confidence deduction. The issue of transects, plots and sample size is extremely relevant despite the proponent's response to the previous NIR.

Proponent Response on September 22, 2009: We will be changing some language in the following area:

II. BASELINE METHODOLOGY PROCEDURE

Table 1: Selected carbon pools

Dead Wood – Justification/Explanation of Choice
Alternatively, project proponents may elect to include the pool (where included pool must be estimated in both the baseline and with project cases) *as long as the dead wood pool remains less than 50% of total carbon volume on the site in any given year.*

Validator Response: This is an adequate response assuming that the balance of the total carbon volume not in dead wood is in predominately in live wood and that dead wood is scattered throughout the project area. This assumption could be clearly stated; however, it is the opinion of the validator that any further findings are immaterial to the validation.

New Information Requests:

NIR Number 1 of 8 Dated July 23, 2009

Finding: Copies of the following references from the methodology are needed to validate equations and assumptions:

1.) Harmon and Sexton 1996 (p. 19)
2.) Warren and Olson 1964 (p.20)
3.) Van Wagner 1968 (p.20)

Proponent Response on September 1, 2009: Copies of requested papers have been sent. Also sent was the IPCC GPG LULUCF as additional support for the methodology.

Validator Response: The requested references were supplied. The references were used to validate the equations and assumptions of the methodology. The equations and assumptions of the methodology appear to be reasonable and justifiable.

NIR Number 2 of 8 Dated July 23, 2009

Finding: The methodology for estimating the biomass of lying dead wood is not consistent as described on pages 20 and 37.

Subscripts for the calculation of uncertainty are not consistent: REDD versus IFM on page 29 and elsewhere.

The methodology developer must clarify these inconsistencies.

Proponent Response on September 1, 2009: Subscripts for the calculation of uncertainty have been corrected (Section II.7)

Dead wood corrected to a constant 100m line length (Section II.5 and II.8).

Validator Response: These inconsistencies were corrected and the methodology calculations are now comprehendible.

NIR Number 6 of 8 Dated July 23, 2009

Finding: The methodology specifies that the UNFCCC tool for the *Calculation of the number sample plots for measurements within A/R CDM project activities* should be used to calculate the number of sample plots for standing wood. However, no tool or method is specified to determine the number of transects for lying dead wood. Instead, the number of transects is tied to the number of plots since there a one-to-one relationship of plots to transects, specified on page 20 of the methodology. Since the UNCCC tool does not account for transects and no alternate tool is given for determining the number of transects, then: the methodology developer must either alter the UNCCC tool to account for transects, de-relate transects from plots and/or specify how the number of transects should be determined.

The number of transects is especially important since the Harmon and Sexton (1996) method has been altered from 100 m transects to 100 ft transects

Proponent Response on September 1, 2009: Justification:

- cf. IPCC GPG LULUCF sections 4.3.3.4.1 and 4.3.3.5.3

- World Bank Sourcebook for LULUCF: "Experience has shown that focusing on the variance in the dominant carbon pool (for example trees for forestry activities) captures most of the variance. Even though variation in the other components may be higher, if a high precision is attained in the dominant component, a lack of precision in the other components will not harm the overall results"

"Since tree biomass will dominate total biomass (and therefore will also dominate the summed variance for the project), it is practical to estimate the number of plots needed for the other carbon pools based loosely on the number of plots for the dominant biomass component. For example a single 100 m line intersect …. would be sufficient per tree plot"

- See also page 8 and page 24 of USFS Gen. Tech. Rep. NRS-18

- Note also that we are using 100 m dead wood transects which are more conservative than Harmon and Sexton (1996).

The critical point is that, as far as crediting is concerned, precision is assessed across the summed pools. If 10% of the mean with 90% confidence is not met, a deduction in credits will occur. It will be good practice for projects to install more than the required number of plots to assure themselves that they can claim the mean but projects should be able to make their own decisions. The methodology determines that the atmosphere will never suffer and users can, to some extent, determine their own costs and benefits with regard to sampling intensity.

The Sourcebook and the USFS Gen.Tech. Report are attached.

Validator Response: The underlying assumption of the proponent's response is that dead wood is a relatively minor pool of carbon compared to above-ground biomass. The proponent's argument does not hold if dead wood is a major pool of carbon (see NCR 1 of 2 dated September 8, 2009).

Opportunities for Improvement: None

4.2.6 Leakage

Assessment of whether the approach for calculating leakage is appropriate and adequate.

Findings: Leakage is described in Section 6 of the methodology. With regard to buffer determination, it was originally unclear how the determination is made. However, clarification was provided on the *VCS Tool for AFOLU Non-Permanence Risk Analysis and Buffer Determination* (see NIR Number 5 of 8 Dated July 23, 2009). As a VCS approved tool, it is appropriate to the methodology.

Initially, leakage only accounted for market effects. However to conform to The Standard, activity shifting leakage was added to the methodology (see NCR Number 6 of 6 Dated July 23, 2009). With respect to leakage, the methodology now accounts for activity shifting and market effects. The methods for quantifying both types of leakage are adequate based on current scientific thinking and best practices associated with AFOLU project design and implementation, as well as carbon accounting and reporting. It is the opinion of the validator that leakage is appropriately and adequately addressed, given the scope and complexity of the methodology.

Conformance: Yes ☒ No ☐ N/A ☐

Non-Conformity Reports:

NCR Number 6 of 6 Dated July 23, 2009

Finding: Step 5, Part 20 of the AFOLU Guidance Document: IFM project developers must demonstrate that there is no leakage within their operations – i.e., on other lands they manage/operate outside the bounds of the VCS carbon project.

There is no method for project developers to demonstrate or quantify activity-shifting leakage. The methodology developer must include activity-shifting leakage in the methodology.

Proponent Response on September 1, 2009: Omission of activity shifting was an oversight that has been corrected both through text in Section 6 and the addition of a new applicability condition

Validator Response: The proponent added an applicability condition prohibiting activity shifting leakage. This is an adequate response.

New Information Requests:

NIR Number 5 of 8 Dated July 23, 2009

Finding: Page 30 of the methodology: it is not the responsibility of the validator to determine the portion of carbon credits to be withheld as a buffer reserve (BRR). Rather, the methodology developer must specify how the BRR is calculated. If the methodology developer implies the usage of the *VCS Tool for AFOLU Non-Permanence Risk Analysis and Buffer Determination* tool, then this must be stated in the methodology. Note that this tool may require validation under the VCS double approval process.

Proponent Response on September 1, 2009: A reference was added to the VCS tool (Section II.7.3). The tool was created by the VCS and as such is approved for use by projects.

Validator Response: This added reference is adequate.

Opportunities for Improvement: None

4.2.7 Monitoring

Assessment of whether the monitoring approach is appropriate and adequate.

Findings: Monitoring is primarily described in Part III, Section 1 and Section 2 of the methodology. Equations related to monitoring are in Part II of the methodology. The monitoring approach is clear and follows generally accepted guidelines, including those of the IPCC. Diameter at Breast Height was initially misstated on Page 15 but subsequently corrected. The description for plot establishment on page 15 was confusing as it initially implied that plots with defiend boundaries could be established with a prism. This was subsequently redefined as plots with a defined boundary or variable radius plots. It is the opinion of the validator that the monitoring approach is appropriate and adequate.

Conformance: Yes ☒ No ☐ N/A ☐

Non-Conformity Reports: None

New Information Requests: See NIR 1, 2 and 6 dated July 23rd, 2009.

Opportunities for Improvement: None

4.2.8 Data and Parameters

Assessment of whether monitored and not monitored data and parameters used in emissions calculations are appropriate and adequate.

Findings: Initially, monitoring data and parameters for living and dead wood were subjective and potentially open to interpretation that could circumvent the inclusion of moderately sized trees in monitoring. In this effect, a project proponent could specify a relative high minimum diameter, for instance, and likewise not include small and medium sized trees in monitoring. The project proponent could then implement management activates to harvest or significantly reduce the volume of small and medium sized trees without affecting their emissions reductions (see NIR Number 7 of 8 Dated July 23, 2009 and NCR Number 2 of 2 Dated September 8, 2009).

This issue was subsequently resolved by specifying a fixed range for the minimum diameter. The specified range for living and dead wood pools is acceptable because it is conservative. In the case of dead wood, we expect a decay rate to be constant across all dead wood diameter classes. Therefore the minimum inherently excludes a portion of dead wood consistently over time.

Based on current scientific thinking and best practices associated with AFOLU project design and implementation, as well as carbon accounting and reporting, it is the opinion of the validator that

the selected data and parameters are appropriate and adequate to the scope and complexity of the methodology.

Conformance: Yes ☒ No ☐ N/A ☐

Non-Conformity Reports:

NCR Number 2 of 2 Dated September 8, 2009

Finding: This NCR addresses three issues related to minimum measures that are specified in the methodology (Section III.3): interpretation of the range, the upper limit of the range for the minimum diameter of standing trees and consistency.

A range is specified for minimum DBH on page 40. As the methodology currently reads, the user is free to arbitrarily select any minimum in this range with the only criteria being tree species and climate. No further guidance is given for evaluating tree species or climate to determine the appropriate minimum diameter within this range. Also, an upper limit on the minimum diameter is set at 20 cm but no justification is provided for this limit. Lastly, the methodology reads "minimum measurement diameter for all sites must not be less than 20cm" which is contradictory to the measurement procedure that states the minimum may be "as high as 20cm."

The proponent must provide guidance for selecting the minimum diameter within the specified range (alternatively set a "hard" minimum across all tree species and climates), justify the upper limit of the range and make the measurement procedure consistent.

Proponent Response on September 22, 2009: We have decided to set a hard minimum for all sites. New language will read as follows:

Typically measured 1.3 meters above-ground. Measure all trees above some minimum *DBH* in the sample plots that result from the IFM project activity. The minimum *DBH* for all sites must not be more than 20cm.

Validator Response: This response clarifies the range and therefore is adequate.

New Information Requests:

NIR Number 7 of 8 Dated July 23, 2009

Finding: The methodology specifies some minimum and maximum measures (diameters and lengths) for data collection. However, minimum and maximum measures are not specified for all data collection components of the methodology. The methodology developer should specify minimum and maximum measures or provide a methodology for determining the minimum and maximum measures.

Proponent Response on September 1, 2009: A minimum added for trees and down dead wood in Section III.3.

Validator Response: A minimum diameter measure for dead wood was added. A range of minimum diameter measures for standing trees was added. However, no guidance was provided for selecting the minimum diameter within the specified range. Also, the proponent did not justify the selected minimum diameters and diameter ranges in their response (see NCR 2 of 2 dated September 8, 2009).

Opportunities for Improvement: None

4.2.9 Adherence to the Project-Level Principles of the VCS Program

Assessment of whether the methodology adheres to the project-level principles of the VCS Program. This element is specifically addressed by Section 4.1 of this report.

Findings: As referenced by Section 4.1 of this report, there are no outstanding issues regarding the adherence to the project-level principles of the VCS program. Based on current scientific thinking and best practices associated with AFOLU project design and implementation, as well as carbon accounting and reporting, it is the opinion of the validator that the methodology adheres to the project-level principles of the VCS program.

Conformance: Yes ☒ No ☐ N/A ☐

Non-Conformity Reports: None

New Information Requests: None

Opportunities for Improvement: None

5. Validation Option, Assessment Statement

Following completion of SCS's duly-accredited validation process, it is our opinion that Ecotrust's proposed methodology, Improved Forest Management through Extension of Rotation Age, conforms to the scope as defined in Section 1.4 of this report, namely the VCS 2007.1 Standard. As the first validators, we support all changes resulting from the second validation and specifically methodology with version date May 4, 2010.

……
Signature of Lead Validator

KYLE HOLLAND, CF
……
Name of Lead Validator

Verification Forester, SCS
…….
Position

6. Eligibility Criteria for Validators

6.1 Eligibility Criteria

The following required evidence, if available, is provided for Non-ARR AFOLU methodology elements in conformance with Section 4.7 of the *VCS Program Normative Document: Double Approval Process*.

6.1.1 Eligibility Criteria 2 for Non-ARR AFOLU

Both Robert J. Hrubes, Ph.D, and Kyle Holland are AFOLU approved experts for the IFM project category. Robert J. Hrubes served as technical reviewer and Kyle Holland served as lead validator.

6.1.2 Eligibility Criteria 3 for Non-ARR AFOLU

Scientific Certification Systems has not completed at least ten project validations in any sectoral scope.

6.2 Supplied Evidence

The above supplied evidence is adequate per Section 4.7.3 of the *VCS Program Normative Document: Double Approval Process*.