URBAN FOREST CARBON REGISTRY

Tree Preservation Protocol

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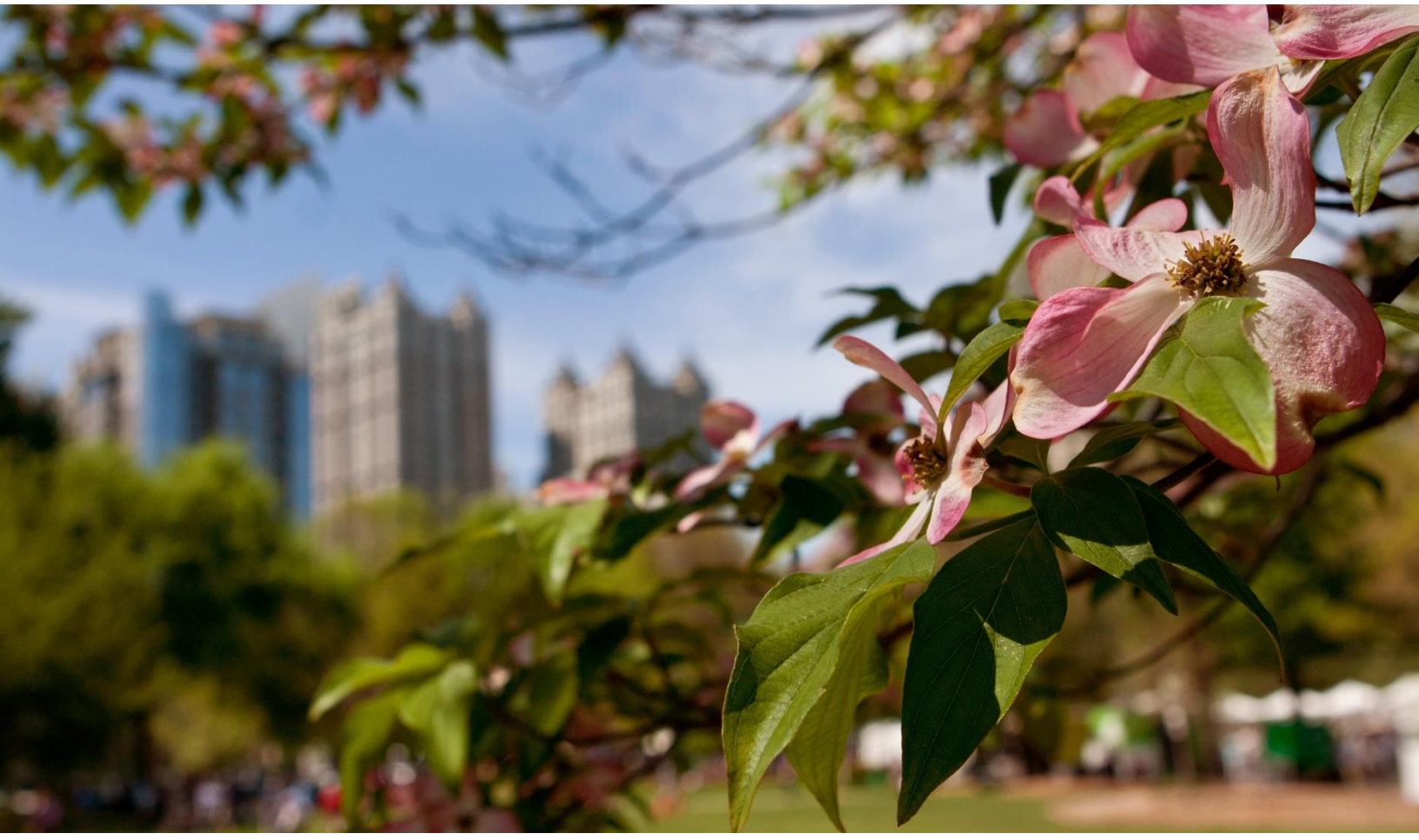

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Introduction

This Urban Forest Carbon Protocol sets forth the requirements for Tree Preservation projects in urban areas in the U.S. to quantify carbon dioxide sequestration from woody biomass. That woody biomass is referred to herein by the broader term "urban forest."

This protocol provides eligibility rules, methods for quantifying biomass and CO2 storage, and reporting, monitoring, issuance of credits, reversal, and verification requirements. We have been guided in our drafting by one of the foundational documents for carbon protocols, the WRI/WBCSD GHG Protocol for Project Accounting, which describes GHG project accounting principles.

Our goal is in this protocol is to provide for accounting of net GHG reductions is a consistent, transparent, and accurate manner, consistent with the principles and policies set forth in the WRI GHG Protocol for Project Accounting document. This process will form the basis for GHG reductions that are real, additional, permanent, verifiable, and enforceable, which can then result in the issuance by the Urban Forest Carbon Registry of carbon offset credits, called Community Carbon Credits™ or Community CarbonGreen Credits™.

Urban forests in the U.S. are estimated to store over 643 million tonnes of CO2.[1] The co-benefits of urban forests include air quality improvements, energy savings from reduction of the urban heat island effect, slope stability, bird and wildlife habitat, sound and visual buffering, public health improvements, safety, livability,

[1] Nowak, David J., et al. "Carbon storage and sequestration by trees in urban and community areas of the United States." *Environmental Pollution* 178 (2013): 229-236, 231.

social cohesiveness, economic improvements, and more.[2] Urban trees clearly influence air temperatures and energy and affect local climate, carbon cycles, and climate change.[3]

Moreover, almost 80% of the population worldwide lives in urban areas, and urbanization is a significant demographic trend of the 21st century. The array of benefits delivered by urban trees directly links to human health and life in cities and towns.

Documents and Standards for Protocol Development

No single authoritative body regulates carbon protocols or determines final standards. The Stockholm Environment Institute's Carbon Offset Research and Education resource lists the various institutions and programs that have set out formulations of basic principles that every carbon offset protocol should contain.[4]

CORE lists twenty-five different programs or institutions that have either developed standards for protocols or issued standards and rules for their own programs. These institutions range from international bodies such as the Kyoto Protocol, the World Resources Institute, and the International Organization for Standardization, to U.S. carbon programs such as the Regional Greenhouse Gas Initiative and Midwest Greenhouse Gas Reduction Accord, to registries such as the American Carbon Registry, the Climate Action Reserve, and the Verified Carbon Standard.

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[2] See Alliance for Community Trees, Benefits of Urban Forests: a Research List at http://www.actrees.org/files/Research/benefits_of_trees.pdf

[3] Nowak, 229.

[4] See CORE at http://www.co2offsetresearch.org/policy/ComparisonTableAdditionality.html

The standards issued by these bodies vary, and the specific rules formulated to give content to these different standards vary even more. For example, the Clean Development Mechanism under the UN Framework stemming from the Kyoto Protocol lists 115 different approved baseline and monitoring methodologies for large scale offset projects.

To complicate matters, the environmental and carbon community have tolerated a de facto different standard between compliance protocols and voluntary protocols. Compliance protocols exist in cap and trade jurisdictions like California. Because these compliance protocols establish the rules for credits that will offset actual regulated GHG emissions from monitored sources, greater rigor is expected than in voluntary protocols, where purchasers are buying credits voluntarily to reduce their carbon footprint, not to offset regulated emissions.

There is, nonetheless, a general consensus that all carbon offset protocols must contain the following:

- Accounting Rules: offsets must be "real, additional, and permanent." These rules cover eligibility requirements and usually include baselines for additionality, quantification methodologies, and permanence standards.
- Monitoring, Reporting, Verification Rules: monitoring, reporting, and verification rules ensure that credits are real and verifiable.

Certification, enforceability, and tracking of credits and reversals are performed by specific programs or registries, guided by language in the protocol where relevant.

Over the last fifteen years, several documents setting forth standard and principles for protocols have emerged as consensus leaders for programs attempting to

develop their own offset protocols for specific project types. We will follow and refer most often to:

- World Resources Institute/WBCSD GHG Protocol for Project Accounting ("WRI GHG Protocol");
- Clean Development Mechanism, Kyoto Protocol, now part of the UN Framework Convention on Climate Change ("CDM").

We have been guided by the WRI GHG Protocol and have modelled this urban Tree Preservation Protocol after the "avoided conversion" protocols that have been developed for forest land. Further discussion of protocol principles and requirements can be found in Appendix D, a separate document that discusses both the Tree Planting and the Tree Preservation Protocols.

Recognition of Distinct Urban Forest Issues in Protocol Development

The task for the Urban Forest Drafting Group was to take the principles and standards set forth in these foundational documents and adapt them to urban forestry. Urban forestry and its potential carbon projects are different than virtually all other types of carbon projects:

- Urban forests are essentially public goods, producing benefits far beyond the specific piece of land upon which individual trees are planted.
- New tree planting in urban areas is almost universally done by non-profit entities, cities or towns, quasi-governmental bodies like utilities, and private property owners.
- Except for a relatively small number of wood utilization projects, urban trees are not merchantable, are not harvested, and generate no revenue or profit.

- With the exception of very recent plantings begun in California using funds from its Greenhouse Gas Reduction Fund, no one currently plants urban trees with carbon as a decisive reason for doing the planting.

- Because urban tree planting and maintenance are expensive relative to carbon revenues, urban forestry has not attracted established for-profit carbon developers.

- Because urban forest projects will take place in urban areas, they will be highly visible to the public and easily visited by carbon buyers. This contrasts with most carbon projects that are designed to generate tradeable credits purchased in volume by distant and "blind" buyers.

During the drafting process, we remained mindful at all times that the above unique factors of urban forestry distill down to three central attributes:

- Urban trees deliver a broad array of documented environmental and human health benefits,

- Urban trees are essentially a public good delivering their array of environmental benefits to the people and communities living in cities and towns – almost 80% of the population, and

- There are little to no harvests, revenues, or profits for those who preserve and grow the urban forest.

These three key attributes lead to the conclusion that urban forest projects are highly desirable, bringing multiple benefits to 80% of the population in a public good that is unlikely to be gamed or exploited.

Our task then was to draft urban forest protocols that encouraged participation in urban forest projects through highly-credible protocols that addressed not just catch-phrase principles of carbon protocols, but the policies underlying those

principles. Where the needs of urban forest practicality required a variance from accepted principles of carbon protocols, we developed solutions to those variances to maintain a high level of stringency.

1. Eligibility Requirements

1.1 Project Operators

A Project requires at least one Project Operator ("PO"), an individual or an entity, who undertakes a Project, registers it with the Urban Forest Carbon Registry (the "Registry"), and is ultimately responsible for the project and its reporting.

1.2 Project Implementation Agreement

A Project Operator must sign a Project Implementation Agreement (PIA) with the Registry setting forth the Project Operator's obligation to comply with this Protocol.

1.3 Project Location

Project Areas must be located within at least one of the following:

A. The Urban Area boundary ("Urban Area"), defined by the most recent publication of the United States Census Bureau (https://www.census.gov/geo/maps-data/maps/2010ua.html);

B. The boundary of any incorporated city or town created under the law of its state;

C. The boundary of any unincorporated city, town, or unincorporated urban area created or designated under the law of its state;

D. A zone or area designated by any governmental entity as a watershed or for source water protection, provided the designated zone or area overlaps some portion of A, B, or C above;

E. A transportation, power transmission, or utility right of way, provided the right of way begins, ends, or passes through some portion of A, B, C, or D above.

1.4 Defining the Project Area

The Project Operator must specify the Project Area and provide an electronic map of the Project Area with geospatial location in any file type that can be imported and read by Google Earth Pro.

The Project Area must be within one of the areas specified in Section 1.3 on Project Location. The Project Area may consist of contiguous or non-contiguous parcels. While it is often convenient for Project Area boundaries to follow land parcel boundaries, Project Area boundaries do not have to follow land parcel boundaries.

Forests naturally have spaces between trees and gaps, and locations of these gaps may change over time. The Project Operator may choose to map gaps in the forest and exclude those non-treed areas from the Project Area. The Project Operator may leave gaps within the Project Area, so long as (a) if the Project Area is in a location that gets at least 20 inches of precipitation per year, tree canopy must cover at least 80% of the entire Project Area, including gaps, or (b) if the Project Area has less than 20 inches of precipitation per year, tree canopy must cover at least 60% of the Project Area, including gaps.

Precipitation may be determined by maps produced by a government agency, or from the average of the most recent ten years of data from the nearest government precipitation measurement station for which data is publicly available. If the Project Operator does not exclude gaps from the Project Area, determination of the carbon stock and sequestration on the Project Area must account for tree canopy gaps.

1.5 Ownership or Eligibility to Receive Potential Credits

The Project Operator must demonstrate ownership of potential credits or eligibility to receive potential credits by meeting at least one of the following:

A. Own the land and potential credits upon which the Project trees are located; or

B. Own an easement or equivalent property interest for a public right of way within which Project trees are located and accept ownership of those Project trees by assuming responsibility for maintenance and liability for them; or

C. Have a written and signed agreement from the landowner committing the landowner to actions, or refraining from actions, required under the Protocol, granting access to Project land to the Project Operator and the Registry to inspect, quantify, or verify data required under this Protocol, and granting ownership to the Project Operator of any credits for carbon storage, other greenhouse gas benefits, and other co-benefits delivered by Project trees on that landowner's land.

2. Project Duration

As set forth in Section 6, the Registry will issue credits based on a 40-year Preservation Commitment (see Section 4.1 for definition of Preservation Commitment). Projects must report throughout their Preservation Commitment. Projects may earn credits after 40 years as provided in Section 8.

3. Project Documentation, Reporting, and Record-keeping

Documentation, reporting, and record-keeping requirements are contained in Appendix A.

4. Demonstrating Preservation and Threat of Loss

To earn credits for Tree Preservation projects (Trees Preserved from Removal), a Project Operator must meet the requirements of Sections 4.1, 4.2, and 4.3:

4.1 That the trees in the Project Area have been preserved as follows (the actions in A and B below are referred to as the "Preservation Commitment"):

A. If the Project Area is privately owned, that the trees are preserved from removal by a recorded easement with a term of at least 40 years. Or,

B. If the Project Area is publicly owned, that the trees are preserved from removal by either:

i. A recorded easement with a term of at least 40 years; or

ii. A management plan or protected status, approved or designated by the governmental body with authority over

that land, which preserves the trees in the Project Area from removal for at least 40 years.

And,

4.2 That prior to the Preservation Commitment in Subsection 4.1 above, the project trees were not preserved from removal through easements, management plans, protected status, or other prohibitions on their removal, and

4.3 That prior to the Preservation Commitment in Subsection 4.1 above, the Project Area meet A below and at least one of B, C, or D:

A. Was in a zoning designation that allows for at least one non-forest use (non-forest uses include industrial, commercial, transportation, residential, agricultural, or resource other than forest, as well as non-forest park, recreation, or open space uses), and is not in an overlay zone that prohibits all development; **and at least one of conditions B, C, or D**:

B. Was surrounded on at least 50% of its perimeter by non-forest, developed, or improved uses, including residential, commercial, or industrial; if the Project Area is surrounded by forested land, the 50% perimeter can apply to the surrounding forested land; **or**

C. Had been sold or conveyed or had an assessed value within three years of preservation under Subsection 4.1 for greater than $10,000 average price per acre for the bare land; **or**

D. Would have a fair market value after conversion to a non-forested "highest and best use" greater than the fair market value prior to preservation in subsection 4.1, as stated in a "highest and best use" study from a state certified general real estate appraiser in good standing.

5. Project Commencement

Tree Preservation projects shall commence upon the recording of an easement or adoption of a management plan or protected status preserving trees in the Project Area from removal per subsection 4.1 above, but no earlier than July 1, 2017.

Projects must submit applications to the Registry within one year of its Preservation Commitment.

6. Issuance of Credits for Tree Preservation Projects

The Registry will issue Community Carbon Credits™, representing a tonne of carbon per credit plus other ecosystem benefits.

If the Project Area is less than 20 acres, the Project may quantify CO2 eligible for crediting and request issuance of credits at any time after the Project Commencement date, subject to the provisions below.

If the Project Area is greater than 20 acres and not more than 200 acres, the Project may quantify CO2 eligible for crediting and request issuance of credits attributable to the equivalent of 20 acres of the Project. At each subsequent annual anniversary of the original issuance of credits, the project may request issuance of credits attributable to the equivalent of 20 more acres of the Project, until all attributed

credits have been issued, using the most recent verified amount of offsets attributed to the Project.

For example, if the Project Area is 60 acres, the Project Operator would quantify the CO2 eligible for crediting on all 60 acres, and then the Project is eligible to be issued one third of the total number of credits attributed to the project each year for three years (one-third being the equivalent of 20 acres), and with all credits for the project thus issued by the end of the third year.

If the Project Area is greater than 200 acres, the Project may quantify CO2 eligible for crediting and request issuance of credits attributable to the equivalent of 10% of the total credits attributed to the Project. The Project can quantify all CO2 eligible for crediting for the Project Area and request issuance of 10% of the credits each year, until all credits have been issued.

In all Tree Preservation projects, the Registry will issue 90% of credits earned and requested and will hold 10% in the Registry's Reversal Pool. At the end of the Project Duration, if application of approved Registry accounting methods shows that the project is eligible to generate more credits than the Project has been issued, then, (if the Project requests) the Registry will issue to the Project all credits that the Project is eligible to generate that have not yet been issued to the Project. Amounts of credits to be issued under the provisions of this section are gross amounts and include amounts to be issued to both the Project Operator and amounts to be transferred to the Registry's Reversal Pool.

Tree Preservation projects must follow the quantification methods and seek verification per sections 9 and 10.

7. Monitoring

At least once every three years, the Project Operator must observe tree conditions across the Project Area and report these conditions to the Registry. These reports must be in writing, and the Project Operator must attest to the accuracy of the reports. The reports must estimate the percentage of the Project Area that appears to be gaining biomass carbon, the percent of the Project Area that appears to have constant biomass carbon stocks, and the percent of the Project Area that appears to be losing biomass carbon stock. If any area appears to be losing carbon stock, the report shall state the estimated amount of loss. The report shall also estimate the number of acres of significant soil disturbance that has occurred since the previous report. Plowing and removal of topsoil both constitute significant soil disturbance. For the purposes of these reports, areas of soil exposed by trees tipping over are not counted as areas of significant soil disturbance.

8. Reversals in Tree Preservation Projects

Reversals are the loss of biomass carbon ("Loss of Biomass Carbon") after credits have been received by projects but before the expiration of the Preservation Commitment. If there is loss of biomass carbon such that the remaining biomass carbon within the project area may be less than the amount of biomass carbon for which Registry credits have been issued, then the Project must estimate the amount of remaining carbon and report this estimate within 60 days of becoming aware of the loss.

The Registry shall determine, at its own discretion, whether a reversal was the result of intentional action or gross negligence by the Project Operator. If a Reversal was not the result of intentional action or gross negligence, the Registry will replace offsets invalidated by the Reversal with credits from the Registry's Reversal Pool.

If the Registry determines that the Reversal was the result of an intentional action or gross negligence by the Project Operator, the Registry shall estimate the number of remaining creditable tonnes CO2e using whatever estimation methods the Registry deems appropriate. The Registry shall notify the Project Operator of this count. If the Registry determines that more credits have been issued to the Project (counting both credits issued to the Project Operator and credits transferred to the Registry's offset insurance account), the Registry shall notify the Project Operator of this shortfall. The Project Operator shall be responsible for replacing the number of credits that have been issued but that are no longer supported by carbon storage within the Project Area. Within 60 days of being notified of the number of credits that it is obligated to replace, the Project Operator shall submit to the Registry a sufficient number of Urban Forest Carbon Registry credits to cover the shortfall. If the Project Operator is unable to obtain sufficient Urban Forest Carbon Registry credits, the Project Operator may pay the Registry $20 per tonne of shortfall to satisfy the Project Operator's reversal obligation.

Quantifications of carbon stocks determined by the Registry shall be considered to be verified amounts.

If the Project Operator disputes the Registry's reversal calculation, the Project Operator may, at its own expense, measure the remaining carbon stocks within the Project Area that may be more accurate than estimates made by the Registry. The Registry shall consider carbon stock counts submitted to it by the Project Operator, and if the Registry finds that the Project Operator's count is likely to be more accurate than the Registry's estimate, the Registry shall use the Project Operator's count of carbon stocks to determine the Project Operator's liability for replacing

credits that are no longer supported by carbon storage within the Project Area.

If a Project has had its carbon stock go below the carbon stock necessary to support offset credits issued by the Registry, no further credits will be issued to the Project until the carbon stocks are above the amounts needed to support issued credits, including credits allocated to the Registry's offset insurance account.

If a Project Operator fails to compensate for a reversal, that Operator may be barred from urban forest projects for a specified time period at the discretion of the Registry.

The above provisions may be set forth in a Project Implementation Agreement between the Project Operator and the Registry.

9. Continuation of Tree Preservation Projects after 40-Year Project Duration

After a 40-year Preservation Commitment, Tree Preservation projects may continue their activities, submit Project Reports under Appendix A, and seek issuance of credits under Section 6. Projects must comply with all applicable requirements of this Protocol.

10. Quantification for Credits

The Registry will issue Community Carbon Credits™ to a Project only after quantification by a Project Operator, verification by the Registry, and a request for issuance of credits by a Project Operator. Project Operators must follow the following Quantification methods.

There are five steps in the quantification of credits generated by the Project:

1. Estimate the biomass stock present, and adjust for uncertainty in the estimate to calculate the "Accounting Stock" (Section 10.1)

2. Calculate the fraction of the Accounting Stock that likely would be emitted as a result of development, to calculate "Avoided Biomass Emissions" (Section 10.2)

3. The Project Operator may elect to also account for growth of trees within the project area, or may choose not to count growth (Section 10.3)

4. Calculate "Avoided Soil Carbon Emissions" (Section 10.4)

5. Calculate the number of credits generated by the Project by either (a) demonstrating that development displaced by the project can be accommodated by redevelopment of existing developed or developable parcels within the urban area, or (b) calculate a deduction in avoided emissions to account for emissions resulting from the Project displacing new development to outside the Project Area (Section 10.5)

10.1 Quantifying Biomass Carbon Stock Present Within the Project Area

Acceptable ways of quantifying the biomass carbon stock present within the Project Area include:

A. The afforestation table from the US Forest Service General Technical Report (GTR) NE-343 appropriate to the geographic area and species, "total nonsoil" carbon stock for stands of the age of the forest on the Project Area. If this method is used, the Project Area must be assessed and divided into stands as by the species grouping in the relevant geographic area in GTR NE-343 and by stand age. Stand age may be determined by publically available historical materials documenting

afforestation of the Project Area or presence of substantially complete tree cover on the Project Area. Stand age may be determined by coring a random or well distributed systematic selection of trees. If the Project Area is classified as one stand, at least 30 co-dominant trees well distributed across the Project Area will be used to calculate stand age. If the Project Area is divided into more than one stand, at least 20 co-dominant trees per stand will be used to determine stand age. For each stand, stand age shall be the median age of the sampled trees.

If using this quantification method, the Project must measure the percent canopy cover. The Project may prove canopy cover by using the i-Tree Canopy tool and submitting to the Registry the i-Tree Canopy report for the Project Area, plus the i-Tree Canopy export file containing the coordinates of all evaluated points and the evaluation of each point. If the estimated percent tree cover, minus one standard error of the estimate (i-Tree Canopy reports the standard error) is less than 80%, then the carbon stock attributed to the Project equal:

Project Stock = Stock * (Percent – Standard Error)

Where "Project Stock" is the number of tonnes of biomass carbon stock used for subsequent calculations of credits attributed to the project, "Stock" is the live tree or total non-soil carbon stock estimated using tables from GTR NE-343, "Percent" is the percent tree cover, and "Standard Error" is the standard error of the percent tree cover.

Because the tables in GTR NE-343 cover a wide range of conditions,

some stands will have less carbon stock than the amount estimated by using the tables. To make the accounting conservative, if a project estimates carbon stock using these tables, the "Accounting Stock" shall be 80% of the "Project Stock" estimated in the equation above in this subsection.

B. An inventory of live trees at least 5" in diameter at 4.5' above the ground (where the height above the ground is measured on the uphill side of the tree) present on the Project Area using i-Tree methods and tools (available from http://www.itreetools.org/). When using this method, the Accounting Stock attributed to the project is up to the carbon stock calculated by i-Tree, minus one standard error of that estimate. For example, if the mean estimated carbon stock is 100 tonnes, and the standard error is 10 tonnes, then the number of Accounting Stock attributed to the project is 90 tonnes.

C. A forest inventory using accepted forestry methods and biomass equations that are valid for the species, growth conditions, and tree sizes to which the equations are being applied and that are published in a peer reviewed publication, by a government agency, or by a not-for-profit organization. The project may choose include smaller trees, standing dead trees, and/or down dead wood. When using this method, the Accounting Stock attributed to the Project is the mean estimated carbon stock, minus one standard error of that estimate.

10.2 Areas Expected to Remain in Trees After Potential Development

When an area is developed, some trees may be retained. This subsection adjusts the "Accounting Stock" calculated in the preceding subsection to adjust for the fact that

even with development, some of the trees within the Project Area may remain, and the carbon in these remaining trees is not emitted during development. To account for these trees that might remain after development, the Project Operator must do the following accounting:

A. In industrial, commercial, mixed use, and non-residential zones, 90% of the Accounting Stock on developable portions of the Project Area is the "Avoided Biomass Emissions"; and

B. In residential zones where the zoning allows at least one dwelling unit per 6,000 square feet of lot size, 90% of the Accounting Stock on developable portions is the "Avoided Biomass Emissions"; and

C. In residential zones where the zoning requires more than 6,000 square feet of lot size for one dwelling unit, the Project Operator must divide the number of square feet of land in the Project Area that is within that zone by the required minimum number of square feet per dwelling to calculate the permissible number of dwelling units. The number of square feet of developable area that is subject to clearing and loss of carbon is the permissible number of dwelling units times 5,400 square feet per dwelling unit. This area is the developable area in the zone. For each residential zone that is within the project area and where more than 6,000 square feet of lot area is required for each permitted dwelling unit, the number of "Avoided Biomass Emissions" is calculated by multiplying the Accounting Stock times the number of permissible dwelling units that zone, then multiplying by 5400 square feet per dwelling unit, and then dividing this resulting number by the total project area in the particular zone. Where more than 6,000 square feet

of lot area is require per dwelling unit, the calculation of the avoided biomass emissions is:

Avoided Biomass Emissions = Accounting Stock * ((Permissible Units * 5,400)/Project Area)

Where "Accounting Stock" is defined in Section 10.1, "Permissible Units" is the total number of dwelling units that zoning rules would allow to be constructed within the Project Area, and "Project Area" is expressed in units of square feet and is areas where development is permitted, as required in Section 4.3.A.

10.3 Re-measurement of Carbon Stock Necessary to Claim Additional Credits for Growth

If the project wishes to claim credits for ongoing tree growth occurring within the Project Area after the Project Commencement, only the quantified increase in biomass carbon from the prior issuance of credits may be requested. Increases may be quantified using any method approved by the Registry in Section 10.1, including deductions for calculation of the "Accounting Stock". The fraction of the "Accounting Stock" of new biomass sequestration in new growth that counts as "Avoided Biomass Emissions" is the same as the fraction that is the number of "Avoided Biomass Emissions" present at the project start date divided by the "Accounting Stock" present at the project start date.

10.4 Quantification of Soil Carbon

On acres determined to be at risk of conversion to developed uses where trees are cleared, as adjusted under the provisions of Section 10.2, the Project may claim

avoidance of emissions from soil carbon caused by conversion of forest soils to impervious surfaces on developable portions of the project area. Avoided soil carbon emissions shall be no more than:

A. On commercial, industrial, and mixed use and other non-residential zones, if the applicable zoning and development rules specify a maximum fraction of parcel area that may be in impervious surface, up to the allowed impervious area may be claimed as avoided conversion to impervious surface. If the applicable zoning and development rules do not limit impervious area, 90% of the developable area within that Project Area and in commercial, industrial, or mixed use zone may be attributed to being eligible for conversion to impervious surface.

B. On residential zones, if the applicable zoning and development rules specify a maximum fraction of parcel area that may be in impervious surface, up to the allowed impervious area may be claimed as avoided conversion to impervious surface. If the applicable zoning and development rules do not limit impervious area, 50% of the developable area within that Project Are and in a residential zone may be attributed to being eligible for conversion to impervious surface.

C. For development uses of the project area that retain live vegetation on the ground, such as creation of recreational grass playfields, there are no soil carbon emissions attributed to development. If potential development of the Project Area would include some vegetative cover, and some non-vegetated surface uses (such as parking lots, restrooms associated with playfields, or artificial turf playfields) divide the Project

Area into areas with vegetation and without vegetation, and analyze each area separately.

If there is existing impervious surface within the Project Area, that existing impervious area must be subtracted from the potential area of impervious surface under developed use, to calculate net area of avoided impervious surface for calculating avoided soil carbon emissions.

Per acre of avoided impervious surface, the project may claim 120 metric tonnes carbon dioxide equivalent of Avoided Soil Carbon Emissions per acre of net avoided impervious surface. This emission rate is based on research studies showing that when soil is removed from a site and piled with minimal revegetation, 65% of the soil carbon stock is lost, and soil carbon mapping showing that almost all US forest soils have more than 185 metric tonnes carbon dioxide equivalent per acre in the top meter of soil. The calculation is:

Avoided Soil Carbon Emissions = Avoided Impervious Surface * 120

Where "Avoided Impervious Surface" is the number of acres within the Project Area that are developable according to the requirements of Section 4.3.A, in units of acres, after the adjustments specified in Sections 10.4.A and 10.4.B.

10.5 Calculation of Deduction for Displaced Development

Preventing development of some lands is likely to displace development to other lands. Displacing development to other lands may or may not cause emissions from trees and soil. If development is displaced to locations with no trees but with minimally disturbed soils, there would be no biomass emission attributed to the displacement but there would be soil carbon emissions resulting from the displacement. If development is displaced to previously developed sites, there could

be negligible emissions from biomass and soil from sites where development is displaced to.

The project is assigned no emissions from displaced development if:

A. The Project Operator can identify existing properties within the urban area where the Project Area is located that are in the same or similar zoning classification (or classifications) as the Project Area, and

B. Those properties could be developed or re-developed to add similar scope and size of development as would have been allowed on the Project Area if it had not been protected. For uses where the potential developed use of the Project Area is vegetated cover, such as grass playfields, identify properties that are currently without trees that could be developed into the developed vegetated use.

If the Project Operator does not identify properties that could be developed or redeveloped to satisfy the demand for development that could have occurred in the Project Area, then emissions from displacement of development are calculated as follows.

A. Of the total number of tonnes of Avoided Biomass Emissions from within the Project Area, 28.8% are assumed to be emitted from development displaced from the Project Area. Therefore, the number of creditable tonnes of avoided biomass emission is calculated by reducing the number of tonnes of avoided biomass emissions attributed to within the project area by 28.8%. In the sequence of calculations, this reduction is done immediately prior to calculation of Reversal Pool obligations. The calculation is:

Credits from Avoided Biomass Emissions = Avoided Biomass Emissions * (1 - 0.288)

B. Of the total number of tonnes of Avoided Soil Carbon Emissions from within the Project Area, 57.1% are assumed to be emitted from development displaced from the Project Area. Therefore, the number of creditable tonnes of avoided soil carbon emission is calculated by reducing the number of tonnes of soil carbon emissions attributed to within the project area by 57.1%. In the sequence of calculations, this reduction is done immediately prior to calculation of Reversal Pool obligations. The number 57.1% is the fraction of U.S. cities that is non-impervious surface and assumes that some development is displaced to existing impervious surfaces. The calculation is:

Credits from Avoided Soil Emissions =
Avoided Soil Carbon Emissions * (1 – 0.571)

Credits attributed to the Project are the sum of Avoided Biomass Emissions plus Avoided Soil Carbon Emissions, after adjusting for displacement of development as provided for in this section.

10.6 Reversal Pool

Of the credits attributed to the project, verified by the Registry, and issued to the project, 90% shall be issued to the Project Operator and 10% shall be transferred to the Registry Reversal Pool.

11. Verification

The Registry will verify compliance with this Tree Preservation Protocol per International Standards Organization 14064-3. Specifically, the Registry adopts and utilizes the following standards from ISO 14064-3:

- Upon receiving a Project Report with updated data on eligibility, quantification of carbon, and a request for credits, the Registry will verify a project's compliance with this Protocol. The Registry will maintain its status as a non-profit organization, and will be independent of specific project activities.
- A trained peer reviewer will audit the Registry's verification, utilizing standards to be adopted by the Registry.
- Registry verification with peer review is justified by the processes and standard set forth below, and by the fact that urban forest planting projects, unlike many other types of carbon offset projects, will be conducted in urban areas, by definition. The trees planted in urban forest projects will be visible to virtually any resident of that urban area, and to anyone who cares to examine project trees.
- The Registry will maintain independence from the activities of projects, will conduct all verification work with ethical conduct and a fair presentation of its verification work, will treat all projects equally with regard to verification, and will conduct its verification work with skill, diligence, and competence.
- The Registry requires a reasonable level of assurance in the accuracy the asserted GHG removals to a reasonable level.
- The verification items identified in Table 11.2 and the following sections are all material elements, and any asserted GHG removals must be free of errors, misstatements, or omissions regarding those elements.

- The Registry will record, store, and track all quantification and verification data and either display it for public review or make it available for public review upon request.
- The Registry will develop a risk assessment standard to provide a cross-check on data collection and review.
- The Registry will adopt a process for follow-up and maintenance for consistency and continuity.

11.1 Verification of Eligibility Requirements

Table 11.2 displays the verification for eligibility requirements.

Table 11.2

Item	**Elements to Verify**	**Protocol Section**	**How**
1.	PO Identity	1.1	
2.	PIA	1.2	
3.	Location	1.3	
4.	Right to Receive Credits	1.4	
5.	Commencement	5	
6.	Project Documentation	4	
7.	Project Duration	3	
8.	Preservation Commitment	4	
9.	No Pre-existing Preservation	4	
10.	Threat of Tree Loss	4	

12. Verification of Project Operator's Quantification of Carbon

12.1 Quantifying Biomass Carbon Stock Within the Project Area under Section 10.1

What method was used to quantify biomass carbon stock?

A. A. US Forest Service table

B. B. i-Tree inventory

C. C. Other inventory

If A, US Forest Service General Technical Report (GTR) NE-343 table:

- Specify the state and forest type (or types) in which the project is located.
- Specify the table (or tables, if more than one forest type) used to estimate biomass carbon stock.
- Describe method for determining stand age. If documentary evidence, provide a copy of the document(s). If by coring, provide the sampling protocol, core data, and age calculation. If the project is measured as one stand and the stand age is measured by coring, are at least 30 trees aged? If the project is more than one stand, are there at least 20 trees cored in each stand? Is the median tree age used as the stand age?
- For each stand, what is the live tree or total non-soil carbon stock from the relevant table(s) in GTR NE-343, in metric tons CO2e/acre? For stand ages between ages given in the table, linearly interpolate. For stand ages older than the oldest age in the table, use the oldest age in the table.
- What is the percent canopy cover?
- If the i-Tree Canopy tool is used to determine the percent canopy cover, provide the i-Tree Canopy report for the Project Area, plus the i-Tree Canopy export file containing the coordinates of all evaluated points and the evaluation of each point.
- What is the i-Tree Canopy estimated percent canopy cover?
- What is the i-Tree Canopy standard error?
- What is the i-Tree Canopy estimated percent canopy cover minus one standard error?

- If the i-Tree Canopy percent cover minus one standard error is more than 80%, then the "Project Stock" per acre is the biomass carbon stock per acre from the GTR.
- If the i-Tree Canopy percent cover minus one standard error is less than 80%, then the "Project Stock" per acre is the biomass carbon stock per acre from the GTR times (the percent canopy cover minus one standard error).
- What is the "Project Stock" in tCO2e/acre, for each stand?
- Calculate the "Accounting Stock" by multiplying the multiplying the "Project Stock" times 0.8. What is the "Accounting Stock" in tCO2e/acre, for each stand? For each stand, multiply by the number of acres in the stand, and sum for all stands to calculate the total project "Accounting Stock". What is the total project accounting stock?

If B, the I-Tree Eco tool inventory method is used:

- What is the version of the inventory method used?
- Provide a copy of the tree data.
- Provide the i-Tree Eco report of the estimated carbon stock, and standard error of the estimate. In tCO2e/acre, for each stand (or stratum), what is the estimated tree carbon stock minus one standard error, for the entire project area, in tCO2e? This is the "Accounting Stock."

If C, a different inventory method is used:

- Provide the inventory field protocol, methods for calculating carbon stock from the inventory data, and electronic copy of the inventory data in an Excel or Access file, and a copy of the carbon calculations. Plot locations or plot information should be specific enough that if the Registry chooses, the Registry should be able to identify individual trees that were sampled, and discern sampled trees from trees that were not sampled. Provide inventory accuracy requirements, quality control procedures, and quality assurance

procedures. Describe quality control and quality assurance activities performed, and the results of these activities. Provide complete citations of sources of all biomass equations, and demonstration of their applicability. Report the mean estimated carbon stock for the entire project area, in tCO2e, and the standard error of this estimate, in tCO2e. The "Accounting Stock" is the mean estimated carbon stock minus one standard error.

12.2 Area Expected to Remain Treed after Development Under Section 10.2

What is the percentage of the acreage of the project are that is developable, that is, where development is permitted and not prevented by zoning, hazard zones, sensitive areas, or other factors prohibiting development?

Multiply the Accounting Stock times the percentage that is developable. What is that amount? Section 10.2.1

- For the fraction of the developable area that is in non-residential zones, multiply the number in 10.2.1 by 0.9 and report this as the biomass carbon stock that could be lost on development, the "Avoided Biomass Emissions."

For the fraction of the area that is developable and that is in a residential zone, is more than 6,000 square feet required per dwelling unit? Section 10.2.2.

- If so, divide the developable area (in square feet) by the number of square feet required per dwelling unit, and round down to the nearest integer. Multiply this integer by 5400. This is the area that is assumed to be cleared of forest during development. Divide the area assumed to be cleared by the total project area and multiply this fraction times the Accounting Stock to obtain the "Avoided Biomass Emissions." Report the "Avoided Biomass Emissions."

If regulations allow one dwelling unit per 6,000 square feet or less, multiply the value determined in section 10.2.1 times 0.9 to calculate the "Avoided biomass Emissions." Report the "Avoided Biomass Emissions." Section 10.2.3.

12.3 Additional or Ongoing Growth Under Section 10.3

Claiming credits for ongoing growth is optional. If the Project Operator chooses to claim credits for ongoing biomass growth, these claims are made after growth occurs. Quantification of growth may use any of the methods given in section 10.1.

12.4 Quantification of Soil Carbon Under Section 10.4

Non-residential zones under Section 10.4.A. Avoided soil carbon emissions = (Developable area from section 10.2 minus pre-existing area of impervious surface) * 0.9 * 120. The areas must be in acres. Show the calculation and amount of avoided soil carbon emissions.

Residential zones under Section 10.4.B. If there is a limit on the fraction of the developable area from section 10.2 that may be impervious surface, take the lesser of 50% or the permissible fraction of lots that may be impervious surface. If there is no regulatory limit on the amount of impervious surface, then the fraction of developable area that may become impervious is assumed to be 50%. Avoided Soil Carbon emissions, in tCO2e) equals (the area that is developable (from section 10.2, in acres) minus the area of pre-existing impervious surface (in acres)) times the fraction that may become impervious times 120. Show the calculation and amount of avoided soil carbon emissions.

12.5 Displaced Development Under Section 10.5

Identifying available redevelopment options outside the project area under Section 10.5.1. Identifying available redevelopment options outside the project area is optional. If the Project Operator does not identify available redevelopment options, deductions for displaced development are applied to the project, as specified in Section 10.5.2 of the Protocol and below.

For Project Areas in non-residential zones, considering the developable area of the Project Area, applicable building setbacks and height limits, estimate the number of square feet of built space that could be built on the Project Area, on or above the existing grade. For Project Areas in residential zones, do the same calculation except calculate the number of permitted dwelling units instead of the number of square feet of potential built space.

For Project Areas in non-residential zones, identify specific land parcels within the same Urban Area where the project is located, and that have existing built space, and where at least the number of square feet of built space that could be built on the Project Area could be added to the built space already existing on these other parcels. Other than specific differences in regulations, the criteria used to estimate potential area of built space on the Project Area can be no more restrictive than the criteria used to estimate potential area of built space on the alternative sites. For example, if fire access regulations are used to reduce the area of potential built space attributed to the Project Area, then these same fire access regulations must be applied when estimating potential build space on parcels outside the Project Area. Provide addresses or parcel numbers of parcels used in these calculations, and provide annotated calculations.

For Project Areas in residential zones, identify parcels with at least one dwelling unit per parcel, where the parcel could be redeveloped to contain more dwelling units. Identify parcels that could contain as many more dwelling units as could be built on the Project Area. Provide addresses or parcel numbers of the parcels where dwelling units could be added, and annotated calculations of how many dwelling units each parcel could contain, and how many each currently contains.

Deduction for displaced development under Section 10.5.2. If the Project Operator does not show an option for alternative development within the Urban Area where the Project Area is located, a deduction for displaced development is applied. Displacement of emissions has a biomass component and a soil component. The amount of the biomass deduction for displaced development is the Avoided

Biomass Emissions times 0.288. The amount of the soil deduction for displaced development is the Avoided Soil Carbon Emissions times 0.571. Calculate these amounts and show the calculations.

12.6 Total Credits Attributed to the Project

The total credits attributed to the project equals the Avoided Biomass Emissions (section 10.2) plus the Avoided Soil Carbon Emissions (section 10.4) minus biomass and soil emissions attributed to displaced development (section 10.5).

If additional or ongoing growth is calculated, the same procedure is used to calculate growth. The Project Operator may either calculate the growth increment since the most recent quantification (using methods in section 10.1) or may estimate Avoided Biomass Emissions using the post-growth stand age or inventory, and then subtract amounts of credits previously attributed to Avoided Biomass Emissions of the project.

When calculating credits attributed to tree growth, no further credits are attributed for avoided soil emissions unless the allowed area of impervious surface has increased. If the allowed area of impervious surface has increased, to calculate the additional Avoided Soil Carbon Emissions calculate the Avoided Soil Carbon Emissions under the new regulations, and subtract the previously calculated amount of Avoided Soil Carbon Emissions attributed to the project.