Bluesource – Massachusetts Tri-City

Improved Forest Management Project

[January 23, 2019]

ACR 376

Cities of Westfield, Holyoke and West Springfield

Prepared by: Bluesource LLC

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A. PROJECT OVERVIEW

A1. PROJECT TITLE

The project title is "Bluesource – Massachusetts Tri-City Improved Forest Management Project".

A2. PROJECT TYPE

This project is to be registered under the American Carbon Registry Standard[1] (ACR, 2018) as an Improved Forest Management (IFM) project and an approved ACR Improved Forest Management Methodology.[2]

A3. PROOF OF PROJECT ELIGIBILITY

Eligibility for this Improved Forest Management project has been determined with reference to the ACR Standard Version 5.1 and the Improved Forest Management Methodology for Quantifying GHG Removals and Emission Reductions through Increased Forest Carbon Sequestration on Non-Federal Forestlands, Version 1.3.

The Massachusetts Tri-City Improved Forest Management Project, hereafter referred to as the "Mass Cities Project" meets all relevant eligibility requirements as described in Table A3.1 below.

Table A3.1. Project Eligibility Requirements

Eligibility Requirements	Proof of Eligibility	Reference
Ownership Type	The project ownership is non-federal U.S. forestland.	See section G1. PROOF OF TITLE
Project proponent has third-party certification or no commercial timber harvesting	The City of Westfield, The City of West Springfield, and the City of Holyoke (hereafter "The Cities") are separate entities. There is no active commercial timber harvesting in The City of Westfield. Both West Springfield and Holyoke are certified through FSC.	See also section A5.1. Background Information
Project area meets the definition of Forestland condition as per USFS FIA program definition	Per the ACR Forest Carbon Project Standard, the project meets the definition of forestland through a minimum of 10% forest cover (or equivalent stocking) by live trees of any size.	See also section A4. LOCATION

[1] ACR. 2018. American Carbon Registry Standard, Version 5.1. American Carbon Registry, Arlington, VA, USA.

[2] ACR. 2018. *Improved Forest Management Methodology for Quantifying GHG Removals and Emission Reductions through Increased Forest Carbon Sequestration on Non-Federal Forestlands*, Version 1.3, April 2018, American Carbon Registry, Arlington, VA, USA.

Project start date	The project start date of March 17, 2017 complies with the ACR Standard Version 5.1. The start date coincides with the signing of the Carbon Marketing & Development Agreement between Massachusetts Tri-City Carbon Offset Project and Bluesource, provided separately for verification purposes. The evidence referenced above further complies with the methodology (Improved Forest Management Methodology for Quantifying GHG Removals and Emission Reductions through Increased Forest Carbon Sequestration on Non‐Federal U.S. Forestlands) requirement that: *"If the project Start Date is more than one year before submission of the GHG plan, the Project Proponent shall provide evidence that GHG mitigation was seriously considered in the decision to proceed with the project activity. Evidence shall be based on official and/or legal documentation. Early actors undertaking voluntary activities to increase forest carbon sequestration prior to the release of this requirement may submit as evidence recorded conservation easements or other deed restrictions that affect onsite carbon stocks."*	See also section H1. START DATE.
Project term	The project proponent commits to maintain the carbon project scenario stocking levels on the project area at least for the required Project Term of 40 years.	See also section H2. PROJECT TIMELINE.
Crediting Period	In compliance with the ACR Standard Version 5.1 (July 2018) and the Improved Forest Management Methodology for Quantifying GHG Removals and Emission Reductions through Increased Forest Carbon Sequestration on Non-Federal Forestlands, Version 1.3 (April 2018), the crediting period for the project is 20 years.	See also section H2. PROJECT TIMELINE.

Real	GHG removals are quantified based on inventory of the standing stock in the project area at the time of verification.	See also sections D. MONITORING PLAN and E. QUANITIFCATION
Land Title	For all areas included in the project, long term land titles have been issued and ownership is thus clear, unique, and uncontested.	See also appendix A. Land Owner and Contracts.
Direct Emissions/ Offset Title	GHG emission reductions generated by the project activity are generated from forest carbon sources and sinks over which The Cities have all management and ownership rights (see Appendix A). The Cities holds the offset title to all lands in the project area (see Section G below) and thus all rights to carbon credits/offsets produced through management of forests in the project area.	See also section G2. CHAIN OF CUSTODY
Additionality	Additionality for the project has been shown through a regulatory surplus test, a common practice test, and an implementation barrier test.	See also section C. ADDITIONALITY
Permanent	The long-term setup, risk analysis, and buffer establishment assure permanence of the project benefits.	See also section B8. PERMANENCE.
Net of Leakage	Possible leakage effects due to activity shifts are quantified and deducted from the GHG benefits.	See also section E3. LEAKAGE.
Independently Validated and Verified	In accordance with ACR methodology, the project benefits will be verified by SCS Global Services.	
Community and Environmental Impacts	Impacts on community and environment were analyzed in accordance with the ACR Standard 5.1, net positive impacts were confirmed.	See also section F. COMMUNITY & ENVIRONMENTAL IMPACTS

A4. LOCATION

A GIS shapefile of the project area, 'MassCities_Boundary.shp' was provided separately for verification. This shapefile gives unique identification and delineation of the specific extent of the project. The vicinity map, Figure A-1. gives project location, nearby urban areas, and latitude/longitude coordinates. The project is located in Hampden and Hampshire counties of Massachusetts.

Figure A-2. shows the local hydrology within the Mass-Cities Project area. The canopy cover map, Figure A-3. clearly shows that the project meets the US Forest Service definition of forestland (at least 10% tree cover) as forest covers majority of the project area. Non-forested acres were removed from the project to a minimum mapping unit of 2.5 acres. A topographic map, Figure A-4. is also provided as a reference.

The roads map, Figure A-5. shows the public and private roads near and on the property, additional foot trails exist that are not mapped. The ownership map, Figure A-6 shows the parcels owned by the cities of Westfield, Holyoke and West Springfield in Hampden and Hampshire counties, Massachusetts.

Figure A-1. Vicinity Map with Latitude and Longitude

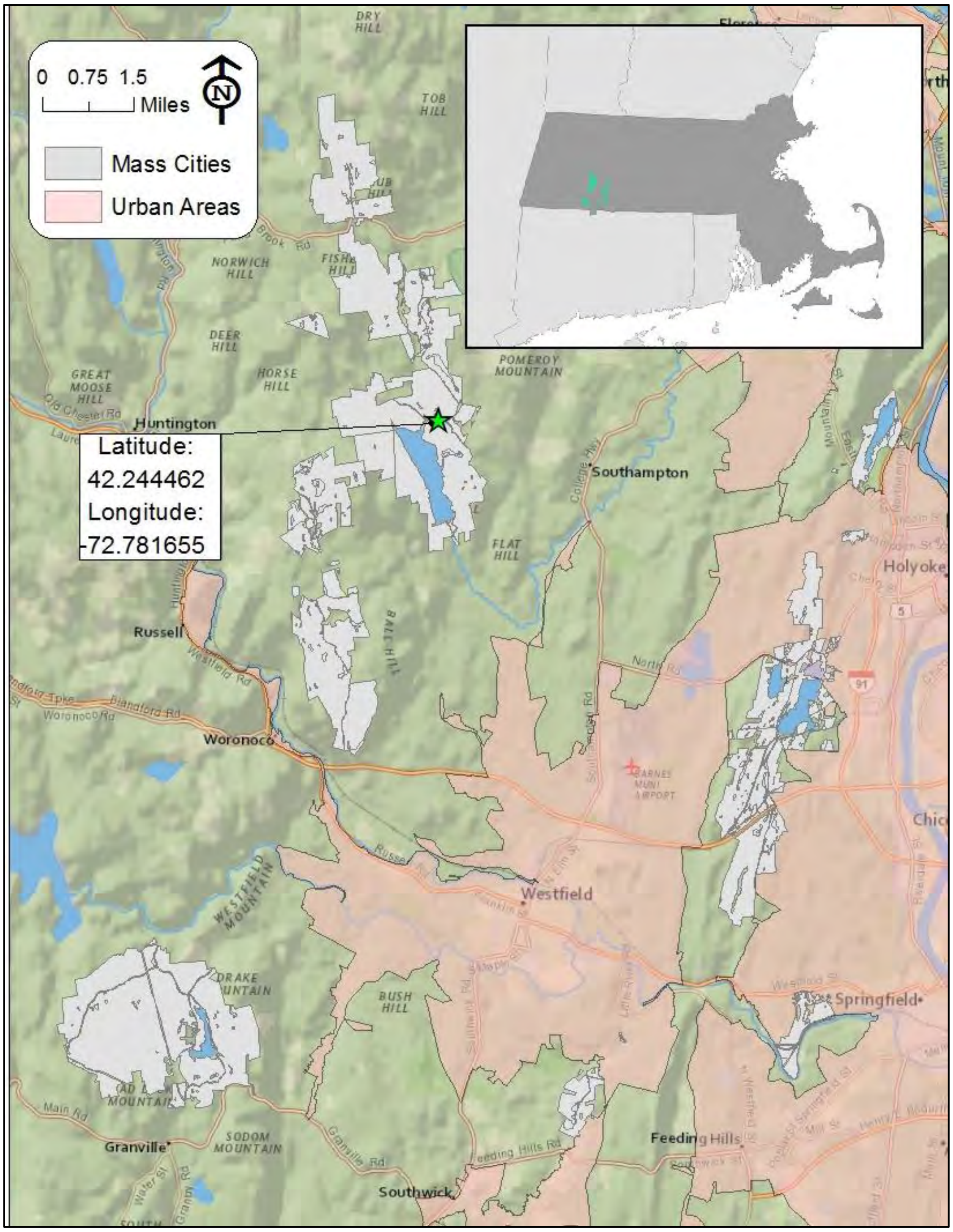


Figure A-2. Regional Hydrology Map

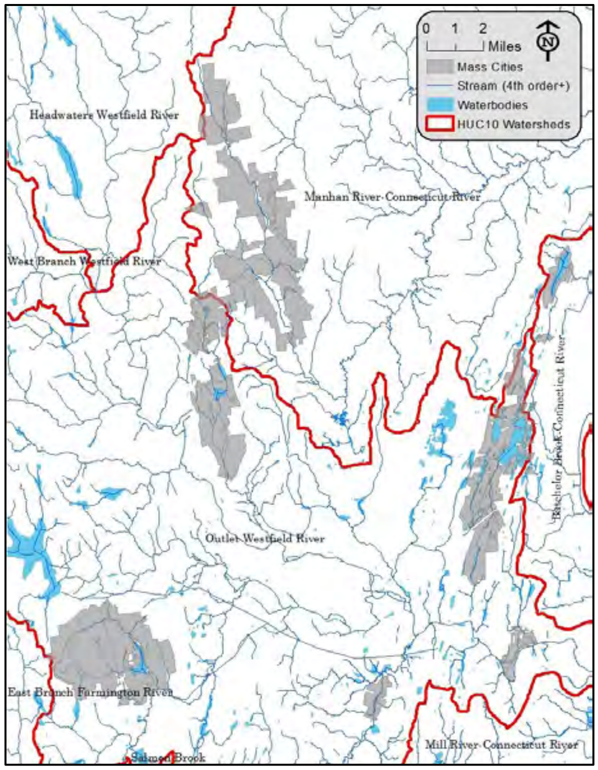


Figure A-3. Canopy Cover Map depicting greater than 10% canopy cover.

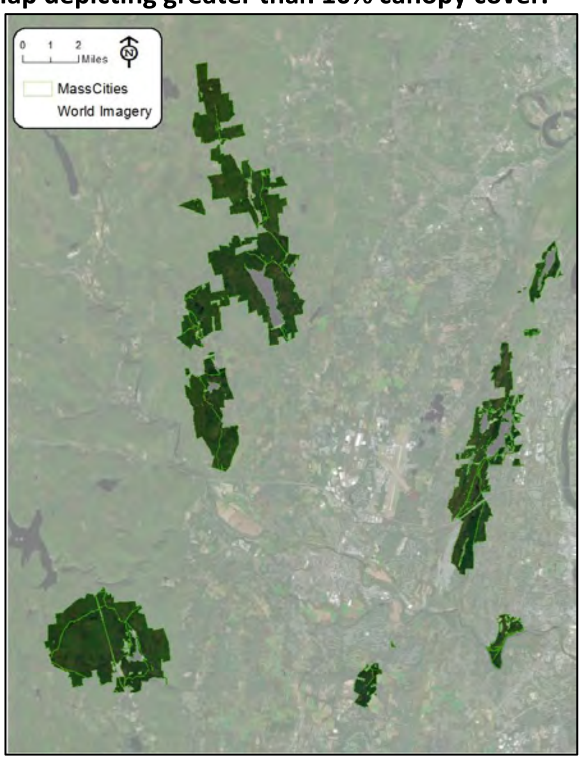


Figure A-4. Topography Map

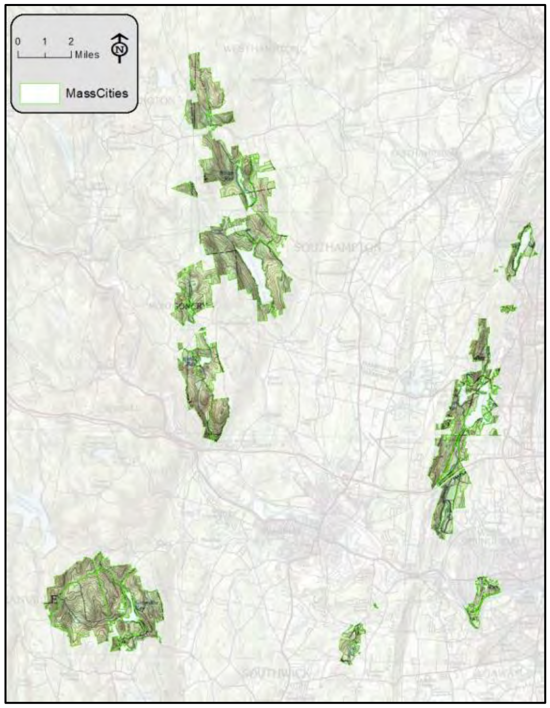


Figure A-5. Roads Map

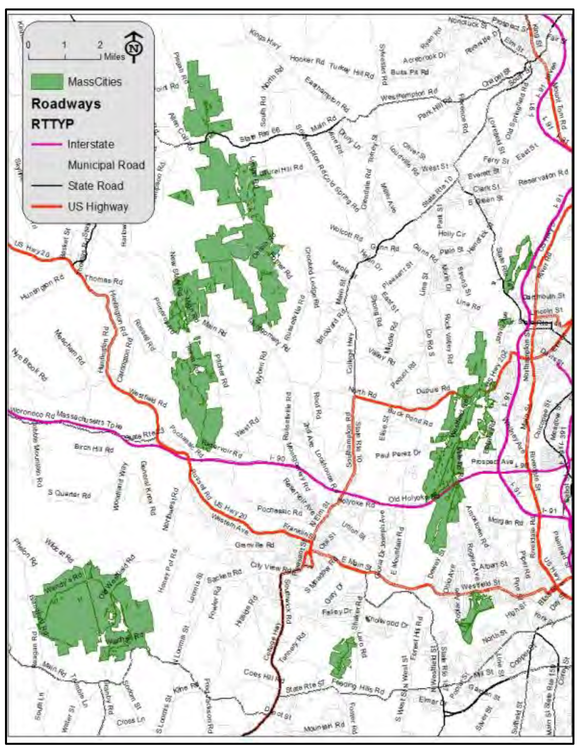
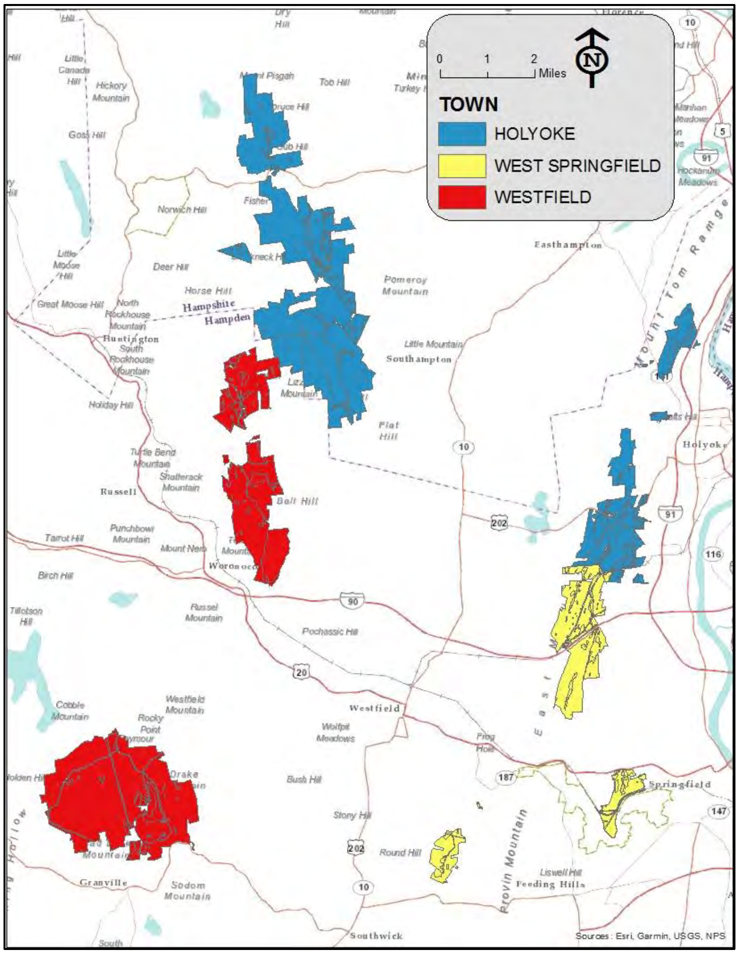


Figure A-6. Ownership Map



A5. BRIEF SUMMARY OF PROJECT

A5.1 Background Information

The Mass-Cities Project area is located on 13,536 acres of oak-hickory hardwoods with some pine-hemlock and spruce-fir stands in Southwestern Massachusetts. The project land use type is forested parcels owned by the cities of Westfield, Holyoke and West Springfield ("The Cities"). By committing to maintain forest CO2 stocks above the regional baseline, the project will provide significant climate benefits through carbon sequestration.

A5.2 Description of Project Activity

The project activity is improved forest management, with the Mass-Cities IFM Project forest management practices representing a significant improvement in the carbon storage and conservation value than higher return, more aggressive management regimes of industrial private lands in the region, which are characterized by shorter, even-aged rotations. Management decisions of the forest focus on sustainable, natural forest growth and non-commercial maintenance harvests to reduce hazards for recreation users and promote forest health. The project ensures long-term sustainable management of the forests, which could otherwise undergo significant commercial timber harvesting.

A5.3 Project Purpose and Objectives

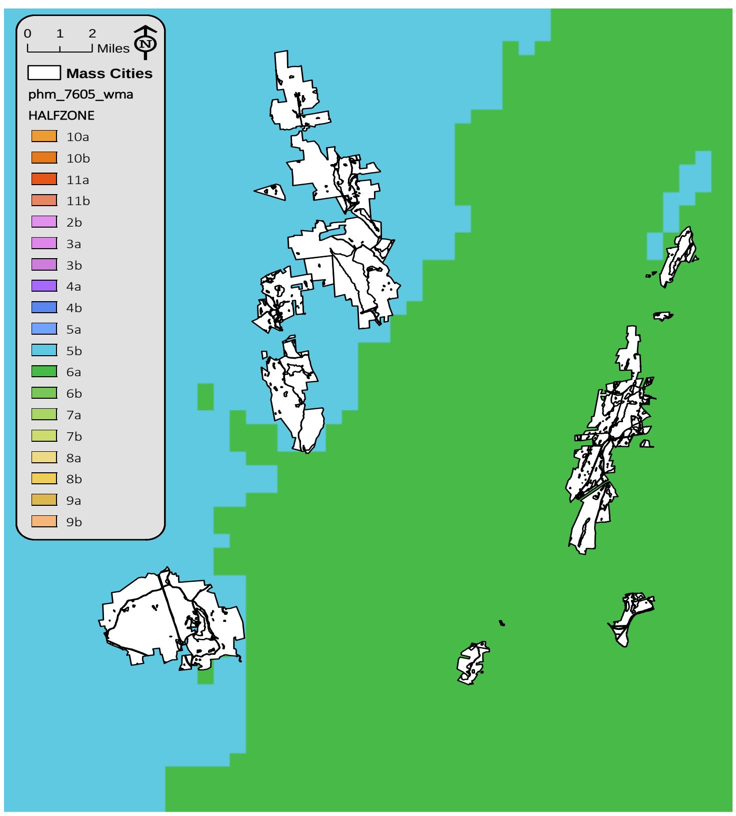
By committing to maintain forest CO2 stocks above the regional baseline level, the project will provide significant climate benefits through carbon sequestration. The aim of this project is also to ensure long-term continuance of all environmental benefits provided by the conservation of this forestland. The aim of this project is also to ensure long-term continuance of all environmental benefits provided by the conservation of this forestland.

A6. PROJECT ACTION

A6.1 Prior Physical Conditions

<u>Climactic Zone</u>

The Mass-Cities Project area falls in zones 5b and 6a on the USDA plant hardiness zone map. Average annual extreme minimum temperatures for 5b are -20 to -10 degrees Fahrenheit, and for 6a are -10 to -5 degrees Fahrenheit.



<u>Ecosystem/Vegetation</u>

Forest types throughout the property include are predominantly oak-hardwood with some pine-hemlock regions and riparian zones. These regions, including some vernal pools, provide habitat for 23 rare species of plants and animals, including reptiles, amphibians, butterflies/moths, and vascular plants. The Mass-Cities Project area is also habitat for several species of squirrel, fox, bear, deer, moose and bobcats.

Land Use

The ownership and transfer of real interest is documented through deeds owing to a recent history of the forestland being used for conservation to protect drinking water supply since it mostly comprises upland forests and associated wetlands. Historic land uses include industrial forestry, conversion to and management for agriculture, and urban/suburban development.

A6.2 Description of Project Technologies, Products, Services, and Expected Level of Activity

Project activity will be low with moderate levels of sustainable, commercial harvesting in West Springfield and Holyoke ownerships. Managers will seek to maintain conditions of recreational trails for usability and safety. Outreach, education, and interpretation are a part of the Mass-Cities Project mission, which are closely tied to the recreation opportunities available to the public and conservation of the associated regions.

A6.3 Project Action

By committing to maintain forest CO2 stocks above the baseline level, the project will provide significant climate benefits through carbon sequestration. The project action will allow the forest to progress naturally with conservative sustainable harvesting practices in Holyoke, and no commercial harvesting in West Springfield and Westfield. The Mass-Cities Project will achieve GHG removals by sequestering more atmospheric CO_2 than a baseline scenario in live aboveground biomass, belowground biomass, dead wood, and soil.

A7. *EX ANTE* OFFSET PROJECTION

Total projected GHG removal is 996,248 mtCO2e (without risk buffer deduction) over the first crediting period of 20 years (including GHG removal from long-term wood products). Table A7.1 lists the estimates of GHG emissions reductions per year:

Table A7.1. Estimate of Net ERTs by Year.

Project Year	Year	Estimated GHG emission reductions (tons CO_2)
0	Start Date	Start Date
1	2017	122,046
2	2018	122,296
3	2019	119,924

4	2020	120,007
5	2021	120,007
6	2022	120,966
7	2023	120,932
8	2024	12,475
9	2025	12,475
10	2026	12,475
11	2027	9,387
12	2028	9,367
13	2029	9,367
14	2030	9,367
15	2031	9,367
16	2032	9,367
17	2033	9,367
18	2034	9,367
19	2035	9,366
20	2036	9,366

A8. PARTIES

The project was jointly implemented by the landowners, the cities of Westfield, Holyoke and West Springfield, under the Bluesource - Massachusetts Tri-City Improved Forest Management Project, and Bluesource, LLC, a carbon offsets project developer. Project verification was completed by SCS Global Services and the forest carbon inventory and technical modeling was performed by the Spatial Informatics Group, LLC.

Table A-3. Project Partners & Responsibilities

Project Parties	Personnel/Point of Contact	Roles and Responsibilities	Contact Information
The Cities	Mark Noonan, Conservation Officer, City of West Springfield	Project Proponent – implementation of long-term project management	26 Central Street West Springfield, MA 01089 Phone: 413-263-3072
Bluesource, LLC	Josh Strauss, Vice President	Offset Developer – coordination of project implementation and modeling	Bluesource LLC 1935 E. Vine Street Murray, UT 84121 Phone: 949-233-1501
SCS Global Services	Christie Pollet-Young, Director, GHG Verification	Verifier	SCS Global Services 2000 Powell Street Emeryville, CA 94608 Phone: 510-452-8000

Spatial Informatics Group, LLC	Charles Kerchner, Director, Forest Carbon Projects	Contractor- Forest Inventory and Modeling	Spatial Informatics Group, LLC 2529 Yolanda Ct. Pleasanton, CA 94566 Phone: 802-999-6986

B. METHODOLOGY

B1. APPROVED METHODOLOGY

The methodology used for the Bluesource – Massachusetts Tri-City Improved Forest Management Project is the American Carbon Registry Improved Forest Management Methodology for Quantifying GHG Removals and Emission Reductions through Increased Forest Carbon Sequestration on Non-Federal U.S. Forestlands, Version 1.3. (April 2018)

(Hereinafter called the "methodology")

B2. METHODOLOGY JUSTIFICATION

All applicability criteria of the selected methodology are fulfilled by the Bluesource – Massachusetts Tri-City Improved Forest Management Project:

1. *This methodology is applicable only on non-federally owned forestland within the United States*

   The cities of Westfield, Holyoke and West Springfield in Hampden county, Massachusetts constitute non-federally owned forestland.

2. *The methodology applies to lands that can be legally harvested by entities owning or controlling timber rights on forestland*

   The cities of Westfield, Holyoke and West Springfield control the timber rights on the forestland and can legally harvest (appendix I2. Land Owner and Contracts).

3. *Private or non-governmental organization ownerships subject to commercial timber harvesting at the project Start Date in the with-project scenario must be certified by FSC, SFI, or ATFS or become certified within one year of the project Start Date. If there are no ongoing harvests at the project Start Date, but harvests occur later in the project life cycle, the project area must become certified before any commercial timber harvesting can occur.*

   Bluesource – Massachusetts Tri-City Improved Forest Management Project is municipally owned.

4. *All Tribal lands in the United States, except those lands that are managed or administered by the Bureau of Indian Affairs are eligible under this methodology, provided that they meet ACR requirements for Tribal lands*

   Not applicable. Bluesource – Massachusetts Tri-City Improved Forest Management Project is not on tribal lands.

5. *Public non-federal ownerships currently subject to commercial timber harvesting in the with-project scenario must:*
   - *be certified by FSC, SFI, or ATFS or become certified within one year of the project Start*
     - *Date; or*

- *have its forest management plan sanctioned by a unit of elected government officials*
        - *within a state, or a state agency, or a federal agency*
    - *Please note that any such forest management plans must be updated at minimum every 10 years*
- *If there are no ongoing harvests on a public non-federal ownership at the project Start Date, but harvests occur later in the project life cycle, the project area must become certified by FSC, SFI, or ATFS, or develop a sanctioned management plan before any commercial timber harvesting can occur*

There is no commercial harvesting in the City of Westfield. The Cities of West Springfield and Holyoke are certified under FSC.

6. *Use of non-native species is prohibited where adequately stocked native stands were converted for forestry or other land uses after 1997*

   There is no use of non-native species where adequately stocked native stands were converted for forestry or other land uses after 1997.

7. *Draining or flooding of wetlands is prohibited*

   There is no draining or flooding of wetlands on or after the project Start Date.

8. *Project proponent must demonstrate its ownership or control of timber rights at the project start date*

   See attached Deeds (appendix I2. Land Owner and Contracts).

9. *The project must demonstrate an increase in on-site stocking levels above the baseline condition by the end of the Crediting Period*

   Stocking levels increase well above the baseline conditions for the duration of the project and by the end of the Crediting Period (see section E1. Baseline).

B3. PROJECT BOUNDARIES

The physical project boundaries include 13,536 acres of forestland, shown in the maps in section A4. Location and in the shapefile 'MassCities_Boundary.shp'. See H2. Project Timeline for the temporal boundaries of the project.

B4. IDENTIFICATION OF GHG SOURCES AND SINKS

Carbon pools	Included / Optional / Excluded	Justification / Explanation of Choice
Above-ground biomass carbon	Included	Major carbon pool subjected to the project activity.
Below-ground biomass carbon	Included	Major carbon pool subjected to the project activity.
Standing dead wood	Included/Optional	Major carbon pool in unmanaged stands subjected to the project activity. Project Proponents may also elect to include the pool in managed stands. Where included, the pool must be estimated in both the baseline and with project cases. *For Bluesource – Massachusetts Tri-City Improved Forest Management Project, standing dead wood will be included in all stands.*
Lying dead wood	Optional	Project proponents may elect to include the pool. Where included, the pool must be estimate in both the baseline and with project cases. *For Bluesource – Massachusetts Tri-City Improved Forest Management Project, lying dead wood will* ***not*** *be included.*
Harvested wood products	Included	Major carbon pool subjected to the project activity,
Litter/Forest Floor	Excluded	Changes in the litter pool are considered *de minimis* as a result of project implementation.
Soil organic carbon	Excluded	Changes in the litter pool are considered *de minimis* as a result of project implementation.

Gas	Source	Included / Excluded	Justification / Explanation of choice
CO_2	Burning of biomass	Excluded	However, carbon stock decreases due to burning are accounted as a carbon stock change.
CH_4	Burning of biomass	Included	Non-CO_2 gas emitted from biomass burning.
N_2O	Burning of biomass	Excluded	Potential emissions are negligible.

Leakage Source		Included / Optional / Excluded	Justification/ Explanation of Choice
Activity-Shifting	Timber Harvesting	Excluded	Project Proponent must demonstrate no activity-shifting leakage beyond the *de minimis* threshold will occur as a result of project implementation
	Crops	Excluded	Forestland eligible for this methodology of not produce agricultural crops that could cause activity shifting

	Livestock	Excluded	Grazing activities, if occurring in the baseline scenario, are assumed to continue at the same levels under the project scenario and thus there are no leakage impacts
Market Effects	Timber	Included	Reductions in project outputs due to project activity may be compensated by other entities in the marketplace. Those emissions must be included in the quantification of project benefits.

B5. BASELINE

The baseline scenario represents an aggressive industrial harvest regime, targeted to maximize net present value at a 4% discount rate (for non-federal public lands), typical of ca. 2017 practices in the project region on private lands. Baseline practices involve clear cuts and high grading throughout the extent of a given property. Derivation and justification for the baseline is detailed in Section E. Quantification.

B6. PROJECT SCENARIO

The project scenario consists of growing the forestland with commercial harvesting maintaining carbon removals above the annual allowable cut as described in Section A5. Project Action.

B7. REDUCTIONS AND ENHANCED REMOVALS

The project will achieve greenhouse gas reductions through natural growth of forestland and improved silvicultural practices such as pre-commercial and commercial thinning, wildlife management cuts, and promotion of early successional forest, on lands that otherwise could be heavily cut in the baseline scenario. The existing carbon stocks will be preserved through maintaining growth above the annual allowable cut over a moving 10-year average as described in Section A5. Project Action.

B8. PERMANENCE

Project Proponents must conduct their risk assessment using the *ACR Tool for Risk Analysis and Buffer Determination*. All Project types must claim a value from risk categories A, B and C. Additional values that must be selected by project type include:

Forestry projects claim one value from each:

- D Conservation Easement (if applicable)
- E Fire
- F Disease/pest
- G Levee failure/water table changes (required only if forested wetlands comprise more than 60% of project area)
- H Other natural disaster risk scores.

1. Management and Governance Risks: All project types must select one value form each risk category that applies:

A	Financial	• 4% Default Value • 3% US Public and Tribal Lands
B	Project Management	• 4% Default Value • 3% US Public and Tribal Lands
C	Social/Policy	• 2% Default Value • 5% if project is located outside of the US • 3% if project is located outside of the US and demonstrates community engagements through ACR-approved mechanism
D	Conservation Easement Deduction	• -2% Default value • -3% if there is regular onsite monitoring of activities related to carbon-specific conservation activities

2. Natural Disaster Risks: Select one value from each risk category that applies:

E	Fire	• 8% if project is located in an area where fire greater than 1000 acres has occurred within 30 mile radius of project area in prior 12 months • 4% if project is located in high fire risk region • 2% if project is located in low fire risk region (verifiable evidence must be provided) • 1% for agriculture and grassland projects only
F	Diseases and Pests	• 8% if epidemic disease or infestation is present within project area, or within 30 mile radius of project area • 4% Default Value
G	Levee Failure and Water Table Changes	• 2% Default for all wetland projects (and for forest projects where more than 60% of the project area is a forested wetland)
H	Other Natural Disaster Events	• 2% Default Value for all sequestration projects

Calculated Risk Score

Section 1 (A + B + C + D) + Section 2 (E + F + G + H) = Total Risk score %

Section 1 (3 + 3 + 2 + 0) + Section 2 (2 + 4 + 0 + 2) = 16%

NOTE: E. Project area is in a majority low fire risk region, especially compared to the lower half of the state. *According to the Wildfire Hazard Potential (WHP) map provided by the USFS.*

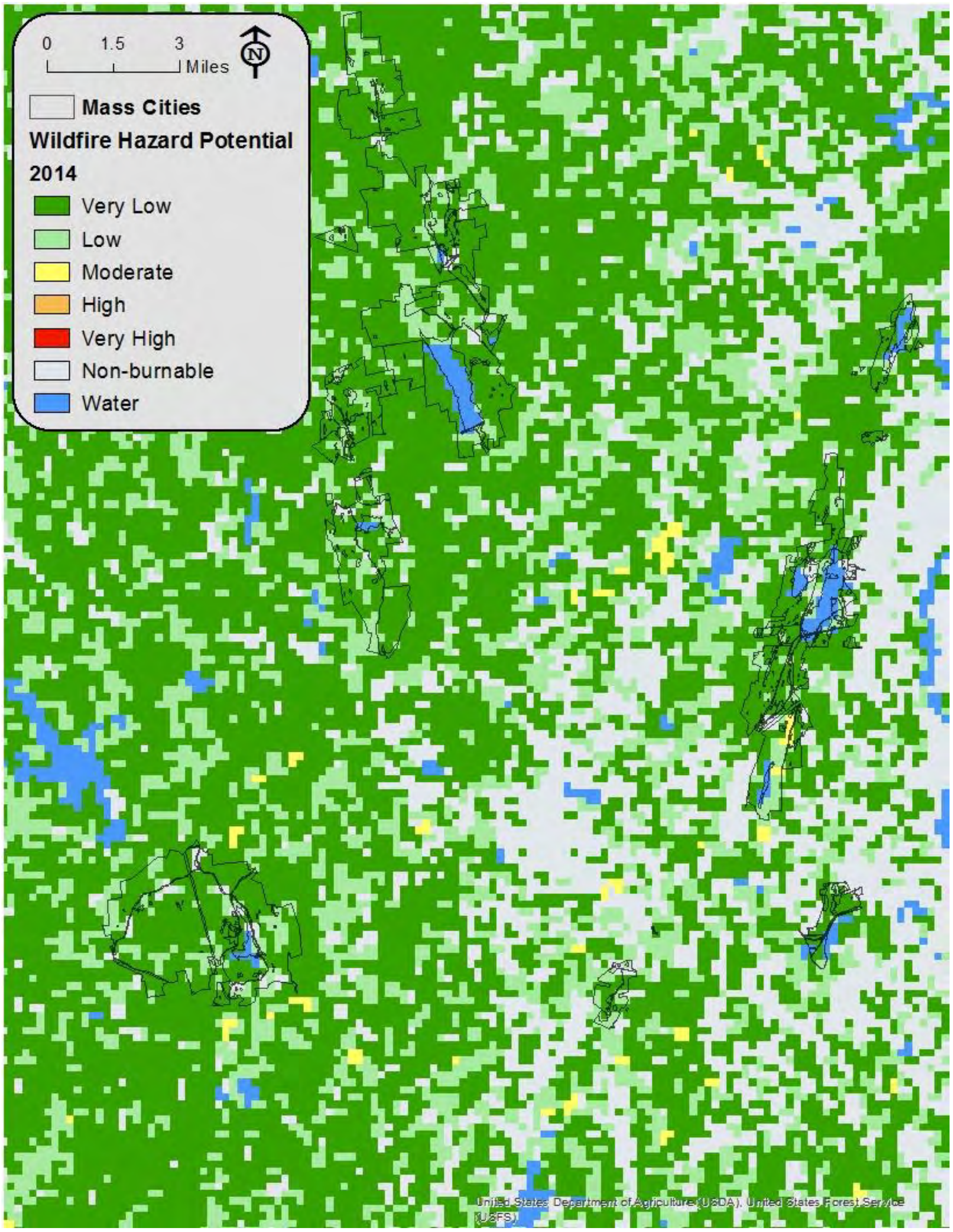


Figure B-1. Bluesource – Massachusetts Tri-City IFM Wildfire Hazard Potential Map.

Buffer Pool Contribution

*(Total Risk score %) * (Total ERTs generated for reporting period)*
= Buffer pool contribution in ERTs at time of issuance.

16% * 122,047 = 19,528 credits of buffer pool contribution (rounded up).

C. ADDITIONALITY

C1. REGULTORY SURPLUS TEST

Relevant laws, regulations, statues, legal rulings, and other regulatory frameworks that affect the project activity:

National laws, regulations and policies.

Clean Water Act
Endangered Species Act
Fair Labor Standards Act (1938) (amended)
Multiple-Use Sustained-Yield Act of 1960
National Environmental Policy Act (NEPA)
National Forest Management Act (NFMA)
Resources Planning Act (RPA)
Wilderness Act
The Logger's Guide to the New OSHA Logging Safety Standards, 1995

State & Local laws.

MGL Ch. 132 Forest Cutting Practices Act
MGL Ch. 131 Wetlands Protection Act, as amended by the Rivers Protection Act 1996

Binding International Agreements.

Paris Agreement, 2016 (unsigned, not applicable)
Kyoto Protocol, 1997 (signed, not ratified)
United Nations Framework Convention on Climate Change, 1992
United Nations Convention on Biological Diversity, 1992 (signed, not ratified)
Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), 1973
UNESCO World Heritage Convention, 1972

None of the above or any other existing law, regulation, statute, legal ruling, or other regulatory framework in effect as of the Start Date in March 2017 effectively requires the forest carbon project activity and its associated GHG emissions reductions/removal enhancements. Consequently, the project passes the Regulatory Surplus test.

C2. COMMON PRACTICE TEST

The Bluesource – Massachusetts Tri-City Improved Forest Management Project is located in Western Massachusetts and shares similar forestry practices to eastern New York, Vermont, and New Hampshire. MA forestry BMPs restrict harvests to 50% of the total basal area in buffer strips and mandate submission of timber cutting plans for areas near wetlands, streams, lakes and ponds. Apart from this, there are no significant regulations on silvicultural practices and harvests for non-riparian zones.

Common harvesting silvicultural practices in this region are clear cuts and diameter limits (high-grading). Diameter-limit cutting over areas up to 1000 acres are common with some clumped seed tree retention with trees over 11” DBH. 20-30 acre clear cuts are common and pervasive, and have also been encouraged by the state as it serves as song bird habitat. Sustainable forest management practices in the region include small group and single tree selections, and shelterwood cutting while mostly retaining the overstory as a perpetual legacy. This region is predominantly an oak-hickory forest system, but regions across the property are northern hardwoods in some higher altitudes of the Holyoke tracts, some plantation lands in the Westfield tracts that were formerly under agricultural land use, and some sections of white pine forests. The regional wood markets expand to Massachusetts, Connecticut, New York, Vermont, New Hampshire, Maine and Quebec province (Canada). Popular species for wood and pulp markets in this region are sugar maple, ash and red oak (specifically from Holyoke) with significant demand from mills in NH and VT. Hardwood pulp markets are strong in this region, while for softwood pulp and roundwood there is significant demand for Hemlock from this region in Connecticut, New Hampshire and Vermont. The regional wood and pulp markets are experiencing ~20% annual growth and the project area is proximate to urban areas If the Blue Source – Massachusetts Tri-City Improved Forest Management Project was not implemented, the forest management could feasibly resemble that of industrial forestland ownership in the region, or undergo development with the expansion of the surrounding urban areas. Instead, the project will exceed the common practice as described in Section A6. Project Action.

C3. IMPLEMENTATION BARRIERS TEST

- ***Financial***
- *Technological*
- *Institutional*

Implementation Barriers	*Choose one of the following three:*
Financial	Does the project face capital constraints that carbon revenues can potentially address; *or* is carbon funding reasonably expected to incentivize the project’s implementation; *or* are carbon revenues a key element to maintaining the project action’s ongoing economic viability after its implementation? **Yes = Pass; No = Fail**
Technological	Does the project face significant technological barriers such as R&D deployment risk, uncorrected market failures, lack of trained personnel and supporting infrastructure for technology implementation, or lack of knowledge on practice/activity, and are carbon market incentives a key element in overcoming these barriers? **Yes = Pass; No = Fail**
Institutional	Does this project face significant organizational, cultural, or social barriers to implementation, and are carbon market incentives a key element in overcoming these barriers? **Yes = Pass; No = Fail**

If the project passes the Regulatory Surplus and Common Practice tests, and at least one Implementation Barrier test, ACR considers the project additional.

Carbon funding is reasonably expected to incentivize the project's implementation. The implementation of the carbon project represents an opportunity cost to lost revenue associated with the potential timber harvesting that could legally and feasibly occur on the property in the lifetime of the carbon project. A financial feasibility assessment is provided separately for verification demonstrating the financial barrier carbon funding overcomes in project implementation.

C4. PERFORMANCE STANDARD TEST

The Bluesource – Massachusetts Tri-City Improved Forest Management project uses the three-pronged approach; therefore, this step is not required.

D. MONITORING PLAN

D1. MONITORED DATA AND PARAMETERS

Data or Parameter Monitored	A_1
Unit of Measurement	Acres
Description	Area of IFM Project
Data Source	GIS shape file derived from GPS coordinates
Measurement Methodology	Strata area figures adjusted based on stocking levels and species distribution projected in modeling and verified through inventory updates
Monitoring Frequency	Every 5 years, following with inventory update
Value applied:	13,536
Reporting Procedure	Hand held GPS unit, GIS software
QA/QC Procedure	Meta data is kept current and uncorrupted
Purpose of Data	Calculation of project emissions
Calculation method:	Calculated in ArcGIS
Notes	

Data or Parameter Monitored	T
Unit of Measurement	Year
Description	Number of years between monitoring time t and t1 (T = t2 – t1)
Data Source	Monitoring reports
Measurement Methodology	
Monitoring Frequency	Yearly
Value applied:	Calendar
Reporting Procedure	
QA/QC Procedure	All calculations double checked for accuracy prior to submission for verification
Purpose of Data	Calculation of project emissions
Calculation method:	Subtraction
Notes	

Data or Parameter Monitored	Diameter at breast height of tree
Unit of Measurement	Inches (to 1/10th an inch)
Description	Tree diameter measure 4.5 feet above ground
Data Source	Field measurement
Measurement Methodology	Measured with Loggers Tape or calipers
Monitoring Frequency	Every 5 years after the first inventory

Value applied:	
Reporting Procedure	Hand held GPS unit or cruise tally sheet
QA/QC Procedure	Equipment will be maintained in excellent condition. Breast height marked with permanent paint on all record trees > 5 in in diameter
Purpose of Data	Calculations of project emissions
Calculation method:	N/A
Notes	

Data or Parameter Monitored	H
Unit of Measurement	Feet
Description	Height of tree to 4" DOB and Phantom Height for Broken Tops
Data Source	Field measurement
Measurement Methodology	Measured with clinometer or hypsometer
Monitoring Frequency	Every 5 years after the first inventory
Value applied:	
Reporting Procedure	Hand held GPS unit or cruise tally sheet
QA/QC Procedure	Equipment will be maintained in excellent condition. All heights will be double checked for reasonableness prior to submission for verification.
Purpose of Data	Calculations of project emissions
Calculation method:	N/A
Notes	

Data or Parameter Monitored	Decay Class
Unit of Measurement	
Description	Qualitative degree of decomposition
Data Source	Forest Inventory
Measurement Methodology	Qualitative assessment of dead tree into 1 of 4 decay classes based on class descriptions
Data Uncertainty	None
Monitoring Frequency	Every 5 years after the first inventory
Value applied:	
Reporting Procedure	Hand held GPS unit or cruise tally sheet
QA/QC Procedure	Equipment will be maintained in excellent condition. All decay classes will be double checked for reasonableness prior to submission for verification
Purpose of Data	
Calculation method:	
Notes	

Data or Parameter Monitored	Tree Live/Dead Status
Unit of Measurement	
Description	Live or Dead
Data Source	Forest Inventory
Measurement Methodology	Measured per the Massachusetts Tri-City Carbon Plot Methodology
Data Uncertainty	None
Monitoring Frequency	Every 5 years after the first inventory
Value applied:	
Reporting Procedure	Hand held GPS unit or cruise tally sheet
QA/QC Procedure	Equipment will be maintained in excellent condition. All tree statuses will be double checked for reasonableness prior to submission for verification
Purpose of Data	
Calculation method:	
Notes	

Data or Parameter Monitored	Defect
Unit of Measurement	%
Description	Qualitative percent of missing biomass
Data Source	Forest Inventory
Measurement Methodology	Tree defect is qualitatively assessed for missing biomass in the bole from 1ft stump to 4" DOB Height. The exception is for broken tops below 4" DOB when the percent biomass missing is calculated from 1ft stump to broken top. Top height and phantom height are measured and missing biomass in the broken portion is calculated post-inventory.
Data Uncertainty	None
Monitoring Frequency	Every 5 years after the first inventory
Value applied:	Tree-specific
Reporting Procedure	Hand held GPS unit or cruise tally sheet
QA/QC Procedure	Equipment will be maintained in excellent condition. All tree defects will be double checked for reasonableness prior to submission for verification.
Purpose of Data	
Calculation method:	
Notes	

Data or Parameter Monitored	Species Composition
Unit of Measurement	%
Description	Spp. composition as a percentage of basal area

Data Source	Forest Inventory
Measurement Methodology	Derived from basal area calculations from inventory data.
Data Uncertainty	None
Monitoring Frequency	Every 5 years after the first inventory
Value applied:	
Reporting Procedure	
QA/QC Procedure	Species identification is confirmed at verification.
Purpose of Data	Calculation of project emissions
Calculation method:	Basal Area = 0.005454 * DBH^2
Notes	

Data or Parameter Monitored	Harvested Wood Products
Unit of Measurement	Metric tons CO_2
Description	Carbon remaining in stores wood products 40 years after harvest for the project in year t.
Data Source	Harvest reports produced by Wigmore Forest Resource Management.
Measurement Methodology	Wood volumes harvested will be monitored using the whichever recordation system is appropriate for the harvest (lump sum v. pay as cut).
Data Uncertainty	None
Monitoring Frequency	Annual data summed for the monitoring period, applied as average annual for the monitoring period
Value applied:	
Reporting Procedure	
QA/QC Procedure	Harvest volumes cut and delivered to the mill will be either (1) weighed at the mill on scales tested annually by the state of Massachusetts (or neighboring state) and converted to wood volume in an appropriate software, or (2) directly scaled to volume by log scalers certified by the state of Massachusetts (or neighboring state).
Purpose of Data	
Calculation method:	
Notes	

Data or Parameter Monitored	Forest Carbon
Unit of Measurement	Metric tons of CO_2
Description	Carbon stores in above and below ground live trees at the beginning of the year t
Data Source	Forest Inventory
Measurement Methodology	Consistent with 'SIG_Tri-City_Forest_Inventory_Manual_v20170503.pdf'

Data Uncertainty	To be calculated as the mean +/- 90% confidence interval
Monitoring Frequency	Every 5 years or less, or at request for ERT issuance
Value applied:	
Reporting Procedure	
QA/QC Procedure	'SIG_Tri-City_Forest_Inventory_Manual_v20170503.pdf' - The inventory will use a random sample design and re-measure the same permanent plots established in 2017, which targeted a precision level of +/- 10% of the mean live tree biomass with 90% confidence.
Purpose of Data	
Calculation method:	
Notes	

D2. MONITORING PLAN

Each year, the Project Proponent shall submit a signed attestation that:

- Confirms the continuance of project activities;
- Confirms that ownership remains clear and uncontested;
- Discloses any negative environmental or community impacts or claims of negative environmental and community impacts, and documents plans to mitigate any reported negative environmental or community impacts;
- Addresses any significant change in external conditions that would affect the quality or environmental integrity of the project.

The following material outlines the monitoring plan to be followed during the decade following the initial project validation and verification.

General Monitoring Method

In the year prior to validation/initial-verification, a representative sample of 67 fixed radius permanent inventory plots were established across the project area. The plot network provided was not enough to keep total project uncertainty below 10% of the net anthropogenic greenhouse gas removals by sinks across the project, thereby uncertainty deductions were required in the quantification process below. All permanent plots will be re-inventoried at least twice over the following decade to calibrate forest growth models and improve carbon sequestration projections.

The heavily monumented and well-maintained plot design gives forest managers the opportunity to consistently track the growth and development of specific trees over an extended timeline and allows for improved ease of plot location during field work and site verifications. All plots will be re-measured in a manner consistent with the Inventory Methodology, provided separately for verification.[3]

In addition to the full inventory update of the entire property that will be conducted on all plots every 5 years, inventories of select portions of the Project Area will be updated periodically in response to natural disturbance or significant forest management activities. Following natural disturbance events, affected project stands will be assessed for damage. If damage is significant, the affected areas will be re-inventoried and project scenario models will be adjusted to reflect onsite carbon stocks.

In years in which forest plots are not re-inventoried carbon stocks will be monitored through forest growth and yield modeling.

In addition to inventory sampling, management staff will consistently monitor the general health and condition of the forest, throughout the course of normal forest management activities (e.g. road maintenance, ecological studies and observation of scale and woolly adelgid in the region, boundary marking, etc.), reducing the risk of reversal by disease, pest invasion, and unauthorized timber removal.

SIG will oversee the execution of all project modeling and Blue Source LLC (Bluesource) will oversee the execution of all project reporting and monitoring activities on behalf of the landowner. The landowner will be responsible for “on the ground” forest management activities on the project area, and Spatial Informatics Group, LLC will conduct inventory measurements and data collection. After forest inventory data collection, Spatial Informatics Group, LLC will report results to Bluesource for processing and updating of modeling projections. After processing is complete, Bluesource will house all data and submit the necessary documentation for compliance with ACR standards. Bluesource will ultimately store project data for at least ten years after the conclusion of the project.

Data Processing and Storage

Manually and electronically filed data are stored and archived. Backup copies of all electronically stored data are maintained in a separate data center with scheduled archiving to assure data protection. Future revisions to project documents after initial verification and registration will be clearly identified by saving them as separate files and including the date of revision in any modified documents. All data will be stored on Dropbox or similar online cloud storage service as well as on an external hard drive and kept by Bluesource for a minimum of 15 years.

QA/QC Procedures

Field Procedures

At the end of each field day, individual foresters will email their plots from the data recorders (or paper) to the senior forester. The senior forester will then look for irregularities in the data and ask the field crew to confirm the data or remeasure any plots that cannot be reconciled. The senior forester will then add

3 The details of the carbon inventory methodology are considered commercially sensitive material as the methodology is the result of considerable investment of Blue Source resources.

all the data to a master spread sheet.

10% of the plots will be checked by a different forester than the one who cruised the plot, preferably by someone senior to the field crew. This will involve full plot measurement to identify any problems with determining in/out trees, species calls, defect measurements, DBH measurements, and height measurements. Any errors noted during the check cruise will be used to update the master spread sheet file. Any consistent height, species, DBH, or defect errors will be resolved by talking with the foresters and removing crew members if need be.

Desk Procedures

The following QA/QC approach is designed to ensure that field data, once input, is appropriately managed and maintained, and that subsequent calculations using that data to determine onsite carbon stocks and associated ROC issuance are correctly implemented.

A three-stage QA/QC process with a defined review group for the project will be established, engaging both personnel intimately familiar with all project files and documentation, as well as independent reviewers who are able to bring “fresh eyes” to key outputs.

Independent Forester Review: The project implementation team (Bluesource) has a team of foresters with intimate knowledge of the files, models and documents. The development of quantitative components, such as Access databases, FVS model runs and Excel workbooks, are led by one of these foresters. Prior to finalization, a second forester who did not lead development of that component is tasked with a QA/QC review including random examinations and data checks to identify and fix any errors.

Technical Review: Once quantitative outputs are finalized, exported from Access/FVS to Excel, and are ready to be transferred into the GHG Plan and other project documents, an independent manager reviews these outputs. This individual performs data checks by tracing key outputs back from final ROC calculations though the chain of Excel documents to the underlying Access/FVS database.

Senior Management Review: Once outputs have been transferred from Excel to the GHG Plan and other project documents, a senior manager reviews these documents and checks that all quantitative elements have been correctly exported from the underlying workbook. At this stage, the senior manager (or other individual not involved in document preparation) also reviews text, grammar and formatting for presentation and accuracy.

E. QUANTIFICATION

E1. BASELINE

Detail the GHG quantification methodology for the baseline, including all relevant emissions or removals. Provide sample calculations wherever possible.

INVENTORY DEVELOPMENT OVERVIEW

The carbon inventory of the project area was conducted in June 2017. The inventory employed a sample of 67 nested, fixed-radius circular plots installed in a systematic grid across the project area. The nested plots consist of a 1/24th acre plot recording trees >= 5" and a 1/300th acre plot recording trees >2" and <5". The entire project area (13,536 acres) was assigned to three sampling stratum with regard average height of stands (see Stratification section below for details). Inventory methods, provided separately for verification (SIG_Tri-City_Forest_Inventory_Manual.pdf), include measurement of tree height and diameter and quantification of tree defect. We reviewed Massachusetts state law and best management practices to identify potential restrictions on timber harvest within the project area. Our review identified no areas within the project boundary subject to such harvest constraints.

Table E1.a Project acreage.

Strata	Number of plots	Unconstrained Acres	Constrained Acres
1	67	13,536	0

GROWTH MODEL OVERVIEW

The Western MA Baseline and Project harvest schedules are computationally based and begin March 17th, 2017. For purposes of this analysis, SIG assumed growth over the first few weeks of the growing season would not impact the calculation of ERTs. The growth model estimates the forest inventory every five years. The annual harvest is generated and reported at the midpoint of each decade, starting in 2022. Harvests are assumed to be the same in every year of the decade.

The growth and yield projections were simulated using the US Forest Service Forest Vegetation Simulator (FVS) Northeast (NE) variant. The FVS-NE model was calibrated to the Western MA project area using the FVS location code 919 (Allegheny NF). Both scenarios use total and merchantable carbon estimates from the FVS-Jenkins model.

The ACR requires Improved Forest Management (IFM) projects to establish a baseline harvest scenario against which to measure carbon accumulation attributable to the project. The ACR protocol defines this baseline as the mix of silvicultural practices that maximizes the net present value (NPV) of timber revenues over the 100-yr project lifespan. We used the Forest Vegetation Simulator (FVS), an empirical forest growth and yield model developed by the US Forest Service, to project carbon stocks and timber revenues under the range of harvest scenarios considered in the baseline. We selected the Northeast (NE) variant of the FVS model, which encompasses Western MA, with model equations calibrated to Allegheny National Forest (location code: 919), the US National Forest located nearest to the project. Both scenarios use total and merchantable carbon estimates from the FVS-Jenkins model.

Site tree calculations are detailed in the 'SiteTree' tab of 'OT_WMA_SiteIndexCalcs.xlsx'.

The FVS model requires an individual species code and site index for each forest plot simulated. The site index is a location-specific measure of forest productivity estimated by the US Department of Agriculture (USDA). These estimates are available from the Web Soil Survey (WSS) maintained by the USDA's Natural Resources Conservation Service (NRCS). The site index for each soil sub-class is reported for at least one tree species. Site tree information was also collected during the inventory and converted to a 50-year site index using the US Forest Service Northeastern Research Station Forest Inventory and Analysis site index equations (WMA_SiteIndexCalcs.xlsx).

Table E1.b Site indices.

Plot	Species common name	Species FIA code	Species FVS code	Site Index	Strata
101	Sugar Maple	318	SM	51.4	1
102	White Ash	541	WA	65.2	1
103	Red Maple	317	RM	43.8	1
104	Northern Red Oak	833	RO	51.6	1
105	Yellow Birch	371	YB	59.2	1
106	Sweet Birch	372	SB	53.5	1
107	Sugar Maple	318	SM	62.3	1
108	Pignut Hickory	403	PH	84.0	1
109	Northern Red Oak	833	RO	64.0	1
110	American Basswood	951	BW	63.4	1
111	Sugar Maple	318	SM	79.5	1
112	Eastern White Pine	129	WP	69.9	1
113	Northern Red Oak	833	RO	66.9	1
114	Sugar Maple	318	SM	45.0	1
115	Eastern White Pine	129	WP	75.5	1
116	Eastern White Pine	129	WP	82.9	1
117	Red Maple	317	RM	52.9	1
118	Eastern Hemlock	261	EH	46.3	1
119	Eastern Hemlock	261	EH	55.1	1

Plot	Species common name	Species FIA code	Species FVS code	Site Index	Strata
120	Northern Red Oak	833	RO	77.2	1
121	Eastern White Pine	129	WP	94.4	1
122	Red Maple	317	RM	67.6	1
123	Eastern White Pine	129	WP	71.5	1
124	Eastern Hemlock	261	EH	33.4	1
125	Red Maple	317	RM	57.4	1
126	Sugar Maple	318	SM	60.9	1
127	White Oak	802	WO	45.9	1
128	Black Oak	837	BO	65.4	1
129	Northern Red Oak	833	RO	60.0	1
130	Northern Red Oak	833	RO	61.8	1
131	Northern Red Oak	833	RO	57.3	1
132	Northern Red Oak	833	RO	64.3	1
135	Red Spruce	97	RS	57.6	1
136	Northern Red Oak	833	RO	64.4	1
137	Sugar Maple	318	SM	74.5	1
138	Yellow Birch	371	YB	56.0	1
139	Eastern Hemlock	261	EH	35.4	1
140	Northern Red Oak	833	RO	58.8	1
141	Eastern White Pine	129	WP	100.1	1
142	Sweet Birch	372	SB	69.0	1
143	Northern Red Oak	833	RO	78.3	1
144	Black Oak	837	BO	63.9	1
145	Scotch Pine	130	SC	78.6	1
146	Eastern White Pine	129	WP	83.3	1
147	Pignut Hickory	403	PH	82.3	1
148	Northern Red Oak	833	RO	58.8	1
149	Sweet Birch	372	SB	65.9	1
150	Northern Red Oak	833	RO	55.2	1
151	Sugar Maple	318	SM	64.2	1

Plot	Species common name	Species FIA code	Species FVS code	Site Index	Strata
152	Northern Red Oak	833	RO	70.4	1
153	Chestnut Oak	832	CO	63.8	1
154	Red Maple	317	RM	48.3	1
155	American Beech	531	AB	62.9	1
156	Chestnut Oak	832	CO	52.7	1
157	White Oak	802	WO	60.6	1
159	Northern Red Oak	833	RO	60.5	1
160	Northern Red Oak	833	RO	68.2	1
161	Northern Red Oak	833	RO	78.1	1
162	Northern Red Oak	833	RO	71.7	1
163	Eastern White Pine	129	WP	80.1	1
164	Red Maple	317	RM	53.2	1
165	Northern Red Oak	833	RO	66.6	1
166	Red Maple	317	RM	70.9	1
167	Sweet Birch	372	SB	73.1	1
168	Black Oak	837	BO	98.1	1
169	Yellow Birch	371	YB	54.4	1
170	Eastern White Pine	129	WP	77.2	1

BASELINE STRATIFICATION

Due to the fact that the project area was not homogenous, stratification was used to improve the precision of the carbon stock estimates. A combination of LiDAR and high resolution imagery was used to estimate the height of every tree across the project area. Next, the model used a clumping algorithm to identify stands of similar heights. For every stand, the following attributes were calculated:

- CAI_Tree: Clark Aggregation Index of the tree canopy.
- TreeH_Avg: Average height of tree canopy from the LiDAR nDSM.
- TreeH_Q95: 95th quartile of the height of tree canopy from the LiDAR nDSM.
- Num_Trees: Number of trees in the stand.
- Num_Trees10: Number of trees in the stand that are shorter than 10 meters. Based on the 95th quartile of the height of the tree from the LiDAR nDSM.
- Num_Trees15: Number of trees in the stand greater than 10 meters and less than 15 meters. Based on the 95th quartile of the height of the tree from the LiDAR nDSM.
- Num_Trees20: Number of trees in the stand greater than 15 meters and less than 20 meters. Based on the 95th quartile of the height of the tree from the LiDAR nDSM.

- Num_Trees25: Number of trees in the stand greater than 20 meters and less than 25 meters. Based on the 95th quartile of the height of the tree from the LiDAR nDSM.
- Num_Trees30: Number of trees in the stand greater than 25 meters and less than 30 meters. Based on the 95th quartile of the height of the tree from the LiDAR nDSM.
- RA_Grnd: Relative area of ground in the stand.
- RA_Tree: Relative are of tree canopy in the stand.

This information was used to classify the stands into either Low, Medium, or High average heights, based on the highest number of trees in each height class (see the associated stratification shapefile). Stands with the highest proportion of trees 30 meters or taller were classified as High, stands with the highest proportion of trees 25 meter was classified as Medium, and stands with the highest proportion of trees 20 meters or lower classified as Low.

BASELINE HARVEST SCHEDULE SCENARIO OVERVIEW

The Baseline Scenario represents an industrial harvest regime designed to maximize the 100-year Net Present Value (NPV) at a 4% discount rate, subject to operational considerations in the region. The acres to cut of each prescription by plot was determined using a linear programming model (see WMA-LP-Baseline.xlsb).

This scenario includes prescriptions that have:

1) One or two commercial thinning followed by a clearcut
2) Clearcuts without any thinning
3) Selection harvest only in stream buffers

PROJECT HARVEST SCHEDULE SCENARIO OVERVIEW

The Project Scenario is a heavily constrained conservation management regime designed to maximize carbon sequestration and other co-benefits (e.g., water quality protection and wildlife habitat). The LP objective function maximizes the NPV of timber revenues plus carbon revenues at 4%.

This scenario includes prescriptions that have:

1) One or two commercial thinnings followed by a shelterwood harvest and overstory removal
2) Shelterwood and overstory removal without any thinning
3) Perpetual selection harvests
4) No harvest on non-stream buffer areas
5) No harvest in stream buffers

CARBON CALCULATION OVERVIEW

The harvest schedule reports the two CO_2 pools used in the uncertainty calculations:

1) Live Stocks: includes above and below ground live stocks
2) Dead Stocks: includes only above ground dead stocks

For this analysis, SIG relies on FVS to estimate CO_2 only at the start of each decade. This is because FVS only provides estimates of carbon at the beginning of the period when there is no harvest for that period. The CO_2 reported in this document, at the mid-point of the decade, is the average of the CO_2 at the start of that decade, and the start of the next decade. The CO_2 in harvested wood products for this analysis are from the FVS output "Merch_Carbon_ Removed," found in table "FVS_Hrv_Carbon."

ERT CALCULATION OVERVIEW

The ERTs were computed based on the equations and coefficients provided in the ACR Document Improved Forest Management Methodology for Quantifying GHG Removals and Emission Reductions through Increased Forest Carbon Sequestration on Non-Federal U.S. Forestlands; April 2018.

The mill efficiencies are from the Regional Mill Efficiency Database and are broken down by species group (hardwood vs. softwood) and wood product (pulp vs. sawlog). However, since FVS provides no estimates of carbon by species or wood product, SIG determined species and product estimates from the ACR wood product classes for the project's Assessment Area (the Lower New England - Northern Appalachia Northern Hardwood).

The following table shows the ACR product estimates, and the (highlighted) SIG computed pulp percentages. ACR provided the lumber percentages, and SIG applied the ratio of softwood to hardwood lumber to the pulp percentages to get the percent of softwood pulp vs. hardwood pulp.

Table E1.c Wood Product Category Percentages

Wood Products Generated for Lower New England - Northern Appalachia Northern Hardwood								
Softwood Lumber	Hardwood Lumber	Plywood	OSB	Panels	Misc	Paper	SW Pulp	HW Pulp
25.79%	27.94%	0.53%	0.01%	12.69%	0.55%	32.48%	22.21%	24.06%

Note that both the baseline and project harvest schedules were developed using acres by plot by town and defect by town. Also, the harvest levels were constrained by town in the first two decades. However, all project acres and ERTs were optimized in a single LP optimization model run, using a single uncertainty statistic developed from all 67 plots.

Regarding harvest since the project start date, Holyoke has had some harvest, while West Springfield and Westfield have not harvested any acres. The LP model assumes equal harvest in every year of the decade. Thus, to model actual harvest (or lack thereof), the ERT CO2 schedule is adjusted by moving harvest out of the first two years and spreading it equally across the next three years. HWPs are also moved forward.

The adjustment process required determining the CO2 stocks five years after the start of the project, without modeling any harvest. The annual increase in CO2 stocks was added to the starting CO2 values in the ERT schedule.

Table E1.d Calculation of Total CO2 Stocks

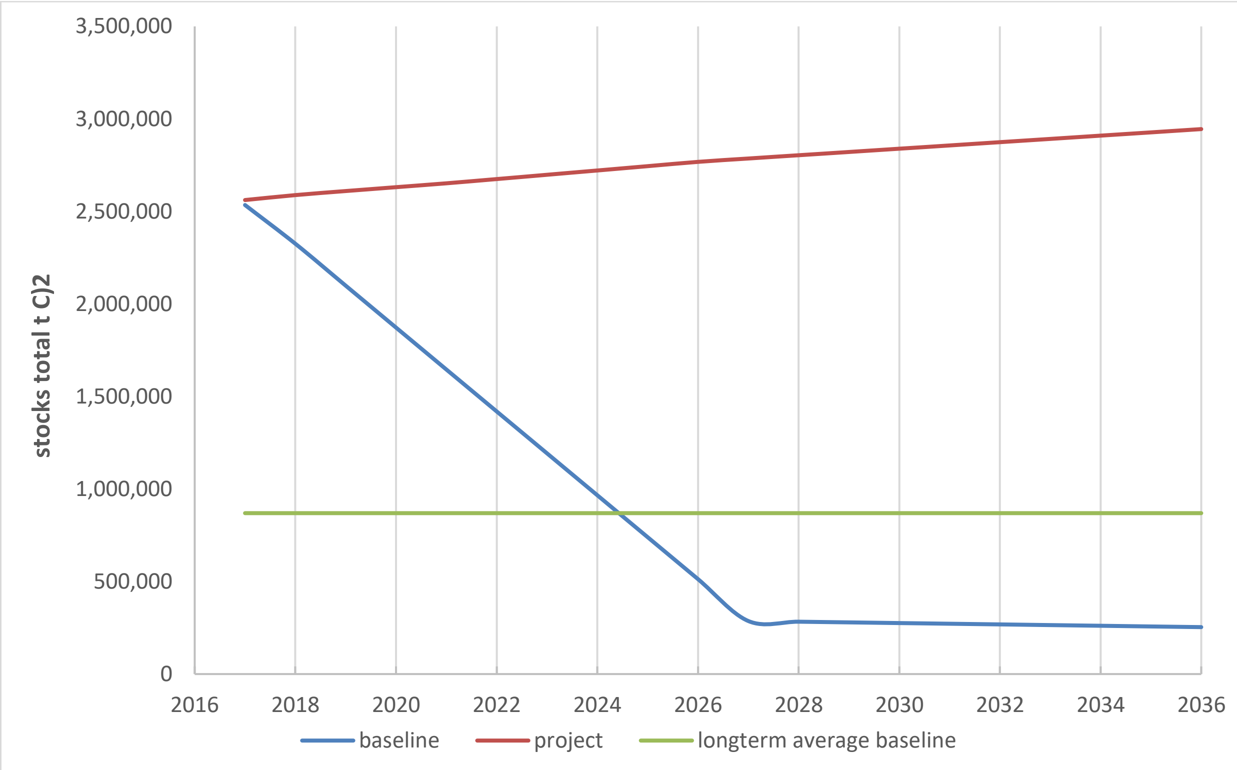
Strata	Total CO2/Acre	StDev	Plots	Std Error	Acres	Total CO2
Low	13	116.2	116.2	17.3	2,870	21%
Medium	37	185.2	185.2	15.9	8,264	61%
High	17	236.8	236.8	35.9	2,402	18%
Total	67	179.7			13,536	100%

Table E1.e Baseline CO2e stocks.

Year	Live trees (tons CO_2e per acre)	Standing dead (tons CO_2e per acre)	Harvested wood products (tons CO_2e per acre)
Start Date	179.7	4.9	-
2017	163.1	5.0	1.3
2018	146.5	5.2	1.3
2019	129.8	5.3	1.3
2020	113.2	5.5	1.3
2021	96.6	5.6	1.3
2022	80.0	5.8	1.3
2023	63.3	5.9	1.3
2024	46.7	6.1	1.3
2025	30.1	6.3	1.3
2026	13.5	6.4	1.3
2027	13.6	6.0	1.3
2028	13.7	5.6	1.3
2029	13.8	5.2	1.3
2030	13.9	4.8	1.3
2031	14.1	4.4	1.3
2032	14.2	4.0	1.3
2033	14.3	3.6	1.3
2034	14.4	3.2	1.3
2035	14.6	2.7	1.3
2036	14.7	2.3	1.3

The 20 year long-term average baseline value was 63.5 T CO2/acre or 858,981 total tonnes CO2.

Figure E1.a Total standing (Live + Dead) CO_2e under baseline and project scenarios.



E2. PROJECT SCENARIO

Detail the GHG quantification methodology for the project scenario, including all relevant emissions or removals. Provide sample calculations wherever possible.

Project scenario

The actual project scenario is measured through future inventories over the course of the project lifetime. However, we produce an ex-ante projection of the project scenario assuming the landowner will conduct the harvest types described in the Project Harvest Schedule Scenario Overview section. These calculations are detailed in the "ERTs" tab in ERTs-WMA-Final-AdjHrvLvls.xlsx. This ex-ante projection applies in years beyond 2018, as the landowner harvested no timber in the first reporting period.

E3. LEAKAGE

Describe how leakage is accounted for and quantified. Provide sample calculations wherever possible.

All active harvest forestlands owned by Massachusetts Tri-City have been certified by the Forest Stewardship Council (FSC). This demonstrates that there will be no leakage beyond de minimus levels through activity-shifting leakage to other lands, as defined in section D6 of the Methodology.

Therefore, leakage is limited to market leakage. We conservatively assume market leakage of 40%.

Table E3.a Baseline leakage factors.

Period	Baseline wood products summed over 20-yr crediting period (tons CO_2)	Project wood products summed over 20-yr crediting period (tons CO_2)	Project decrease in wood products relative to baseline (%)	Applicable leakage factor (%)
2017-2037	340,725	22,834	-93%	40%

E4. UNCERTAINTY

Describe how ex-post uncertainty is accounted for and quantified. Provide sample calculations wherever possible.

We computed uncertainty in project and baseline CO_2e according to equations 10 and 18 of the ACR protocol. Error terms for live and dead CO_2e are calculated using the inventory data in the "Stats" tab of OT_PlotStats.xlsx. As required by ACR equations 10 and 18, these error terms (e_{TREE} and e_{DEAD}), estimated from the most recent inventory data, are used for computing total CO_2e uncertainty in both the project and baseline scenarios. The ACR protocol also specifies that the error term for live CO_2e (e_{TREE}) be used as the uncertainty estimate for CO_2e stored in wood products. As Massachusetts Tri-City does not burn logging slash, expected greenhouse gas emissions (GHG) under both the project and baseline scenarios are zero. Total uncertainty in combined baseline CO_2e stocks (ACR equation 10) is 10.9%. Median uncertainty in combined project CO_2e stocks (ACR equation 18) over the 20-year is 10.9%. Median total uncertainty encompassing both the baseline and project scenarios (ACR equation 19) over the 20-year is 10.9%. These calculations are all found in the "Stats" tab of ERTs-WMA-WST-AdjHrvLvls.xlsx.

Table E4.a Uncertainty in start date CO_2e stocks.

Live Stats

Strata	No. of Plots	Avg mtCO2e/acre	Std. Dev.	Std. Error	Acres	%	Total mtCO2e
Low	13	116.2	116.2	17.3	2,870	21%	333,375
Medium	37	185.2	185.2	15.9	8,264	61%	1,530,464
High	17	236.8	236.8	35.9	2,402	18%	568,803
Total	**67**	**179.7**			**13,536**	**100%**	**2,432,642**

Dead Stats

Strata	No. of Plots	Avg mtCO2e/acre	Std. Dev.	Std. Error	Acres	%	Total mtCO2e
Low	13	0.3	0.3	0.2	2,870	21%	876
Medium	37	6.5	6.5	2.2	8,264	61%	53,902
High	17	4.6	4.6	2.4	2,402	18%	11,013
Total	**67**	**4.9**			**13,536**	**100%**	**65,791**

Uncertainty expressed as 90% CI

Live ($e_{TREE,t=1}$)	11.14%
Dead ($e_{DEAD,t=1}$)	47.08%

E5. REDUCTIONS AND REMOVAL ENHANCEMENTS

Show how net reductions and removals enhancements are quantified, taking into account leakage and uncertainty. Provide sample calculations wherever possible.

Table E1.n shows estimated net reductions and removal enhancements attributable to the Massachusetts Tri-City project over the first 20-year crediting period (2017 - 2037). As the annual project-level uncertainty remains below the 10% threshold required by the ACR protocol, no uncertainty deduction was applied to the annual Emission Reduction Tons (ERTs) generated by the project. ERTs presented in Table E1.n incorporate the assumed 40% market leakage. ERTs are dated beginning on March 17, 2017, the project start date. Therefore, annual values in Table E5.a correspond to the 1-year interval ending on March 16th of each year. For example, ERTs in 2018 include GHG reductions and removals occurring between March 17, 2017 and March 16th, 2018.

Table E5.a Estimate of net Emission Reduction Tons (ERTs) by year (includes buffer tonnes).

Project year	Year	Estimated GHG emission reductions (tons CO_2)
0	Start Date	
1	2017	122,046
2	2018	122,296
3	2019	119,924
4	2020	120,007
5	2021	120,007
6	2022	120,966
7	2023	120,932
8	2024	12,475
9	2025	12,475
10	2026	12,475
11	2027	9,387
12	2028	9,367
13	2029	9,367

Project year	Year	Estimated GHG emission reductions (tons CO_2)
14	2030	9,367
15	2031	9,367
16	2032	9,367
17	2033	9,367
18	2034	9,367
19	2035	9,366
20	2036	9,366

E6. EX-ANTE ESTIMATION METHODS

Describe the methods that are to be used to create the ex-ante projection of net GHG emission reductions and removals.

Table E6.a shows projected CO_2e stocks under the project scenario described in Section E2.

Table E6.a Project CO_2e stocks.

Year	Live trees (tons CO_2e per acre)	Standing dead (tons CO_2e per acre)	Harvested wood products (tons CO_2e per acre)
Start Date	179.7	4.9	-
2017	181.2	5.4	0.0
2018	182.6	5.9	0.0
2019	183.6	6.4	0.1
2020	184.7	6.9	0.1
2021	185.7	7.3	0.1
2022	186.9	7.8	0.1
2023	188.1	8.3	0.1
2024	189.3	8.8	0.1
2025	190.5	9.3	0.1
2026	191.7	9.8	0.1

Year	Live trees (tons CO_2e per acre)	Standing dead (tons CO_2e per acre)	Harvested wood products (tons CO_2e per acre)
2027	193.0	9.8	0.1
2028	194.2	9.7	0.1
2029	195.5	9.7	0.1
2030	196.8	9.6	0.1
2031	198.1	9.6	0.1
2032	199.4	9.5	0.1
2033	200.7	9.5	0.1
2034	201.9	9.4	0.1
2035	203.2	9.4	0.1
2036	204.5	9.3	0.1

F. COMMUNITY & ENVIRONMENTAL IMPACTS

F1. NET POSITIVE IMPACTS

Community and Environmental Assessment

1. *An overview of the Project Activity and geographic location.*

   See section A5. Brief Summary of Project and A4. Location.

2. *Applicable laws, regulations, rules, and procedures and the associated oversight institutions.*

   See section C1. Regulatory Surplus Test

3. *A description of the process to identify community(ies) and other stakeholders affected by the project and, as applicable, the community consultation and communications plan.*

   Bluesource - Massachusetts Tri-City Improved Forest Management Project is a multi-city funded entity governed by the cities of Westfield, Holyoke and West Springfield located in, and guided by the common place laws under the Commonwealth of Massachusetts state. The cities are consulting Wigmore Forest Resource Management for the development of management plans. All the land under the Mass-Cities Project is under the ownership of the three cities and updates regarding the Project development and monitoring will be discussed and communicated by the respective Boards of Directors for the cities of Westfield, Holyoke and West Springfield in their scheduled board meetings. Information regarding the carbon project can be requested through the cities' public information request process.

4. *An assessment of the project's environmental risks and impacts, including factors such as climate change mitigation and adaptation, biodiversity, air quality, water quality, soil quality, and ozone quality, as well as the protection, conservation, or restoration of natural habitats such as forests, grasslands, and wetlands. The assessment shall: 1) identify each risk/impact; 2) categorize the risk/impact as positive, negative, or neutral and substantiate the risk category; 3) describe how any negative impacts will be avoided, reduced, mitigated, or compensated; 4) detail how risks and impacts will be monitored, and how often and by whom; and 5) describe how positive impacts contribute to sustainable development goals (optional).*

Impact	Carbon sequestration
Risk Category	Positive
Monitoring Plan (how, how often, by whom)	Forest management activities described in the Forest Management Plans and monitoring for the carbon project is described in Section D2. Monitoring Plan
If negative, describe aversion, reduction, mitigation, or compensation strategy:	n/a

Impact	Habitat protection for wildlife, plant species, and trees in the forested communities.
Risk Category	Positive
Monitoring Plan (how, how often, by whom)	Forest management activities described in the Forest Management Plans and monitoring for the carbon project is described in Section D2. Monitoring Plan.
If negative, describe aversion, reduction, mitigation, or compensation strategy:	n/a

Impact	Water quality protection
Risk Category	Positive
Monitoring Plan (how, how often, by whom)	Forest management activities described in the Forest Management Plans and monitoring for the carbon project is described in Section D2. Monitoring Plan.
If negative, describe aversion, reduction, mitigation, or compensation strategy:	n/a

Impact	Protection from soil erosion and degradation
Risk Category	Positive
Monitoring Plan (how, how often, by whom)	Forest management activities described in the Forest Management Plans and monitoring for the carbon project is described in Section D2. Monitoring Plan.
If negative, describe aversion, reduction, mitigation, or compensation strategy:	n/a

Impact	Access to recreation opportunities
Risk Category	Positive
Monitoring Plan (how, how often, by whom)	Forest management activities described in the Forest Management Plans and monitoring for

	the carbon project is described in Section D2. Monitoring Plan.
If negative, describe aversion, reduction, mitigation, or compensation strategy:	n/a

Bluesource – Massachusetts Tri-City Improved Forest Management Project has no anticipated negative community or environmental impacts. Annual attestations confirming this assessment will be provided separately for verification purposes.

5. *For community-based projects, an assessment of the project's community risks and impacts, including factors such as land and natural resource tenure, land use and access arrangements, natural resource access (e.g., water, fuelwood), food security, land conflicts, economic development and jobs, cultural heritage, and relocation.*

   Bluesource – Massachusetts Tri-City Improved Forest Management Project is not a community-based project.

F2. STAKEHOLDER COMMENTS

Describe relevant outcomes from stakeholder consultations and mechanisms for ongoing communication, as applicable.

No formal stakeholder consultation was conducted in advance of the project, but the project itself represents a collaboration between internal departments within each city and between the cities themselves. If Project Proponent is contacted by any persons regarding the project, Project Proponent will provide references to the publicly available documentation for the project.

G. OWNERSHIP AND TITLE

G1. PROOF OF TITLE

G1.1 Ownership of forestlands

Forestlands included in the project are owned directly by the project proponent, The Cities, which hold full legal titles and thus have long term control of the land. Titles and contracts are available for review by verifier in the "MassCities_Project_Supporting_Documents.zip".

G1.2 Emission reduction rights

Emissions reductions rights are owned by the Project Proponent.

G2. CHAIN OF CUSTODY

No sales or purchasing of offsets was conducted prior to project registration.

G3. PRIOR APPLICATION

The Bluesource – Massachusetts Tri-City Improved Forest Management Project has not previously applied or been registered under any GHG emission trading system or program.

H. PROJECT TIMELINE

H1. START DATE

The project “Bluesource – Massachusetts Tri-City Improved Forest Management Project” has a project start date of March 17, 2017, the date of the contractual signing agreement between the Project Proponent and the Offset Developer. This start date is appropriate and consistent with the ACR Standard v5.1.

H2. PROJECT TIMELINE

Below is a schedule of the project activities in chronological order for important aspects of the Bluesource – Massachusetts Tri-City Improved Forest Management Project.

Project Activity	Date	Source/Notes
Project Start Date (Initiation of project activities)	March 17, 2017	CDMA contract signing
Frequency of monitoring, reporting and verification		Every 5 years after the first verification
Length of First Crediting period	Through March 16, 2037	20 years
Expected project longevity	Minimum Project Term of at least 40 Years	40 years