Wetland Implementation and Rice Cultivation in the Sacramento-San Joaquin Delta, San Francisco Estuary and the Coast of California – Methodology for Quantifying Greenhouse Gas Emissions Reductions, Version 1.0 – BASELINE MODULES

Preface

The objective of this methodology is to describe quantification procedures for the reduction of greenhouse gas (GHG) emissions through conversion of land to wetlands and rice cultivation in the Sacramento-San Joaquin Delta, San Francisco Estuary and in in coastal areas of California. The methodology has been written in a module format; Project Proponents can choose the applicable modules for their specific project and site. The Framework Module provides background and an over-arching description of the methodology requirements and modules. The remaining modules provide guidance for baseline and project scenario quantification, methods, modeling, calculation of uncertainty, and other quantification tools. Project Proponents should refer first to the Framework Module for applicability requirements and an outline of the specific modules necessary for their project type.

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(BL-Ag) Wetland Restoration and Rice Methodological Module - Estimation of agricultural baseline greenhouse gas emissions and carbon stock changes

I. SCOPE, BACKGROUND, APPLICABILITY AND PARAMETERS

Scope

This module provides guidance for estimating carbon stock changes and GHG emissions for agricultural lands in the Sacramento-San Joaquin Delta in the baseline case where the project activity will be managed wetland construction or rice cultivation. The module provides specific guidance for identifying the baseline scenario, defining the project GHG boundary, stratification and estimating carbon stock changes and GHG emissions.

Applicability

The module is applicable for estimating baseline GHG emissions and carbon-stock changes for project areas planned for wetland construction and/or rice cultivation. Project activities will occur due to some combination of hydrologic management changes and infrastructural modification with assisted natural regeneration, and seeding. Infrastructural modification includes drainage modification and earth moving. Project activities shall meet the applicability conditions in the methodology framework listed under wetland construction and rice cultivation. The following conditions must be met to apply this module.

- The project area must be on agricultural lands where crops are grown and/or animals are grazed in the Sacramento-San Joaquin Delta. Agricultural land that is temporally fallow for a maximum of 2 years is also included.
- The project area must have been used as agricultural land at least 6 out of the 10 years prior to the project start date, with no more than two consecutive fallow years.

Parameters

This module provides procedures to determine the following parameter:

Parameter	SI Units	Description
$\Delta C_{BSL\ Ag\ W/RC}$	Metric tons CO_2-e (t CO_2-e)	Cumulative total of carbon stock changes and greenhouse gas emissions for the baseline agricultural scenario when the project activity will include managed wetlands or rice
Comment	The notation for this parameter in the Framework Module is expressed in its generic form as ΔC_{BSL} in Equation 1	

II. PROCEDURE

Step 1. Identification of the Baseline Scenario and Performance Standard Evaluation

Project Proponents must identify the most plausible and credible baseline scenario describing what would have occurred in absence of the Project Activities. Under this module, the baseline scenario must

be limited to agricultural land uses. The geographical coordinates of the boundaries of each project area must be unambiguously defined and provided to the Validation/Verification Body (VVB) in shapefile format.

Evaluation Against Established Performance Standard

Emission reductions and carbon stock changes achieved by a rice cultivation or wetland project must exceed those likely to occur in a conservative business-as-usual scenario and are subject to a practice-based performance standard. Practice based performance standard requirements are detailed in the Wetland-Rice Methodology Framework Module (WR-MF).

Step 2. Establishment and Documentation of the GHG Boundary

The project GHG boundary describes the carbon pools and emissions sources that will be included or excluded from GHG accounting, as defined in the WR-MF. It shall be demonstrated that each discrete parcel of land to be included in the project boundary is eligible as an ACR project activity. For the baseline case, the primary carbon pools include the soil organic carbon pool and emissions due to oxidation of soil organic matter and fertilizer use. Further, the project proponent must account for GHG emissions and removals that affect the determination of net baseline GHG emissions.

Table 1. Baseline emissions sources included in the project boundary. Nitrous oxide and methane are considered optional (see Framework Module, WR-MF)

Source	**Gas**
Soil emissions due to fertilizer application	N_2O
Soil emissions due to oxidation of organic soils	N_2O, CO_2, CH_4
Emissions resulting from Fossil Fuel Combustion	CO_2

Step 3. Baseline Stratification

For estimation of baseline net GHG removals or emissions, or estimation of project net GHG benefit, strata shall be defined based on parameters that affect GHG removals or emissions and/or are factors the influence measurement of changes in biomass stocks. These may include but are not limited to factors and practices shown in Table 6. Baseline sampling may be used to delineate strata.

Table 2. Factors and practices that can be used for stratification and their effects on GHG emissions and removals.

Stratification Factor or Practice	Description	Potential GHG Effect
Wetland management practices	Depth of water	Depth of water affects GHG removal and emissions and vegetation
Wetland management practices	Flow through or limited or zero outflow	May affect CH_4 emissions
Wetland vegetation	Variation in species	May affect GHG removals
Wetland vegetation	Planted seedlings, seeded, colonization or natural recruitment	Affects time required for vegetative cover, CH_4 emissions and GHG removal.
Wetland vegetation	Open water areas	Minimal GHG removal, CH_4 emissions
Wetland spatial variability	Location relative water circulation	May affect GHG removals and GHG emissions
Wetland age		May affect GHG removal rates
Soil chemical composition – soil organic matter content	For baseline conditions	Soil organic matter is key determinant of baseline GHG emissions on organic soils
Soil hydrology	Depth to groundwater, oxidation-reduction conditions	Depth to groundwater is an important determinant of baseline GHG emissions on organic soils
Agricultural land use	Crop type	Affects baseline GHG emissions and removals

It will generally be sufficient to stratify according to soil organic matter content, agricultural land use (i.e., field crops, hay and grain crops, pasture, etc.), fertilizer use, soil chemical and physical properties (e.g., redox conditions, temperature) and average depth to groundwater as these are the primary factors that affect GHG emissions for baseline conditions.

Step 4. Baseline Carbon Stock Changes and Emissions

The baseline scenario consists of the most likely projected emissions and removals in the absence of project implementation for the life of the project. The baseline scenario is fixed for the life of the project. The baseline net GHG emissions shall be estimated using the methodology described in this section and the Methods Module (MM-W/R) and/or using biogeochemical models as specified in the Models Module (MODEL-WR/C). For *ex-ante* calculation of baseline net GHG emissions, the Project Proponents shall provide estimates of the site-specific values for the appropriate parameters used in the calculations and/or model estimates. Project Proponents shall retain a conservative approach in making these *ex-ante* estimates.

The cumulative total carbon stock change for the baseline agricultural scenario when the project activity will include managed wetlands or rice;

$$\Delta C_{BSL\ Ag\ W/RC} = \Delta GHG_{BSL\ Ag\ W/RC} + T_p * E_{FFC} \qquad (4)$$

where:

$\Delta GHG_{BSL\ Ag\ W/RC}$ is the cumulative total of GHG emissions due to oxidation of organic soils as shown in the Methods Module (MM-W/R) and determined using eddy covariance, subsidence measurements or biogeochemical models (t CO_2-e);

T_p is the period of time which corresponds to the project reporting period (yr); and

E_{FFC} is the emissions of fossil fuels per time period (t CO_2-e per T_p).

It is assumed that the soil carbon pool is decreasing via oxidation, and emissions and carbon stock changes are accounted for by $\Delta GHG_{BSL\ Ag\ W/RC}$ in the above equation. The decrease in the soil carbon pool is estimated using methods described in the Methods Module (MM-W/R). For calculation of fossil fuel combustion see the module "estimation of emissions from fossil fuel combustion" (E-FFC).

Step 5. Monitoring Requirements for Baseline Renewal

A Crediting Period for all projects using this methodology is 40 years, during which the baseline scenario is fixed. In order to renew the crediting period the Project Proponents must:

- Re-submit the GHG Project Plan in compliance with then-current GHG Program standards and criteria;
- Re-evaluate the project baseline;
- Demonstrate additionality against then-current regulations and performance standards;
- Use GHG program-approved baseline methods, emission factors, tools, models and methodologies in effect at the time of Crediting Period renewal;
- Undergo validation by an approved validation/verification body.

PARAMETERS ORIGINATING IN OTHER MODULES

Data /parameter:	$\Delta GHG_{BSL\ Ag\ W/RC}$
Data unit:	t CO_2-e
Used in Equations:	4
Description:	Cumulative total of GHG emissions due to oxidation of organic soils for the baseline scenario
Module parameter originates in:	M-M-W/RC
Any comment:	Baseline GHG emissions due to organic soil oxidation from the project area shall be estimated from direct measurement of gaseous fluxes using the eddy covariance technique, subsidence measurements, by modeling or equivalent method or determined based on an acceptable proxy, data from peer-reviewed literature or approved parameters or a combination of gaseous flux and subsidence measurements.

Data /parameter:	E_{FFC}
Data unit:	t CO_2-e

Used in Equations:	4
Description:	Annual emission of fossil fuels in the baseline scenario
Module parameter originates in:	E-FFC
Any comment:	Only included if significant

(BL-SW) Wetland Restoration and Rice Methodological Module - Estimation of baseline greenhouse gas emissions and carbon stock changes for seasonal wetlands

I. SCOPE, BACKGROUND, APPLICABILITY AND PARAMETERS

Scope

This module provides guidance for estimating carbon stock changes and GHG emissions for seasonal wetlands in the Sacramento-San Joaquin Delta and San Francisco Estuary in the baseline case where the project activity will be managed wetland construction or rice cultivation. The module provides specific guidance for identifying the baseline scenario, defining the project GHG boundary, stratification and estimating carbon stock changes and GHG emissions.

Applicability

The module is applicable for estimating baseline GHG emissions and carbon stock changes for project areas planned for wetland construction or rice cultivation in the Sacramento-San Joaquin Delta or San Francisco Estuary. These land use changes will occur due to some combination of hydrologic management changes and infrastructural modification with assisted natural regeneration, and seeding. Infrastructural modification includes drainage modification and earth moving. The following conditions must be met to apply this module.

- The project area must be on lands where there are seasonal wetlands in the Sacramento-San Joaquin Delta or San Francisco Estuary.
- This module is always mandatory when the project activity will include hydrologic management and infrastructural modification for wetland construction and restoration and rice cultivation on lands where there are seasonal wetlands and organic soils or highly organic mineral soils.
- Seasonal wetlands include areas in the Delta and San Francisco Estuary that may be used for attracting and breeding waterfowl for hunting such as duck clubs (Table 7).

Table 3. Examples of eligible seasonal wetlands.

Seasonal Wetland Type	Examples	Comments
Managed seasonal wetlands or organic soils	Suisun Marsh seasonal wetlands used for attracting and breeding waterfowl for hunting. There are also seasonal wetlands used for hunting in the Delta.	Most of the land within Suisun Marsh (85%) consists of diked wetlands which are flooded part of the year and are drained from mid-July through mid-September[1].
Unmanaged seasonal wetlands on organic soils in the Delta	Many areas of the central Delta where elevations are less than -2 m have become too wet to farm and are now seasonal wetlands.[2]	These areas likely continue to subside and emit carbon dioxide although there are no measurements.

Parameters

This module provides procedures to determine the following parameter:

Parameter	SI Unit	Description
$\Delta C_{BSL\_SW\ W/RC}$	t CO_2-e	Cumulative total of carbon stock changes and greenhouse gas emissions for the seasonal wetlands baseline scenario.
Comment	The notation for this parameter in the Framework Module is expressed in its generic form as ΔC_{BSL} in Equation 1	

II. PROCEDURE

Step 1. Identification of the Baseline Scenario and Performance Standard Evaluation.

Project Proponents must identify the most plausible and credible baseline scenario that would have occurred in absence of the Project Activities. Therefore, the project developer needs to demonstrate that seasonal wetlands are the most likely scenario. The geographical coordinates of the boundaries of each project area must be unambiguously defined and provided to the Validation/Verification Body (VVB) in shapefile format.

Step 2. Establishment and Documentation of the GHG Boundary

The project GHG boundary describes the carbon pools that will be included or excluded from GHG accounting. It shall be demonstrated that each discrete parcel of land to be included in the boundary is eligible for wetland or rice project activity. For the baseline case, the GHG boundary includes primarily emissions due to oxidation and loss of soil organic carbon. Hydrologic management and infrastructural modification practices in seasonal wetlands may result in GHG emissions that shall be accounted for. These include emissions associated with earth moving and vegetation control if determined to be significant. Exclusion of carbon pools and emission sources is allowed subject to considerations of

[1] Steven Chappell, November 2006, Suisun Marsh Resource Conservation District, personal communication Rubissow Okamoto, Ariel, Wong, Kathleen, 2011, Natural History of San Francisco Bay, University of California Press. Map on p. 189 shows the large area of managed habitat in Suisun Marsh.

[2] Deverel, Steven J., Lucero, Christina, Bachand, Sandra, 2015, Evolution of arability and land use, Sacramento-San Joaquin Delta, California, San Francisco and Estuary Science

conservativeness and significance testing. Pools or sources can be neglected (i.e., counted as zero) if application of the tool T-SIG indicates that the source is insignificant, i.e. the source represents less than 3% of the *ex-ante* calculation of GHG emission reductions/removal enhancements. If monitoring of baseline and project emissions determines that an emission source(s) initially included in the GHG assessment boundary is insignificant using the tool T-SIG, monitoring may cease. The baseline scenario consists of the most likely emissions and removals in the absence of project implementation as shown in Table 8.

Table 4. Baseline emissions sources included in the project boundary. Nitrous oxide and methane are considered optional (see Framework Module).

Source	**Gas**
Soil emissions due to fertilizer application	N_2O
Soil emissions due oxidation of organic soils	N_2O, CO_2, CH_4
Emissions resulting from Fossil Fuel Combustion	CO_2,

Step 3. Baseline Stratification

For estimation of baseline net GHG removals or emissions, or estimation of project net GHG benefit, strata shall be defined based on parameters that affect GHG removals or emissions and/or are factors that influence measurement of changes in biomass stocks. Potential stratification factors for seasonal wetlands as a baseline scenario are listed in Table 9.

Table 5. Factors and practices that can be used for stratification and their effects on GHG emissions and removals.

Stratification Factor or Practice	Description	Potential GHG Effect
Wetland management practices	Depth of water	Depth of water affects GHG removal and emissions and vegetation
Wetland management practices	Flow through or limited or zero outflow	May affect CH_4 emissions
Wetland vegetation	Variation in species	May affect GHG removals
Wetland vegetation	Planted seedlings, seeded, colonize or natural recruitment	Affects time required for vegetative cover, CH_4 emissions and GHG removal.
Wetland vegetation	Open water areas	Minimal GHG removal, GHG emissions
Wetland spatial variability	Location relative water circulation	May affect GHG removals and GHG emissions
Wetland age		May affect GHG removal rates
Soil chemical composition – soil organic matter content	For baseline conditions	Soil organic matter is key determinant of baseline GHG emissions on organic soils
Soil hydrology	Depth to groundwater, oxidation-reduction conditions	Depth to groundwater is an important determinant of baseline GHG emissions on organic soils

For baseline net GHG emissions, it will usually be sufficient to stratify according to soil organic matter content, vegetation, soil chemical and physical properties (e.g., redox conditions, temperature) and surface-water depth as these are the primary factors that affect GHG emissions.

For actual baseline emissions, the stratification for *ex-ante* estimations shall be based on the project monitoring plan. The stratification for *ex post* estimations shall be based on the actual implementation of the project monitoring plan. If natural or anthropogenic impacts (e.g., levee breaks and flooding) or other factors (e.g. altered hydrology or water management) add variability in the vegetation of the project area, then the stratification shall be revised accordingly. The Project Proponents may use remotely sensed data acquired close to the time of project commencement and/or the occurrence of natural or anthropogenic impacts for *ex-ante* and *ex-post* stratification.

Step 4. Baseline Emissions and Carbon Stock Changes

The baseline net GHG emissions shall be estimated using methodology described in this section and the Methods Module (MM – W/R) and/or using biogeochemical models as specified in the Models Module (MODEL-WR/C) and the Framework Module (W/R – FM). For *ex-ante* calculation of baseline net GHG emissions, the Project Proponents shall provide estimates of the site-specific values for the appropriate parameters used in the calculations and/or model estimates. Project Proponents shall retain a conservative approach in making these *ex-ante* estimates.

The cumulative total of carbon stock change for the baseline seasonal wetlands scenario when the project activity will include managed wetlands or rice:

$$\Delta C_{BSL\ SW\ W/RC} = \Delta GHG_{BSL\ SW\ W/RC} + T_p * E_{FFC} \quad (5)$$

where:

$\Delta GHG_{BSL\ SW\ W/RC}$	is the cumulative net emissions due to oxidation of organic soils as shown in Equations 13 and 18 in the Methods Module (MM-W/R) and determined using eddy covariance, subsidence measurements or biogeochemical models (t CO_2-e);
T_p	is the period of time which corresponds to the project reporting period (yr); and
E_{FFC}	is the emissions of fossil fuels per time period (t CO_2-e per T_p).

It is assumed that the soil carbon pool is decreasing via oxidation and emissions are accounted for by $\Delta GHG_{BSL\ SW\ W/RC}$ in the above equation. For calculation of fossil fuel combustion see the module "estimation of emissions from fossil fuel combustion" E-FFC.

Step 5. Monitoring Requirements for Baseline Renewal

A Crediting Period for a project is a predetermined length of time for which the baseline scenario is applicable. This period of time is used for carbon quantification of offsets generated relative to its baseline. In order to renew the Crediting Periods the Project Proponents must:

- Re-submit the GHG Project Plan in compliance with then-current GHG Program standards and criteria
- Re-evaluate the project baseline
- Demonstrate additionality against then-current regulations and performance standard data
- Use GHG program-approved baseline methods, emission factors, tools, and methodologies in effect at the time of Crediting Period renewal
- Undergo validation by an approved validation/verification body

PARAMETERS ORIGINATING IN OTHER MODULES

Data /parameter:	$\Delta GHG_{BSL\ SW\ W/RC}$
Data unit:	t CO_2-e
Used in Equations:	5
Description:	Cumulative net emissions due to oxidation of organic soils for the baseline scenario
Module parameter originates in:	MM-W/RC
Any comment:	The net baseline GHG emissions due to organic soil oxidation from the project area shall be estimated from direct measurement of gaseous fluxes using the eddy covariance technique, subsidence measurements, by modeling or equivalent method or determined based on an acceptable proxy, data from peer-reviewed literature or approved parameters or a combination of gaseous flux and subsidence measurements.
Data /parameter:	E_{FFC}
Data unit:	t CO_2-e
Used in Equations:	5
Description:	Annual emission of fossil fuels in the baseline scenario
Module parameter originates in:	E-FFC
Any comment:	

(BL OW W) Wetland Restoration and Rice Methodological Module - Estimation of baseline greenhouse gas emissions and carbon stock changes for open water

I. SCOPE, BACKGROUND, APPLICABILITY AND PARAMETERS

Scope

This module provides guidance for estimating carbon stock changes and GHG emissions for open water areas in the San Francisco Estuary in the baseline case where the project activity will be tidal wetland restoration. The module provides specific guidance for identifying the baseline scenario, defining the project GHG boundary, stratification and estimating carbon stock changes and GHG emissions.

Applicability

The module is applicable for estimating baseline carbon stock changes and GHG emissions for project areas planned for tidal wetland construction and restoration. This module is always mandatory when the project activity includes hydrologic management and infrastructural modification for tidal wetlands including tidal marshes and eelgrass meadows. These land use changes will occur due to some combination of hydrologic management changes and infrastructural modification with assisted natural regeneration, and seeding. Infrastructural modification includes earth moving, berm and levee construction, drainage modification and application of dredge materials.

The following condition must be met to apply this module.

- Under this module, the baseline scenario must be limited to open water in the San Francisco Estuary and the Sacramento-San Joaquin Delta.

Parameters

This module provides procedures to determine the following parameter:

Parameter	SI Unit	Description
$\Delta C_{BSL\_OW\ W/RC}$	t CO_2-e	Cumulative total of carbon stock changes and greenhouse gas emissions for the open water baseline scenario.
Comment	The notation for this parameter in the Framework Module is expressed in its generic form as ΔC_{BSL} in Equation 1	

II. PROCEDURE

Step 1. Identification of the Baseline Scenario and Performance Standard Evaluation

Project Proponents must identify the most plausible and credible baseline scenario describing what would have occurred in absence of the Project Activities. Under this module, the baseline scenario must be limited to open water and tidal wetlands. The geographical coordinates of the boundaries of each project area must be unambiguously defined and provided to the Validation/Verification Body (VVB) in shapefile format.

Step 2. Establishment and Documentation of the GHG Boundary

The project GHG boundary describes the carbon pools that will be included or excluded from GHG accounting as defined in the WR-MF. It shall be demonstrated that each discrete parcel of land to be included in the boundary is eligible for project activity. For the open-water/tidal wetland baseline case, emissions will occur due to fossil fuel combustion during dredging operations, infrastructural modification, earth moving and construction. These emissions must be accounted for if they are determined to be significant. Methane ebullition may also occur. Emissions shall be estimated based on site/project specific data, an acceptable proxy, reference sample plots or field monitoring of similar sites, peer-reviewed literature, approved local parameters and model estimates. Baseline emissions include GHG emissions within the project boundary within the year prior to site preparation, or the most likely emissions in the absence of the project activity (Table 10).

Table 6. Baseline emissions sources included in the project boundary. Nitrous oxide and methane are considered optional (see Framework Module, WR-MF).

Source	**Gas**
Emissions due oxidation of organic matter	N_2O, CO_2, CH_4
Emissions resulting from Fossil Fuel Combustion	CO_2,

Allochthonous carbon may enter the open water area from outside source which may contribute to carbon accumulation at the site. However, for purposes of this methodology, carbon from outside sources is not counted in determination of baseline GHG emissions or removals as per guidance in the Methods Module. Only autochthonous processes are to be considered in the determination of the GHG baseline removals or emissions.

The Project Proponents using emission values from the literature or non-site data must make conservative estimates to determine the baseline GHG emissions. Exclusion of carbon pools and emission sources is allowed subject to considerations of conservativeness and significance testing. This may be accomplished by using peer-reviewed literature, reference sample plots or field monitoring of similar sites, approved local or national parameters, the most recent default emission factors provided by IPCC, government reports and models. Pools or sources may be excluded if exclusion will tend to underestimate net project GHG emission reductions or removal enhancements relative to the baseline. Additional guidance is provided in the Methods Module (MM-W/RC).

Pools or sources can be neglected (i.e., counted as zero) if application of the tool T-SIG (http://unfccc.int/home/items/2783.php) indicates that the source is insignificant, i.e. the source represents less than 3% of the *ex-ante* calculation of GHG emission reductions/removal enhancements. If monitoring of baseline and project emissions indicate that an emission source(s) initially included in the GHG assessment boundary is insignificant using the tool T-SIG, monitoring may cease.

Step 3. Baseline Stratification

For estimation of baseline net GHG emissions, strata shall be defined based on parameters that affect GHG emissions. These may include:

- Elevation and depth of open water
- Water quality (e.g. salinity, nutrient inputs, distance from source, etc.)

For baseline conditions, it will usually be sufficient to stratify according to soil organic matter content, vegetation, soil chemical and physical properties (e.g. redox conditions, temperature) and surface-water depth as these are the primary factors that affect GHG emissions. If natural or anthropogenic impacts (e.g., levee breaks and flooding) or other factors (e.g. altered hydrology or water management) add variability in the vegetation of the project area, then the stratification shall be revised accordingly.

Step 4. Baseline Carbon Stock Changes and Emissions

The baseline scenario consists of the emissions immediately prior to tidal wetland construction. The baseline net GHG emissions may be estimated using methodology described in this section and the Methods Module (MM-W/R). When applying these methods for the *ex-ante* calculation of baseline net GHG removals or emissions, the Project Proponents shall provide estimates of the site-specific values for the appropriate parameters. The Project Proponents shall retain a conservative approach in making these *ex-ante* estimates.

Net baseline emissions and cumulative carbon stock changes are estimated using the following equations.

The net carbon stock changes in the baseline are equal to the soil organic carbon stock minus the baseline greenhouse gas emissions including the combustion of fossil fuels if determined to be significant. Project Proponents may elect to assume carbon stock changes in the baseline are de minimis and proceed to step 5.

Baseline stock changes, $\Delta C_{BSL,}$ must be estimated using the following equations:

$$\Delta C_{BSL\_OW\ W/RC} = (\Delta C_{SOC} - NBE) * T_{pp} \quad (6)$$

$$NBE = GHG_{BSL\_OW\ W/RC} + E_{BSL,FFC} \quad (7)$$

where:

NBE is the net baseline annual greenhouse gas emissions (t CO_2-e yr^{-1});

$GHG_{BSL\_OW\ W/RC}$ is the annual net emissions of N_2O, CO_2, and CH_4 due to the oxidation of organic matter (t CO_2-e yr^{-1});

$E_{BSL\ FFC}$ is the annual net emissions as a result of fossil fuel combustion within the project boundary for the baseline scenario (t CO_2-e yr^{-1});

ΔC_{SOC} is the annual carbon stock change of soils for the baseline scenario (t CO_2-e yr^{-1}); and

T_{pp} is the period of time which corresponds to the pre-project reporting period (yr).

If deemed significant based on *ex-ante* estimates, the baseline GHG emissions due to organic matter oxidation from the project area may be estimated from direct measurement of gaseous fluxes prior to project activity using eddy covariance technique or by modeling or equivalent method or determined based on an acceptable proxy, data from peer-reviewed literature or approved parameters.

Estimation of emissions from fossil fuel combustion shall be estimated as described in the emissions module (E-FFC). The total baseline emission is the sum of the product of NBE and the area of each stratum for all strata in the project area (t CO_2-e yr^{-1}).

Step 5. Monitoring Requirements for Baseline Renewal

A Crediting Period for a project is a predetermined length of time for which the baseline scenario is applicable. This period of time is used for carbon quantification of offsets generated relative to its baseline. In order to renew the Crediting Periods the Project Proponents must:

- Re-submit the GHG Project Plan in compliance with then-current GHG Program standards and criteria
- Re-evaluate the project baseline

- Demonstrate additionality against then-current regulations and performance standard data
- Use GHG program-approved baseline methods, emission factors, tools, and methodologies in effect at the time of Crediting Period renewal
- Undergo validation by an approved validation/verification body

PARAMETERS ORIGINATING IN OTHER MODULES

Data /parameter:	$\Delta GHG_{BSL\_OW\ W/RC}$
Data unit:	t CO_2-e
Used in Equations:	7
Description:	Cumulative total of GHG emissions due to the oxidation of organic matter for the baseline scenario
Module parameter originates in:	MM – WR/C
Any comment:	

Data /parameter:	ΔC_{SOC}
Data unit:	t CO_2-e yr^{-1}
Used in Equations:	6
Description:	Annual carbon stock change of soils for the baseline scenario
Module parameter originates in:	MM – WR/C
Any comment:	

Data /parameter:	$E_{BSL\ FFC}$
Data unit:	t CO_2-e
Used in Equations:	7
Description:	Cumulative total of GHG emissions as a result of fossil fuel combustion for the baseline scenario
Module parameter originates in:	E-FFC
Any comment:	