RESPONSE TO PUBLIC COMMENTS

A modular methodology for *Restoration of Degraded Deltaic Wetlands of the Mississippi Delta* was developed by Dr. Sarah K. Mack of Tierra Resources LLC, with contributions from Dr. Robert R. Lane, Dr. John W. Day, and Tiffany M. Potter, and submitted to ACR for approval through the public consultation and scientific peer review process.

An early draft of the methodology was submitted to ACR on November 10, 2010 and a revised draft on May 25, 2011. ACR conducted its standard internal methodology screening including review by Dr. Sandra Brown of Winrock. The authors submitted a revised methodology in modular format on October 21, 2011.

The methodology was posted for public comment from January 18 – February 15, 2012. Public comments and responses by the authors are given below.

Following public consultation, the methodology will be submitted to three anonymous peer reviewers, experts in the field of fertilizer/nutrient management and GHG offset methodologies. Peer review comments and responses are summarized in a separate document.

General

	Comment	Commenter	Response
0.1	The framework and various modules are an impressive effort, and we are appreciative of the advancements that they create. We note that there are many areas where procedures to define baseline conditions, boundaries, significance of certain pools or emissions, and other issues are very vague and left to professional judgment, however we have no specific comments on those elements and leave this to the peer review process.	Louisiana Coastal Protection and Restoration Authority (CPRA), CH2M HILL, EKO Asset Management Partners, and Equator LLC ("CH2M Hill team")	In some circumstances the modules suggest using multiple sources of data including peer-reviewed literature, archives, maps or satellite images, field surveys, governmental reports, and expert judgment. Many sources of data will require interpretation and extrapolation to apply to a project site or activity (e.g. land loss rates). It is specifically stated in the modules that justification should be supplied for all values derived from expert judgment and that these values be subject to considerations of conservativeness and significance testing.

Framework module WR-MF

	Comment	Commenter	Response
1.1	In the framework, WR-MR, Pages 11-12, it is stated that the "leakage" from fuel use for site preparation, seeding, and water management activities are considered insignificant. First, we understand that per the standards of ACR and other registries, emission from fuel use within the project boundary would be considered a project emission, not leakage. Second, based on experience gained in actual project implementation by CPRA and in working with the US Army Corps of Engineers, fuel used to move sediment to create conditions conducive to wetland regeneration or create hydrologic modifications can in many cases be a significant "penalty" as compared to increase to soil carbon. It is therefore inappropriate to neglect this impact in all cases; use of diesel and other fuels should be	CH2M Hill team	According to the *Applicability Conditions,* this methodology is not applicable if leakage exceeds *de minimis* levels. The authors did not originally design the methodology to include pumped sediments because of the potential significant "penalty" due to fossil fuel combustion. To assist the State's restoration goals the authors did add module E-FFC and revise the methodology to account for fossil fuel combustion that occurs when moving sediments. The potential project activity emission sources from fossil fuel combustion due to water management activities is considered insignificant. Most systems such as river diversions are gravity fed, while other systems such as wetland assimilation systems will require equivalent fossil

	Comment	Commenter	Response
	evaluated on a project by project basis, and the methodology should include procedures to account for these emissions where significant.		fuel combustion to reroute existing pumped discharges.

BL-WR, Estimation of baseline carbon stock changes from wetland restoration

	Comment	Commenter	Response
2.1			

BL-WR-WL, Estimation of baseline carbon stock changes from WR including projected wetland loss for the baseline scenario

	Comment	Commenter	Response
3.1			

BL-WR-HM, Estimation of baseline carbon stock changes from WR where the project activity includes hydrologic management

	Comment	Commenter	Response
4.1			

BL-WR-HM-WL, Estimation of baseline carbon stock changes from WR where the project activity includes hydrologic management as well as projected wetland loss for the baseline scenario

	Comment	Commenter	Response
5.1			

PS-WR, Estimation of project scenario carbon stock changes and greenhouse gas emissions from WR

	Comment	Commenter	Response
6.1			

PS-WR-HM, Estimation of project scenario carbon stock changes and greenhouse gas emissions from WR with hydrologic management

	Comment	Commenter	Response
7.1			

CP-TB, Estimation of carbon stocks in above- and belowground tree biomass

	Comment	Commenter	Response
8.1			

CP-S, Estimation of carbon stocks in the soil organic carbon pool

	Comment	Commenter	Response
9.1			

E-E, Estimation of greenhouse gas emissions

	Comment	Commenter	Response
10.1	This module is designed to estimate greenhouse gas (CO2, CH4 and N2O) emissions from wetlands. Like all work trying to capture these dynamics, this module is faced with an inherent challenge -- greenhouse gas emissions from wetland are notoriously variable in both time and space. An additional challenge for this module is linking these greenhouse gas dynamics – which are measured on	Jason K. Keller, Ph.D. School of Earth and Environmental Sciences	The spatial and temporal components of this comment are addressed in additional comments below. In regard to the propagation of error comment, the hourly number that is multiplied by 8766 to get an annual value is actually the average of tens to hundreds of measurements that reflect natural variability. Thus, the propagation of error associated with this calculation is much lower than if a

	Comment	Commenter	Response
	a time scale of hours – to soil carbon dynamics which are measured over much longer time scales of years to decades, i.e., propagation of error needs to be considered here when multiplying hourly numbers by a factor of 8766 to get an annual number.	Faculty of Biological Sciences Chapman University	single hourly rate value was used.
10.2	There is no consideration of the placement of static chambers in the measurement procedures (i.e., the table on page 5). Specifically, it is likely that chambers place over open soil, while much simpler logistically, will underestimate actually flux by not including flux taking place through plants. Soil-only chambers also fail to capture any effects of plant activity/structure on microbial processes (e.g., release of labile root exudates or oxygenation of the rhizosphere). Chamber work becomes much more complex with large-statured vegetation.	Jason K. Keller, Ph.D.	Chambers should be placed over emergent vegetation (clipped if necessary) as well as above open water for various stratums in the project area, with sufficient replication as to reach a desired confidence level (i.e., 90%). This is made more specific in the revised module.
10.3	Static chambers inherently miss ebullition events (e.g., release of greenhouse gases through bubbling events). These can be incredibly important for ecosystem-scale fluxes of CH4 in particular.	Jason K. Keller, Ph.D.	This comment is misleading, static chambers are a widely accepted method for measuring GHGs, and have been used to measure ebullition events (Bartlett et al. 1990, Devol et al. 1988, and Wilson et al. 1989). We agree that static chambers can potentially miss ebullition events, but we believe that the advantages (ease of use, low cost, direct measurement) overcome this deficiency. There are other methods, such as using sensors on towers, that can measure GHGs on a landscape scale but this technology is cost-prohibitive and not adequately developed for use in this methodology. As technology develops for measuring GHGs this methodology can be modified accordingly. Bartlett, K.B., P.M. Crill, J.A. Bonassai, J.F. Richey, and R.C. Harris. 1990. Methane flux from the Amazon River Floodplain: emissions during rising water. Journal of Geophysical Research 95: 16.773- 16.778. Devol, A.H., J.F. Richey, W.A. Clark, and S.T. King. 1988. Methane emissions to the troposphere from the Amazon floodplain. Journal of Geophysical Research 93: 1583-1592.

	Comment	Commenter	Response
			Wilson, J.O., P.M. Crill, K.B. Bartlett, D.I. Sebacher, R.C. Harris, and R.L. Sass. 1989. Seasonal variation of methane emissions from a temperate swamp. Biogeochemistry 8: 55-71 DOI: 10.1007/BF02180167
10.4	It isn't clear to me that the flux of CO2 in static chambers needs to be accounted for in this module. The values obtained from this approach are essentially net ecosystem respiration (NER) and include respiration from soil heterotrophs (e.g., microbes) as well as autotrophs (e.g., above and belowground plant tissues and algae). The affiliated modules dealing with carbon stocks in soil (CP-S) and biomass (CP-TB) already have this NER flux "removed" (i.e., any carbon entering a soil carbon pool has already passed through the microbial decomposition filter). In effect, discounting carbon storage for CO2 flux measured in this approach is essentially double counting this respiratory loss. These NER data would be necessary if C storage was calculated differently, but they might be redundant here. However, this is a conservative error and only serves to underestimate carbon storage making the error less problematic.	Jason K. Keller, Ph.D.	The authors agree and CO2 measurement has been excluded in the revised module.
10.5	The procedures do acknowledge the importance of temporal variation, but this seems to only focus on temporal variation within a given year. The dramatic temporal variations which can occur across years are also likely to be incredibly important for accurate measurements of greenhouse gas dynamics. Does this need to be considered in the context of baseline measurements?	Jason K. Keller, Ph.D.	In general, short-term measurements reflect long-term processes, such as significant long-term trends of increasing or decreasing emissions. Continuously measuring emissions during the project lifetime would be cost-prohibitive for commercial wetland carbon sequestration projects. It should be noted, however, that episodic events (i.e., hurricanes) are considered in the permanence assessment and buffer pool contributions.
10.6	There is little mention of how to account for spatial variability which is equally dramatic and important. While strata type are included in calculation, there is a lack of language discussing spatial replication within a strata. In contrast, the soil carbon pool protocol (CP-S) discusses	Jason K. Keller, Ph.D.	Yes, sampling to reach a desired confidence level (i.e., 90%) was implied in the module. This language is made more specific in the revised module.

	Comment	Commenter	Response
	sampling to reach a desired confidence level (e.g., 90%). Should similar language be included here?		
10.7	The suggestion that late summer values are inherently greatest fluxes seems problematic. The implicit assumption here is that temperature is the sole control of these microbial processes. While temperature clearly matters, there are other controls which can be just as important. For example, late summer drops in the water table could lead to seasonal lows in CH4 flux due to an increased aerobic zone capable of CH4 oxidation. N2O fluxes are likely to be heavily regulated by NO3 availability in the system and I can think of lots of reasons why NO3 input may not coincide with high summer temperatures.	Jason K. Keller, Ph.D.	The methodology states "measurements of greenhouse gases should ensure that temporal variations are accounted for, or be measured during the time of greatest anticipated flux (e.g. during late summer) in order to conservatively underestimate net GHG emission reductions/removal enhancements." The module provides flexibility for project proponents to try and reduce monitoring costs. However, project proponents will need to scientifically justify their measurement design to the third party verifier.
10.8	The global warming potentials used as correction factors for CH4 and N2O fluxes (e.g., 21 and 310) are based on the second annual report from the IPCC. There are more up-to-date correction factors available. These correction factors are also based on the time frame in question (the numbers used here assume a 100 year time frame). Does this need to be considered in the protocol? If a project were to be "stopped" or "lost" after a shorter time period (e.g., through a loss of funding or natural disaster) the impact of greenhouse gas emissions could be different, and in the case of CH4 much greater (the GWP for CH4 over the 20-year time frame is 72 compared to 25 over the 100-year time frame). Does this need to be considered?	Jason K. Keller, Ph.D.	The E-E module uses the IPCC default values for the first commitment period from IPCC SAR-100 of 21 and 310. There are different 4th Assessment Report values, but the *ACR Standard* requires the use of SAR-100 values for reasons of fungibility. The module has been revised to be more specific as to why these values were selected.
10.9	Our team finds that the procedures for estimation of methane flux in the estimation of emissions module, E-E, is overly simplistic and not adequate to accurately and conservatively characterize these emissions. We support	CH2M Hill team	This comment is incorrect; the module does not propose that one measurement is needed per stratum. The number of sample locations per stratum is based on the number needed to reach the required confidence level

	Comment	Commenter	Response
	efforts to develop and document acceptable proxy methods, and are currently conducting a 12 month field program using eddy covariance, flux chamber, salinity, and other measurements to develop such a proxy. However where field measurements are used per the E-E module, we note that the number of sample locations per stratum is unspecified. As such, the module proposes that one measurement per stratum of as little as two hours could be used to characterize the baseline, and a second measurement of equal duration could be used to characterize the project for as long as 20 years. Our scientists are in agreement that, given the large number of factors that affect methane emissions from coastal wetlands, this monitoring frequency, duration, and extent are inadequate.		(i.e., 90%).
10.10	Also regarding methane flux per E-E, we are in agreement that methane flux would be expected to be highest in late summer, and if measurements taken during this time were assumed representative of annual averages, this would yield conservative (high) results. It should be clarified, however, that use of summer measurements for the baseline but annual averages for the project case would be inappropriate as it may underestimate increases or overestimate decreases in emissions for the project.	CH2M Hill team	The authors agree with this comment and have revised the module accordingly.
10.11	Regarding carbon dioxide flux per E-E, we suggest that it is unnecessary to include this emission. Flux of carbon dioxide is complex in the wetland system and includes both sequestration from the atmosphere as well as emissions back to the atmosphere. Carbon accretion is directly measured in the soil and tree carbon pools, and thus inherently captures the *net* uptake from the atmosphere into the wetland. Attempts to measure or	CH2M Hill team	The authors agree and CO2 measurements have been excluded from the revised module.

	Comment	Commenter	Response
	predict flux from the wetland back to the atmosphere are therefore unnecessary and confusing. We suggest that carbon dioxide not be included as a project emission.		

X-UNC, Estimation of uncertainty in WR activities

	Comment	Commenter	Response
11.1			