

**Statement of Work
To
Subcontract Number 7073056 Modification No. XX
Between
The Regents of the University of California
Lawrence Berkeley National Laboratory
And
University of Wisconsin-Madison
For
AmeriFlux Management Project Core Site -
ChEAS**

1. Site Designation and Point of Contact

Cluster Designation	ChEAS
Primary Point of contact (PI)	Ankur Desai, University of Wisconsin, desai@aos.wisc.edu, (608) 218-4208 * h (608) 260-2668
Point of contact (PI)	Kenneth Davis, Penn State University, kjd10@psu.edu, (814) 863-8601
Primary Core Site(s)	Lost Creek (US-Los)*
Secondary Core Site(s)	Sylvania Wilderness Area (US-Syv)
Secondary Core Site(s)	Park Falls / WLEF (US-PFa)
Secondary Core Site(s)	Willow Creek (mature hardwood) (US-WCr)

2. Introduction and Purpose of AmeriFlux Management Project

The AmeriFlux network is a set of research sites measuring fluxes of carbon, water, energy using eddy covariance techniques, as well as other terrestrial stocks, fluxes, and processes, to quantify and understand carbon sources and sinks and the response of terrestrial ecosystems to climate and disturbance. The U.S. Department of Energy (DOE) has established the AmeriFlux Management Project (AMP) at Lawrence Berkeley National Laboratory (LBNL) to strengthen and enhance the network. A critical function of AMP is to support a set of long term AmeriFlux sites to ensure the availability of high-quality, long term flux data to a broad community of scientists. AMP-supported sites are hereafter referred to as “core sites.”

3. General expectations for both parties

Support and Service from AMP

In terms of material support and service provided by AMP to Core Sites that might affect Core Sites’ funding needs, LBNL expects that AMP will:

- Provide eddy covariance instruments (e.g., IRGAs and sonic anemometers) needed to maintain and upgrade sites as appropriate and spares for instruments that need repair or maintenance that

would create multi-week data gaps. Provision is expected for the primary core site and is possible for secondary core sites. LBNL does not require all Core Sites to use the same instrumentation, but LBNL is only able to support spares and maintenance for some of the major sensor/instrument options.

- Loan calibrated sensors (e.g., PAR, relative humidity, air temperature) to benchmark in situ sensors.
- Supply secondary gas standards for CO₂ and CH₄ fluxes measured as part of the project.
- Carry out QA/QC activities such as deploying a roving flux system on site for ~10 days every few years.
- Support data uploads, data QA/QC, data quick-looks, and assistance with data processing issues
- Assist with soil characterization if needed.

Expectations for Core Sites

In addition to being research sites for the Principal Investigators (PIs), the Core Sites will serve as a resource for the community. The general expectations for Core Sites include providing high quality data with long-term duration that is publicly accessible, participating cooperatively in the network, and being responsive to DOE requests. The specific tasks and deliverables are given in Section 5.

4. Definitions and Protocols

Biological, Ancillary, Disturbance and Meta Data (BADM) will be reported following AmeriFlux protocols that were developed by AMP in conjunction with international flux networks.

Baseline definitions for “associated meteorological and concentration data sets”, measurement protocols, and instruments are given by Law et al. 2008.

The AmeriFlux network is an evolving scientific enterprise. Instruments deployed and protocols used have changed over time and will continue to evolve. Likewise, the specific instruments and protocols that are recommended by AMP will change over time.

Currently, AmeriFlux flux/met data are released for public access annually, but in future AMP will be releasing some data products, including core site data, more frequently.

The Tasks in this statement of work refer to levels of data processing and data reporting. Here are definitions of these levels as used in this statement of work (they may not match other schemes). For full definitions of levels and the latest AMP protocols, see <http://ameriflux.lbl.gov/data/aboutdata/>

Level 0: Data representative of individual sensor surroundings without any temporal aggregation; data should not be considered as representative of the footprint or ecosystem.

Level 1: All data at original spatial resolution (sensor-level) but aggregated to half-hourly (or hourly) products.

Level 2: Standard temporal aggregation to half-hourly or hourly product, aggregation of spatially distributed measurements, and standard variable label and units.

5. Tasks and Deliverables

All tasks and deliverables pertain to all Core sites, i.e., the Primary and Secondary sites listed above, which comprise the Cluster.

1. Generate eddy covariance data sets and associated meteorological and concentration data sets and submit measurements, plus quality flags when available (not filtered) to AMP, using acceptable protocols. Links to protocols can be found at <http://ameriflux.lbl.gov/data/aboutdata/>.

Submission timing will be:

- a. Daily-weekly. Level 0 data.
High frequency micromet and other time series data, at original spatial and temporal resolutions, converted to physical units. According to AMP-provided protocol. If site is not set up for transfer of Level 0 data, arrange with AMP for frequent submission of preliminary Level 1 data.
 - b. Quarterly. Preliminary Level 1 data.
Data aggregated to half-hourly or hourly products with standard variable labels and units. Spatially distributed measurements reported without spatial aggregation (OK to include spatially aggregated data as well). Full data QA/QC recommended but not required.
 - c. Annually. Fully processed Level 1 data.
Data aggregated to half-hourly or hourly products with standard variable labels and units. Spatially distributed measurements reported without spatial aggregation (OK to include spatially aggregated data as well). Full data QA/QC, suitable for data publication.
2. Provide past flux/met data to AMP:
 - a. Submit past Level 0 and Level 1 data and metadata records needed to bring the site data submission current within six months of Subcontract issuance. These should be in AMP standardized csv or Excel file format (standardized variable names, units, and column format). AMP personnel can aid in development of conversion routines.
 - b. Provide to AMP all past raw high frequency (Level 0) data files that are available for each of the sites.
 3. Report BADM data using AmeriFlux-accepted protocols (<http://ameriflux.lbl.gov/data/aboutdata/>).
 - a. Submit data for all “BADM-lite” templates within six months of the Subcontract initiation and update annually. Submission of more detailed templates (and more complete data streams) on behalf of specific synthesis or modeling activities may be requested.
 - b. Update BADM annually and within three (3) months after a major event occurs (e.g., fire).
 - c. Provide historical BADM data files that are available for each of the sites.
 4. Respond to QA/QC queries related to data quality and processing in a timely manner.
 5. Maintain high quality data collection with minimal data gaps. In addition:
 - a. Participate in on-site QA/QC activities and site visits and follow AmeriFlux protocols.
 - b. In collaboration with AMP, develop a contingency plan for minimizing data gaps including system redundancy, access to a pool of critical spare parts, and planned maintenance and scheduled replacement of sensors before they are likely to fail. AMP will make major purchases associated with instrument upgrades or malfunctions. Core Sites will be responsible for timely deployment.
 6. Analyze, interpret, and synthesize results and communicate findings at science conferences and in peer-reviewed literature. Expectations are that site data will be used in publications each year. In addition:

- a. The DOE-AMP funding source must be acknowledged in publications as follows:
Funding for AmeriFlux core site data was provided by the U.S. Department of Energy Office of Science.
 - b. Report research highlights in formats that can be used by AMP and DOE program managers.
7. Participate in Core-Site conference calls and an annual team meeting. The team meeting may be integrated with the AmeriFlux Annual PI meeting, ESS PI meeting, or NACP meeting.
8. Make core sites available to outside investigators, subject to reasonable limitations that prevent disruption of ongoing research.
9. Participate with AMP and other Core Site PIs to develop improved systems for data submission and data users. Use new (online) systems for tracking maintenance, repairs, data issues, and so on, as AMP implements them. Participate in training and coordination workshops.
10. Work safely and maintain safety documentation
 - a. Produce a written safety plan for each AMP-funded site and associated lab activities and implement this site safety plan. AMP will review this plan.
 - b. Obtain inspections of, for example, instrument towers, fire extinguishers, and compress gas regulators at recommended intervals. Document in quarterly or annual report.
11. Develop and maintain documentation on each site, such as for safety, equipment, and metadata. In addition to expectations listed above, this includes:
 - a. Maintain an up-to-date inventory of instruments and equipment, using BADM or other requested formats. Additional information will be requested for AMP-provided instruments.
 - b. Provide material for Core Site webpages. Send high quality photos of site and research for AMP use. Video submissions also welcome. If students recognizable in images, please provide students' permission to use and limitations, if any.
12. Quarterly status update, communicated by text document and/or online form. Updates can include problems or opportunities, changes in staff or contact information, highlights, upcoming highlights, safety issues, significant leveraging of core site or other funding, and presentations.
13. Annual Report to AMP by May 1st of each year, to augment material in quarterly reports, including:
 - a. Description of the observed fluxes
 - b. Description of research conducted at the site or under site funding
 - c. List or description of personnel, collaborators, and leverage
 - d. Instrument or data-stream changes (include intercomparisons or significant changes)
 - e. Update site webpages
 - f. Site safety update report including required inspections, and documenting any incidents (e.g., report should include copies of annual tower inspections for towers 3m or taller that people stand on), documenting fire extinguisher inspections, replacement of climbing gear when scheduled, and description of any safety incidents)

6. AmeriFlux Network

To provide some background on the types of research conducted with AmeriFlux data, such as that generated by core sites, the AmeriFlux strategic plan (2005) identified four priorities for research by the network:

1. What are the magnitudes of carbon storage and the exchanges of carbon, water, and energy in terrestrial systems? What is the spatial and temporal variability of Flux?
2. How is this variability influenced by vegetation type, phenology, changes in land use, management, and disturbance history, and what is the relative effect of these factors?
3. What is the causal link between climate and the exchanges of carbon, water, and energy for major vegetation types, and how does seasonal and inter-annual climate variability and anomalies influence fluxes?
4. What is the spatial and temporal variation of boundary layer CO₂ concentrations, and how does this vary with topography, climatic zone and vegetation?

7. AmeriFlux References

For current protocols, acknowledgments, data submissions, and other functions: ameriFlux.lbl.gov

Law, B. E., Baldocchi, D. D., Dahlman, R., Davis, K., Hollinger, D. and co-authors 2005. Ameriflux Strategic Plan.

Law, B. E., Arkebauer, T., Campbell, J. L., Chen, J., Sun, O. and co-authors 2008. Terrestrial Carbon Observations: Protocols for Vegetation Sampling and Data Submission. Food and Agriculture Organization of United Nations, Global Terrestrial Observing System, Rome.