ERW Field Data Partnership Grants: Request for Proposals

The Challenge

Enhanced rock weathering (ERW) is a carbon dioxide removal (CDR) strategy that involves the spreading of alkaline feedstocks (e.g., silicates, carbonates, or other alkaline materials) on agricultural soils. In the last few years, there has been a dramatic increase in the number of commercial ERW deployments globally driven by voluntary carbon market demand. The quantification of carbon removal in an ERW deployment is complex, and involves a range of biogeochemical fluxes that can impact the net carbon balance across soil systems, groundwater, surface water systems, and the ocean. (See Cascade's recently published, 'Foundations for Carbon Dioxide Removal Quantification in ERW Deployments').

For ERW deployments to be economically feasible at scale, it is highly likely that quantification of CDR will need to shift from "measurement-driven" to being increasingly reliant on biogeochemical models. Currently, models cannot reliably predict and quantify the net carbon balance resulting from ERW deployments, particularly across heterogeneous environments.

In the context of commercial ERW deployments, common quantification practice today[1] is to directly measure the release of base cations from the feedstock and subsequent cation or dissolved inorganic carbon (DIC) export within the top 20-30 cm of the soil profile.[2] A key bottleneck for present modeling efforts, and for our broader understanding of rock weathering and solute transport dynamics, is a lack of high-quality measurements of biogeochemical processes in ERW deployments beyond the initial dissolution of the feedstock in surface soils. While not typically measured at high resolution in commercial deployments, these processes are still critical to constraining the net climate impact of an ERW project, and so field data is needed to better calibrate and validate future models.

The Objective

We welcome research **proposals between $20,000 and $200,000 that aim to collect and publish high-quality ERW field datasets on existing or planned deployments, that go beyond typical commercial expectations for CDR quantification (e.g., beyond feedstock dissolution measurements in shallow soils) .** In these scientific partnerships, **Deployment Partners** agree to open up an existing or upcoming deployment site for additional monitoring and help coordinate logistics, and **Researchers** co-propose a study, collect and analyze the data, and publish the results.

We believe that this partnership model—in which researchers "piggyback" on existing deployments by carrying out measurements that go beyond what is already planned—will

[1] For example, see Isometric's EW protocol or Puro's ERW methodology.
[2] In addition to these "Near-Field Zone" measurements, models or geochemical calculations are frequently used to calculate conservative loss estimates associated with downstream loss processes in surface water and marine systems.

accelerate the collection of novel field datasets in ERW. It offers an attractive avenue for tackling high-priority research questions by decreasing the logistical and cost burden for researchers, while extracting even greater scientific learning value from the current wave of commercial ERW activity.

We expect that initial measurements characterizing the feedstock and initial soil conditions, as well as measurements of feedstock dissolution rates in surface soils, are already paid for in the deployment through some other means (e.g. commercial carbon credit sales). Thus, this RFP will not fund the collection of these **Contextual Data** variables as defined in Appendix A; it will fund only the collection of the 'additional' dataset (e.g., sample collection and lab analyses) along with associated research and analysis.

Eligible Datasets and Priority Topic Areas

We seek proposals that build upon the data typically collected in ERW commercial deployments, beyond the initial release and export of cations from the feedstock in surface soils. **We welcome the creativity of the ERW community to propose the collection of any datasets that would advance the field.** Below are some topic areas of particular interest:

- Measurement of secondary phases (e.g., silicates, carbonates, Fe- and Al-oxyhydroxides, amorphous phases) in deep soil cores (>50 cm)
- Measurement of the components of the carbonate system and/or cations in waters that drain ERW deployments (e.g., groundwater/porewater, tile drains, or low-order streams)
- Measurement of greenhouse gas fluxes (N_2O, CH_4, CO_2)
- Cation sorption in deep soil cores
- Soil organic carbon stock monitoring

Research proposals focused on collecting field data to inform health and safety impacts of ERW (e.g., the transport and speciation of trace metals) will also be considered.

The following are **not** in scope for this RFP:

- Direct funding of new ERW deployments or field trials (e.g. feedstock transport, logistics, spreading)
- Measurements that are generally required for commercial MRV — see Appendix A for full list of Contextual Data expected at the deployment site. In some circumstances, if additional measurements of one or more of the Contextual Data variables is needed in order to increase the resolution of data collection already planned by the Deployment Partner, this request can be included in the proposal and funding will be considered on a case-by-case basis.

Partnership Requirements

We seek to fund collaborations between Researchers and Deployment Partners—any proposal submitted to this RFP must include information about both partners. The Researcher and Deployment Partner cannot be from the same organization. Upon award, funds will be sent to

one organization, who then will be responsible for partitioning the funds between partners; the proposal should specify and justify the single organization that should receive the funds from Cascade.

Researcher Eligibility Requirements: Any scientific researcher with the necessary expertise and instrumentation to carry out the collection, analysis, and publication of a proposed dataset may apply to this RFP. This may include Principal Investigators (PIs) or post-docs at academic institutions and researchers at non-profit or government labs.

Graduate students may also *directly apply* as the Researcher for a proposal with a budget of between $5,000 and $10,000, provided they find a Deployment Partner to work with and demonstrate a credible plan to collect a relevant dataset. To be considered for funding, graduate students must submit a letter of recommendation from their PI, and also complete the full proposal application.

Deployment Partner Eligibility Requirements: Deployment Partners may be commercial ERW project developers, non-profit organizations, or academic institutions who have set up an ERW field trial or deployment, and who are already funded to collect the relevant data variables in Appendix A. Proposals must reference a specific (either planned or already existing) ERW deployment site where these measurements will be carried out.

Deployment Partners bear no formal responsibility for the analysis and publication of results from the study, but are strongly encouraged to participate in the research process and can be co-authors in the resulting publication as decided with the Researcher.

A single organization may be listed as a Deployment Partner on multiple proposal submissions. We encourage Deployment Partners to collaborate with a variety of researchers across disciplines in order to maximize the scientific value of existing deployment sites.

Data Sharing Requirements

In order to provide the required context to interpret the additional field measurements funded via this RFP (“RFP Study Data”), it’s critical that measurements for a) feedstock characterization, b) initial site characterization and baseline soil measurements, and c) feedstock application and dissolution rate, have been collected for the fields being used for this study (“Contextual Data”, as defined in Appendix A).

Sharing of Contextual Data

Direct sharing of Contextual Data with research collaborators should occur quickly after its collection by the Deployment Partner, with the exact timeline to be worked out between the parties.

The Deployment Partner must submit Contextual Data to the ERW Data Quarry for the fields being monitored in this study, in addition to direct sharing with research collaborators. This

means that the dataset will be added to a permissioned database, which will publicly display a description of the dataset and variables available. Any scientific researcher will be able to request access to this Contextual Data by submitting a brief research proposal and a financial conflict of interest statement. Cascade will facilitate a neutral governing board to determine dataset release based on: a) if there are any credible conflicts of interest, and b) if the research proposal relates to advancing ERW science.

Deployment Partners selected for this RFP commit to sharing Contextual Data with the ERW Data Quarry within 18 months of the deployment completion date, or within 3 months of a crediting event, whichever happens sooner. Project data from subsequent seasons should be shared at least annually thereafter until the project is completed. Regardless of deployment or crediting event dates, the Deployment Partner will have up to 6 months to contribute the data after concluding the first complete post-deployment measurements.

The Contextual Data must be made fully public upon the release of a peer-reviewed publication of an associated paper. For this RFP, we also strongly encourage the public release of the Contextual Data alongside the release of a preprint.

Sharing of RFP Study Data

The RFP Study Data can be kept private by the Research Partner during the process of completing analysis and writing up results. We expect researchers to publish a preprint with their findings; the RFP Study Data must be made public alongside the release of this preprint, within 18 months of final data collection, or within 4 years of funding received, whichever occurs sooner.

Other Requirements

If no peer-reviewed publication comes out of this study, we still expect that the sample-level dataset, high quality metadata and an associated analysis be made public (e.g., as a preprint or white paper) within 18 months of final data collection.

This RFP also includes the following requirements across all data that is shared (both Contextual Data and RFP Study Data):

- Sample-level data must be shared
- Interoperable, meaning units, relevant methods and other metadata are shared for all fields following FAIR Data Principles
- Exclude any personal identifiable information (PII), including but not limited to: farmer name, email, address, exact geolocation or any data that could identify an individual farm, etc.
- Consistent with Ag Data Transparency Principles, including a) Farmers consenting to data sharing and b) Data is anonymized to a level that prevents farm and farmer identification. Default anonymization should be watershed + County / District unless otherwise agreed upon.

Selection Criteria

Applications will be assessed based on how well the proposed research question aligns with the goals proposed in the RFP, the approach and methods put forward, and the ability of the team to execute the proposed plan. Successful proposals will:

- Demonstrate that their proposed field dataset goes above and beyond current commercial MRV expectations in ERW (i.e., beyond measurements of feedstock dissolution in surface soils)
- Have a deployment site with conditions well-suited to answer the chosen research question
- Demonstrate that the research team has access to skills, expertise, and instrumentation necessary to carry out proposal
- Propose appropriate methods to answer the research question (e.g. collect data at sufficient spatial and/or temporal resolution to capture signal)
- Create a budget that demonstrates a credible and efficient resourcing plan to carry out the study
- Have access or will have access to the Contextual Data necessary to design an appropriate research plan and interpret the newly collected dataset

Special consideration will be given to proposals that:

- Plan to commence initial measurements in Spring or Fall 2025
- Collect data on fields outside of Northern America and Europe
- Can publicly release new field data within 2 years of proposal selection
- Offer additional Contextual Data submissions to the Data Quarry, beyond the fields in which RFP Study Data is being collected
- Involve researchers who are new to the field of ERW, or who haven't worked on ERW in the context of carbon removal before

Review Process and Reporting Requirements

The review and selection process will occur in January 2025, and involve external review of a selected subset of proposals by a group of academic experts. We are also establishing an RFP Advisory Board who advise us on process governance (e.g. external review process and final proposal selection). All external reviewers and members of the RFP Advisory Board will be required to disclose any conflicts of interest (e.g. equity or revenue-linked compensation in any ERW project developer).

For all proposals, we may request clarification via email or a targeted follow-up conversation, on a case-by-case basis. If the proposal's Researcher is a graduate student, we will request a conversation with the Researcher.

We will require a short midterm update and a final report. Exact dates will be derived in collaboration with the grantee, prior to the grant being awarded, to allow for differing rock application dates.

Important Dates

The proposals will be due on **December 20th at 11:59pm ET**, and funding decisions will be made by no later than **February 6th**. For proposals that have a start date in Spring 2025, Cascade can provide a letter that specifies our intent to fund the project upon selection.

Applications should be no longer than four to eight pages (exclusive of supporting information), and should be submitted via this form. Applicants are welcome to include figures and references to papers, preprints, and similar as a part of the application; please have all citations at the end of the document. Applicants are advised to not share any information that is considered confidential or a trade secret.

For additional questions related to this RfP or the proposal process, please contact the Cascade Climate RFP Team at grants@cascadeclimate.org. Potential applicants are also encouraged to bring their questions to our webinar and Q&A session for this RFP, scheduled for **Thursday, November 14 at 12pm ET**. This will be recorded and made available on the Cascade website.

Allowable Expenses

Funds may be used for direct research costs, including: personnel, equipment, materials, analysis, domestic or international travel for project members for scientific purposes (including conferences and meetings), support for visitors and collaborators (including domestic and international travel), publication expenses, professional membership dues, and other expenses directly related to the research.

For academic faculty on an academic year salary in PI or co-PI roles, the grant can provide up to one month of summer salary support and related benefits. These salary funds are not substitutional (cannot be used to relieve a university of salary costs) and cannot be used to reduce teaching loads below the departmental norm.

For staff and research scientists in PI or co-PI roles, the grant can provide salary support and related benefits.

For staff and research scientists not in non-PI or co-PI roles, as well as postdoctoral, graduate and/or undergraduate research assistants, the grant can provide salary support and related benefits, including graduate student tuition.

Indirect Costs

Indirect costs such as administrative support salaries, general office equipment, etc. may be included but must not exceed 10% of the total project budget. Funds may not be used for unrelated or personal expenses, unrelated business activities, or lobbying efforts.

Appendix A: Contextual Data

The following data (at sample-level) for the feedstock and deployment site used for this study must be made available as per the 'Data Sharing Requirements' section above. This variable list is identical to the list of variables required for submission to the ERW Data Quarry.

Data for public release (including time and measurement depth, if applicable):

A. Feedstock screen of all metals: arsenic (As), cadmium (Cd), cobalt (Co), chromium (Cr), copper (Cu), lead (Pb), mercury (Hg), manganese (Mn), nickel (Ni), thallium (Tl), uranium (U), vanadium (V) and zinc (Zn)
B. Feedstocks: asbestos and asbestiform minerals, radioactivity
C. Soil and biomass levels of metals deemed relevant from baseline and post application time points

Regardless of measurement approach

- Feedstock screen of all metals: arsenic (As), cadmium (Cd), cobalt (Co), chromium (Cr), copper (Cu), lead (Pb), mercury (Hg), manganese (Mn), nickel (Ni), thallium (Tl), uranium (U), vanadium (V) and zinc (Zn)
- Feedstock screen of asbestos and asbestiform minerals, radioactivity
- Soil and biomass levels of metals deemed relevant from feedstock screen for baseline and all post application time points
- Current and past application rate and dates
- Soil pH and buffer pH
- Feedstock particle size distribution
- Feedstock mineralogy
- Net infiltration (total, combined irrigation + precipitation - evapotranspiration)
- Regional climate (elevation (rounded to nearest 100m), county or similar administrative district, mean quarterly temperature rounded to the nearest degree C)
- SOC
- Bulk density
- CEC
- Base saturation
- Soil texture
- Crop type
- Tillage type, depth and frequency
- Fertilizer type and application rate if using to constrain strong acid (can be total seasonal levels)
- If measured: Soil inorganic carbon
- *Time and depth stamp of all measurements from both control and treatment plots. Metadata describing measurement protocols/laboratory procedures*

If using aqueous measurements

- Dissolution rate: include time unit
- Dissolution rate measurements:
    - Two of three: pH, total alkalinity, DIC
    - Net infiltration over time
- Major cations
- Major anions

If using solid phase (soil) measurements

- Dissolution rate - include time unit
- Dissolution rate measurements
    - Example: Mobile (e.g., Ca) / immobile (e.g., Ti) tracer element concentrations
- Element-specific base saturation
- Total uptake of cations in removed biomass