Lower Elkhorn Natural Resources District

Request for Proposal

in support of the Nebraska Environmental Trust study:

"Observing Water and Nutrient Mobility in the Vadose Zone"

Study Task 2: Geological, Agronomic, Vadose Zone field data collection, interpretation, analysis and consulting

Background

The Lower Elkhorn Natural Resources District (LENRD) promotes sustainable stewardship through conservation, resource management, and environmental protection. We protect lives by managing water resources, pollution control, and waste disposal for sustainable use and conservation, protect property through erosion control, flood management, and soil conservation, and protect the future by improving drainage, managing habitats, developing recreation facilities, and sustaining forests and rangelands. The LENRD's "Observing Water and Nutrient Mobility in the Vadose Zone" study is supported by a generous grant from the Nebraska Environmental Trust (NET).

Purpose

The "Observing Water and Nutrient Mobility in the Vadose Zone" study seeks to build on historic observations by construction and utilization of a field-scale observation system that will help us evaluate nutrient and water mobility under conventional farming, limited tillage, and regenerative cropping systems in the context of local weather, soil, and hydrogeologic conditions. This will help LENRD and others understand which "best management practices" are truly better and adopt appropriate incentives to protect water quality or prevent contamination while maintaining or enhancing recharge to our aquifers.

We're currently seeking qualified specialists and service providers to support specific study tasks while collaborating and sharing data with a multi-disciplinary team. Our overarching goal is to understand and illustrate water and nutrient mobility in the subsurface between the crop root zone and water table in a way that is spatially and temporally discrete enough to facilitate development of improved vadose zone models or non-invasive monitoring techniques that can be used to begin developing recommended

best management practices that are specific to the current farming practice, soil type and texture, vadose characteristics and weathering condition, and depositional environment.

Study Scope of Work and Budget

The study seeks to gain access to eighteen fields under row-crop production at six to nine locations in the LENRD that will be observed during the 2027 and 2028 calendar years. The study completion report for the study is planned to be finalized in June of 2029. We will seek access to irrigated and dryland fields characterized by three different soil textures (sandy, silty, and clayey) and three different cropping systems (conventional, no-till/conservation tillage, and regenerative agriculture/continuous cover crop). LENRD will identify and recruit producers to allow access to these farms for the study duration and secure easements to install and maintain monitoring wells over the long term at selected sites as needed.

Each location will be instrumented with a means of recording precipitation, evapotranspiration, soil moisture content/temperature/electrical conductivity, and groundwater level on an hourly basis. Spot measurements at each location will include discrete depth soils samples within and below the crop root zone, and surface nuclear magnetic resonance (NMR) soundings, electrical resistance tomography (ERT) and induced polarization (IP) profiles that coincide in time and space with the soil samples, NMR, and/or tracer locations, and water quality samples from the monitoring wells prior to spring planting and during crop senescence to capture the pre-crop and post-crop conditions. Preplant and in-season fertilizer application timing and rates will be obtained for each field from the producers. In addition to spring and fall readings, staff will collect additional in-season water meter readings to better discretize groundwater pumping data from the irrigated systems.

One or two locations may be co-located with existing monitoring wells. In locations needing wells, we will drill test holes to collect continuous cores (vadose zone) and cuttings (aquifer strata) and geophysical boring logs to produce detailed geologic and geophysical descriptions of regolith and strata from the land surface to Cretaceous bedrock. At each test hole location, we will install monitoring well pairs with dedicated sampling hardware together with water and weather monitoring systems that will collect and transmit groundwater level, temperature, and weather data. Borehole NMR data will be collected to map water content, pore size, bound/mobile porosity, and Hydraulic Conductivity in the vadose zone. Also, we will collect soil samples from the vadose zone and create electrical conductivity (EC), injection pressure (HPT), and HPT flow profiles at

each location with a direct-push rig (at 18 fields up to 50 feet below ground surface). In locations where monitoring wells already exist, weather stations will be added and vadose zones samples collected by direct-push technique during the spring and fall field excursions in 2027 and 2028.

In the second crop year (2028, at sites that exhibit divergent results), we will select up to 6 sites to incorporate a one-time bromide tracer to compare expected nutrient movement due to the physiochemical characteristics of the vadose zone. Subsequent vadose zone sampling for the tracer and nitrate concentrations will allow us to discern how much influence the vadose zone's microbial community impacts nitrate fate and transport (e.g., denitrification, assimilation, etc.) under the field specific soil texture, vadose strata, and cropping system.

All data collected during the study will be shared among partners through design and deployment of an online database and mapping software that will result from the integration of data threads, database population, online implementation, and design of maps, applications, and 3-D scenes. Study partners whose deliverables include data will receive tech support to facilitate the formatting, upload and sharing of study data.

Budgeted study tasks:

1. Geodatabase development and study data management ($73,225)
2. Geological, agronomic, and vadose zone field data collection, interpretation, analysis and consulting ($124,000)
3. Nuclear Magnetic Resonance Imaging ($157,000)
4. Direct-push sampling and hydraulic profiling ($9,900)
5. Continuous vadose zone coring ($22,400)
6. Groundwater monitoring well installation ($62,510)
7. Laboratory analyses ($75,066)

Study Task 2 - Geological, agronomic, vadose zone field data collection, interpretation, analysis and consulting ($124,000 budgeted)

The selected firm/research group will provide expertise in agricultural cropping systems, vadose zone science, geophysics, and geology. We prefer teams that have related these disciplines to hydrogeology in their work. The scope of work associated with **Study Task 2** includes, but may not be limited to the following:

A. Participate in online study meetings to formulate a proper understanding of the study, gather feedback from other contracted partners, contribute to development

of collaborative tools, and evaluate the effectiveness of the tools developed under **Study Task 1**. Lead experts from each subdiscipline on this team will also be expected to contribute to project decision-making by responding to email and/or text messaging polls, questions, and proposed paths forward as the project is developed, implemented, and documented.

B. Provide and/or contribute to the experimental design of the study as sites (parcel clusters) are identified and secured, provide interpretation of data in the context of all data streams as the data populates the database, and develop cross-disciplinary collaborations using the geodatabase, maps, applications, 3-D scenes and data management services provided to the study under **Study Task 1**.

C. Complete small diameter (5" or less) mud rotary geological test holes from the land surface to the top of Cretaceous and collect borehole geophysical logs (SP, natural gamma, lateral resistance, 16 & 64 inch normal resistivity) and caliper logs **before March 26, 2027** at up to seven study sites (parcel clusters) in locations that require the installation of new monitoring wells without impacting landowners' crops. Produce recommended well designs (screened intervals) for shallow and deep monitoring wells (**Study Task 6**) that will be used to monitor water level and chemistry as described in the **Study Task 7** request for proposals. Cuttings must be described according to EC-21, *Reference list for describing cuttings and cores of sediments and sedimentary rocks in Nebraska* (Korus, et.al., 2011), and test hole results are expected to be submitted to the University of Nebraska – Lincoln for inclusion in the UNL – Conservation and Survey Division's test hole database. The project anticipates renting and mobilizing equipment to collect nuclear magnetic resonance (NMR) data from each of the test holes to further characterize the vadose zone and aquifer (as described in the **Study Task 3** request for proposals), and geologists employed as part of this task will also be required to contribute to interpreting and integrating the NMR data with other data collected.

D. Continuous vadose zone coring will be completed under **Study Task 5** at each parcel cluster using the descriptive scheme developed by the Midwest Geosciences Group documented in their Field Guide for Soil and Stratigraphic Analysis (2001-2002) and characterized under the Unified Soil Classification System. Individuals in the geology and/or vadose zone science sub-disciplines contracted under **Study Task 2** are expected to complete the core descriptions under the methodology and prepare the cores for inclusion in the Conservation and Survey Division's Geological Sample Repository as appropriate.

E. Individuals from any/all of the sub-disciplines under **Study Task 2** who contribute to the project will be expected to collect soil samples from within and beneath the root zone in each of eighteen fields in the spring (before planting) and fall (during crop senescence /after harvest) of calendar years 2027 and 2028 and submit them for chemical or nutrient analysis under **Study Task 7**. Samples must be collected in concert with **Study Task 4:** Direct-push sampling and hydraulic profiling.

F. Individuals from the cropping systems sub-discipline contracted under **Study Task 2** are expected to be responsible for cover crop or cash crop biomass; including seed and residue sampling in each of eighteen fields during calendar years 2027 and 2028 and submit them to the contracted laboratory for nutrient analysis under **Study Task 7**.

G. Individuals in the cropping systems sub-discipline contracted under **Study Task 2** are expected to be responsible for recording of any nutrient balance crop/producer relevant data that landowners are willing to share with the study team, including but not limited to; height of sprayer booms, irrigation systems, or other equipment that will be operated in the fields, timing and amount of irrigation, timing and application rate of fertilizer, chemical composition of fertilizer applied, and timing and application rate of herbicides and/or pesticides.

H. Complete Electrical Resistance Tomography and Self Potential profiles on eighteen fields scheduled to roughly coincide in time and location with **Study Task 4** (Direct-push sampling and hydraulic profiling) in the spring (before planting) and fall (during crop senescence /after harvest) of calendar years 2027 and 2028. Electrode spacing and array length/configuration will be optimized to produce the highest spatial resolution possible while characterizing the entire vadose zone thickness expected at each parcel cluster, and Induced Polarization data will be produced when the site and data conditions permit.

I. Tracer testing may be conducted in the 2028 crop year (at sites that exhibit divergent results) using a one-time bromide tracer to compare expected nutrient movement due to the physiochemical characteristics of the vadose zone. Subsequent vadose zone sampling for the tracer and nitrate concentrations will be used to discern how much influence the vadose zone's microbial community impacts nitrate fate and transport (e.g., denitrification, assimilation, etc.) under the field specific soil texture, vadose strata, and cropping system.

Study Task 2 – Anticipated Challenges

This complex study with several discrete and unique tasks has significant and distinct challenges related to Study Task 2, including:

- The task will require coordination with a data services firm, technical experts, field technicians, and students to manage the flow of data into the geodatabase and mapping products. Some data will include automated (API) connections to recorders, but will also involve gathering periodic (twice/year) data updates from teams with duties under the study.
- All field data collected will need to be digitally formatted to facilitate easy upload and incorporation into the project geodatabase that will then ensure cross-disciplinary functionality and availability to the various teams.
- Turnaround times for post-processing data are short. In order to facilitate technical coordination and data review meetings twice a year in the summer and winter, sample delivery to the lab(s) will need to be immediate, and post-processing/inversions of field data will need to be completed in a timely fashion.
- Scheduling field work around agricultural operations during the test hole drilling and the seasonal field excursions that require data collection from multiple teams in a short timeframe will pose significant scheduling and logistical challenges that will require close coordination and communication among the project partners.

Selection Criteria

Selection criteria for this study are framed by the procurement policies of the Nebraska Environmental Trust and Lower Elkhorn NRD and will be considered Professional Services. Firms will be selected by a committee of LENRD Boad Members with the assistance of staff, in conformance with the LENRD and NET procurement policies.

Selection criteria include experience and qualifications of personnel, successful completion of similar work in the past, capability to meet time requirements of the study, ability to curate data format and portability, and proposed solutions to Anticipated Challenges.

LENRD will select the lowest responsible bid when products are substantially equivalent.

The ideal vendor has:

- Will be a research group with particular expertise and experience in geosciences (including geology, geophysics, sedimentology & stratigraphy, hydrogeology), vadose zone science, agricultural cropping systems (agronomy) and will be familiar with the hydrogeological complexities along the margins of the High Plains Aquifer, the range of farming practices and soil textures in eastern Nebraska, and the implications of depositional environments on water and nutrient pathways and mobility in the vadose zone.
- Has experience working with large multi-disciplinary teams on projects that contribute directly to local subdivisions of state government.
- Has a proven record of publishing applied research relating to agricultural and water systems in Nebraska.
- Can contribute constructively in a responsive, collaborative, and transparent work group with a large multi-disciplinary team.

Other terms and conditions:

- All parties shall have publication and reproduction rights for all reports and materials which are produced as a result of this Study.
- All parties shall recognize funding from the NET on all published materials and news releases related to this NET funded project and associated activities.
- LENRD shall have the right to review and provide comment on any publication or promotional materials that are produced as a result of this work, and co-authorship of any resulting publications by relevant LENRD staff shall be considered by mutual agreement of the parties.
- If the Study results in any copyrightable material or inventions, the LENRD, NET and/or the State of Nebraska reserves the right to a royalty-free, nonexclusive, and irrevocable license to reproduce, publish, or otherwise use and/or authorize others to use the work, data collected, or materials for governmental purposes.
- LENRD and any contractor or subcontractor will comply with all applicable laws, regulations, and orders, including but not limited to, those relating to Social Security, unemployment compensation, OSHA, affirmative action, equal employment opportunity, and the Americans with Disabilities Act.

- Contractors are expected to comply with all Nebraska Secretary of State and Department of Revenue registration requirements, including any registration requirements pertaining to types of business entities (e.g. sole proprietorship, partnership, foreign/domestic limited liability company, association, or foreign/domestic corporation).
- The Sponsor and any contractor or subcontractor of the Sponsor is required to use the EVerify Program authorized by the Illegal Immigration Reform and Immigrant Responsibility Act of 1996, 8 U.S.C. 1324a to determine the work eligibility status of newly hired employees physically performing services within the State of Nebraska.
- NET grant funds cannot be used to offset costs when bidding for services for any other grant funded activities. NET grant funds cannot be used as matching funds for another NET grant, or another grant funded in part by NET.
- Facilities expenses should not be charged to the project, and the NET limits the amount of General Administrative Expense. Costs that are administrative in nature and are in direct support of a project activity should be charged to the project activity and not to General Administration. General Administration expenses relate solely to administration of the grant by Project Sponsor staff and shall not exceed 5% of Project Costs or $10,000, whichever is less.

Submission Criteria

A submission should include the following elements:

- Firm name, address, telephone number.
- Statement of Interest in the study, or letter declining to submit a proposal that states the reasons that your firm chooses not to submit a proposal.
- Years established and former names.
- Type of services particularly qualified to perform.
- Names of principals and states in which they are registered.
- Names of key personnel to be utilized, experience of each and length of service with the firm.
- Maximum number of staff contributing to the study at any one time.
- Outside consultants and associates that might be employed.

- List of similar completed studies/projects for which the firm was the principal professional.
- Similar current projects of the firm and estimated approximate budgets of each.
- History of professional negligence claims made against the firm during the past five years.
- Statement of Qualifications that contains a brief description of your Firm, the nature of your business with a brief history, and names and credentials of team members who may be employed on this study.
- A one-page or less narrative outlining the knowledge, strengths, and distinguishing skills or capabilities of your firm as they relate directly to **Study Task 2**.
- A representative selection of previous work that demonstrates your ability to complete the task as outlined.
- A detailed budget that relates directly to your preferred invoice format (1 to 1 with your preferred billable units).

Submission Process

Submissions may be sent electronically by the submission deadline. Send submissions to:

Julie Wragge, Grant Coordinator
Email: jwragge@lenrd.org
Subject Line: Study Task 2: Geological, Agronomic, Vadose Zone field data collection, interpretation, analysis and consulting
Telephone: 402-371-7313

Submission Deadline

Proposals must be submitted by June 19, 2026. The award will be granted no later than July 24, 2026.