

## Memorandum

**To:** Papio-Missouri River Natural Resources District Programs Projects and Operations Subcommittee  
**From:** Paul W. Woodward, PE, Groundwater Management Engineer  
**Date:** February 1, 2018  
**Re:** Review and Recommendation on Research Agreement with University of Nebraska – Lincoln for a Vadose Zone Nitrate Study near Springfield, NE

---

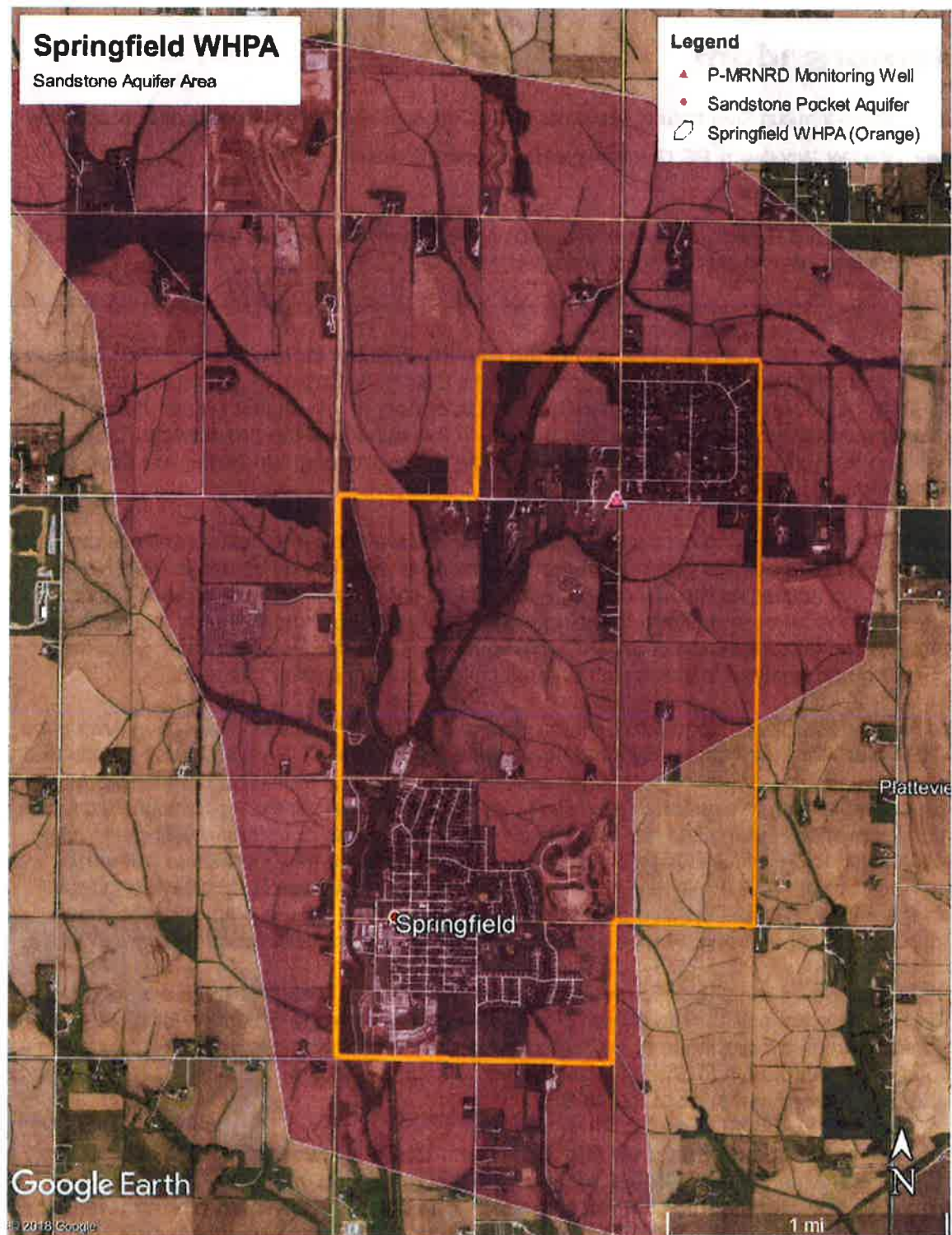
Following information collected as part of the Airborne Electromagnetic Survey (AEM) within the City of Springfield's Wellhead Protection Area, the District has been in communication with the University of Nebraska's (UNL) Water Science Laboratory to investigate research methods aimed at monitoring the level of nitrates already in the soil above the groundwater table and what long-term affects those nitrates may have on the quality of groundwater available in Springfield.

Data collected on existing nitrate levels held in the vadose zone (the vertical soil column below plants roots but above the groundwater table) would serve as a very valuable source of information in accessing the risk of future contamination. This is information the District is interested in to apply in a nitrate mapping project using the AEM data already available, see attached map (Figure 1) and cross section (Figure 2). Other NRDs are collecting similar monitoring and analysis in areas with potential nitrate contamination concerns.

Additionally, the City of Springfield is interested in pursuing a Wellhead Protection Area plan (WHPA plan) for their community's municipal water supply. A WHPA plan is used to inventory and access the risk of potential contaminants to the quality of a municipal drinking water supply. Data available from this research study will play a major role in assessing Springfield's future water supply risk. Springfield has had issues with high nitrates from their existing municipal wells and is facing a future decision to invest in a new well at a new location or potentially work on a hook up with MUD. Since part of Springfield will be in a Phase II Groundwater Quality Management Area, the District may elect to cost-share on the WHPA plan once the new Groundwater Management Plan is adopted and policies for financial assistance are in place.

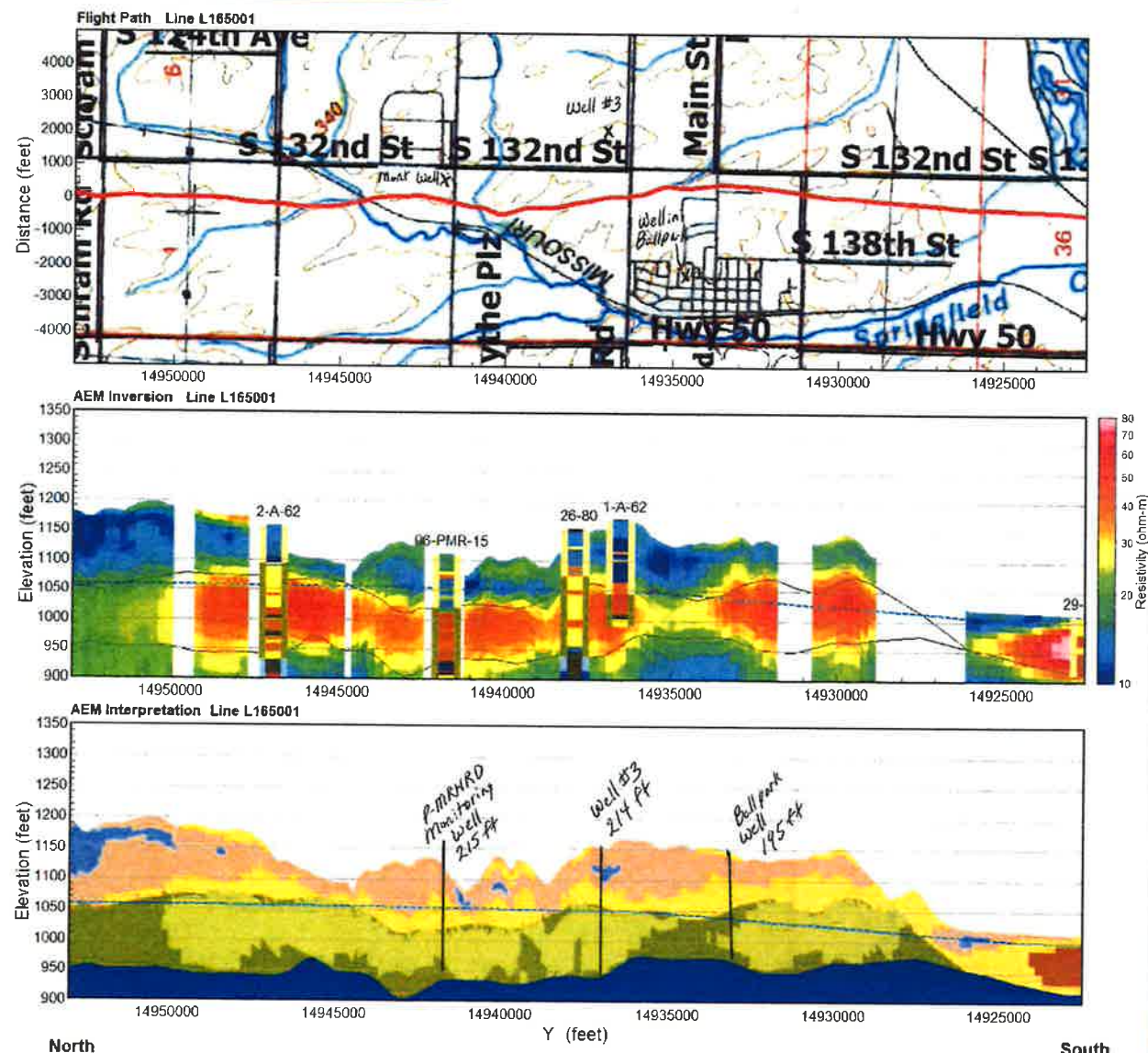
UNL has prepared the enclosed research agreement with the District to have a drilling crew collect six different soil sample cores up to 70 feet deep above the groundwater table, see Figure 3, and then have those cores tested every two feet for nitrate levels. Soil properties will also be tested in the lab to characterize the nitrate source and time of travel. The proposed cost to the District is a fixed price of \$20,999.

**Management recommends that the Subcommittee recommend to the Board that the General Manager be authorized to execute the proposed research agreement with the University of Nebraska-Lincoln for a vadose zone nitrate study near Springfield, NE for a fixed cost of \$20,999, subject to changes deemed necessary by the General Manager and approval as to form by District Legal Counsel.**

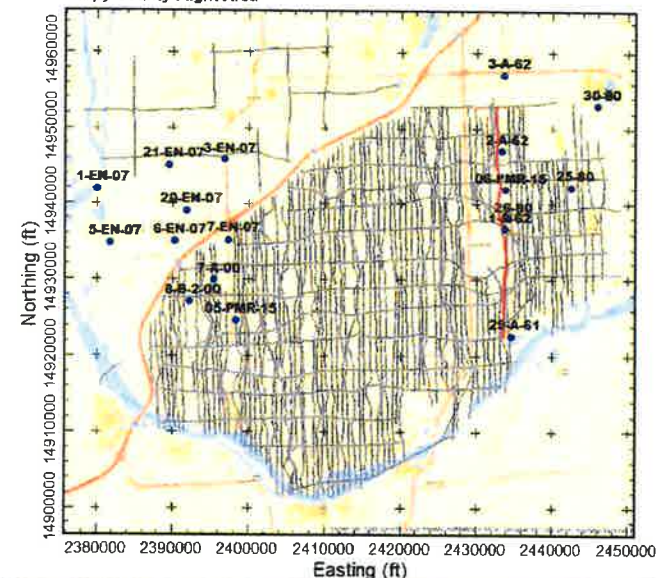


**Figure 1 – Map of Springfield WHPA and AEM derived Sandstone Pocket Aquifer**

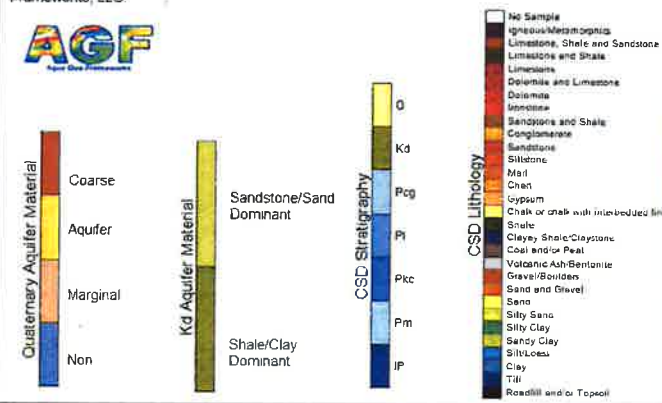




Sarpy County Flight Area



Results of the final inversion of Airborne Electromagnetic (AEM) data collected along flight lines within the Papio-Missouri River Natural Resources District July 27-28, 2016 (gray lines on Sarpy County Flight Area Map). The red line on the Flight Path Map and the Sarpy County Flight Area Map indicates the current profile. The inversions shown are Spatially-Constrained using the Aarhus Geo Software Workbench version 5.2.2.0. Boreholes are from the Conservation Survey Division (CSD) public website downloaded on April 22, 2016 (blue dots). Gray dashed lines on the AEM inversion profile represent the Depth of Investigation (DOI). CSD boreholes within 1/4 mile of the flight line are shown on the AEM inversion profile indicating lithology and stratigraphy when available. White gaps in the AEM inversion profile indicate gaps in data coverage due to electromagnetic coupling or areas that were not flown due to infrastructure. Black lines on the AEM inversion profile indicate stratigraphic contacts. The blue dashed line on the AEM Inversion and AEM Interpretation profiles indicates the CSD 1995 water table. Colors on the AEM Interpretation profile indicate interpreted aquifer material types and stratigraphy. Prepared for the Papio-Missouri River Natural Resources District by Aqua Geo Frameworks, LLC.



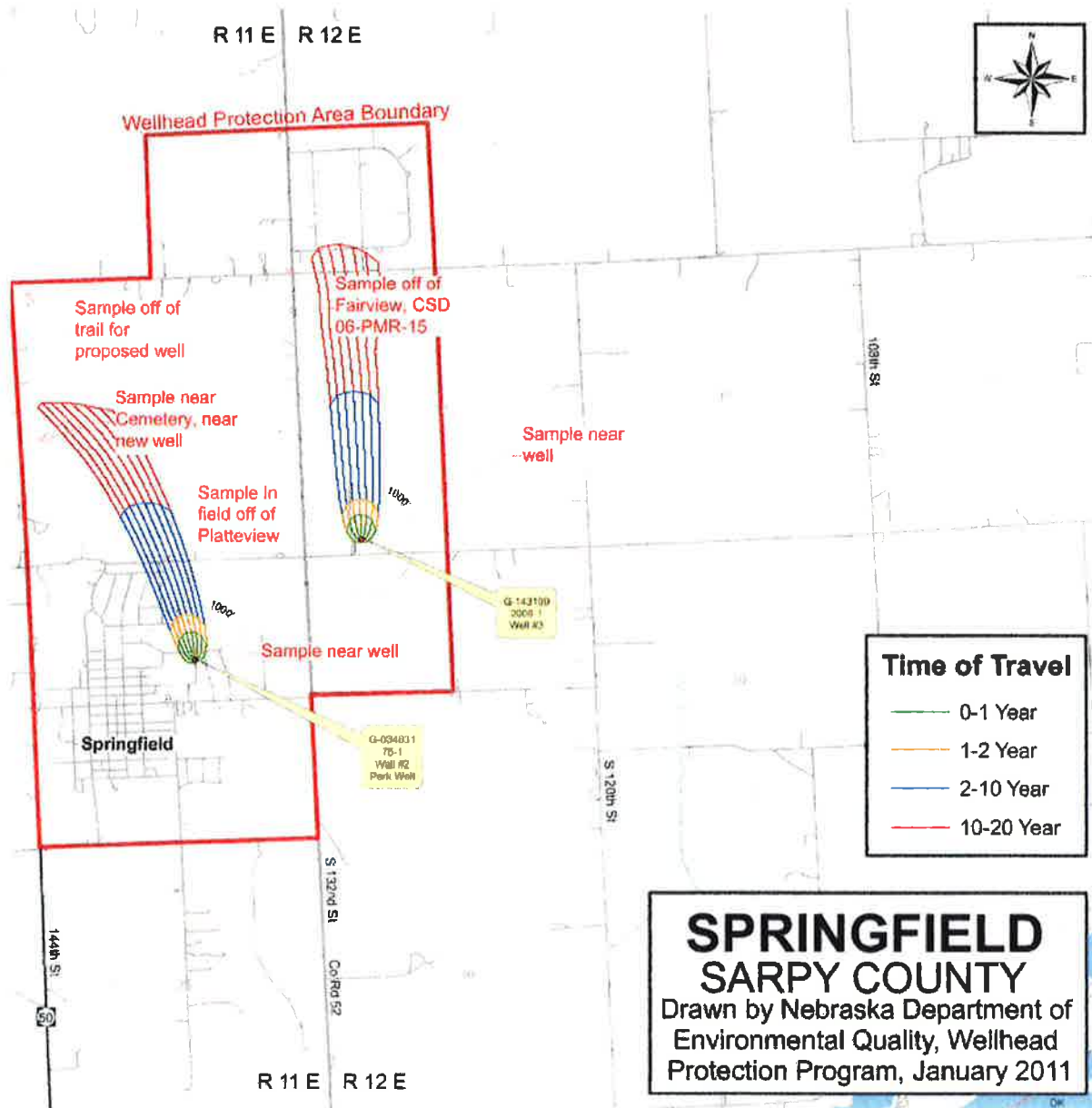


Figure 3 – Proposed location of vadose zone samples in relation to Springfield’s WHPA.

**OFFICE OF SPONSORED PROGRAMS**

**RESEARCH AGREEMENT #122107**

**RESEARCH AGREEMENT** (the "Agreement") between the Board of Regents of the University of Nebraska on behalf of the University of Nebraska-Lincoln, a non-profit, public educational institution of the State of Nebraska, hereinafter referred to as "UNL", and Papio-Missouri River Natural Resources District, located at 8901 S 154<sup>th</sup> St., Omaha, NE 68138, hereinafter referred to as the "Sponsor". Party shall mean the Sponsor or UNL as the context dictates, and when used in the plural, shall mean the Sponsor and UNL.

**WHEREAS**, the research program contemplated by this Agreement is of mutual interest and benefit to UNL and to the Sponsor, and will further the instructional and research objectives of UNL in a manner consistent with its status as a non-profit, tax-exempt, educational institution.

**NOW, THEREFORE**, the Parties hereto agree as follows:

1. **STATEMENT OF WORK.** UNL agrees to use reasonable efforts to perform the research program as described in Attachment A (the "Research") which is incorporated and made part of this Agreement.
2. **PRINCIPAL INVESTIGATOR.** The Research will be supervised by Dr. Daniel Snow the "Principal Investigator". If, for any reason, Dr. Snow is unable to continue to serve as Principal Investigator and a successor acceptable to both UNL and the Sponsor is not available, this Agreement shall be terminated as provided in Article 8.
3. **PERIOD OF PERFORMANCE.** The Research shall be conducted during the period 02/01/2018 (the "Effective Date") through 04/01/2019 (the "Completion Date"). The Completion Date may be modified or extended only by mutual written agreement of the Parties.
4. **DESIGNATION.** For the purposes of this Agreement, "Cost" is defined as all direct and indirect costs incurred by UNL in performing the Research. This Agreement is designated as a Fixed-Price Agreement and the anticipated budget is \$20,999.

Sponsor will pay UNL the Cost as indicated in Article 5 below. The parties estimate that the Cost is sufficient to support the Research. UNL may submit to Sponsor a revised budget requesting additional funds if Sponsor requests a change in the Research scope of work. Sponsor will not be liable for any payment in excess of Cost except as per Sponsor's written agreement. UNL has the authority to rebudget costs at the discretion of the Principal Investigator, as long as the rebudgeting is consistent with the goals of the Research. Sponsor is not entitled to any refund of funds not spent if all Research commitments have been met.

5. **PAYMENT.** A payment equal to 50% (\$10,499.50) of the total contract amount will be made upon signing. Thereafter, payment(s) shall be made to UNL by the Sponsor in accordance with the following schedule in U.S. dollars:

|            |                |
|------------|----------------|
| \$5,249.75 | due 08/01/2018 |
| \$5,249.75 | due 04/01/2019 |

Checks shall be made payable to the University of Nebraska (ID #47-0049123).

Checks shall be mailed to:

University of Nebraska-Lincoln  
 Sponsored Programs  
 151 Prem S. Paul Research Center  
 2200 Vine Street  
 PO Box 830861  
 Lincoln, NE 68583-0861

For identification purposes, each payment shall include the Research Agreement number, title of the Research Project and the name of the Principal Investigator.

At the conclusion of each payment event, UNL will invoice the Sponsor for the appropriate amount, and the Sponsor will pay any undisputed invoice within thirty (30) days of receipt of that invoice by the Sponsor. Any amount not received by the due date so noted in the invoice will be subject to interest on the unpaid principal balance at the rate specified in Neb. Rev. Stat. § 45-104.02, as such rate may from time to time be adjusted.

|   |               |
|---|---------------|
| The invoice may be sent by the following method(s): | With copy to: |
| EMAIL: pwoodward@pacionrd.org                       | EMAIL:        |
| FAX:  | FAX:          |
| POSTAL: 8901 S. 154th Street                        | POSTAL:       |
| Omaha, NE 68138-3621                                |               |

*UNL's institutional preference for sending invoices is via electronic mail*

6. **TAXES.** UNL is a non-profit, public educational institution. Sponsor agrees that if this Agreement is subject to taxation by any governmental authority, Sponsor will pay these taxes in full. UNL will have no liability for payment of these taxes.
7. **EXPENDABLES AND EQUIPMENT.** UNL owns all expendables and equipment purchased or fabricated to perform the Research.
8. **TERMINATION.** Performance under this Agreement may be terminated by either Party upon sixty (60) days' prior written notice to the other Party. Upon termination by either Party, UNL will be reimbursed as specified in Article 5 for all costs and non-cancelable commitments incurred in the performance of the Research up to and including the effective date of termination, such reimbursement not to exceed the total estimated cost specified in Article 5. If any UNL student is supported under this Agreement, Sponsor will remain responsible for the full cost of the student support through the academic semester if this Agreement is terminated.

In the event that either Party hereto shall commit any breach of or default in any of the terms or conditions of the Agreement, and also shall fail to remedy such default or breach within thirty (30) days after receipt of written notice thereof from the other party hereto, the party giving notice may, at its option and in addition to any other remedies which it may have at law or in equity, terminate this Agreement by sending notice of termination in writing to the other party to such effect. Such termination shall be effective as of the date of receipt of such notice.

Termination of this Agreement by either party for any reason shall not affect the rights and obligations of the parties accrued prior to the effective date of the termination of this Agreement. No termination of the Agreement, however effectuated, shall release the parties from their rights and obligations under Articles 4, through 16, inclusive, and Article 20.

- 9. CONFIDENTIAL INFORMATION.** The University and the Sponsor agree that any "Confidential Information" as defined herein, shall be handled according to the following terms the parties have chosen, indicated below by their initials:

"Confidential Information" hereunder shall mean any materials, written information, and data marked "Confidential" by either party or non-written information and data disclosed by either party that is identified at the time of disclosure to the receiving party as confidential and is reduced to writing and transmitted to the receiving party within thirty (30) days of such non-written disclosure. Each party agrees to use the same degree of care it uses to protect its own confidential information and, to the extent permitted by law, to maintain as confidential for a period of three (3) years the Confidential Information. The obligations of confidentiality set forth herein shall not apply to any Information which is:

- A. possessed by the receiving party, other than through prior disclosure by the disclosing party, as evidenced by the receiving party's written records and which was not acquired directly or indirectly from the disclosing party;
- B. in the public knowledge at the time of disclosure;
- C. published or available to the general public after disclosure, otherwise than through a breach of this Agreement;
- D. obtained by the receiving party from a third party with a valid right to disclose such Information, provided that said third party is not under a confidentiality obligation to the disclosing party or any other third party;
- E. independently developed by the receiving party without reference to the disclosing party's Confidential Information as shown by the receiving party's written records; or
- F. required to be disclosed by legal process, or subject to the obligations of the University pursuant to the provisions of the Nebraska Public Records Act, Neb. Rev. Stat. §84-712 et. seq.

- 10. PUBLICATIONS.** UNL will be free to publish the results of the Research in whole or in part, provided that UNL complies with this Article 10. UNL agrees to provide Sponsor with a copy of each manuscript, presentation, poster, and/or any other form of public disclosure intended to be presented visually or audibly or in writing to any third party or organization disclosing the Research ("Manuscript") at least thirty (30) days prior to its submission, presentation, and/or disclosure to any third party or organization ("Publication"). Within thirty (30) days of receipt of the Manuscript, Sponsor may request delay in Publication for a period not to exceed an additional sixty (60) days (or some longer period of time as agreed to by the Parties) from the date Sponsor gives notice to UNL that patentable subject matter is included in such Manuscript to allow for the filing of appropriate intellectual property protection. If Sponsor notifies UNL of subject matter in any such Manuscript that should be



protected, UNL agrees to coordinate with Sponsor the disclosure, drafting and filing such intellectual property protection prior to Publication of the Manuscript as provided in Article 13 below within the time period referenced herein. If Sponsor does not make a written request for such delay within thirty (30) days after receipt of a Manuscript, UNL shall be free to publish the Manuscript at any time after the end of the thirty (30) days. UNL agree to remove any Sponsor Confidential Information (as defined in Article 9, or in Attachment B, as applicable) that is identified by Sponsor as Confidential Information prior to publication. Pursuant to the policies of the University and traditional academic practice, the author(s) of such publications shall retain ownership of all copyright interest thereto.

**11. SPONSOR INTELLECTUAL PROPERTY.** Title to any invention made solely by the Sponsor's personnel without the use of UNL administered funds or facilities ("Sponsor Invention") shall remain with the Sponsor. Title to and the right to determine the disposition of any copyrights or copyrightable material first produced or composed in the performance of the Research solely by employees of the Sponsor without the use of UNL administered funds or facilities ("Sponsor Copyright") shall remain with the Sponsor. Neither Sponsor Inventions nor Sponsor Copyrights shall be subject to the terms and conditions of this Agreement.

**12. JOINT INTELLECTUAL PROPERTY.**

- A. TITLE TO JOINT INVENTIONS. Inventions made jointly by employees and/or students of UNL and employees of the Sponsor in the performance of the Research or inventions made solely by employees of the Sponsor with use of UNL administered funds or facilities ("Joint Inventions") shall be jointly owned by both Parties. The Sponsor shall be notified of any Joint Invention promptly after an invention disclosure is received by UNL. UNL shall have the first right to file a patent application on a Joint Invention in the names of both Parties. All expenses incurred in obtaining and maintaining any patent on such Joint Invention shall be equally shared except that if one Party declines to share in such expenses, the other Party may take over the prosecution and maintenance thereof, at its own expense, provided that title to the patent remains in the names of both Parties. It is agreed that any disputes in inventorship will be determined by a patent attorney mutually agreed upon by Sponsor and UNL.
- B. LICENSING OPTIONS. Each Party shall have the independent, unrestricted right to license to third parties any such Joint Invention without accounting to the other Party, except that the Sponsor shall be entitled to elect an exclusive license to UNL's interest in a Joint Invention as provided under Article 13.B.2 below.
- C. JOINTLY DEVELOPED COPYRIGHTABLE MATERIALS. Copyrightable materials, including computer software (but not including scholarly publications pursuant to Article 10) , developed jointly in the performance of the Research by employees and/or students of UNL and employees of the Sponsor, or copyrightable materials, including software, developed solely by employees of the Sponsor with use of UNL administered funds or facilities, shall be jointly owned by both Parties, who shall each have the independent, unrestricted right to dispose of such copyrightable materials as they deem appropriate, without any obligation of accounting to the other Party.

**13. UNL INTELLECTUAL PROPERTY.**



- A. **TITLE TO INVENTIONS.** Title to any invention conceived or first reduced to practice solely by employees and/or students of UNL in the performance of the Research ("UNL Invention") shall remain with UNL. The Sponsor shall be notified of any UNL Invention promptly after a disclosure is received by UNL. UNL (i) may file a patent application at its own discretion or (ii) shall do so at the request of the Sponsor and at the Sponsor's expense.
- B. **LICENSING OPTIONS.** In the event that a patent application on a UNL Invention is filed by UNL, for each UNL Invention, UNL hereby grants the Sponsor a non-exclusive, non-transferable, royalty-free license for internal research purposes. The Sponsor shall further be entitled to elect one of the following license options by notice in writing to UNL within four (4) months after UNL's notification to the Sponsor that a patent application has been filed:
1. a non-exclusive, non-transferable, world-wide, royalty-free license without the right to sublicense (in a designated field of use, where appropriate) to the Sponsor to make, have made, use, lease, sell and import products embodying or produced through the use of such invention, provided that the Sponsor agrees to (i) demonstrate reasonable efforts to commercialize the technology in the public interest and (ii) pay all patent prosecution and maintenance costs in all countries, including the United States, in which the Sponsor is granted a non-exclusive license right under this Article; or
  2. a royalty-bearing, limited-term, exclusive license (subject to third party rights, if any) to the Sponsor, including the right to sublicense, in the United States and/or any foreign country elected by the Sponsor (subject to Article C below), to make, have made, use, lease, sell and import (in a designated field of use, where appropriate) products embodying or produced through the use of such invention, provided that the Sponsor agrees to reimburse UNL for the costs of patent prosecution and maintenance in the United States and any elected foreign country and further agrees that any products produced pursuant to this license, and that are sold in the United States, shall be substantially manufactured in the United States. This license option is subject to UNL's concurrence and the negotiation of commercially reasonable terms and conditions within three (3) months after selection of this option.
- C. **FOREIGN FILING ELECTION.** If the Sponsor elects a license under Article 13.B.1 or Article 13.B.2, the Sponsor shall notify UNL of those foreign countries in which it desires a license in sufficient time for UNL to satisfy the patent law requirements of those countries. The Sponsor will reimburse UNL for the out-of-pocket costs, including patent filing, prosecution and maintenance fees, related to those foreign filings.
- D. **CONFIDENTIALITY OF INVENTION DISCLOSURES.** The Sponsor shall retain all invention disclosures submitted to the Sponsor by UNL in confidence and use its best efforts to prevent their disclosure to third parties. The Sponsor shall be relieved of this obligation only when this information becomes publicly available through no fault of the Sponsor.
- E. **COPYRIGHT OWNERSHIP AND LICENSES.** Excluding scholarly publications dealt with pursuant to Article 10 above, Title to and the right to determine the disposition of any other copyrights or copyrightable material first produced or composed in the performance of the Research solely by employees and/or students of UNL shall remain with UNL.

1. For any copyrights or copyrightable material other than computer software and its documentation and/or informational databases required to be delivered in accordance with Attachment A, the Sponsor is hereby granted an irrevocable, royalty-free, non-transferable, non-exclusive right and license to use, reproduce, make derivative works, display, distribute and perform all such copyrightable materials for the Sponsor's internal purposes.
  2. For a period of four (4) months following UNL's notification or delivery to the Sponsor of computer software and its documentation and/or informational databases required to be delivered to the Sponsor in accordance with Attachment A, the Sponsor shall be entitled to elect a royalty-free, non-transferable, non-exclusive right and license to use, reproduce, make derivative works, display, and distribute to end users, such computer software and its documentation and/or databases for internal and/or commercial purposes. If the use of the software would infringe claims of a patent application filed pursuant to Article 13.A above, then the Sponsor will need to exercise its license rights in such patent as set forth in Article 13.B above. If such computer software is a derivative of UNL software existing prior to the start of the Research, then such license may not be royalty-free.
- F. RIGHTS IN TRP. In the event that UNL elects to establish property rights other than patents to any tangible research property (TRP), including but not limited to biological materials, developed during the course of the Research, UNL and the Sponsor will determine the disposition of rights to such property by separate agreement. UNL will, at a minimum, reserve the right to use and distribute TRP for non-commercial research purposes.
- G. LICENSE EFFECTIVE DATE. All licenses elected by the Sponsor pursuant to Sections B, E and F of this Article 13 become effective as of the date the Parties sign a subsequent license agreement.
- H. BACKGROUND INTELLECTUAL PROPERTY.
- NOTE: UNL reviews all proposed Research to determine whether there is background intellectual property created by the Principal Investigator that might be relevant to the proposed Research. If such background intellectual property is identified, UNL shall inform the Sponsor prior to the execution of this Agreement, amend this Section H of Article 13 and discuss its implications.*
- I. NUTECH VENTURES. UNL has entered into an agreement with NUtech Ventures ("NUtech"), a 501(c)(3) supporting organization of UNL, whereby upon assignment from UNL NUtech has the exclusive worldwide rights to market and commercialize any UNL patent rights, copyrights, inventions or discoveries and technology derived therefrom ("UNL IP"). NUtech is also responsible for obtaining patent or copyright protection, or otherwise protecting or disposing of UNL IP as it sees fit. UNL may assign its interest to UNL IP under this Agreement to NUtech without further approval from Sponsor.
- 14. USE OF NAMES.** Sponsor and its affiliates shall not use the name "University of Nebraska" or any variation, adaptation, or abbreviation thereof, or the name of any of UNL's trustees, officers, faculty members, students, employees, or agents, or any trademark owned by UNL, in any promotional material or other public announcement or disclosure without the prior written consent of UNL's Vice Chancellor for Business and Finance, which consent UNL may withhold in its sole discretion.

**15. REPRESENTATIONS AND WARRANTIES.** UNL MAKES NO REPRESENTATIONS OR WARRANTIES OF ANY KIND, EXPRESS OR IMPLIED, CONCERNING THE RESEARCH OR ANY INTELLECTUAL PROPERTY RIGHTS, INCLUDING, WITHOUT LIMITATION, WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, NONINFRINGEMENT, VALIDITY OF ANY INTELLECTUAL PROPERTY RIGHTS OR CLAIMS, WHETHER ISSUED OR PENDING, AND THE ABSENCE OF LATENT OR OTHER DEFECTS, WHETHER OR NOT DISCOVERABLE. Specifically, and not to limit the foregoing, UNL makes no warranty or representation (i) regarding the validity or scope of the Research or any intellectual property rights optioned or granted hereunder and (ii) that the exploitation of the Research or any intellectual property rights will not infringe any patents or other intellectual property rights of UNL or of a third party.

IN NO EVENT SHALL EITHER PARTY, ITS TRUSTEES, DIRECTORS, OFFICERS, EMPLOYEES, STUDENTS AND AFFILIATES, BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES OF ANY KIND, INCLUDING ECONOMIC DAMAGES OR INJURY TO PERSONS OR PROPERTY AND LOST PROFITS, REGARDLESS OF WHETHER THE PARTY WAS ADVISED, HAD OTHER REASON TO KNOW OR IN FACT KNEW OF THE POSSIBILITY OF THE FOREGOING. THIS ARTICLE 13 SHALL SURVIVE THE EXPIRATION OR ANY EARLIER TERMINATION OF THIS AGREEMENT.

**16. INDEMNIFICATION.** Sponsor shall indemnify and hold harmless Principal Investigator and UNL, its governing board, officers, agents, and employees from any liability, loss or damage they may suffer as the result of claims, demands, judgments against them, or costs incurred arising out of the activities to be carried out pursuant to this Agreement, provided however, that any such liability, loss or damage resulting from the following are excluded from this agreement to indemnify and hold harmless:

- A. Unreasonable failure to adhere to the provisions of the Statement of Work;
- B. Failure to comply with any applicable government regulations; or
- C. Gross negligence or willful malfeasance by the Principal Investigator, UNL, its officers, agents, or employees.

**17. NOTICES.** Any notices required to be given or which shall be given under this Agreement shall be in writing and be addressed to the Parties as shown below. Notices shall be delivered by certified or registered first class mail (air mail if not domestic) or by commercial courier service and shall be deemed to have been given or made as of the date received.

If to UNL:                      University of Nebraska - Lincoln  
Director, OSP  
151 Prem S. Paul Research Center  
2200 Vine Street  
PO Box 830861  
Lincoln, NE 68583-0861

With copy to:                Daniel Snow  
WL 202A, UNL  
Lincoln, NE 68583-0844

If to Sponsor: Paul W. Woodward  
8901 S. 154th Street  
Omaha, NE 68138-3621

- 18. ASSIGNMENT.** Neither party shall assign this Agreement to another without the prior written consent of the other party hereto. Any other purported assignment shall be void.
- 19. INDEPENDENT CONTRACTOR.** In the performance of all activities hereunder, (i) UNL shall be deemed to be and shall be an independent contractor, and as such, shall not be entitled to any benefits applicable to employees of the Sponsor, and (ii) neither party is authorized or empowered to act as agent for the other for any purpose and shall not on behalf of the other enter into any contract, warranty, or representation as to any matter. Neither party shall be bound by the acts or conduct of the other.
- 20. GOVERNING LAW.** This Agreement shall be governed by the laws of the State of Nebraska.
- 21. FORCE MAJEURE.** Neither Party shall be responsible to the other for failure to perform any of the obligations imposed by this Agreement, provided such failure shall be occasioned by fire, flood, explosion, lightning, windstorm, earthquake, subsidence of soil, failure or destruction, in whole or in part, of machinery or equipment, or failure of supply of materials, discontinuity in the supply of power, governmental interference, civil commotion, riot, war, strikes, labor disturbance, transportation difficulties, labor shortage or any cause beyond its reasonable control.
- 22. EXPORT CONTROLS.** UNL is subject to United States laws and regulations controlling the export of goods, software and technology including technical data, laboratory prototypes and other commodities. UNL's policy is to comply with all applicable laws and regulations including the Arms Export Control Act, the International Traffic in Arms Regulations ("ITAR"), the Export Administration Regulations ("EAR") and the laws and regulations implemented by the Office of Foreign Assets Control, U.S. Department of the Treasury ("OFAC"). Diversion contrary to U.S. law is prohibited. The transfer of certain technical data, services and commodities may require a license from the cognizant agency of the United States Government and/or written assurances by the Sponsor that the Sponsor will not re-export or retransfer the data or commodities, other than prohibited information, to certain foreign countries without prior approval of the cognizant U.S. government agency. While UNL agrees to cooperate in securing any license which the cognizant agency deems necessary in connection with this Agreement, UNL cannot guarantee that such licenses will be granted. The Sponsor agrees to obtain permission from the U.S. government to re-transfer or re-export for any goods, software and technology that requires such authorization and will not allow any U.S.-origin goods, software or technology to be used for any purposes prohibited by United States law, including, without limitation, support for terrorism or for the development, design, manufacture or production of nuclear, chemical or biological weapons of mass destruction.
- 23. ENTIRE AGREEMENT.** Unless otherwise specified, this Agreement and its Attachments embody the entire understanding between UNL and the Sponsor for the Research, and any prior or contemporaneous representations, either oral or written, are hereby superseded. No amendments or changes to this Agreement, including without limitation; changes in the statement of work, period of performance or total estimated cost, shall be effective unless made in writing and signed by



authorized representatives of the Parties. In the event of any inconsistency between the terms of this Agreement and the documents referenced or incorporated into this Agreement, the terms of this Agreement prevail.

- 24. COUNTERPARTS.** This Agreement and any amendment hereto may be executed in counterparts and all such counterparts taken together shall be deemed to constitute one and the same instrument. If this Agreement is executed in counterparts, no signatory hereto will be bound until all the Parties named below have duly executed a counterpart of this Agreement.
- 25. COMPLIANCE WITH CIVIL RIGHTS LAWS AND EQUAL OPPORTUNITY EMPLOYMENT.** Sponsor shall comply with all applicable local, State and Federal statutes and regulations regarding civil rights laws and equal opportunity employment. Neither Sponsor nor any subcontractors shall discriminate against any employee or applicant for employment, to be employed in the performance of this Agreement, with respect to the employee or applicant's hire, tenure, terms, conditions or privileges of employment, because of his or her race, color, religion, sex, disability or national origin.
- 26. ELECTRONIC SIGNATURES.** The parties to this Agreement agree that a copy of the original signature (including an electronic copy) may be used for any and all purposes for which the electronic signature may have been used. The parties further waive any right to challenge the admissibility or authenticity of this Agreement in a court of law based solely on the absence of an original signature.

[Signature Page Follows]

**IN WITNESS WHEREOF**, the Sponsor and UNL, intending to be legally bound, have executed this Agreement as of the Effective Date by their respective duly authorized representatives.

**BOARD OF REGENTS OF THE  
UNIVERSITY OF NEBRASKA**

**SPONSOR**

Signature: \_\_\_\_\_

Signature: \_\_\_\_\_

Name: Jeanne Wicks

Name: \_\_\_\_\_

Title: Director, Office of Sponsored Programs

Title: \_\_\_\_\_

Date: \_\_\_\_\_

Date: \_\_\_\_\_

**Principal Investigator's Acknowledgement:**

I have read this Agreement and agree to perform my obligations as Principal Investigator under this Agreement. I will inform students and other participants performing research services of the terms and conditions of this Agreement.

Signature: \_\_\_\_\_

Name: Daniel Snow

Date: \_\_\_\_\_

**ATTACHMENT A**

**UNL STATEMENT OF WORK**

**The following information outlined in this Statement of Work consists of confidential, proprietary business information and unpublished research. Unauthorized disclosure is strictly prohibited.**

**Vadose Zone Nitrate – Springfield, Nebraska**  
**Draft Statement of Work for Papio-Missouri Natural Resources District**  
**January 2018**

**Daniel D. Snow and Chittaranjan Ray - University of Nebraska**

This task includes conducting an investigation of the vadose (unsaturated) zone of locations identified for characterization of nitrate and agrichemical contaminant occurrence and transport in the Springfield, Nebraska municipal wellhead protection area in Sarpy County (Figure 1). Test holes will be drilled to collect and characterize soil types and physical properties, and chemical analysis will be

conducted on selected core samples. The sampling plan, collection, and chemical analysis will be led by Dr. Daniel Snow, Nebraska Water Sciences Laboratory and based on an approved Quality Assurance and Protection Plan (QAPP). The Papio-Missouri Natural Resources District (NRD) will contact land owners and provide logistical support for sample collection. The results will be summarized in a Technical Report including datasets, geologic classification and chemical analysis of the core intervals, water samples (if included) and other interpretations.

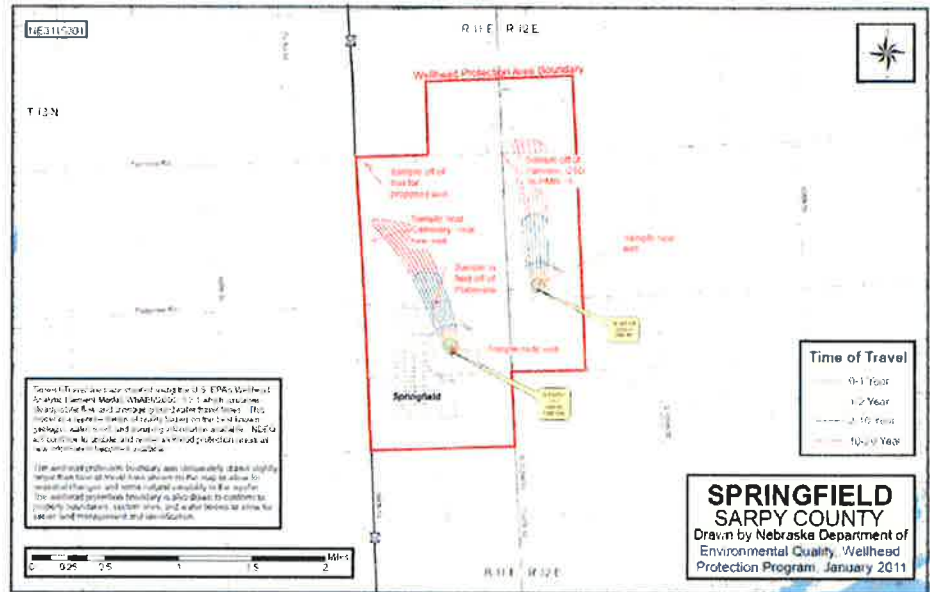


Figure 1. Wellhead protection area for Springfield, Nebraska in the Papio-Missouri Natural Resources District (NRD).

**Elements of this task include:**

- Review and document previous analytical results of vadose zone monitoring in the area.
- Develop a sampling plan and QAPP if required to conduct the vadose sampling.
- Continuous cores will be collected, described and geologically classified, composited subsamples analyzed chemically every 2 to 5 feet.
- Selected core subsamples will be analyzed for nitrate, arsenic, uranium, other inorganics and isotope analysis and results graphed to indicate changes in composition versus depth below the surface.
- Subsamples of a few undisturbed core intervals will be collected to measure hydraulic conductivity using moisture release method
- Calculate the nitrate amount in the vadose zone by lbs./acre and at discrete depths.
- Estimate the vertical transit rate of water and nitrate or other chemicals at specific locations using data obtained from the vadose zone and ground water samples



## **Description of work**

The University of Nebraska will compare the profiles of nitrate to any previously collected vadose zone core profiles to determine where additional cores may provide the best overall information to characterize nitrate storage and estimated transport rates to the water table. After agreement on the locations for coring, the Papio-Missouri NRD will obtain permission to collect core samples. After permission has been obtained from the landowner by the Papio-Missouri NRD, the University of Nebraska will arrange and schedule core collection using the Nebraska Conservation and Survey drilling equipment and crew. Depending on weather and availability of the drilling crew, coring will be scheduled in spring or late fall of 2018. Sites with agricultural crops will be sampled either before the growing season or after harvest to minimize distribution of landowner activities. The driller will be responsible for ensuring the locations have been checked for underground cables and utilities. The University of Nebraska will determine the best method for coring, schedule collection of cores, collect cores, store and then process cores using approved methods. Total depth for vadose zone characterization will be from the surface to the water table. Existing test holes and well logs from the area suggest that the vadose zone is characterized by 20-30 feet of silts (loess) overlying another 30-40 feet of clay or glacial till which overly alluvial sands and gravels.

Cores will be divided in to 2' intervals and subsamples immediately collected for determination of gravimetric moisture content. The remaining core will be air dried and composited by grinding and mixing. Ground and dried subsamples of composites will be extracted for nitrate and ammonia using 1M KCl<sup>1</sup>. Particle sizes will be measured using wet sieving and pipette methods<sup>2</sup>. Sediment pH will be measured using 0.01 M CaCl<sub>2</sub> slurry. Nitrate and ammonia will be extracted using 1M KCl and analyzed using a Lachat 8500 autoanalyzer by Cd reduction and salicylate colorimetric methods<sup>1</sup>. Additionally, undisturbed cores will be retrieved from appropriate depths (based on geologic heterogeneity) to determine bulk density, saturated hydraulic conductivity, and water retention properties, which will be useful for travel time analysis in the vadose zone.

Detailed textural descriptions will be compared to measurements of nitrate-N, ammonia-N, pH, moisture and lithology. If requested as part of the project, stable isotope analysis of nitrate from either the vadose zone or wells in the area will be used to characterize the nitrate sources and transport. Determination of water retention properties and hydraulic conductivity of undisturbed cores will help estimating rate of travel of nitrate pulse to ground water. Repeated coring at specific locations will permit correlation of nitrate concentration profiles and potentially provide *in situ* estimates of transport and attenuation rates. Calibration of vadose zone transport calculations at these locations could permit more accurate estimates of transport rates at new sites. Finally, accurate assessment of the occurrence and potential leaching rates beneath specific land uses can help land and water resource managers identify areas where the most effort should be placed on managing fertilizer application and irrigation practices. A standardized protocol for collecting and analyzing vadose zone cores is currently being developed to collect vadose zone data used in estimating nitrate occurrence and transport potential. This project will help in development of this standardized protocol.

## **Budget**

The project budget will be used to support coring by the Nebraska Conservation and Survey using either direct-push or hollow stem auger drilling techniques. Shallow cores (<50' below the

surface) will generally be collected using the direct push methods, while deeper cores will be collected using hollow stem auger. Auger or direct-push sampling cores can be collected at the rate of 1 to 1.5 per day, and the rate for each approach is \$1000 per day including the operator and assistant. Laboratory costs will include analysis of an average of 40 composite samples per core for gravimetric moisture, ammonia and nitrate-N, pH, and particle size (%clay, silt, sand). Pesticides, uranium and arsenic will be measured in subsamples from 1-2 cores (20 samples x \$100 per sample). Up to 10 ground water samples may be collected from area monitoring wells for nitrate isotopes (\$80 each). Partial salary support for Dr. Snow and summer support (3-months) for a graduate student stipend will be used to cover costs for laboratory processing, data reduction, analysis and generation of final report. Data from this project will be formatted and provided to existing NDEQ-NET Vadose Zone database. Laboratory measurements of hydraulic conductivity, using pressure plate extractors, and *in situ* measurements using a Geoprobe Hydraulic Profiling Tool (HPT) will be included at no additional project cost.

**UNL Subcontract Budget (February 1, 2018-April 1, 2019)**

| <b>UNL Basic Request Budget</b>    |                  |      |               |          |               |
|------------------------------------|------------------|------|---------------|----------|---------------|
|                                    | Person<br>Months |      | Year 1        | Year 2   | Total         |
| <i>Senior Personnel</i>            | Yr1              | Yr2  |               |          |               |
| Dan Snow                           | 0.50             | 0.00 | 3,954         | -        | 3,954         |
| <b>Total Senior Personnel</b>      |                  |      | <b>3,954</b>  | <b>-</b> | <b>3,954</b>  |
| <i>Other Personnel</i>             | # of Ppl         |      |               |          |               |
| Post Docs                          | 0                | 0    | -             | -        | -             |
| Other Professionals                | 0                | 0    | -             | -        | -             |
| Graduate Students                  | 0.25             | 0.00 | 4,625         | -        | 4,625         |
| Undergraduate Students             | 0                | 0    | -             | -        | -             |
| Secretarial                        | 0                | 0    | -             | -        | -             |
| Other                              | 0                | 0    | -             | -        | -             |
| <b>Total Other Personnel</b>       |                  |      | <b>4,625</b>  | <b>-</b> | <b>4,625</b>  |
| Fringe Benefits                    |                  |      | 3,379         | -        | 3,379         |
| <b>Total Salaries and Benefits</b> |                  |      | <b>11,958</b> | <b>-</b> | <b>11,958</b> |
| Equipment                          |                  |      | -             | -        | -             |
| Travel                             |                  |      | -             | -        | -             |
| Supplies                           |                  |      | -             | -        | -             |
| Subawards                          |                  |      | -             | -        | -             |
| Other                              |                  |      | 7,300         | -        | 7,300         |
| <b>Total Other Direct Costs</b>    |                  |      | <b>7,300</b>  | <b>-</b> | <b>7,300</b>  |
| <b>Total Direct Costs</b>          |                  |      | <b>19,258</b> | <b>-</b> | <b>19,258</b> |
| F&A Base                           | MTDC             |      | 17,408        | -        | 17,408        |
| F&A                                | 10.0%            |      | 1,741         | -        | 1,741         |
| <b>Total Request</b>               |                  |      | <b>20,999</b> | <b>-</b> | <b>20,999</b> |

#### References

1. Spalding, R. F.; Kitchen, L. A., Nitrate in the intermediate vadose zone beneath irrigated cropland. *Ground Water Monitoring & Remediation* **1988**, 8, (2), 89-95.
2. ASTM, Standard Test Method for Particle-Size Analysis of Soils **2014**, *ASTM D422-63*.

**ATTACHMENT B**  
**ANCILLARY CONFIDENTIALITY AGREEMENT**

**NOT APPLICABLE**



**ATTACHMENT C**

**BUDGET**

|                                    | Person Months |      | Year 1        | Year 2   | Total         |
|------------------------------------|---------------|------|---------------|----------|---------------|
| <i>Senior Personnel</i>            | Yr1           | Yr2  |               |          |               |
| Dan Snow                           | 0.50          | 0.00 | 3,954         | -        | 3,954         |
| <b>Total Senior Personnel</b>      |               |      | <b>3,954</b>  | <b>-</b> | <b>3,954</b>  |
| <i>Other Personnel</i>             | # of Ppl      |      |               |          |               |
| Post Docs                          | 0             | 0    | -             | -        | -             |
| Other Professionals                | 0             | 0    | -             | -        | -             |
| Graduate Students                  | 0.25          | 0.00 | 4,625         | -        | 4,625         |
| Undergraduate Students             | 0             | 0    | -             | -        | -             |
| Secretarial                        | 0             | 0    | -             | -        | -             |
| Other                              | 0             | 0    | -             | -        | -             |
| <b>Total Other Personnel</b>       |               |      | <b>4,625</b>  | <b>-</b> | <b>4,625</b>  |
| Fringe Benefits                    |               |      | 3,379         | -        | 3,379         |
| <b>Total Salaries and Benefits</b> |               |      | <b>11,958</b> | <b>-</b> | <b>11,958</b> |
| Equipment                          |               |      | -             | -        | -             |
| Travel                             |               |      | -             | -        | -             |
| Supplies                           |               |      | -             | -        | -             |
| Subawards                          |               |      | -             | -        | -             |
| Other                              |               |      | 7,300         | -        | 7,300         |
| <b>Total Other Direct Costs</b>    |               |      | <b>7,300</b>  | <b>-</b> | <b>7,300</b>  |
| <b>Total Direct Costs</b>          |               |      | <b>19,258</b> | <b>-</b> | <b>19,258</b> |
| F&A Base                           | MTDC          |      | 17,408        | -        | 17,408        |
| F&A                                | 10.0%         |      | 1,741         | -        | 1,741         |
| <b>Total Request</b>               |               |      | <b>20,999</b> | <b>-</b> | <b>20,999</b> |

| MTDC Exclusions              | Year 1       | Year 2   | Total        |
|------------------------------|--------------|----------|--------------|
| Equipment                    | -            | -        | -            |
| Tuition Remission            | 1,850        | -        | 1,850        |
| Subawards in excess of \$25K | -            | -        | -            |
| Participant Support Costs    | -            | -        | -            |
| Rent                         | -            | -        | -            |
| Alterations and Renovations  | -            | -        | -            |
| <b>Total Exclusions</b>      | <b>1,850</b> | <b>-</b> | <b>1,850</b> |

Project Title: Vadose Zone and nitrate source characterization City of Waverly Source Water Assessment and Drinking Water Protection Plan