Environment and Natural Resources Trust Fund
2020 Request for Proposals (RFP)

Project Title: **ENRTF ID: 079-B**

Novel Field Methods to Evaluate Groundwater Quality Investments

Category: B. Water Resources

Sub-Category:

Total Project Budget: $ 219,900

Proposed Project Time Period for the Funding Requested: June 30, 2022 (2 yrs)

Summary:

Implement sampling technologies/approaches to measure vertical groundwater nitrate profiles. This alternative method will evaluate groundwater quality improvements from targeted land management changes and provide data for communication with producers.

Name: Laura DeBeer

Sponsoring Organization: Pipestone County Soil and Water Conservation District

Job Title:

Department:

Address: 119 2nd Avenue SW, Suite 13

Pipestone MN 56164

Telephone Number: (507) 825-1185

Email laura.debeer@co.pipestone.mn.us

Web Address: http://www.pipestoneswcd.org/home.html

Location:

Region: Southwest

County Name: Lincoln, Lyon, Murray, Nobles, Pipestone, Rock

City / Township:

Alternate Text for Visual:

Schematic showing how vertical profile sampling works and a map depicting agricultural production in a wellhead protection area with the question “Does farming with a BMP reduce groundwater nitrate below these fields?”

_____ Funding Priorities	_____ Multiple Benefits	_____ Outcomes	_____ Knowledge Base
_____ Extent of Impact	_____ Innovation	_____ Scientific/Tech Basis	_____ Urgency
_____ Capacity Readiness	_____ Leverage	_____ TOTAL	_____%

PROJECT TITLE: Novel field methods to evaluate groundwater quality investments

I. PROJECT STATEMENT

Will forcing a farmer to use best management practices result in cleaner groundwater for a municipal water supply? What if neighboring farmers don't also participate? How much of a difference can one land owner make? SHOW ME THE DATA!

The proposed project will demonstrate "direct-push" vertical groundwater sampling as a robust sampling strategy for evaluating investments made to reduce nitrate leaching to groundwater. The methods developed in this project are intended to be used in the future by stakeholders who need to evaluate land management investments made to achieve groundwater quality outcomes for water supplies in shallow, vulnerable aquifers.

"Direct push" rigs provide temporary access to groundwater by simply pushing a sample screen, pump, and a series of sensors through soil and aquifer to *provide instantaneous data in the field about groundwater flowpaths and vertical contaminant distribution*. Direct-push technology has been used for decades to map point-source contaminants like petroleum. Recent improvements in direct-push samplers and nitrate sensors make possible rapid field measurements of the vertical distribution of nitrate. This method provides much higher resolution data about aquifer nitrate distributions and flowpaths compared to traditional monitoring wells. Compiling vertical profile data from several locations within drinking water supply management areas will provide insights into the spatial distribution of nitrate contributions to groundwater.

Many water suppliers and private well owners in Minnesota are faced with high nitrate and desperately need data to inform investments made to improve groundwater quality. The project will take place in southwestern Minnesota (in Lincoln, Pipestone, and Rock Counties) where several water suppliers are currently facing high nitrate in drinking water supplies.

II. PROJECT ACTIVITIES AND OUTCOMES

Activity 1 Title: Design and test direct-push vertical groundwater sampling system
Description: *The primary objective of this activity is to acquire, design, and test the vertical groundwater sampling system. A significant expenditure in this activity is the purchase of a Geoprobe HPT/EC system. This system logs vertical profiles of hydraulic conductivity and electrical conductivity in real time in the field. The first outcome will be a functioning water quality (including nitrate) pumping and logging system capable of generating data in the field. A data acquisition platform will be devised to efficiently capture digital data in the field. The second outcome will be a standard operating procedure for logging hydrogeological and water quality data in vertical profiles with a direct push rig. This will be accomplished through field trials.*

ENRTF BUDGET: $80,400

Outcome	Completion Date
1. Design field data sampling and logging system	*March, 2021*
2. Develop direct-push groundwater sampling protocol: vertical profiles of hydrogeologic properties, instantaneous measurements of nitrate, oxygen, pH, conductance, temperature, and lab confirmation samples)	*July, 2021*

Activity 2 Title: Conduct field study to evaluate investments made in best management practices.
Description: *The primary objective of this activity is to design, conduct, and document a field study that demonstrates the vertical profiling method. The first outcome will be a sampling strategy optimized to demonstrate the effects that different areas within a drinking water supply management area fields have on groundwater quality. Historical and geologic data will be used to identify important sampling locations. The second outcome will be a data set containing vertical profiles of hydrogeologic properties and water quality upgradient and downgradient of land parcels managed with BMPs. Duplicate water-quality samples will be collected and sent to the lab to confirm that field nitrate sensors are producing accurate data. The third outcome will be a dissemination of project data and results that describe the system operating procedures, evaluations of field-scale sampling designs, and interpretations of field study results. The form of the disseminated results will be determined by stakeholder preferences.*

ENRTF BUDGET: $139,500

Outcome	Completion Date
1. Site selection and sampling design at Rock County Rural Water, Lincoln Pipestone Rural Water, or City of Edgerton well fields	*June, 2021*
2. Collect field data with direct-push system. Up to 150 groundwater sample points will be analyzed for nitrate in the field and a subset sent to lab for confirmation.	*October, 2021*
3. Analyze data; present results at local conferences; produce publicly-available final synthesis report; publish hydrogeologic and water-quality data	*June, 2022*

III. PROJECT PARTNERS AND COLLABORATORS:
Laura DeBeer, Pipestone County Soil and Water; Jared Trost, Tim Cowdery, Hydrologists, U.S. Geological Survey; Andrew Berg, James Letsos, John Lund, field technicians, U.S. Geological Survey; Aaron Meyer, Source water specialist, Minnesota Rural Water; Doug Bos, Rock County Soil and Water Conservation District; Ryan Holtz, Director Rock County Rural Water; Jason Overby, General Manager Lincoln-Pipestone Rural Water System; Doug Brands, City of Edgerton; Steve Robertson, Minnesota Department of Health; William VanRyswyk, Minnesota Department of Agriculture; Jacob Jungers, University of Minnesota

IV. LONG-TERM IMPLEMENTATION AND FUNDING:
This proposed project will produce a sampling approach intended to be used statewide for evaluating land management investments made to achieve groundwater quality outcomes in quality in shallow, vulnerable aquifers. After completion of this project, the method will be available to stakeholders faced with source water quality management. The Minnesota Department of Agriculture may use this method to document BMP effectiveness. Water suppliers could acquire funding through the MN Department of Health's Source Water Protection Competitive Grant program to support direct-push sampling of their drinking water supply areas.

V. SEE ADDITIONAL PROPOSAL COMPONENTS:

A. Proposal Budget Spreadsheet
B. Visual Component or Map
F. Project Manager Qualifications and Organization Description
G. Letter or Resolution

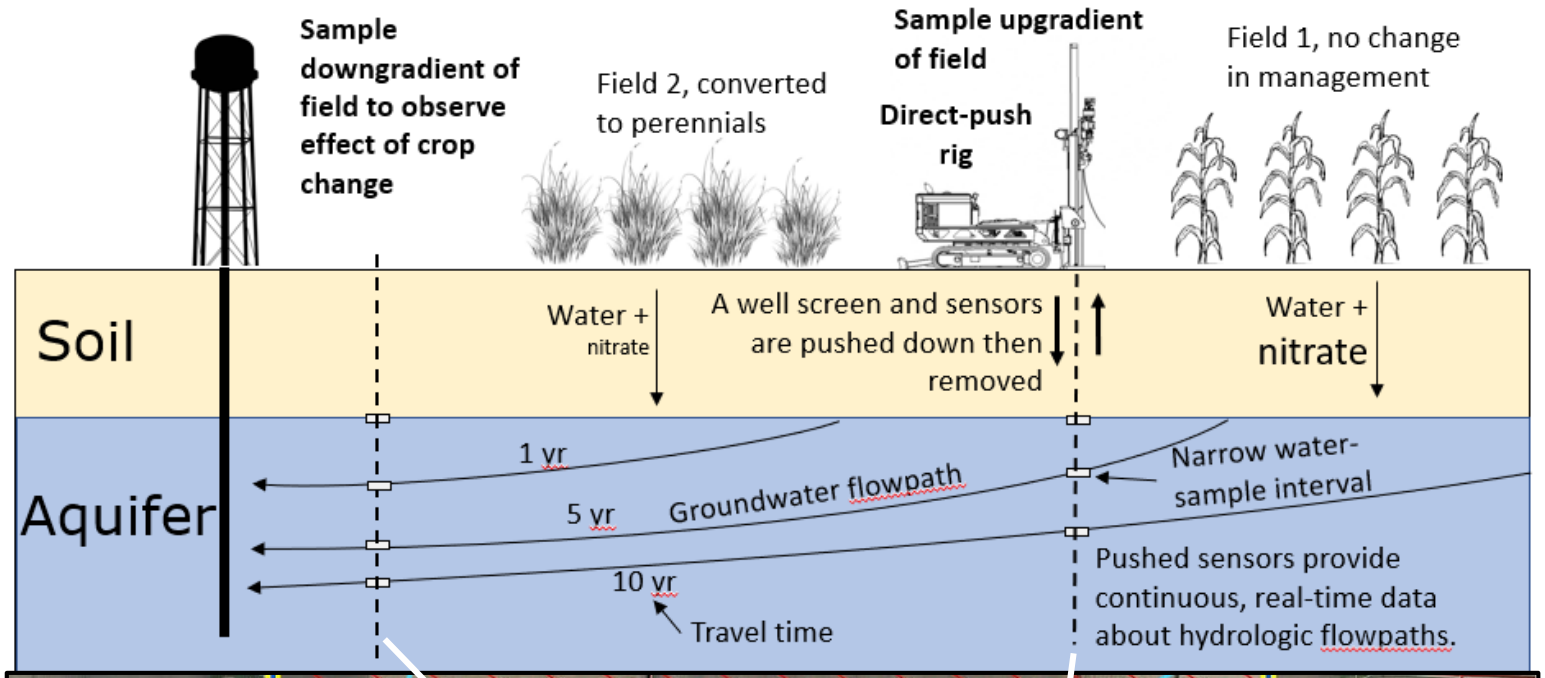
Attachment A: Project Budget Spreadsheet
Environment and Natural Resources Trust Fund
M.L. 2020 Budget Spreadsheet
Legal Citation:
Project Manager: Laura DeBeer
Project Title: Novel field methods to evaluate groundwater quality investments
Organization: Pipestone Soil and Water Conservation District
Project Budget: $219,900
Project Length and Completion Date: July 1, 2020 - August 31, 2022
Today's Date: 4/15/2019

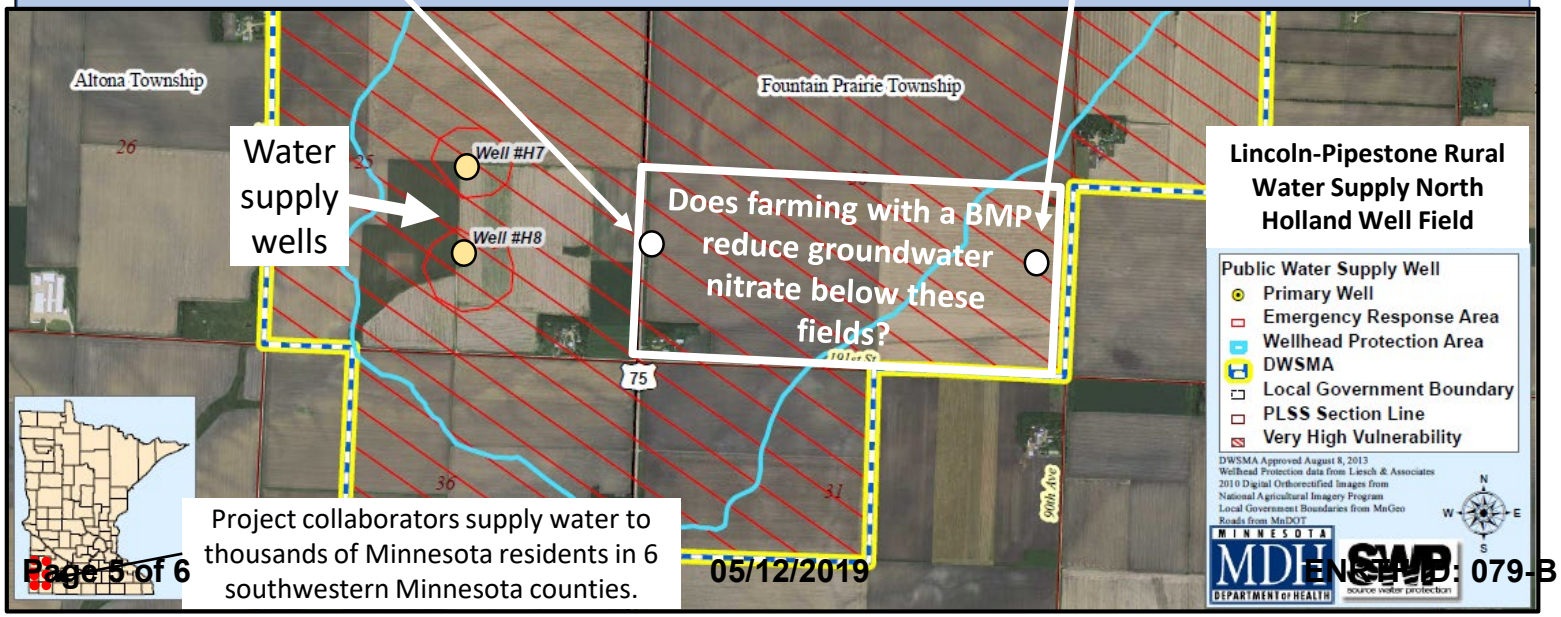
ENVIRONMENT AND NATURAL RESOURCES TRUST FUND BUDGET	Budget	Amount Spent	Balance
BUDGET ITEM			
Personnel (Wages and Benefits): Pipestone County project manager, for administrative tasks and coordination of USGS activities with local landowners and stakeholders [LAURA FILL IN HRS and %FTE over 2 years]	$ 3,000.00	$ -	$ 3,000
USGS subcontract details:			
Personnel (Wages and Benefits)	$ 158,500	$ -	$ 158,500
USGS Hydrologists: project management, develop conceptual design, lead data analysis, interpret hydrogeologic data, write reports, 2 people, equivalent of .30 FTE over 2 years, $91,700 (72% salary, 28% benefits)			
USGS Technicians: construction of sampling system, field trials, field data collection, data management and organization, assist with report preparations. 4 people, equivalent to .27 FTE over 2 years, $40,600 (72% salary, 28% benefits)			
USGS Water-quality specialist. Design and review quality control aspects of water quality data collection, 1 person, equivalent to 0.04 FTE over 2 years, $15,300 (74% salary, 26% benefits)			
USGS Administrative assistant and IT support staff. Administrative support for funding agreements, cost accounting, and billing. Technology support to meet USGS data storage standards and requirements, 2 people, equivalent to 0.04 FTE over 2 years, $10,900 (70% salary, 30% benefits)			
Professional/Technical/Service Contracts			
analysis of water samples at USGS NWQL (single-source contract-this is the standard USGS production lab used for routine chemical analyses of water samples)	$ 300	$ -	$ 300
report publication expenses (single-source contract-this is the service used within the USGS for publishing USGS reports)	$ 3,000	$ -	$ 3,000
Equipment/Tools/Supplies			
Geoprobe operating expenses for 3 weeks of drilling	$ 8,000	$ -	$ 8,000
sample bottles, filters, tubing, consumable supplies, field analytical supplies, water quality sonde maintenance	$ 6,000	$ -	$ 6,000
Capital Expenditures Over $5,000			
Purchase of Geoprobe hydraulic profiling and electrical conductivity system (HPT/EC) for characterizing the hydrogeologic profiles at each field sampling location. It is our intention that this piece of equipment will be used in future partnerships with water providers to characterize water quality and hydrogeology within drinking water source management areas after completion of the LCCMR project.	$ 35,000	$ -	$ 35,000
Printing			
	$ -	$ -	$ -
Travel expenses in Minnesota			
hotel, meal, and vehicle expenses for USGS personnel for up to 6 weeks of travel to field sites in Rock, Pipestone, and Lincoln Counties	$ 5,100	$ -	$ 5,100
Other			
shipping samples, local conference registration fees	$ 1,000	$ -	$ 1,000
COLUMN TOTAL	$ 219,900	$ -	$ 219,900

SOURCE AND USE OF OTHER FUNDS CONTRIBUTED TO THE PROJECT	Status (secured or pending)	Budget	Spent	Balance
Non-State: USGS cooperative matching funds in support of a portion of USGS facility and other indirect costs not covered by ENRTF request and travel to out-of-state professional meetings.	Pending	$ 79,000	$ -	$ 79,000
State:		$ -	$ -	$ -
In kind:				
MN Department of Agriculture analysis of water samples for nutrients and pesticides	Pending	$ 25,000	$ -	$ 25,000
MN Department of Health analysis of water samples for major ions and other indicators of anthropogenic influence	Pending	$ 10,000	$ -	$ 10,000
Pipestone County Soil and Water staff time for field sampling support and coordination of field site access	Pending	$ 5,000	$ -	$ 5,000
Rock County Soil and Water staff time for field sampling support and coordination of field site access	Pending	$ 8,800	$ -	$ 8,800

Other ENRTF APPROPRIATIONS AWARDED IN THE LAST SIX YEARS	Amount legally obligated but not yet spent	Budget	Spent	Balance
		$ -	$ -	$ -

Direct-push vertical groundwater sampling as a robust sampling strategy for evaluating investments made to reduce nitrate leaching to groundwater.





Project collaborators supply water to thousands of Minnesota residents in 6 southwestern Minnesota counties.

Laura DeBeer, Water Resources Specialist for Pipestone County Soil and Water Conservation District

(507) 825-1198, laura.debeer@co.pipestone.mn.us

My primary responsibilities in this project will be to manage project funds, and coordinate communication between USGS personnel, water suppliers working with the project, and the landowners who have property where sampling will occur. In my capacity as a Water Resources Specialist, I have successfully managed and completed many grant-funded projects focused on water resource management. These projects were funded by entities and programs including the Board of Water and Soil Resources, the Clean Water Legacy program, and the Minnesota Department of Agriculture's Nitrate Township Testing Program. The primary purpose of my current position with Pipestone Soil and Water Conservation District is to promote nutrient management strategies to improve water quality. This is accomplished by coordinating producers and water suppliers and preparing and organizing educational events and meetings.

Organization description:

Pipestone Soil and Water Conservation District promotes conservation of natural resources through education, technical assistance, and stewardship. Through a partnership with area Water Suppliers, the Soil and Water District works to intentionally promote best management practices and alternate management strategies to producers within wellhead protection areas. Pipestone Soil and Water Conservation District manages local, state and federal grants for the purpose of protecting and enhancing our land and water resources. Find Pipestone Soil and Water Conservation District at our webpage at www.pipestoneswcd.org or on Facebook at www.facebook.com/pipestoneswcd/.