Environment and Natural Resources Trust Fund

2027 Request for Proposal

General Information

Proposal ID: 2027-490

Proposal Title: Using Irrigation to Rid Minnesota of PFAS

Project Manager Information

Name: Matt Simcik

Organization: U of MN - School of Public Health

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Project Basic Information

Project Summary: We propose to implement a proven technology for PFAS sequestration in groundwater to take advantage of irrigation to flush the land clean of PFAS.

ENRTF Funds Requested: $370,000

Proposed Project Completion: June 30, 2029

LCCMR Funding Category: Water (B)

Project Location

What is the best scale for describing where your work will take place?

Region(s): Metro

What is the best scale to describe the area impacted by your work?

Statewide

When will the work impact occur?

During the Project and In the Future

Narrative

Describe the opportunity or problem your proposal seeks to address. Include any relevant background information.

Per- and polyfluoroalklyl substances (PFAS), or "forever chemicals", have become a ubiquitous issue in Minnesota. They have contaminated our land and water, our waste streams and every facet of our daily lives. Because they are so disperse, and because they are so hard to break down, trying to remove them from the environment has proven quite difficult. We can build drinking water treatment systems to remove them from our drinking water, but it does nothing to remove them from the environment and the source to that drinking water. In many cases PFAS is simply moved around the environment by the movement of water. One area where this has become particularly relevant are irrigation systems pulling water from contaminated aquifers. This may become even more important in the future as more water is withdrawn for cooling of data centers. Areas around the country are dealing with increased water contamination through the evaporative loss of water in these cooling systems. The contaminants are essentially concentrated in the water that then needs to be returned to the system. What is needed is a method to remove them from the environment in a low cost and effective manner.

What is your proposed solution to the problem or opportunity discussed above? Introduce us to the work you are seeking funding to do. You will be asked to expand on this proposed solution in Activities & Milestones.

At the University of Minnesota we have developed and field tested a method for sequestering PFAS near wells. By injecting a stabilized powdered activated carbon (S-PAC) or simply a chemical common to drinking water treatment (depending on soil conditions), we can trap PFAS in the soil of groundwater, allowing clean water to flow through to a well where it can be extracted. While the Minnesota Department of Health will not allow us to treat drinking water wells, we can treat non-potable wells used for irrigation. Our method would allow irrigation wells to be used to remove PFAS from our groundwater and the land to which it is applied. By cleaning the irrigation water of PFAS any contamination of the land on which it is applied would be flushed of PFAS back into the groundwater where it can be trapped in the same manner.

What are the specific project outcomes as they relate to the public purpose of protection, conservation, preservation, and enhancement of the state's natural resources?

If successful, the methods employed in this project could be applied to irrigation wells across the state wherever there is PFAS contamination. This could include existing wells for municipal and agricultural wells. While not the source of the problem, they could be part of the solution of this challenge both in Minnesota and across the country.

Activities and Milestones

Activity 1: Asses the site: Determine PFAS concentrations including soil, irrigation water and leachate. Determine best amendment to employ.

Activity Budget: $157,328

Activity Description:
The chosen site is a Christmas tree farm in Lake Elmo, MN where there is PFAS contamination in the groundwater, and we have cooperation from the owner to employ our demonstration. In order to best address the PFAS challenge, the site must be evaluated. This includes several steps from measuring existing PFAS and deciding what the best material is to add to the aquifer to sequester the PFAS. To do this we will install four lysimeters (underground water collectors) to determine how much PFAS is flushed from the surface soil down into the aquifer, if any. We will also measure the PFAS levels in the soil and irrigation water. A suite of 30 PFAS compounds will be analyzed at the University of Minnesota's School of Public Health using established methods, which Dr. Simcik's laboratory is proficient. Finally, we will take soil cores to perform laboratory experiments with both stabilized powdered activated carbon and a drinking water contaminant (polyDADMAC) to determine the best material and amount of that material to employ on site.

Activity Milestones:

Description	Approximate Completion Date
Determine type and amount of amendment to install	November 30, 2026
Install lysimeters	July 31, 2027
Determine PFAS in Soil, irrigation water and leachate	October 31, 2027
Final Treatability Report submitted	December 31, 2027

Activity 2: Install PFAS sequestration wells around the existing irrigation well. Drill wells and pump in soil amendment.

Activity Budget: $79,031

Activity Description:
This will consist of surrounding the existing irrigation well at Krueger Christmas Trees with 8 injection wells. Each well will be drilled to a depth just beyond that of the existing well and spaced out evenly in a circle of a 20 foot diameter so that each well is 10 feet from the existing well. The amendment material will be injected into each well to create a zone of treatment that overlaps with each adjacent well (approximately 8 feet in diameter). The material will be pumped into the well in a series of lifts to create a depth equivalent to the distance from the bottom of the well to the top of the water column. The wells will also be capped in a way that allows for the sampling of water within the well. This work will be carried out by Jacobs Solutions who has experience with installing these types of wells with the University of Minnesota.

Activity Milestones:

Description	Approximate Completion Date
Install wells and inject material.	June 30, 2028

Activity 3: Monitoring the irrigation water, soil and leachate for PFAS post-treatment.

Activity Budget: $133,641

Activity Description:

In the same way that the irrigation water, soil and leachate (collected by the lysimeters) were analyzed for PFAS in Activity 1 they will be analyzed again post-treatment for this Activity. A suite of 30 PFAS compounds will be analyzed at the University of Minnesota's School of Public Health using established methods, which Dr. Simcik's laboratory is proficient. Samples will be collected monthly during the ice-free part of the year and and analyzed. The levels will be compared to pre-treatment levels to determine the effectiveness of the treatment.

Activity Milestones:

Description	Approximate Completion Date
Post-treatment sampling and analysis of soil, irrigation water and leachate for PFAS	April 30, 2029
Treatment Effectiveness Final Report	May 31, 2029

Project Partners and Collaborators

Name	Organization	Role	Receiving Funds
Jim Hatton	Jacobs Solutions	Contractor tasked with installing technology and sampling infrastructure.	Yes

Dissemination

Describe your plans for dissemination, presentation, documentation, or sharing of data, results, samples, physical collections, and other products and how they will follow ENRTF Acknowledgement Requirements and Guidelines.
Results from this project will be disseminated to the Minnesota Pollution Control Agency (MPCA), wastewater utilities, and other state partners through technical briefings and summary reports and press releases. As part of the Graduate Research Assistant's training, they will present the results of the study at scientific conferences like the Minnesota Groundwater Association and the Minnesota Water Resources Conferences. Furthermore, the results will be published in the peer reviewed literature and as a Masters thesis for the student.

Long-Term Implementation and Funding

Describe how the results will be implemented and how any ongoing effort will be funded. If not already addressed as part of the project, how will findings, results, and products developed be implemented after project completion? If additional work is needed, how will this work be funded?
Results from this project will be shared directly with the Minnesota Pollution Control Agency (MPCA), the Minnesota Department of Health, the Minnesota Department of Agriculture, municipalities, and other state partners through technical briefings and summary reports. If this method is successful, the findings will provide the state of Minnesota with practical guidance for sequestering PFAS in our water resources. Implementation could occur through pilot-scale adoption at interested irrigation employers both municipal and agricultural, supported by partnerships between the University and public partners.

Project Manager and Organization Qualifications

Project Manager Name: Matt Simcik

Job Title: Professor

Provide description of the project manager's qualifications to manage the proposed project.
Dr. Simcik is a Professor in the School of Public Health at the University of Minnesota. He is an expert in the fate and transport of organic contaminants and has spent the past 25+ years studying PFAS. His laboratory is equipped to do trace PFAS analysis and has analyzed biosolids, soil and plant material for projects in the past. His lab has also performed the leaching experiments outlined in the proposal for prior projects. Over his career he has managed in excess of $4.5M in grant funding as the Project Manager including several LCCMR projects. He has also served as an investigator on several other grants including many LCCMR projects.

Organization: U of MN - School of Public Health

Organization Description:
The University of Minnesota is the flagship land grant university in Minnesota. The School of Public Health is ranked the #6 public university public health program in the nation.

Budget Summary

Category / Name	Subcategory or Type	Description	Purpose	Gen. Ineligible	% Benefits	# FTE	Classified Staff?	$ Amount
Personnel								
Project manager		Supervise overall project and custodian of data			36.6%	0.4		$121,400
Graduate Research Assistant		Perform PFAS analysis			24.2%	1		$119,224
							Sub Total	**$240,624**
Contracts and Services								
Jacobs Solutions	Service Contract	Install technology and sampling infrastructure in the field.				0.2		$100,000
Internal UofM equipment usage	Service Contract	Per sample cost to use LC/MS/MS for PFAS analysis				0		$1,016
							Sub Total	**$101,016**
Equipment, Tools, and Supplies								
	Tools and Supplies	Native and isotopically labeled PFAS standards	Needed for PFAS analysis					$10,000
	Tools and Supplies	Consumables	Solvents, solid-phase extraction cartridges, filters and disposable labware					$13,560
	Tools and Supplies	Lysimiters	Field supplies to collect seeping water (4 x $60)					$240
	Tools and Supplies	Pumps for lysimeter	supplies needed to sample seeping water from site (4x$140)					$560
							Sub Total	**$24,360**
Capital Equipment								
							Sub Total	**-**

Acquisitions and Stewardship								
							Sub Total	**-**
Travel In Minnesota								
	Conference Registration Miles/ Meals/ Lodging	One trip per year, local mileage, two people, conference registration, housing.	One local conference per year to present results of the project for the Project Manager and Graduate Research Assistant.					$4,000
							Sub Total	**$4,000**
Travel Outside Minnesota								
							Sub Total	**-**
Printing and Publication								
							Sub Total	**-**
Other Expenses								
							Sub Total	**-**
							Grand Total	**$370,000**

Classified Staff or Generally Ineligible Expenses

Category/Name	Subcategory or Type	Description	Justification Ineligible Expense or Classified Staff Request

Non ENRTF Funds

Category	Specific Source	Use	Status	Amount
State				
			State Sub Total	**-**
Non-State				
			Non State Sub Total	**-**
			Funds Total	**-**

Total Project Cost: $370,000

This amount accurately reflects total project cost?

Yes

Attachments

Required Attachments

Visual Component

File: a261fe9d-331.pdf

Alternate Text for Visual Component

The graphic shows a well with an irrigation pivot. The water leaching from the soil and underground has PFAS. That PFAS is trapped near the well and PFAS free water is exiting the irrigation pivot....

Supplemental Attachments

Capital Project Questionnaire, Budget Supplements, Support Letter, Photos, Media, Other

Title	File
UofM Sponsored Projects Administration Authorization	fa9fee28-1ba.pdf
Support Letter from Krueger Christmas Tree Farm	bfbeac5c-91d.docx

Administrative Use

Does your project include restoration or acquisition of land rights?

No

Do you understand that travel expenses are only approved if they follow the "Commissioner's Plan" promulgated by the Commissioner of Management of Budget or, for University of Minnesota projects, the University of Minnesota plan?

Yes, I understand the UMN Policy on travel applies.

Does your project have potential for royalties, copyrights, patents, sale of products and assets, or revenue generation?

No

Do you understand and acknowledge IP and revenue-return and sharing requirements in 116P.10?

N/A

Do you wish to request reinvestment of any revenues into your project instead of returning revenue to the ENRTF?

N/A

Does your project include original, hypothesis-driven research?

Yes

Does the organization have a fiscal agent for this project?

No

Does your project include the pre-design, design, construction, or renovation of a building, trail, campground, or other fixed capital asset costing $10,000 or more or large-scale stream or wetland restoration?

No

Do you propose using an appropriation from the Environment and Natural Resources Trust Fund to conduct a project that provides children's services (as defined in Minnesota Statutes section 299C.61 Subd.7 as "the provision of care, treatment, education, training, instruction, or recreation to children")?

No

Provide the name(s) and organization(s) of additional individuals assisting in the completion of this proposal:

Kristina McReynolds, University of Minnesota Sponsored Projects Administration

Do you understand that a named service contract does not constitute a funder-designated subrecipient or approval of a sole-source contract? In other words, a service contract entity is only approved if it has been selected according to the contracting rules identified in state law and policy for organizations that receive ENRTF funds through direct appropriations, or in the DNR's reimbursement manual for non-state organizations. These rules may include competitive bidding and prevailing wage requirements

Yes, I understand