

**Environment and Natural Resources Trust Fund
2019 Request for Proposals (RFP)**

Project Title:

ENRTF ID: 058-B

Reducing Municipal Wastewater Mercury Pollution to Lake Superior

Category: B. Water Resources

Sub-Category:

Total Project Budget: \$ 297,000

Proposed Project Time Period for the Funding Requested: June 30, 2022 (3 yrs)

Summary:

This technology transfer project helps the municipal wastewater plants in the Lake Superior basin reduce mercury pollution and save money.

Name: Scott Kyser

Sponsoring Organization: Minnesota Pollution Control Agency

Title: Wastewater Engineer

Department: _____

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St. Paul MN 55155

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Web Address

Location

Region: Statewide, Northeast

County Name: Statewide, Carlton, Cook, Lake, St. Louis

City / Township:

Alternate Text for Visual:

Municipal wastewater plants in the Lake Superior basin with low-level mercury limits and selected mercury treatment technologies

<input type="checkbox"/>	Funding Priorities	<input type="checkbox"/>	Multiple Benefits	<input type="checkbox"/>	Outcomes	<input type="checkbox"/>	Knowledge Base
<input type="checkbox"/>	Extent of Impact	<input type="checkbox"/>	Innovation	<input type="checkbox"/>	Scientific/Tech Basis	<input type="checkbox"/>	Urgency
<input type="checkbox"/>	Capacity Readiness	<input type="checkbox"/>	Leverage	<input type="checkbox"/>		TOTAL	<input type="checkbox"/> %
<input type="checkbox"/> If under \$200,000, waive presentation?							



PROJECT TITLE: Reducing municipal wastewater mercury pollution to Lake Superior

I. PROJECT STATEMENT

This technology transfer project helps the municipal wastewater plants in the Lake Superior basin reduce mercury pollution and save money.

Many Minnesota cities need guidance on the wastewater treatment technologies available to cost-effectively reduce mercury pollution. This project will produce a document that summarizes and evaluates mercury treatment technologies, allowing municipalities to select a mercury treatment strategy that appropriately meets their community's needs while also minimizing mercury pollution.

Every surface water of the state requires protection from mercury pollution, because of risks to aquatic life and from human fish consumption. In the Lake Superior basin the protective water quality standard is 1.3 ng/L. In order to protect human health and aquatic life, all 16 municipal WWTPs in the Lake Superior basin will eventually (dependent on affordability) need to comply with mercury effluent limits protective of the 1.3 ng/L.

Some treatment systems in the Lake Superior basin successfully operate technologies that cost-effectively comply with mercury limits. (See partial list of technologies at right). Currently, each facility that is not meeting effluent limits needs to individually implement a costly compliance study when a permit is renewed. By compiling this technology transfer information into a single publically-accessible document, this project will allow wastewater facilities in the Lake Superior Basin to learn which technologies effectively reduce mercury pollution and save each WWTP over \$70,000 in engineering fees for individual compliance studies. Since treatment effectiveness depends on water characteristics, this study will identify important differences in wastewater characteristics that impact mercury treatment. The results of this study will also provide the MPCA with consistent information it could not otherwise obtain to help develop a more robust and systematic mercury permitting strategy for municipal WWTPs. Eventually, the results of this project will lead to lower mercury inputs to Lake Superior and other Minnesota waters by systematically identifying cost-effective means to remove mercury from wastewater.

Table with 1 column: Technologies. Rows include: Dual Media Filters (Aurora, Duluth), Solid Contact Clarifiers (Silver Bay), Cloth Media Filters (Central Iron Range), Cerium Precipitation (Virginia), Ferric Precipitation (Hibbing), Alum Precipitation (Hoyt Lakes, Babbitt), Membrane Bio-Reactors (Gilbert).

II. PROJECT ACTIVITIES AND OUTCOMES

Activity 1: Evaluate 16 wastewater plants and seven different treatment technologies in the Lake Superior Basin

We will inventory treatment technologies and previously collected mercury measurements from Minnesota WWTPs. We will compile and evaluate this existing information to understand, at a basic level, which technologies are effectively removing mercury. Key outcomes of this activity will be 1) systematic documentation of effective mercury removal processes in MN; and 2) cost estimates associated with, different treatment technologies known to be effective for mercury removal. These cost estimates will be useful for both facility capital expense planning as well as MPCA permit evaluations.



**Environment and Natural Resources Trust Fund (ENRTF)
2019 Main Proposal Template**

ENRTF BUDGET: \$145,000

Outcome	Completion Date
1. Review of existing mercury wastewater treatment performance	June, 2021
2. Evaluate and document costs for mercury treatment technologies	June, 2021
3. Recommendations providing a basis for guidance document	June, 2021

Activity 2: Targeted sampling of mercury treatment technologies to develop a treatment design theory

Activity 2 will measure mercury and water characteristics in wastewater from WWTPs in the Lake Superior basin in order to identify how mercury behaves using different treatment technologies. A key outcome from this activity will be the documentation of critical water chemistry parameters that impact mercury removal for each evaluated technology. These tests will ensure that treatment technologies are transferrable across different water types.

ENRTF BUDGET: \$140,000

Outcome	Completion Date
1. Mercury chemistry samples from all MN treatment technology types	June, 2022
2. Evaluate key water characteristics impacting mercury removal performance	June, 2022
3. Document providing basis for evaluating transferability	June, 2022

Activity 3: Technology transfer communication and outreach

We will disseminate the findings from the proposed study to wastewater engineers, managers and operators through public presentations and publications in peer-reviewed journals. The key outcome from this activity will be presentations at local and statewide wastewater conferences.

ENRTF BUDGET: \$12,000

Outcome	Completion Date
1. Present results to MN conference for wastewater operators & engineers	June, 2022
2. Publication of results in peer-reviewed manuscripts	June, 2022

III. PROJECT PARTNERS:

A. Partners receiving ENRTF funding

Name	Title	Affiliation	Role
Dr. Nathan Johnson	Associate Professor	UMD – Civil Engineering	Lead Project Investigator
Dr. Adrian Hanson, PE	Professor	UMD – Civil Engineering	Co-Investigator

B. Partners NOT receiving ENRTF funding

Name	Cities submitting letters of support	Role
Lake Superior Basin Cities	Chisholm, Duluth, Silver Bay	Project partners

IV. LONG-TERM- IMPLEMENTATION AND FUNDING:

Reducing mercury discharges to Minnesota waterbodies is part of the MPCA’s long term strategy to reduce pollution. The MPCA undertakes routine measurements for mercury in wastewater discharges, surface waters, and fish and these ongoing measurements will be ultimately be used to evaluate the effectiveness of the proposed work in reducing mercury pollution from wastewater plants. The results of this study will be incorporated into regular discussions with wastewater treatment facilities in the Lake Superior Basin and throughout the state. This study will not need long term funding past this funding cycle.

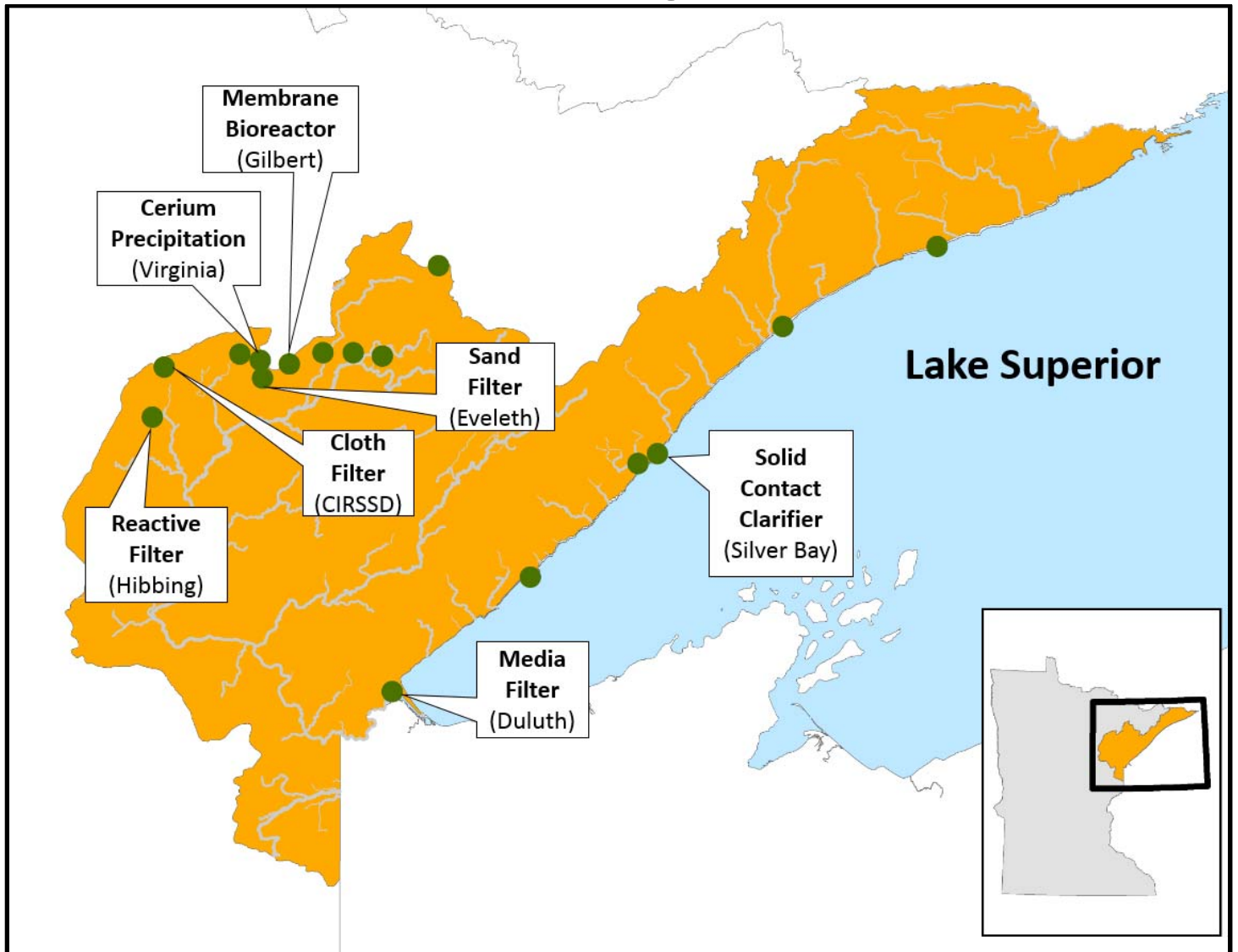
2019 Proposal Budget Spreadsheet

Project Title: Reducing municipal wastewater mercury pollution to Lake Superior

IV. TOTAL ENRTF REQUEST BUDGET: 3 years (MPCA appropriations to contract with UMD)	
BUDGET ITEM (See "Guidance on Allowable Expenses")	AMOUNT
Principal Investigator: \$32,300	\$215,300
UMD Graduate Students: Two students for two years at \$40,300 per year	
Present at two MN water conferences: \$2,000	
Undergraduate Laboratory Assistant: \$20,000	
Professional/Technical/Service Contracts: Contract with analytical services for mercury fraction analysis. (1/2 samples at \$85 per sample)	\$31,700
Equipment/Tools/Supplies:	\$45,000
700 mercury samples at \$40 per sample (\$28,000)	
600 filtration and solids separation samples at \$17 per sample (\$10,000) 175 Anions & Cations & Dissolved Organic Carbon at \$40 per sample (\$7000)	
Acquisition (Fee Title or Permanent Easements):	\$0
Travel: UMD researchers visit 16 wastewater plants and collect samples. Rates at UMD vehicle rates.	\$5,000
Additional Budget Items:	\$297,000
TOTAL ENVIRONMENT AND NATURAL RESOURCES TRUST FUND \$ REQUEST =	

V. OTHER FUNDS (This entire section must be filled out. Do not delete rows. Indicate "N/A" if row is not)	AMOUNT
SOURCE OF FUNDS	\$ -
Other Non-State \$ To Be Applied To Project During Project Period:	\$ -
Other State \$ To Be Applied To Project During Project Period:	\$ 13,248
In-kind Services To Be Applied To Project During Project Period: MPCA Project Manager time (.0125 FTE for one year x \$X hourly salary and fringe = \$13,248). Funds provided through the Federal	\$ -
Past and Current ENRTF Appropriation:	\$ -
Other Funding History:	

Municipal wastewater plants in the Lake Superior basin with low-level mercury limits and selected mercury treatment technologies



- Many types of mercury treatment technologies are used in the lake Superior Watershed
- Some are more affordable, some are less affordable
- Some remove mercury well, some do not, some have yet to be fully evaluated



Environment and Natural Resources Trust Fund (ENRTF)

2019 Main Proposal

Project Title: Reducing municipal wastewater mercury pollution to Lake Superior

Project Manager Qualifications/Organization: Minnesota Pollution Control Agency

Project Manager

Scott Kyser is professional wastewater engineer in the Environmental Analysis and Outcomes Division of the Minnesota Pollution Control Agency. He will be lead technical administrator for the project with responsibility for MPCA's portion of the study and overseeing management, project reporting, and contracting.

Qualifications

Education:

M.S. 2011 University of Minnesota (Environmental Engineering)
B.A. 2007 Gustavus Adolphus College (Biology)

Work Experience:

2013-Present Environmental Engineer, Minnesota Pollution Control Agency
2011-2013 Environmental Engineer, Barr Engineering, Minneapolis, Minnesota.

Organization Description

The Minnesota Pollution Control Agency's mission is to protect and improve the environment and enhance human health. The MPCA monitors environmental quality, offers technical and financial assistance, and enforces environmental regulations.