Environment and Natural Resources Trust Fund (ENRTF)
M.L. 2019 ENRTF Work Plan (Main Document)

Today's Date: August 24, 2018

Date of Next Status Update Report: March 1, 2020

Date of Work Plan Approval:

Project Completion Date: June 30, 2022

Does this submission include an amendment request? No

PROJECT TITLE: Protecting Minnesota Waters by Removing Contaminants from Wastewater

Project Manager: Matt F. Simcik, Ph.D.

Organization: University of Minnesota

College/Department/Division: School of Public Health

Mailing Address: MMC 807, 420 Delaware Street SE

City/State/Zip Code: Minneapolis, MN 55455

Telephone Number: 612-626-6269

Email Address: msimcik@umn.edu

Web Address:

Location: Statewide

Total Project Budget: $250,000

Amount Spent: $0

Balance: $250,000

Legal Citation: M.L. 2019, Chp. xx, Sec. xx, Subd. xx

Appropriation Language:

I. PROJECT STATEMENT: Everything we flush down the drain ends up in our waste stream. Most of this ends up going through one of our wastewater treatment plants (WWTPs). These plants have protected our environment from raw sewage for over 100 years. Without them we would have fish dying from lack of oxygen, as it takes oxygen to break down all that waste. Unfortunately, these plants are not equipped to handle contaminants at the part per million or part per billion level. Therefore, many contaminants make it through our WWTPs into our surface waters. They include per and polyfluoroalkyl substances (PFAS) like PFOS and PFOA, and microplastics. A study in 2002 found as many as 82 industrial, residential and agricultural chemicals downstream of WWTPs.

Recent research by the two Principal Investigators has developed a method for the sequestration of PFAS in groundwater. They have used a polymer commonly used as a drinking water coagulant to dramatically increase the sorption of PFAS to soil particles in a groundwater system. This same coagulant is expected to increase the sorption of PFAS and microplastics to activated sludge in a wastewater treatment plant.

This method is effective because of the negative charge on the PFAS molecules and the positive charge on the coagulant. Therefore, it is expected that the coagulant addition will also improve the removal of other negatively charged materials like microplastics.

PFAS enter our waste stream, mostly from consumer products, but some industrial sources may be present. PFAS were used as stain and water repellents in upholstery and clothing for many years. They were also used in food packaging like microwave popcorn bags. As surfaces containing these compounds are washed they enter our waste stream.

Recent interest has grown over microplastics. The small pieces of plastic are formed from abrasion and may be present in various products. They are also be formed by the degradation of other larger plastics, such as water bottles and food packaging. Once in the waste stream they are not readily removed by WWTPs.

II. OVERALL PROJECT STATUS UPDATES:

First Update March 1, 2020

Second Update September 1, 2021

Third Update March 1, 2021

Fourth Update September 1, 2022

Fifth Update March 1, 2022

Final Report between project end (June 30) and August 15, 2022

III. PROJECT ACTIVITIES AND OUTCOMES:

ACTIVITY 1 Title: ***Determine the optimum coagulant(s) and dosage to remove PFAS and microplastics in approximately 30 WWTP samples taken over an 18 month period***

Description:

We propose a series of experiments to determine the optimal coagulant dose to remove the most contaminants from the waste stream. The concentration necessary to adequately remove the contaminants will also be determined. This will be an experiment where WWTP samples will be treated in the laboratory, and the concentrations determined in both Dr Simcik's and Dr. Arnold's laboratories. Samples will be collected using a pump and 4L glass bottles from the Metropolitan WWTP, and sterilized with sodium azide to insure safety from pathogens for personnel. Contaminant concentrations will be determined from bottles where the sludge has been allowed to settle. Varying concentrations and type of coagulant will be added to each of the same bottles.

They will then be shaken and allowed to settle again. The contaminant concentration will be determined on the treated bottles, and compared to the untreated values.

ACTIVITY 1 ENRTF BUDGET: $124,630

Outcome	Completion Date
1. *Determine optimum coagulant(s) and dosage to remove contaminants of interest*	January 1, 2021

ACTIVITY 2 Title: ***Dose coagulant(s) in a simulated WWTP and monitor effluent over a period of 18 months.***

Description:

We propose to use the loading/concentration determined in Activity 1 to add coagulant(s) to a simulated WWTP. The simulated WWTP is actually a bench-scale duplication of the Metropolitan WWTP. It is housed at the Metro plant in their laboratory, and will be made available to this project for the expressed purpose of determining the correct dosage of coagulant to reduce contaminants without affecting the intended capabilities of the plant. Approximately 36 samples will be taken over an 18 month period (one from each side each month). Contaminants will be determined in the same manner as Activity 1.

ACTIVITY 2 ENRTF BUDGET: $125,370

Outcome	Completion Date
1. *Determine the efficacy of the method to remove contaminants without impacting the primary function of the WWTP*	June 31, 2022

First Update March 1, 2020

Second Update September 1, 2021

Third Update March 1, 2021

Fourth Update September 1, 2022

Fifth Update March 1, 2022

Final Report between project end (June 30) and August 15, 2022

IV. DISSEMINATION:

Description: Results from this project will be disseminated to the wastewater treatment community and the greater scientific community through a variety of mechanisms. The wastewater treatment community will be informed of the results through presentation at conferences targeting managers of WWTPs like the Air and Waste Management Association Conference. The greater scientific community will be informed through conference presentations, but also in the peer reviewed literature.

The Minnesota Environment and Natural Resources Trust Fund (ENRTF) will be acknowledged through use of the trust fund logo or attribution language on project print and electronic media, publications, signage, and other communications per the ENRTF Acknowledgement Guidelines.

First Update March 1, 2020

Second Update September 1, 2021

Third Update March 1, 2021

Fourth Update September 1, 2022

Fifth Update March 1, 2022

Final Report between project end (June 30) and August 15, 2022

V. ADDITIONAL BUDGET INFORMATION:

A. Personnel and Capital Expenditures

Explanation of Capital Expenditures Greater Than $5,000: N/A

Explanation of Use of Classified Staff: N/A

Total Number of Full-time Equivalents (FTE) Directly Funded with this ENRTF Appropriation:

Enter Total Estimated Personnel Hours for entire duration of project: 4472	Divide total personnel hours by 2,080 hours in 1 yr = TOTAL FTE: 2.15

Total Number of Full-time Equivalents (FTE) Estimated to Be Funded through Contracts with this ENRTF Appropriation:

Enter Total Estimated Contract Personnel Hours for entire duration of project: 0	Divide total contract hours by 2,080 hours in 1 yr = TOTAL FTE: 0

VI. PROJECT PARTNERS:

A. Partners outside of project manager's organization receiving ENRTF funding
N/A
B. Partners outside of project manager's organization NOT receiving ENRTF funding
Metropolitan Council Environmental Services

VII. LONG-TERM- IMPLEMENTATION AND FUNDING:

The results of this project will be used to inform other WWTP's in Minnesota as to how best to improve the removal of these contaminants from their waste streams.

VIII. REPORTING REQUIREMENTS:

- Project status update reports will be submitted March 1 and September 1 each year of the project
- A final report and associated products will be submitted between June 30 and August 15, 2022

IX. SEE ADDITIONAL WORK PLAN COMPONENTS:

A. Budget Spreadsheet Submitted
B. Visual Component or Map N/A
C. Parcel List Spreadsheet N/A
D. Acquisition, Easements, and Restoration Requirements N/A
E. Research Addendum TBD

Attachment A:
Environment and Natural Resources Trust Fund
M.L. 2019 Budget Spreadsheet
Legal Citation: M.L. 2019, Chp. xx, Sec. xx, Subd. xx
Project Manager: Matt Simcik
Project Title: Protecting Minnesota Waters by Removing Contaminants from Wastewater
Organization: University of Minnesota
Project Budget: $250,000
Project Length and Completion Date: 3 years; complete 06/30/2022
Today's Date: 08/24/2018

ENVIRONMENT AND NATURAL RESOURCES TRUST FUND BUDGET	Budget	Amount Spent	Balance
BUDGET ITEM			
Personnel (Wages and Benefits)	$ 220,000	$ -	$ 220,000
PI: Matt F. Simcik (13% effort years 1 and 2, 12% year 3) Fringe is 34.2% of salary			
Co-PI: William A. Arnold (1% effort all three years) Fringe is 34.2% of salary			
Lab Manager: Michael McCarty (8% effort all three years) Fringe is 28.4% of salary			
Grad RA: Mary Kosuth (50% effort all three years, fringe is 17.7% of salary plus tuition at $15,522/year)			
Professional/Technical/Service Contracts			
	$ -	$ -	$ -
Equipment/Tools/Supplies			
Consumables for extraction and analysis of microplastics and PFAS, coagulant	$ 30,000	$ -	$ 30,000
Capital Expenditures Over $5,000			
	$ -	$ -	$ -
Fee Title Acquisition			
	$ -	$ -	$ -
Easement Acquisition			
	$ -	$ -	$ -
Professional Services for Acquisition			
	$ -	$ -	$ -
Printing			
	$ -	$ -	$ -
Travel expenses in Minnesota			
	$ -	$ -	$ -
Other			
	$ -	$ -	$ -
COLUMN TOTAL	$ 250,000	$ -	$ 250,000

OTHER FUNDS CONTRIBUTED TO THE PROJECT	Status (secured or pending)	Budget	Spent	Balance
Non-State:		$ -	$ -	$ -
State:		$ -	$ -	$ -
In kind: Indirect costs contributed in-kind by the University of Minnesota		$ 109,855	$ -	$ 109,855

PAST AND CURRENT ENRTF APPROPRIATIONS	Amount legally obligated but not yet spent	Budget	Spent	Balance
Current appropriation:		$ -	$ -	$ -
Past appropriations:		$ -	$ -	$ -