



Environment and Natural Resources Trust Fund (ENRTF)

M.L. 2018 ENRTF Work Plan (Main Document)

Today's Date: December 15, 2017

Date of Next Status Update Report:

Date of Work Plan Approval: 06/05/2018

Project Completion Date: June 30, 2020

Does this submission include an amendment request? ___

PROJECT TITLE: Pilot Program to Optimize Local Mechanical and Pond Wastewater-Treatment Plants

Project Manager: Joel Peck

Organization: Minnesota Pollution Control Agency

College/Department/Division: Municipal Wastewater Division

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City/State/Zip Code: St. Paul, MN, 55110

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Web Address: pca.state.mn.us

Location: Multiple locations throughout the state of Minnesota

Total Project Budget: \$700,000

Amount Spent: \$0

Balance: \$0

Legal Citation: M.L. 2018, Chp. 214, Art. 4, Sec. 02, Subd. 04a

Appropriation Language:

\$89,000 the first year and \$611,000 the second year are from the trust fund to the commissioner of the Minnesota Pollution Control Agency, in partnership with the Minnesota Rural Water Association and the University of Minnesota's Technical Assistance Program, to implement a pilot program to optimize existing local mechanical and pond wastewater-treatment systems to increase nutrient removal and improve efficiency without requiring costly upgrades.

I. PROJECT STATEMENT:

Effective wastewater treatment systems are critical infrastructure to manage waste effluent within hundreds of communities throughout Minnesota. Optimization, in general, means getting better results through existing infrastructure. This proposal will determine how both mechanical and pond wastewater treatment systems can be optimized, and the new effluent limits met, without adding substantial new infrastructure. Infrastructure improvements should be the last resort when new, or more restrictive effluent limitations are required to meet water quality standards. The goal is to optimize existing wastewater treatment processes to improve nutrient (phosphorus and nitrogen) removal.

The primary purpose of wastewater treatment is to protect the environment from contamination and preserve water sources for residential, industrial and recreational use as well as minimizing impact on wildlife and aquatic species. Cities throughout the state are responsible for providing effective, affordable wastewater treatment services for residents and businesses within their communities. Effective operation of wastewater services is vital to preserve the environment, maintain public health, and support regional economic development.

To ensure communities manage their environmental impact, wastewater effluent discharged to Minnesota waterways are subject to federal and state regulation. These regulations continue to become more stringent over time as treatment demands increase and as negative environmental impacts to receiving waters are better understood. This proposal would add a new option for municipalities – wastewater facility optimization – that may help many communities meet new pollutant limits without requiring expensive new infrastructure. This will result in lower costs for communities and cleaner water for all Minnesotans.

The outcomes of these projects will be:

- Increased nutrient removal and improved operational efficiencies at mechanical and pond wastewater treatment plants,
- Ability of at least some cities to comply with new water quality standards without needing expensive new construction,
- Cost savings to cities and to the state, as the useful life of optimized wastewater systems is extended.
- This project will allow MNTAP, Minnesota Rural Waters, MCES, City of St. Cloud and the MPCA to collaboratively work together to help rural communities save money and resources to assure that wastewater effluent limitations are met and maintained.
- This project will establish mentoring relationships that will foster learning and the exchange of knowledge for years to come.

II. OVERALL PROJECT STATUS UPDATES:

First Update January 31, 2019

Second Update June 30, 2019

Third Update January 31, 2020

Final Update June 30, 2020

III. PROJECT ACTIVITIES AND OUTCOMES:

ACTIVITY 1: Instruction and Selection of Pilot Participants

Description:

To pique the interest of prospective facilities, we need to tell those who operate them what we want to do, what optimization is, and what it has done elsewhere. To that end, two seminars that describe the activities and possible benefits – one for wastewater treatment plants, and one for wastewater treatment ponds – will be conducted.

The seminar for *mechanical systems* will cover what WWTP Optimization is and why it may be a viable alternative to infrastructure improvements to meet nutrient effluent limitations. We will select three to five candidate-WWTP from seminar attendees to participate in the pilot program.

A seminar for *pond systems* with project partners Minnesota Rural Water Association and Minnesota Technical Assistance Program will show what is already being done well by ponds, but also what opportunities exist for further nutrient reductions. In addition, asset management protocols and Minnesota Water/Wastewater Utilities Agency Response Network (MnWARN) training will be offered to participating facilities. We will select approximately 30 candidate pond facilities from seminar attendees to participate in the pilot program.

The objective is to help wastewater operators who say, “I operate the plant this way because I was trained to operate the plant this way,” to a position of confidence where they can say, “I operate the plant this way because this is what the effluent data indicates.”

ENRTF BUDGET: \$7584

| Outcome | Completion Date |
|--|-----------------|
| 1. Provide a seminar to transfer knowledge from experts to interested parties about wastewater treatment plant optimization. | 12/01/2018 |
| 2. Provide a seminar to transfer knowledge on pond system optimization. Seminar to include also demonstration of Rural Water Association’s asset management tool. | 12/30/2018 |
| 3. Identify facilities that express an interest in optimizing their operations, after hearing from seminar presenters, what those activities might involve. 4 or 5 treatment plants, and as many as 30 pond facilities will be selected. | 12/30/2018 |

ACTIVITY 2: Operator Mentorship and Technical Assistance

Description:

Technical assistance will commence with a site visit to the participating WWTP and pond systems to understand the plants process, existing components, and general capability of both the facility and the operator. Additional instruction will likely occur at program partner facilities.

The *mechanical system* pilot facilities will enter into an agreement under which program partners, namely wastewater operators from the Met Council’s and City of St. Cloud’s wastewater systems, will act as mentors for pilot cities undertaking optimization. Mentors will provide technical assistance such as: evaluating each pilot plant’s treatment processes, making adjustments through process control, training and mentoring operators, and increasing or decreasing wastewater detention time.

Optimization in *pond systems* is by definition more labor intensive, due to complex biological processes occurring within ponds and because most pond system operators have multiple jobs within the government of a small city. This activity will provide “one on one” optimization tailored to each pond facility, so that municipalities can operate pond systems ongoing with low-level labor input. Optimization will entail detailed analysis of a given pond system, followed by developing and establishing an ongoing protocol to achieve maximum pollution reduction in pond system effluent. This work will be provided by subcontract with

Minnesota Rural Water Association and will include enhanced coagulation and flocculation, and discharge window optimization

Technical assistance will also include upstream pollution prevention activities, asset management training, and emergency preparedness training and will include connecting site staff with external resources as needed to assist with implementation of recommendations.

Data will be collected for each of the pilot systems for analysis and compilation into a report as part of Activity 3.

ENRTF BUDGET: \$585,550

| Outcome | Completion Date |
|--|------------------------|
| 1. Develop protocol for facility assessment including treatment process and inputs | 12/31/2018 |
| 2. Work with partners to make low cost recommendations to optimize treatment process at both mechanical and pond pilot locations | 06/30/2019 |
| 3. Additional training and technical assistance completed, including conducting upstream pollution prevention assessments to reduce load coming to each facility | 06/30/2020 |
| 4. Generate report outlining operational actions to reduce effluent contamination (how is this different from #2 above or activit 3 outcome 4 below?). | 08/30/2020 |

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ACTIVITY 3: Academic Analysis, Assessment and Knowledge Transfer

Description:

Academic analysis and assessment is necessary to both quantify the data gathered of the project duration, and to understand the results of the data. We will work with students supervised by the University of Minnesota’s MN TAP program engineers to collect data, analyze datasets, draw conclusions, and publish findings.

ENRTF BUDGET: \$106,866

| Outcome | Completion Date |
|--|------------------------|
| 1. “Before” data collected from each pilot system (3-5 mechanical, ~30 ponds) | Beginning 7//30/2018 |
| 2. “After” data collected from each pilot system (3-5 mechanical, ~30 ponds) | Beginning 7/30/2019 |
| 3. Evaluation of datasets, assessment of results, and final recommendations | 6/30/2020 |
| 4. Final reports published as field guides to optimization practices and processes, transfer of knowledge completed through publication on MPCA web site and shared broadly with other facilities across the state | 6/30/2020 |

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IV. DISSEMINATION:

Description: The raw data and results of optimization activities will be available for all interested parties. The final report, comprising of academic data analysis and evaluation of optimization activities should have some rigor applied to it.

As many as three upper-class engineering students will be working on this project to evaluate the results of the treatment-plant and the treatment-pond tracks. Their work products should be in a format that is capable of serving as a field guide for any future operator who has an interest in improving treatment without adding infrastructure costs. These field guides will be available for down load on the MPCA wastewater web pages at <https://www.pca.state.mn.us/water/municipal-wastewater>.

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V. PROJECT BUDGET SUMMARY:

A. Preliminary ENRTF Budget Overview:

See attached spreadsheet

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: | Divide by 2,080 = TOTAL FTE: 0 |
|--|--------------------------------|

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

| | |
|---|----------------------------------|
| Enter Total Estimated Personnel Hours: 5450 | Divide by 2,080 = TOTAL FTE: 2.6 |
|---|----------------------------------|

B. Other Funds:

| SOURCE OF AND USE OF OTHER FUNDS | Amount Proposed | Amount Spent | Status and Timeframe |
|---|-----------------|--------------|----------------------|
| Other Non-State \$ To Be Applied To Project During Project Period: | | | |
| MPCA Municipal Liaison labor expected over a period of 180 hours. | \$ 9448 | \$ | |
| Other State \$ To Be Applied To Project During Project Period: | | | |
| | \$ | \$ | |
| Past and Current ENRTF Appropriation: | | | |
| | \$ | \$ | |
| Other Funding History: | | | |
| | \$ | \$ | |

VI. PROJECT PARTNERS:

A. Partners receiving ENRTF funding

| Name | Title | Affiliation | Role |
|---------------|---|-----------------------------------|--------------|
| Ruth Hubbard | Executive Director | Minnesota Rural Water | Pond Expert |
| Laura Babcock | Executive Director | MnTAP | Plant-Expert |
| Tracy Hodel | Assistant Public Utilities Director | St. Cloud WWTP | Plant-Expert |
| Larry Rogacki | Assistant General Manager, Support Services | Met Council Environmental Service | Plant-Expert |

B. Partners NOT receiving ENRTF funding

| Name | Title | Affiliation | Role |
|-------------------|---------------------|-------------|-----------------------|
| Joel Peck | Municipal Liaison | MPCA | Project Manager |
| Brian Fitzpatrick | Wastewater Engineer | MPCA | Technical Supervision |

VII. LONG-TERM- IMPLEMENTATION AND FUNDING: The project will have an immediate impact on the pilot projects selected by reducing nutrient levels into waters and by extending the use of treatments systems without having to pay for additional capital improvements. The results and protocols will also be shared with other operators throughout the state. This proposal also sets the table for future research on denitrification in wastewater pond systems, to define the biological processes by which nitrogen is removed from pond water and evaporates into the air. Anammox and ammonia volatilization, as well as biological indicators in ponds are also worthy areas of study that will lead to better pond performance. While sufficient time to develop and plan this study is not available at this time, we fully believe the activities outlined here will facilitate the next phase of understanding the microbiology of denitrification within these ponds.

VIII. REPORTING REQUIREMENTS:

- The project is for two years, will begin on 7/1/19, and end on 6/30/20.

- **Periodic project status update reports will be submitted 1/31 and 6/30 of each year.**
- **A final report and associated products will be submitted between June 30 and August 15, 2020.**

IX. SEE ADDITIONAL WORK PLAN COMPONENTS:

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

Attachment A:
 Environment and Natural Resources Trust Fund
 M.L. 2018 Budget Spreadsheet



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 Legal Citation: M.L. 2018, Chp. 214, Art. 4, Sec. 02, Subd. 04a
 Project Manager: Joel Peck
 Organization: MPCA
 College/Department/Division: Municipal Wastewater
 M.L. 2018 ENRTF Appropriation: \$700,000
 Project Length and Completion Date: 6/30/2020
 Date of Report: 2/21/18

| ENVIRONMENT AND NATURAL RESOURCES TRUST FUND BUDGET | TOTAL BUDGET | TOTAL SPENT | TOTAL BALANCE |
|--|------------------|-------------|------------------|
| BUDGET ITEM | | | |
| Professional/Technical/Service Contracts | | | |
| <i>Mechanical Plant Technical Assistance: MnTAP, MCES, and St. Cloud staff through Sole-source contract, which their technical and operational experience affords.</i> | \$179,200 | | \$179,200 |
| <i>MRWA Pond Expert through sole-source contract, which MRWA's technical and operational experience affords.</i> | \$390,000 | | \$390,000 |
| <i>Optimization Venue, Presentations, and Materials</i> | \$7,584 | | \$7,584 |
| <i>Civil Engineering Students</i> | \$106,866 | | \$106,866 |
| | | | |
| Equipment/Tools/Supplies | | | |
| <i>Five portable lab spectrophotometers for rapid wastewater analysis</i> | \$16,350 | | \$16,350 |
| | | | |
| Capital Expenditures Over \$5,000 | | | |
| | | | |
| COLUMN TOTAL | \$700,000 | \$0 | \$700,000 |