

**Environment and Natural Resources Trust Fund  
2018 Request for Proposals (RFP)**

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**Project Title:**

**ENRTF ID: 035-B**

Wastewater Treatment Plant Optimization Pilot Program

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**Category:** B. Water Resources

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**Total Project Budget:** \$ 779,058

**Proposed Project Time Period for the Funding Requested:** 1.5 years, July 2017 to December 2018

**Summary:**

A pilot program of wastewater treatment optimization without costly facility upgrades. This will lead to cleaner lakes and rivers without needless costs, and achieve significantly better treatment results.

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**Name:** Joel Peck

**Sponsoring Organization:** Minnesota Pollution Control Agency

**Address:** 520 Lafayette Rd. N.  
St. Paul MN 55155

**Telephone Number:** (651) 7572202

**Email** joel.peck@state.mn.us

**Web Address** pca.state.mn.us

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**Location**

**Region:** Statewide

**County Name:** Statewide

**City / Township:**

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**Alternate Text for Visual:**

Map of Minnesota showing Phosphorous trends by watershed.

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



**PROJECT TITLE: Wastewater Treatment Plant Optimization Pilot Program (Mechanical and Pond)**

**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 fund two projects to determine how 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.

**II. PROJECT ACTIVITIES AND OUTCOMES**

The two projects in this proposal have different means and outcomes, due to the differences between mechanical treatment systems and pond systems.

Mechanical Project: The first activity will be a seminar to inform municipal mechanical wastewater operators and administrative officials about the concept of mechanical plant optimization and how it has worked in other situations. From the pool of seminar attendees, three to four pilot facilities will be selected. These 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. Data from various trials will be recorded and compiled into a Field Guide to share broadly with all mechanical wastewater treatment facilities across the state.

Pond Project: 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 proposal would provide “one on one” optimization tailored to each 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 provide by subcontract with Minnesota Rural Water Association and will include enhanced coagulation and flocculation, discharge window optimization, while collecting and analyzing datasets that compiled into a report. The University of Minnesota’s



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**Project Title: Wastewater Treatment Plant Optimization Pilot Program**

Technical Assistance Program (MN TAP) program will analyze these datasets, detail trends and reach conclusions about the datasets.

Finally, this proposal 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. This will be published and made available to the public.

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.

**Activity 1: Mechanical Plants: Instruction and Selection phase**

**Budget: \$ 3,584**

Advertise for and conduct a seminar on what WWTP Optimization is, and why it may be a viable alternative to infrastructure improvements to meet nutrient effluent limitations. Select three to five candidate-WWTP from seminar attendees to participate in pilot program.

<b>Outcome</b>	<b>Completion Date</b>
1. Provide a seminar to transfer knowledge from experts to interested parties about optimization. The seminar will include asset management tool demonstration.	12/1/2018
2. Identify 3-5 pilot municipalities	12/1/2018

**Activity 2: Mechanical Plants: Technical assistance phase**

**Budget: \$197,050**

Once the pool of participants from WWTP optimization seminar have been identified, they will need to enter into a memorandum of understanding that offers the program partners indemnification and clearly defines what is expected of each party. Technical assistance will commence with a site visit to the participating WWTP 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.

<b>Outcome</b>	<b>Completion Date</b>
1. MOU will be signed engaging the facility in pilot program. Expectations of each party are clearly understood, program partners are indemnified	12/01/2018
2. Mentors provide site evaluation and technical assistance to participating pilot operators.	12/30/2018
3. Contract and project administration	06/30/2020



**Activity 3: Mechanical Plants – Data analysis and conclusions by MN TAP**

**Budget: \$77,406**

<b>Outcome</b>	<b>Completion Date:</b>
1. Evaluation of optimization activities at pilot plants (by MN TAP grad student as supervised by MN TAP engineer)	06/30/20 06/30/20
2. Knowledge sharing via publication of findings and recommendations.	

**Activity 4: Pond Plants – Seminar**

**Budget: \$ 4,000**

<b>Outcome</b>	<b>Completion Date:</b>
1. 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

**Activity 5: Pond Plants: Technical assistance delivery by Rural Water Association engineering consultant**

**Budget: \$433,825**

<b>Outcome</b>	<b>Completion Date</b>
1. Through intensive evaluation and engineering technical assistance, create and install optimization protocols at participating municipal pond wastewater treatment systems. Technical assistance will also include asset management training and emergency preparedness training.	06/30/20
2. Compile and analyze data from the above optimization processes, and publish a Field Guide of optimization practices and processes to be shared broadly with other facilities across the state	06/30/20
3. Contract and project administration by MPCA	6/30/20

**Activity 6: Pond Plants – Data analysis and conclusions at MN TAP**

**Budget: \$ 63,193**

<b>Outcome</b>	<b>Completion Date</b>
1. Analyze datasets from pond optimization trials and draw conclusions (by grad student supervised by MN TAP engineer)	06/30/20
2. Publish findings for technology transfer	06/30/20

**Total Budget: \$ 779,058**

**III. PROJECT STRATEGY**

**A. Project Team/Partners**

Partners: MPCA will partner with the Met Council and the City of St. Cloud for mentorship of municipal mechanical wastewater treatment plants. MPCA will partner with the Minnesota Rural Water Association for design and installation of optimization for municipal pond wastewater treatment systems. These partners have experience in both types of treatment systems. Results will be compiled, analyzed and published in Field Guides by the MN TAP program.



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**2018 Main Proposal**

**Project Title:** *Wastewater Treatment Plant Optimization Pilot Program*

**B. Project Impact and Long-Term Strategy**

*The long-term strategy is to understand how plant optimization activities and techniques work in an upper Midwestern climate. The pilot program will inform future decisions about funding technical assistance programs that can be more cost effective than funding infrastructure projects to meet new effluent limitations. Optimization also will provide for maximum pollution removal, which will result in cleaner water in Minnesota.*

**C. Timeline Requirements**

*This project requires a 3-year timeline to both demonstrate and install WWTP optimization activities in both pond and mechanical systems.*

## 2018 Detailed Project Budget

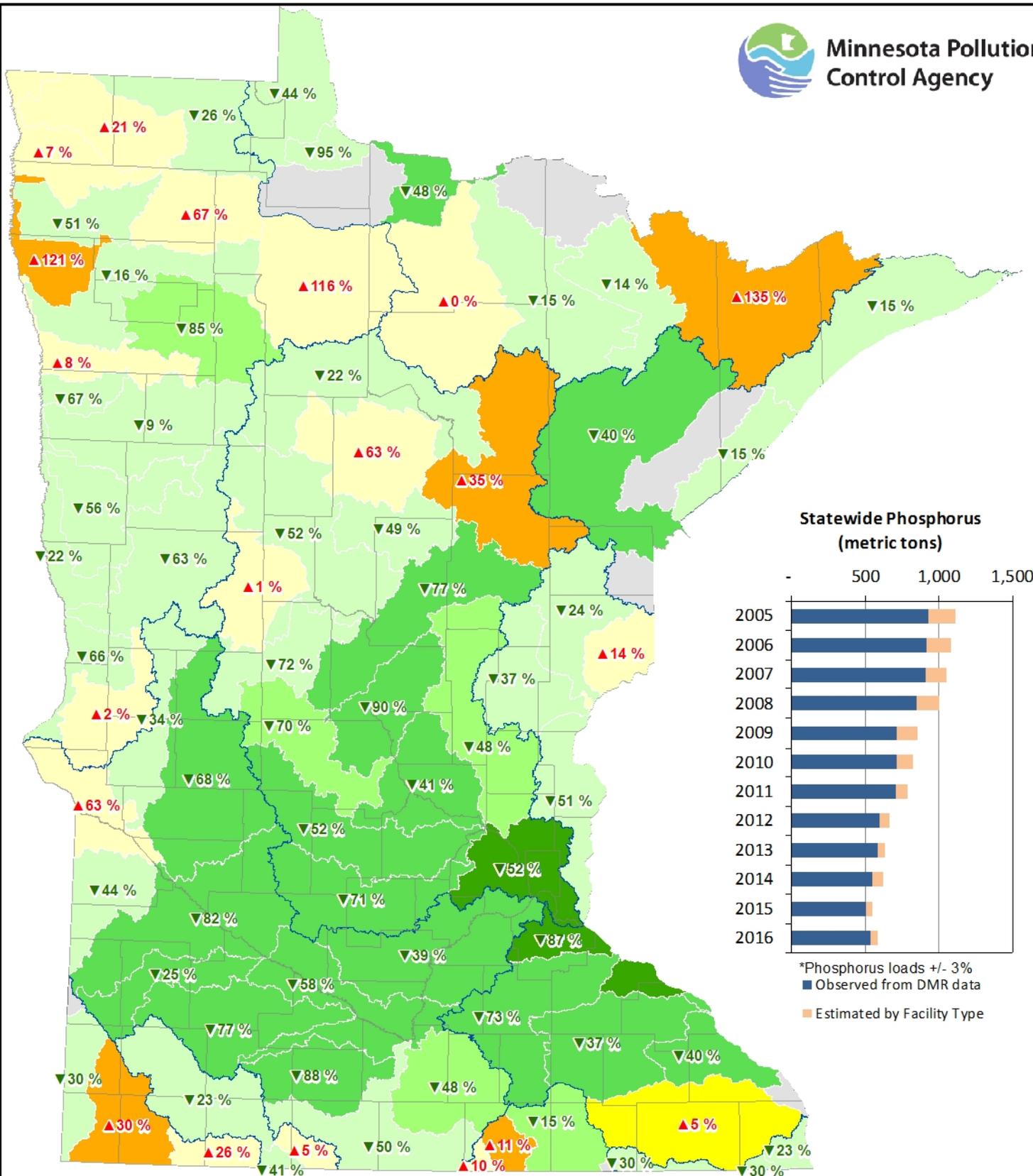
**Project Title:** Wastewater Treatment Plant Optimization Pilot Program

### IV. TOTAL ENRTF REQUEST BUDGET Two years

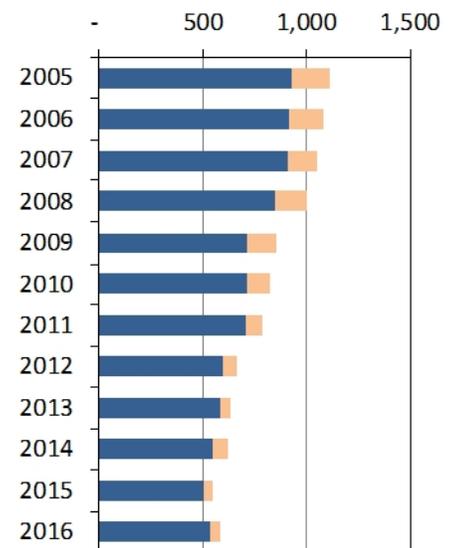
<u>BUDGET ITEM</u>	<u>AMOUNT</u>
<b>Personnel:</b>	na
Professional/Technical/Service Contracts: The amount proposed for contract amounts with MCES, St. Cloud WWTP, and MnTAP, includes two wastewater engineers at 160 hours each at a rate of \$185 per hour (\$59,200) through sole-source contract.	\$ 59,200
Professional/Technical/Service Contracts: Three experienced wastewater operators from MCES, St. Cloud WWTP, and MnTAP, at 320 hours each at a rate of \$125 per hour (\$60,000) through sole-source contract.	\$ 120,000
Professional/Technical/Service Contracts: ; and one graduate-level student at 25 percent apportionment for 940 hours at \$20 per hour, plus tuition, and fringe benefits	\$ 34,656
Equipment/Tools/Supplies: Materials and consumables \$1,500; five Portable Spectrophotometers (5x\$3,270)	\$ 17,850
Professional/Technical/Service Contracts: 1 FTE for Minnesota Rural Water Association for three years (390,000) sole-source contract; graduate-level data analysis (\$63,193)	\$ 453,198
<b>Travel:</b> Estimated 2000 miles at \$.535 per mile	\$ 1,070
<b>Additional Budget Items:</b> Expenses for an opening and closing seminar for treatment plants, estimated at \$3,584; opening and closing seminar for pond systems, estimated at 4,000; contract and project administration of .25 FTE for MPCA over three year term	\$ 93,084
<b>TOTAL ENVIRONMENT AND NATURAL RESOURCES TRUST FUND \$ REQUEST =</b>	<b>\$ 779,058</b>

### V. OTHER FUNDS

<u>SOURCE OF FUNDS</u>	<u>AMOUNT</u>	<u>Status</u>
<b>Other Non-State \$ To Be Applied To Project During Project Period:</b>	na	<i>Indicate: Secured or</i>
<b>Other State \$ To Be Applied To Project During Project Period:</b> Joel Peck, MPCA Municipal Liaison, project management and administration at 160 hours, or 8.3 percent of annual salary, and 8.3 percent of fringe benefits. The anticipated work requirement is 160 hours over the six-month period individual sum, list out the source of the funds, the amount, and indicate whether the funds	\$ 9,448	<i>Secured</i>
<b>In-kind Services To Be Applied To Project During Project Period:</b> MRWA will deliver in-kind contribution in the form of Asset Management Assistance and training, as well as emergency preparedness for wastewater facilities (MnWARN)	TBD	<i>Secured</i>
<b>Past and Current ENRTF Appropriation:</b>	na	<i>Indicate: Unspent?</i>
<b>Other Funding History:</b>	na	



Statewide Phosphorus (metric tons)



\*Phosphorus loads +/- 3%  
 ■ Observed from DMR data  
 ■ Estimated by Facility Type

Decrease from 2005 to 2014-16 avg.(kg)

- 0 - 5,000
- 5,000 - 10,000
- 10,000 - 50,000
- >50,000

Increase from 2005 to 2014-16 avg.(kg)

- 1 - 500
- 501 - 1,000
- 1,001 - 3,000
- No WWTP Loads

Statewide NPDES Permitted Wastewater Phosphorus Loading Change from 2005 to 2014-16 Average

Joel Peck, Municipal Liaison  
[Joel.peck@state.mn.us](mailto:Joel.peck@state.mn.us) 651.757.2202  
520 Lafayette Rd. N., St. Paul, MN 55155



**Municipal Liaison**

This position exists to serve as the liaison for Municipal wastewater facilities that require interaction with the Minnesota Pollution Control Agency. This work includes building and fostering relationships with municipal administrators and wastewater professionals, providing outreach and education on the basis and need for new and proposed water quality regulations with potential to impact wastewater facilities, and specifically assisting municipal facilities to understand the impact of applicable rules and requirements of agency on financial and human resources. In particular, this position assists municipalities in implementing and participating in the water quality standards rulemaking process and navigating the NPDES/SDS permitting process. The position also provides direction on the public funding programs for water infrastructure projects.

**Joel Peck's Professional History**

Municipal Liaison  
2015-present Minnesota Pollution Control Agency

City Administrator  
2011-2015 St. Croix Falls, WI

City Administrator  
2008-2011 Crosby, MN

Intern to Director of Member Service  
2007-2008 League of Minnesota Cities

Administrative Assistant  
2003-2007 Third Floor Documents Division, Office of the Chief Clerk of the Minnesota House of Representatives

**Education**

Masters of Science in Public Administration  
2006 Hamline University

Bachelor of Arts in Journalism  
2003 North Central University