2019 Project Abstract For the Period Ending June 30, 2022, Submitted August 15, 2022

PROJECT TITLE: Wastewater Nutrient Reduction through Industrial Source Reduction Assistance PROJECT MANAGER: Laura Babcock AFFILIATION: University of Minnesota, School of Public Health/Environmental Health Sciences/Minnesota Technical Assistance Program MAILING ADDRESS: 200 Oak St SE, Suite 350-1 CITY/STATE/ZIP: Minneapolis, MN 55455 PHONE: 612-624-4678 E-MAIL: Ibabcock@umn.edu WEBSITE: www.mntap.umn.edu FUNDING SOURCE: Environment and Natural Resources Trust Fund LEGAL CITATION: M.L. 2019, First Special Session, Chp. 4, Art. 2, Sec. 2, Subd. 04c

APPROPRIATION AMOUNT: \$200,000 AMOUNT SPENT: \$183,124 AMOUNT REMAINING: \$16,876

Sound bite of Project Outcomes and Results

This project explored ways to keep Minnesota surface waters at high quality and make municipal wastewater treatment easier by reducing nutrient load sent to wastewater facilities by applying source reduction technical assistance at upstream industrial sites.

Overall Project Outcome and Results

Nutrient pollution refers to the presence of excess nitrogen and phosphorus in water and is a major environmental concern. High nutrient levels promote plant growth that can result in eutrophication, algal blooms, or the creation of 'dead zones' in bodies of water where beneficial aquatic life cannot thrive. Wastewater treatment facilities are critical infrastructure sites purposed with reducing nutrient levels in wastewater to levels safe for the environment.

Wastewater treatment operations work hard to discharge high quality treated water. In areas of increasing community growth and industrial expansion, the wastewater infrastructure may not be able to keep up with treatment needs. When discharge exceeds the treatment capacity, communities have few choices: they can regulate load sent to the treatment plant limiting community growth or invest in costly new infrastructure.

The purpose of this project was to explore a third option to improve water quality by reducing nutrient pollution discharged by industrial facilities to municipal wastewater treatment facilities. This reduction is supported by source reduction technical assistance at the industrial site. The primary activities of this project included:

- Engaging industrial facilities in communities with high nutrient discharge;
- Providing technical assistance to identify and implement nutrient reduction; and
- Sharing strategies for industrial nutrient reduction with additional facilities.

By promoting strategies for upstream nutrient source reduction, the treatment intensity needed to meet wastewater discharge requirements may be reduced. This could reduce operating costs and possibly postpone or eliminate capital investment needs for treatment expansion projects. Key outcomes of this project include:

- Completed eight facility assessments that investigated nutrient reduction;
- Completed four intern projects with recommendations for nutrient reduction;
- Implemented 14,730 lbs of nutrient reduction or 67% of the identified opportunity;
- Developed a guide for wastewater operators to identify practical nutrient reduction options; and
- Delivered a webinar highlighting successful upstream nutrient reduction practices.

Project Results Use and Dissemination

Since nutrient pollution in wastewater can be a challenge for many treatment facilities and treatment costs can drain community resources, MnTAP created two resources to share the strategies developed and tested during this project. A <u>webinar</u> was created featuring wastewater sites and businesses that participated in activities to reduce discharge nutrient. Speakers provided perspectives on nutrient challenges and the value in collaboration. A <u>guide</u> was created to provide wastewater operators and community leaders with a framework for identifying and addressing opportunities to reduce nutrient pollution at the source and save of treatment costs. Four intern project summaries are posted on the MnTAP website for <u>Kerry Ingredients</u>, <u>August Schell Brewing</u>, <u>Minnesota Specialty Yeast</u> and <u>Rochester Meats</u>.



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

Today's Date: August 15, 2022 Final Report Date of Work Plan Approval: June 5, 2019 Project Completion Date: June 30, 2022

PROJECT TITLE: Wastewater Nutrient Reduction through Industrial Source Reduction Assistance

Project Manager: Laura Babcock

Organization: University of Minnesota

College/Department/Division: School of Public Health/Environmental Health Sciences/Minnesota Technical Assistance Program

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Location: Statewide

Total Project Budget: \$200,000

Amount Spent: \$183,124 through June 30, 2022

Balance: \$16,876

Legal Citation: M.L. 2019, First Special Session, Chp. 4, Art. 2, Sec. 2, Subd. 04c

Appropriation Language: \$200,000 the first year is from the trust fund to the Board of Regents of the University of Minnesota to provide technical assistance for industrial facilities to optimize their processes, reduce nutrient loads to wastewater treatment facilities, and improve water quality. The economic savings and water quality improvements achieved through this work must be documented.

I. PROJECT STATEMENT:

Treatment facilities manage effluent as part of the public infrastructure needed for public health, economic development and job growth. This project will provide source reduction technical assistance for industrial facilities discharging high wastewater nutrient load to their municipal wastewater facility. Businesses that generally have achievable nutrient source reduction opportunities include:

- Car/Truck Washing
- Meat Packing Plants
 - **Metal Finishing Facilities**
- Restaurants Schools

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Dairies

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• **Food Processing Plants Nursing Homes** •

Industrial Cleaning/Sanitizing

By promoting strategies for upstream nutrient management in the feed to mechanical and pond wastewater systems, the treatment intensity needed to meet wastewater discharge requirements is reduced. Reduced treatment requirements may postpone or eliminate capital investment needs. The Minnesota Technical Assistance Program (MnTAP) has demonstrated source reduction strategies to improve a wastewater facility's ability to meet effluent targets while enhancing business operations through expanded capacity, improved quality and reduced cost.

- Mankato, MN a long time manufacturer changed their coating line and optimized chemical use to eliminate 340 lb phosphorus to the wastewater stream while decreasing off-grade production
- Monticello, MN a food processing facility streamlined the chemicals used in their cleaning and sanitizing • operations reducing the phosphorus in their wastewater effluent by 80%

II. OVERALL PROJECT STATUS UPDATES:

First Update March 1, 2020

Since project initiation, MnTAP has made strides in terms of Activity 1 and 2 deliverables. Utilizing wastewater treatment effluent data, communities have been ranked based on nutrient values for Nitrogen and Phosphorous and plotted on maps to better-understand regional opportunities. This list has influenced targeted outreach to more than 30 communities, which has resulted in the engagement of 8 separate communities for nutrient reduction assistance.

MnTAP staff have visited 4 facilities in target communities and source reduction assessments are in progress. MnTAP aims to continue targeted site assessments alongside intern projects in 2020.

Among the communities engaged, one MnTAP intern project was completed in 2019 with implemented savings of over \$250,000 and over 190,000 lbs. biological oxygen demand (BOD) wastewater effluent reduction. Two businesses in separate communities have been selected for 2020 MnTAP interns: one fully supported through LCCMR funding (a MN brewing facility) and the second project co-funded, with one-half support from LCCMR (a food ingredients manufacturer).

Second Update September 1, 2020

Following a successful 2019 intern project and early community engagement efforts, MnTAP staff have continued to pursue and execute on opportunities for wastewater nutrient reduction and business efficiency.

Two preliminary process assessments were transitioned to 2020 MnTAP Intern projects, which were completed in August 2020. Between those two projects, more than 5,000 lbs. of phosphorus reduction opportunity has

been recommended. Those projects have also yielded substantial savings in terms of other resource reduction and cost savings categories. Executive summaries of those projects will be published by the end of 2020.

MnTAP staff continue to engage targeted communities, with one additional assessment in progress and another assessment planned for fall 2020. Project staff are planning to engage 2 or more communities, beyond the current list, which could lead to additional upstream process assessments and corresponding recommendations.

Third Update March 1, 2021

By the end of January 2021, MnTAP staff had conducted the first follow-up review of recommendations that resulted from the 2020 MnTAP Intern Program. From those projects, 2 recommendations have been *implemented* and 2 are marked as *planned*. There are an additional 7 recommendations that have been *proposed*, and technical staff are confident that a portion will be implemented within MnTAP's standard 2-year follow-up period. Executive summaries for those intern projects have been published in print and online, in *MnTAP Solutions 2020*. Those projects have also been featured by an international media source, ProFood World.

MnTAP technical staff completed an assessment (previously *in-progress*) which identified an annual phosphorous reduction opportunity of 1,700 lbs. conservatively. Implementation of changes could not only lead to phosphorous reduction, but also reductions in Biological Oxygen Demand (BOD), Total Suspended Solids (TSS) and associated cost savings.

Three additional sites have moved to *in-progress* assessments – with one of those sites being in a newly engaged community for upstream nutrient reduction assistance. Preliminary assessments in these communities indicate that at least 2 sites have opportunities for improvement through MnTAP staff assistance and/or future intern projects.

For the remainder of 2021, the Upstream Nutrient Reduction team at MnTAP will conduct both remote and inperson follow-up to engaged facilities and will seek engagement with at least 1 additional Minnesota community.

Fourth Update September 1, 2021

During March and April 2021, MnTAP staff approved 2 prospective sites for 2021 intern projects. One of these sites chose to withdraw from selection due to personnel and budget challenges. This was a strong project, so MnTAP will consider the site for future assistance through an intern project or follow-up assessment.

A successful 2021 intern project was completed in August, which identified annual reductions of 600 lbs. Nitrogen and 30 lbs. Phosphorus. One of the key recommendations that would reduce Nitrogen and Phosphorous would also divert food product waste to a better use, saving approximately 15,000 lbs. annually. This project also yielded annual savings for energy and water, as well.

As targeted in the previous LCCMR update, MnTAP staff have now engaged 1 additional Minnesota community and have completed a preliminary assessment. The project team will continue work with this community and conducting follow-up to many other engaged communities and sites during the remainder of the project.

MnTAP staff look forward to presenting a live webinar in February 2022. The format and content of this webinar are both in the planning phase and will be confirmed by end of Q4 2021.

Fifth Update March 1, 2022

As 2021 came to a close, MnTAP staff continued follow-up with past intern host companies, assessment sites and engaged communities.

During follow-up, MnTAP staff learned that the Rochester Meat Company implemented recommendations that will reduce at total of 15,000 lbs. of wastewater effluent: 600 lbs. of Nitrogen, 30 lbs. Phosphorous, and 14,370 lbs. food product solids (which have been diverted to beneficial reuse).

Additional findings from follow-up revealed that some sites need more time to plan for implementation of recommendations for various reasons, such as staffing and budget cycles. MnTAP staff have learned that it is common for implementation to take place 1-2 years from intern project or assessment completion, occasionally going beyond this timeframe as well. Certain recommendations can be implemented much sooner, which is why MnTAP staff and interns seek a variety of solutions for sites.

In two communities that MnTAP staff have been engaged with, wastewater operators and MnTAP staff are finding minimal contribution from local industrial sources, which point to some other potential contributors that have yet to be identified. This topic will be discussed in the Final Report submission (completed by August 15, 2022).

MnTAP hosted a live webinar on February 15th, 2022, featuring 2 wastewater treatment sites and 2 industrial project facilities. A representative from one of the treatment facilities and one from an intern project host company participated as speakers for the webinar. Both speakers provided interesting perspectives that addresses the challenges they face, but also the value in collaboration between wastewater facilities and businesses. A recording of the webinar will be posted to the MnTAP webpage by April 2022.

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

At the conclusion of the project, MnTAP staff and interns have collaborated to complete 8 assessments and 4 intern projects in 7 Minnesota communities. For a more detailed summary of project outputs, outcomes and overall findings, please read the final project abstract, as well as the provided project report narrative.

MnTAP staff are eager to continue follow-up with communities and sites that were engaged during this project to provide further assistance and to learn of implementation for any pending recommendations. In addition, MnTAP hopes that case study summaries, the Upstream Nutrient Operator Guide, and web resources provide inspiration to businesses with opportunity to minimize nutrient effluent pollution.

As of June 30th, project-end, implementation reduction totals for all sites are as follows:

- 13,400 lbs nitrogen
- 1,330 lbs phosphorous
- 205,000 lbs wastewater effluent
- 30,200,000 gallons water
- 18,000 kWh electricity
- \$572,600 in annual cost savings

Overall Project Outcome and Results

Nutrient pollution refers to the presence of excess nitrogen and phosphorus in water and is a major environmental concern. High nutrient levels promote plant growth that can result in eutrophication, algal blooms or the creation of 'dead zones' in bodies of water where beneficial aquatic life cannot thrive. Wastewater treatment facilities are critical infrastructure sites purposed with reducing nutrient in wastewater to levels safe for the environment.

Wastewater treatment operations work hard to discharging high quality treated water. In areas of increasing community growth and industrial expansion, the wastewater infrastructure may not be able to keep up with treatment needs. When discharge exceeds the treatment capacity, communities have few choices, they can regulate load sent to the treatment plant limiting community growth or invest in costly new infrastructure.

The purpose of this project was to explore a third option to improve water quality by reducing nutrient pollution discharged by industrial facilities to municipal wastewater treatment facilities. This reduction is supported by source reduction technical assistance at the industrial site. The primary activities of this project included:

- Engaging industrial facilities in communities with high nutrient discharge
- Providing technical assistance to identify and implement nutrient reduction
- Sharing strategies for industrial nutrient reduction with additional facilities.

By promoting strategies for upstream nutrient source reduction, the treatment intensity needed to meet wastewater discharge requirements may be reduced. This could reduce operating costs and possibly postpone or eliminate capital investment needs for treatment expansion projects. Key outcomes of this project include:

- Completed eight facility assessments that investigated nutrient reduction
- Completed four intern projects with recommendations for nutrient reduction
- Implemented 14,730 lbs of nutrient reduction or 67% of the identified opportunity
- Developed a guide for wastewater operators to identify practical nutrient reduction options
- Delivered a webinar highlighting successful upstream nutrient reduction practices.

III. PROJECT ACTIVITIES AND OUTCOMES:

ACTIVITY 1 Title: Identify/Engage Locations with High Nutrient Effluent and Industrial Clients for Assistance Activities

Description: Select communities with wastewater facilities that can benefit from upstream nutrient source reduction technical assistance. This includes facilities with high P and N discharge levels that may be in areas with impaired surface water and serve industries traditionally having high wastewater load. Contact wastewater facilities, municipalities and their clients to share information on upstream effluent nutrient reduction options, the potential impact wastewater plant operations and local surface water quality.

ACTIVITY 1 ENRTF BUDGET: \$32,000

Outcome	Completion Date
1. 20-30 communities identified with high potential for effluent nutrient reduction	9/30/2019
2. 20-30 communities informed on options for nutrient source reduction	12/31/2019
3. 5-10 communities seek to explore source reduction technical assistance	3/31/2020
4. 5-10 upstream sites agree to source reduction assessments	4/30/2020

First Update March 1, 2020

Outcome progress	Completion Status
 20-30 communities identified with high potential for effluent nutrient reduction 29 target communities identified using the following parameters: Identified communities with multiple businesses in food processing industry 	Target completion date: 9/30/2019 Status: Complete

Outcome progress	Completion Status
 Identified priority treatment plants and ponds based on following criteria: High effluent nitrogen concentration and mass flow High effluent phosphorus concentration and mass flow Large total facility design flow Final communities were identified by the correlation of communities with food processors within close range (≤3 mi.) to a priority plant/pond "Quality" check of each final community using Google Maps satellite view to verify already identified and additional potential upstream businesses 	
2. 20-30 communities informed on options for nutrient source reduction	Target completion
 9 communities contacted by email and phone 9 communities express interest in response to outreach 	Status: Complete
 3. 5-10 communities seek to explore source reduction technical assistance 8 communities fully engaged Meetings completed with 7 wastewater treatment facilities Preliminary site visit completed in 1 additional community, with plans to meet with the treatment facility in 2020 	Target completion date: 3/31/2020 Status: Complete
 4. 5-10 upstream sites agree to source reduction assessments • 3 site assessments in progress 	Target completion date: 4/30/2020 Status: In progress

Community Identifier*	Wastewater System Type	Wastewater treatment provider engaged** (Yes/No)	Intern Project	Business Assessments
C1	Mechanical Plant	Yes	Planned	1 in progress
C2	Treatment Pond	Yes		TBD
C3	Mechanical Plant	Yes	Planned	1 in progress
C4	Mechanical Plant	Yes	Completed	Follow-up in progress
C5	Mechanical Plant	Yes		TBD
C6	Treatment Pond	Yes		TBD
C7	Mechanical Plant	Yes		TBD
C8	Mechanical Plant	No	2021 prospect	1 in progress

*C# refers to the community engaged in the project

**Engagement refers to physical meetings or web-conferences held with community wastewater treatment facilities to discuss potential for upstream nutrient source reduction.

Second Update September 1, 2020

Outcome pro	Completion Status	
 20-30 con reduction Completion 	nmunities identified with high potential for effluent nutrient eted in previous update	Target completion date: 9/30/2019 Status: Complete
2. 20-30 con • Comple	nmunities informed on options for nutrient source reduction eted in previous update	Target completion date: 12/31/2019 Status: Complete
3. 5-10 comCompleTarget	munities seek to explore source reduction technical assistance eted in previous update to engage an additional 2 or more communities by March 2021	Target completion date: 3/31/2020 Status: Complete
4. 5-10 upst ● Site ass ○ ○	ream sites agree to source reduction assessments essments as of September 2020 update: 2 completed 2 in progress 1 planned	Target completion date: 4/30/2020 Status: In progress

Community Identifier*	Wastewater System Type	Wastewater treatment provider engaged** (Yes/No)	Intern Project	Business Assessments
C1	Mechanical Plant	Yes	Completed	1 completed, 1 in progress
C2	Treatment Pond	Yes		TBD
C3	Mechanical Plant	Yes	Completed	1 completed
C4	Mechanical Plant	Yes	Completed	Follow-up in progress
C5	Mechanical Plant	Yes		TBD
C6	Treatment Pond	Yes		1 planned
C7	Mechanical Plant	Yes		TBD
C8	Mechanical Plant	No	2021 prospect	1 in progress

*C# refers to the community engaged in the project

**Engagement refers to physical meetings or web-conferences held with community wastewater treatment facilities to discuss potential for upstream nutrient source reduction.

Third Update March 1, 2021

Ou	tcome progress	Completion Status
1.	20-30 communities identified with high potential for effluent nutrient reductionCompleted in previous update	Target completion date: 9/30/2019 Status: Complete

2.	20-30 communities informed on options for nutrient source reductionCompleted in previous update	Target completion date: 12/31/2019 Status: Complete
3.	 5-10 communities seek to explore source reduction technical assistance Completed in previous update One additional community engaged with leads to facilities for assessments and/or future intern projects 	Target completion date: 3/31/2020 Status: Complete
4.	 5-10 upstream sites agree to source reduction assessments Site assessments as of March 2021 update: 3 completed 4 in progress 	Target completion date: 4/30/2020 Status: In progress

Community Identifier*	Wastewater System Type	Wastewater treatment provider engaged** (Yes/No)	Intern Project	Business Assessments
C1	Mechanical Plant	Yes	Completed	2 completed
C2	Treatment Pond	Yes		TBD
C3	Mechanical Plant	Yes	Completed	1 completed
C4	Mechanical Plant	Yes	Completed	1 in progress
C5	Mechanical Plant	Yes		TBD
C6	Treatment Pond	Yes		1 in progress
C7	Mechanical Plant	Yes		TBD
C8	Mechanical Plant	No	2021 prospect	1 in progress
C9	Mechanical Plant	Yes	2021 prospect	1 in progress

*C# refers to the community engaged in the project

**Engagement refers to physical meetings or web-conferences held with community wastewater treatment facilities to discuss potential for upstream nutrient source reduction.

Fourth Update September 1, 2021

Οι	itcome progress	Completion Status
1.	20-30 communities identified with high potential for effluent nutrient reductionCompleted in previous update	Target completion date: 9/30/2019 Status: Complete
2.	20-30 communities informed on options for nutrient source reductionCompleted in previous update	Target completion date: 12/31/2019 Status: Complete
3.	 5-10 communities seek to explore source reduction technical assistance Completed in previous update One additional community engaged with leads to facilities for assessments and/or future intern projects 	Target completion date: 3/31/2020 Status: Complete

Outcome progress	Completion Status
 4. 5-10 upstream sites agree to source reduction assessments Site assessments as of September 2021 update: 5 completed 3 in progress 	Target completion date: 4/30/2020 Status: In progress

Community Identifier*	Wastewater System Type	Wastewater treatment provider engaged** (Yes/No)	Intern Project	Business Assessments
C1	Mechanical Plant	Yes	1 completed	2 completed
C2	Treatment Pond	Yes		TBD
C3	Mechanical Plant	Yes	1 completed	1 completed
C4	Mechanical Plant	Yes	2 Completed	1 completed
C5	Mechanical Plant	Yes		TBD
C6	Treatment Pond	Yes		1 completed
C7	Mechanical Plant	Yes		TBD
C8	Mechanical Plant	No	2022 prospect	1 in progress
C9	Mechanical Plant	Yes	2022 prospect	1 in progress
C10	Treatment Pond	Yes		1 in progress

*C# refers to the community engaged in the project

******Engagement refers to physical meetings or web-conferences held with community wastewater treatment facilities to discuss potential for upstream nutrient source reduction.

Fifth Update March 1, 2022

Ou	itcome progress	Completion Status
1.	20-30 communities identified with high potential for effluent nutrient reductionCompleted in previous update	Target completion date: 9/30/2019 Status: Complete
2.	20-30 communities informed on options for nutrient source reductionCompleted in previous update	Target completion date: 12/31/2019 Status: Complete
3.	5-10 communities seek to explore source reduction technical assistanceCompleted in previous update	Target completion date: 3/31/2020 Status: Complete
4.	 5-10 upstream sites agree to source reduction assessments 8 site assessments completed as of March 2022 update 	Target completion date: 4/30/2020 Status: Complete

Community engagement, assessments and intern project tracking

Community Wastewater Syste Identifier* Type		Wastewater treatment provider engaged** (Yes/No)	Intern Project	Business Assessments
C1	Mechanical Plant	Yes	1 completed	2 completed
C2	Treatment Pond	Yes		TBD
C3	Mechanical Plant	Yes	1 completed	1 completed
C4	Mechanical Plant	Yes	2 Completed	1 completed
C5	Mechanical Plant	Yes		TBD
C6	Treatment Pond	Yes		1 completed
C7	Mechanical Plant	Yes		TBD
C8	Mechanical Plant	No	2023 prospect	1 completed
C9	Mechanical Plant	Yes		1 completed
C10	Treatment Pond	Yes		1 completed

*C# refers to the community engaged in the project

**Engagement refers to physical meetings or web-conferences held with community wastewater treatment facilities to discuss potential for upstream nutrient source reduction.

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

Ou	tcome progress	Completion Status
1.	20-30 communities identified with high potential for effluent nutrient reductionCompleted in previous update	Target completion date: 9/30/2019 Status: Complete
2.	20-30 communities informed on options for nutrient source reductionCompleted in previous update	Target completion date: 12/31/2019 Status: Complete
3.	5-10 communities seek to explore source reduction technical assistanceCompleted in previous update	Target completion date: 3/31/2020 Status: Complete
4.	5-10 upstream sites agree to source reduction assessmentsCompleted in previous update	Target completion date: 4/30/2020 Status: Complete

Target communities were identified using the following parameters:

- Identified communities with multiple businesses in food processing industry
- Identified priority treatment plants and ponds based on following criteria:
 - High effluent nitrogen concentration and mass flow
 - o High effluent phosphorus concentration and mass flow
 - o Large total facility design flow
- Final communities were identified by the correlation of communities with food processors within close range (≤3 mi.) to a priority plant/pond

The resulting list of communities influenced targeted outreach to more than 30 communities.

While mail and flier outreach was modestly effective, the most effective outreach efforts involved direct person to person outreach. This involved calling wastewater treatment operations staff in target communities to discuss program activities and request referrals to business sites in their communities that might benefit from these technical assistance activities. Additionally direct introduction to wastewater and community staff through outreach efforts from other MnTAP projects, specifically the wastewater treatment facility nutrient optimization project with the Minnesota Pollution Control Agency and Minnesota Rural Water Association, SWIFT 148605, supported with funding from the Environmental and Natural Resources Trust Fund. These two projects' outreach and outcome objectives were highly complementary and allowed MnTAP to offer comprehensive nutrient reduction services to help wastewater treatment facilities improve overall nutrient discharge to Minnesota surface waters.

Outreach activities were successful in connecting with at least 30 facilities. From these contacts, nine communities expressed interest in engaging MnTAP for nutrient source reduction assessments at facilities upstream from their wastewater treatment facilities. One additional facility is still in discussion for future interactions with MnTAP for upstream nutrient reduction

Community Wastewater System Identifier* Type		Wastewater treatment provider engaged** (Yes/No)	Intern Project	Business Assessments
C1	Mechanical Plant	Yes	1 completed	2 completed
C2	Treatment Pond	Yes		TBD
C3	Mechanical Plant	Yes	1 completed	1 completed
C4	Mechanical Plant	Yes	2 Completed	1 completed
C5	Mechanical Plant	Yes		TBD
C6	Treatment Pond	Yes		1 completed
C7	Mechanical Plant	Yes		TBD
C8	Mechanical Plant	No	2023 prospect	1 completed
C9	Mechanical Plant	Yes		1 completed
C10	Treatment Pond	Yes		1 completed

Community engagement, assessments and intern project tracking

*C# refers to the community engaged in the project

**Engagement refers to physical meetings or web-conferences held with community wastewater treatment facilities to discuss potential for upstream nutrient source reduction.

ACTIVITY 2 Title: Conduct Nutrient Source Reduction Assessments at Industrial Facilities and Measure Impact Description: Conduct technical assistance assessments to identify and implement source reduction opportunities that will decrease municipal wastewater nutrient load. Record results and assess impact on wastewater operations and discharge. Technical assistance activities will recommend process optimization strategies and material substitution to reduce site load released to wastewater. Highly complex systems will be able to apply to the MnTAP Intern Program for a summer intern to provide added engineering manpower to support identification, implementation and outcome documentation of nutrient reduction activities.

ACTIVITY 2 ENRTF BUDGET: \$148,000

Outcome	Completion Date
1. 5-10 source reduction site assessments for wastewater nutrient reduction	12/31/2021

Outcome	Completion Date
2. At least 2 source reduction intern projects for wastewater nutrient reduction	9/30/2021
3. All participating sites receive follow up assistance from MnTAP	3/31/2022
4. At least 5000 lb nutrient load to wastewater facilities reduced	6/30/2022

First Update March 1, 2020

Ou	tcome progress	Completion Status
1.	 5-10 source reduction site assessments for wastewater nutrient reduction 3 site assessments in progress (refer to tables below) Sites B2 and B3 – intern projects designed for 2020 as a result of preliminary assessments Site B4 engaged for further assessment or potential intern in 2021 	Target completion date: 12/31/2021 Status: In progress
2.	 At least 2 source reduction intern projects (1000 intern project hours*) for wastewater nutrient reduction 250 intern project hours completed in 2019 750 intern project hours (one 500 and one 250) planned for two student interns Summer 2020 	Target completion date: 9/30/2021 Status: In progress
3.	 All participating sites receive follow-up assistance from MnTAP 3-month follow-up to the 2019 intern project has been completed Follow-up for intern projects conducted for a minimum of 2 years 	Target completion date: 3/31/2022 Status: In progress
4.	 At least 5000 lb nutrient load to wastewater facilities reduced 190,500 lbs. reduction in Biological Oxygen Demand (BOD) wastewater load 	Target completion date: 6/30/2022 Status: In progress

*500 hours = 1 full-time Summer MnTAP Intern

Total Recommended Project Savings

Business	Intern or	Nitrogen	Phosphorous	Wastewater	Water	Energy	Annual
identifier*	Assessment	(lb)	(lb)	effluent, product solids(BOD)	reduction (gal)	(kWh)	Savings (\$)
B1	Intern	N/A	N/A	190,500	30,000,000	N/A	\$1,176,000
B2	Assessment	TBD	TBD	TBD	TBD	TBD	TBD
B3	Assessment	TBD	TBD	TBD	TBD	TBD	TBD
B4	Assessment	TBD	TBD	TBD	TBD	TBD	TBD

Total Implemented Project Savings

Business identifier	Intern or Assessment	Nitrogen (Ib)	Phosphorous (Ib)	Wastewater effluent, product solids (BOD)	Water reduction (gal)	Energy (kWh or therms)	Annual Savings (\$)
B1	Intern	N/A	N/A	190,500	TBD	N/A	\$252,000

Business identifier	Intern or Assessment	Nitrogen (lb)	Phosphorous (lb)	Wastewater effluent, product solids (BOD)	Water reduction (gal)	Energy (kWh or therms)	Annual Savings (\$)
B2	Assessment	TBD	TBD	TBD	TBD	TBD	TBD
B3	Assessment	TBD	TBD	TBD	TBD	TBD	TBD
B4	Assessment	TBD	TBD	TBD	TBD	TBD	TBD

*B# refers to the business engaged in the project

Second Update September 1, 2020

Ou	tcome progress	Completion Status
1.	 5-10 source reduction site assessments for wastewater nutrient reduction 2 site assessments completed (Sites B2, B3) 2 site assessments in progress (refer to tables below) Preliminary assessment completed at Site B5, follow-up in progress Follow-up pending with Site B4 1 site assessment planned for Community 6 (C6) 	Target completion date: 12/31/2021 Status: In progress
2.	 At least 2 source reduction intern projects (1000 intern project hours*) for wastewater nutrient reduction 1000 intern project hours completed in 2020 (250 completed in 2019) 	Target completion date: 9/30/2021 Status: Complete
3.	 All participating sites receive follow-up assistance from MnTAP 6-month follow-up to the 2019 intern project has been completed Follow-up for intern projects conducted for a minimum of 2 years 	Target completion date: 3/31/2022 Status: In progress
4.	 At least 5000 lb nutrient load to wastewater facilities reduced 190,500 lbs. reduction in Biological Oxygen Demand (BOD) wastewater load implemented More than 5,000 lb. phosphorus reduction opportunity identified 	Target completion date: 6/30/2022 Status: In progress

*500 hours = 1 full-time Summer MnTAP Intern

Total Recommended Project Savings

Business	Intern or	Nitrogen	Phosphorous	Wastewater	Water	Energy	Annual
identifier*	Assessment	(lb)	(lb)	effluent,	reduction	(kWh or	Savings (\$)
				product	(gal)	therms)	
				solids(BOD,			
				TSS)			
B1	Intern	N/A	N/A	190,500	30,000,000	N/A	\$1,176,000
B2	Assessment	N/A	See B2	N/A	N/A	N/A	N/A
			Intern**				
B2	Intern	N/A	1,040	N/A	101,800,000	3,900	\$22,500
						therms	
В3	Assessment	N/A	See B3	N/A	N/A	N/A	N/A
			Intern**				

Business	Intern or	Nitrogen	Phosphorous	Wastewater	Water	Energy	Annual
identifier*	Assessment	(lb)	(lb)	effluent,	reduction	(kWh or	Savings (\$)
				product	(gal)	therms)	
				solids(BOD,			
				TSS)			
B3	Intern	N/A	4,650	439,600	750,000	N/A	\$199,300
				BOD;			
				240,000 TSS			
B4	Assessment	TBD	TBD	TBD	TBD	TBD	TBD
B5	Assessment	TBD	TBD	TBD	TBD	TBD	TBD

Total Implemented Project Savings

Business identifier	Intern or Assessment	Nitrogen (lb)	Phosphorous (lb)	Wastewater effluent, product solids (BOD)	Water reduction (gal)	Energy (kWh or therms)	Annual Savings (\$)
B1	Intern	N/A	N/A	190,500	TBD	N/A	\$252,000
B2	Assessment	N/A	N/A	N/A	N/A	N/A	N/A
B2	Intern	N/A	TBD	N/A	TBD	TBD	TBD
B3	Assessment	N/A	N/A	N/A	N/A	N/A	N/A
B3	Intern	N/A	TBD	TBD	200,000	N/A	\$1,000
B4	Assessment	TBD	TBD	TBD	TBD	TBD	TBD
B5	Assessment	TBD	TBD	TBD	TBD	TBD	TBD

*B# refers to the business engaged in the project

**Recommended savings carried over from preliminary assessment to intern project at Sites B2 & B3. Assessments are critical to developing successful relationships and effective projects.

Third Update March 1, 2021

Ou	tcome progress	Completion Status
1.	5-10 source reduction site assessments for wastewater nutrient reduction	Target completion date:
	 3 site assessments completed (Sites B2, B3, B5) 	12/31/2021
	 4 site assessments in progress (refer to tables below) 	Status: In progress
	 Preliminary assessment completed for Community 6 (C6), 	
	assessment referenced as B6 – follow-up in progress	
	 Preliminary assessments completed for sites B7 and B8 	
2.	At least 2 source reduction intern projects (1000 intern project hours*) for	Target completion date:
	wastewater nutrient reduction	9/30/2021
	 1000 intern project hours completed in 2020 (250 completed in 2019) 	Status: Complete
	 Project leads are under consideration for the 2021 MnTAP Intern Program 	
3.	All participating sites receive follow-up assistance from MnTAP	Target completion date:
	• One-year follow-up to the 2019 intern project has been completed, as well	3/31/2022
	as 3-month follow-up for 2020 intern projects	Status: In progress
	 Follow-up for intern projects conducted for a minimum of 2 years 	

Ou	itcome progress	Completion Status
4.	At least 5000 lb nutrient load to wastewater facilities reduced	Target completion date:
	 190,500 lbs. reduction in Biological Oxygen Demand (BOD) wastewater load implemented 	Status: In progress
	 More than 7,000 lb phosphorus reduction opportunity identified 	

Total Recommended Project Savings

Business	Intern or	Nitrogen	Phosphorous	Wastewater	Water	Energy	Annual
identifier*	Assessment	(lb)	(lb)	effluent,	reduction	(kWh or	Savings (\$)
				product	(gal)	therms)	
				solids(BOD,			
				TSS)			
B1	Intern	N/A	N/A	190,500	30,000,000	N/A	\$1,176,000
B2	Assessment	N/A	See B2	N/A	N/A	N/A	N/A
			Intern**				
B2	Intern	N/A	1,040	N/A	101,800,000	3,900	\$22,500
						therms	
B3	Assessment	N/A	See B3	N/A	N/A	N/A	N/A
			Intern**				
В3	Intern	N/A	4,650	439,600	750,000	N/A	\$199,300
				BOD;			
				240,000 TSS			
B4	Assessment	TBD	TBD	TBD	TBD	TBD	TBD
B5	Assessment	TBD	1,700	113,000	TBD	TBD	\$47,600
				BOD;			
				60,000 TSS			
B6	Assessment	TBD	TBD	TBD	TBD	TBD	TBD
B7	Assessment	TBD	TBD	TBD	TBD	TBD	TBD
B8	Assessment	TBD	TBD	TBD	TBD	TBD	TBD

Total Implemented Project Savings

Business*	Intern or	Nitrogen	Phosphorous	Wastewater	Water	Energy	Annual
identifier	Assessment	(lb)	(lb)	effluent,	reduction	(kWh or	Savings (\$)
				product	(gal)	therms)	
				solids (BOD)			
B1	Intern	N/A	N/A	190,500	TBD	N/A	\$252,000
B2**	Assessment	N/A	N/A	N/A	N/A	N/A	N/A
B2	Intern	N/A	TBD	N/A	480,000	TBD	\$4,300
B3**	Assessment	N/A	N/A	N/A	N/A	N/A	N/A
B3	Intern	N/A	TBD	TBD	200,000	N/A	\$1,000
B4	Assessment	TBD	TBD	TBD	TBD	TBD	TBD
B5	Assessment	TBD	TBD	TBD	TBD	TBD	TBD
B6	Assessment	TBD	TBD	TBD	TBD	TBD	TBD
B7	Assessment	TBD	TBD	TBD	TBD	TBD	TBD
B8	Assessment	TBD	TBD	TBD	TBD	TBD	TBD

*B# refers to the business engaged in the project

**Recommended savings carried over from preliminary assessment to intern project at Sites B2 & B3. Assessments are critical to developing successful relationships and effective projects.

Fourth Update September 1, 2021

Ou	tcome progress	Completion Status
1.	 5-10 source reduction site assessments for wastewater nutrient reduction 5 site assessments completed (Sites B2, B3, B5, B6, B8) B8 assessment findings carried over to a 2021 intern project B6 assessment currently yielded no significant opportunity. Follow-up will be conducted to all completed assessments to identify implemented savings. 3 site assessments in progress (refer to tables below) Preliminary assessment completed for Community 10 (C10), assessment referenced as B9 – follow-up in progress Sites B4 and B7 still engaged for potential follow-up assessments and/or intern projects 	Target completion date: 12/31/2021 Status: In progress
2.	 At least 2 source reduction intern projects (1000 intern project hours*) for wastewater nutrient reduction 500 intern project hours completed in 2021 (1000 intern project hours completed in 2020 and 250 completed in 2019) 	Target completion date: 9/30/2021 Status: Complete
3.	 All participating sites receive follow-up assistance from MnTAP One-year follow-up to the 2020 intern project sites has been completed Follow-up for intern projects conducted for a minimum of 2 years 	Target completion date: 3/31/2022 Status: In progress
4.	 At least 5000 lb nutrient load to wastewater facilities reduced 190,500 lbs. reduction in Biological Oxygen Demand (BOD) wastewater load implemented More than 7,600 lb phosphorus reduction opportunity identified 	Target completion date: 6/30/2022 Status: In progress

Business	Intern or	Nitrogen	Phosphorous	Wastewater	Water	Energy	Annual
identifier*	Assessment	(lb)	(lb)	effluent,	reduction	(kWh or	Savings (\$)
				product	(gal)	therms)	
				solids (BOD,			
				TSS)			
B1	Intern	N/A	N/A	190,500	30,000,000	N/A	\$1,176,00
							0
B2	Assessment	N/A	See B2	N/A	N/A	N/A	N/A
			Intern**				
B2	Intern	N/A	1,040	N/A	101,800,000	3,900	\$22,500
						therms	
B3	Assessment	N/A	See B3	N/A	N/A	N/A	N/A
			Intern**				
B3	Intern	N/A	4,650	439,600	750,000	N/A	\$199,300
				BOD;			
				240,000 TSS			
B4	Assessment	TBD	TBD	TBD	TBD	TBD	TBD

Business	Intern or	Nitrogen	Phosphorous	Wastewater	Water	Energy	Annual
identifier*	Assessment	(lb)	(lb)	effluent,	reduction	(kWh or	Savings (\$)
				product	(gal)	therms)	
				solids (BOD,			
				TSS)			
B5	Assessment	TBD	1,700	113,000	TBD	TBD	\$47,600
				BOD;			
				60,000 TSS			
B6	Assessment	N/A	N/A	N/A	N/A	N/A	N/A
B7	Assessment	TBD	TBD	TBD	TBD	TBD	TBD
B8	Assessment	See B8	See B8	See B8	See B8	See B8	See B8
		Intern**	Intern**	Intern**	Intern**	Intern**	Intern**
B8	Intern	600	30	15,000	2,900,000	365,000	\$63,400
						kWh	
B9	Assessment	TBD	TBD	TBD	TBD	TBD	TBD

Total Implemented Project Savings

Business* identifier	Intern or Assessment	Nitrogen (Ib)	Phosphorous (Ib)	Wastewater effluent, product solids (BOD)	Water reduction (gal)	Energy (kWh or therms)	Annual Savings (\$)
B1	Intern	N/A	N/A	190,500	TBD	N/A	\$252,000
B2**	Assessment	N/A	N/A	N/A	N/A	N/A	N/A
B2	Intern	N/A	TBD	N/A	480,000	TBD	\$4,300
B3**	Assessment	N/A	N/A	N/A	N/A	N/A	N/A
B3	Intern	N/A	TBD	TBD	200,000	N/A	\$1,000
B4	Assessment	TBD	TBD	TBD	TBD	TBD	TBD
B5	Assessment	TBD	TBD	TBD	TBD	TBD	TBD
B6	Assessment	N/A	N/A	N/A	N/A	N/A	N/A
B7	Assessment	TBD	TBD	TBD	TBD	TBD	TBD
B8**	Assessment	N/A	N/A	N/A	N/A	N/A	N/A
B8	Intern	TBD	TBD	TBD	TBD	TBD	TBD
В9	Assessment	TBD	TBD	TBD	TBD	TBD	TBD

*B# refers to the business engaged in the project

**Recommended savings carried over from preliminary assessment to intern project at Sites B2, B3 and B8. Assessments are critical to developing successful relationships and effective projects.

Fifth Update March 1, 2022

Οι	itcome progress	Completion Status
1.	 5-10 source reduction site assessments for wastewater nutrient reduction 8 site assessments completed (Sites B2-B9) 	Target completion date: 12/31/2021 Status: Complete

Ou	tcome progress	Completion Status	
	0	Assessment B9 yielded no significant opportunity for industrial site nutrient reduction. Staff are engaged with the community to consider other contributors to nutrient load. Sites B4 and B7 assessments are closed with no actionable recommendations. Follow-up will be conducted for potential future intern projects or assessments.	
2.	At least 2 source wastewater nut • 1750 intern p o o	e reduction intern projects (1000 intern project hours*) for rient reduction roject hours completed from 2019-2021 500 hours completed in 2021 1000 hours completed in 2020 250 hours completed in 2019	Target completion date: 9/30/2021 Status: Complete
3.	All participatingSix month folFollow-up for of project co	Target completion date: 3/31/2022 Status: In progress	
4.	At least 5000 lb • 204,870 lbs. r • 600 lbs. Nitro • More than 7, implementa	nutrient load to wastewater facilities reduced eduction in wastewater load implemented gen and 30 lbs. Phosphorous reduction implemented 000 lb phosphorus reduction opportunity - pending ition to be tracked through MnTAP follow-up	Target completion date: 6/30/2022 Status: In progress

Total Recommended Project Savings

Business	Intern or	Nitrogen	Phosphorous	Wastewater	Water	Energy	Annual
identifier*	Assessment	(lb)	(lb)	effluent,	reduction	(kWh or	Savings (\$)
				product	(gal)	therms)	
				solids (BOD,			
				TSS)			
B1	Intern	N/A	N/A	190,500	30,000,000	N/A	\$1,176,00
							0
B2	Assessment	N/A	See B2	N/A	N/A	N/A	N/A
			Intern**				
B2	Intern	N/A	1,040	N/A	101,800,000	3,900	\$22,500
						therms	
В3	Assessment	N/A	See B3	N/A	N/A	N/A	N/A
			Intern**				
В3	Intern	N/A	4,650	439,600	750,000	N/A	\$199,300
				BOD;			
				240,000 TSS			
B4	Assessment	N/A	N/A	N/A	N/A	N/A	N/A
B5	Assessment	N/A	1,700	113,000	N/A	N/A	\$47,600
				BOD;			
				60,000 TSS			
B6	Assessment	N/A	N/A	N/A	N/A	N/A	N/A
B7	Assessment	N/A	N/A	N/A	N/A	N/A	N/A

Business	Intern or	Nitrogen	Phosphorous	Wastewater	Water	Energy	Annual
identifier*	Assessment	(lb)	(lb)	effluent,	reduction	(kWh or	Savings (\$)
				product	(gal)	therms)	
				solids (BOD,			
				TSS)			
B8	Assessment	See B8	See B8	See B8	See B8	See B8	See B8
		Intern**	Intern**	Intern**	Intern**	Intern**	Intern**
B8	Intern	600	30	14,370***	2,900,000	365,000	\$63,400
						kWh	
B9	Assessment	N/A	N/A	N/A	N/A	N/A	N/A

Total Implemented Project Savings

Business * identifier	Intern or Assessment	Nitrogen (Ib)	Phosphorous (lb)	Wastewater effluent, product solids (BOD)	Water reduction (gal)	Energy (kWh or therms)	Annual Savings (\$)
B1	Intern	N/A	N/A	190,500	30,000,000* **	N/A	\$552,000***
B2**	Assessment	N/A	N/A	N/A	N/A	N/A	N/A
B2	Intern	N/A	TBD	N/A	480,000	TBD	\$4,300
B3**	Assessment	N/A	N/A	N/A	N/A	N/A	N/A
B3	Intern	N/A	TBD	TBD	200,000	N/A	\$1,000
B4	Assessment	N/A	N/A	N/A	N/A	N/A	N/A
B5	Assessment	TBD	TBD	TBD	N/A	N/A	TBD
B6	Assessment	N/A	N/A	N/A	N/A	N/A	N/A
B7	Assessment	N/A	N/A	N/A	N/A	N/A	N/A
B8**	Assessment	N/A	N/A	N/A	N/A	N/A	N/A
B8	Intern	600	30	14,370***	TBD	18,000 kWh	\$15,300
B9	Assessment	N/A	N/A	N/A	N/A	N/A	N/A

*B# refers to the business engaged in the project

**Recommended savings carried over from preliminary assessment to intern project at Sites B2, B3 and B8. Assessments are critical to developing successful relationships and effective projects.

***Revised product wastewater effluent solids value. New value = total product loss reduction minus the Nitrogen and Phosphorous reduction values in lb.

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

Outcome progress	Completion Status
 5-10 source reduction site assessments for wastewater nutrient reduction Completed in previous update 8 site assessments completed (Sites B2-B9) 	Target completion date: 12/31/2021 Status: Complete

Out	come progress	Completion Status
2.	 At least 2 source reduction intern projects (1000 intern project hours*) for wastewater nutrient reduction Completed in previous update 1750 intern project hours completed from 2019-2021 	Target completion date: 9/30/2021 Status: Complete
3.	 All participating sites receive follow-up assistance from MnTAP 1 and 2 year follow-up to 2021 and 2022 intern project sites planned for August 2022 Follow-up for intern projects conducted for a minimum of 2 years from date of project completion 	Target completion date: 3/31/2022 Status: Complete
4.	 At least 5000 lb nutrient load to wastewater facilities reduced 204,870 lbs. reduction in wastewater load implemented 13,400 lbs. Nitrogen and 1,330 lbs. Phosphorous reduction implemented More than 8,000 lb phosphorus reduction opportunity - pending implementation to be tracked through MnTAP follow-up 	Target completion date: 6/30/2022 Status: Complete

Overall MnTAP connected with eight industrial facilities for site assessments. Site assessment activities include introducing the facility to the project and MnTAP services and understanding site performance goals related to nutrient effluent. MnTAP staff become familiar with site operations through discussions with site staff, walk throughs and gathering data such as the composition of materials used, site utility bills to indentify opportunities for change. When the data has been collected, MnTAP staff research alternative options and make recommendations to the site that are targeted to improve performance.

Over the course of the project, eight site assessments were conducted in seven engaged communties. Each site received a confidential report of the observations and recommendations for site nutrient reduction. Site implementation of the recommendations is voluntary. MnTAP staff follow up with the site to ensure there are no additional questions and request the status of recommendations – implemented, planned or not planned. Continued follow up provides additional information or encouragement to participate in the MnTAP Intern Program to support implementation.

For sites that have highly complex processes or implementation of recommendations is anticipated to require significant staff time, funding was available through the project to support two MnTAP interns. The MnTAP Intern Program provides facilities with an additional trained resource for 12 weeks to help identify and implement waste reduction faster. The intern has the time, technical training and creativity to research alternative equipment, procedures, chemicals, and raw materials. MnTAP Interns are technically supported by MnTAP staff to further enhance their ability to drive source reduction of nutrients discharged to the local wastewater facility with site effluent.

MnTAP was able to leverage resources to support four intern projects 3 engaged communities Table 2. Each intern host site received a confidential report of the observations, recommendations and implemented actions for site nutrient reduction. While site implementation of the recommendations is still voluntary, more projects are implemented because the site had resources to complete the work and did not have to reassign permanent staff from their business critical work. MnTAP staff follow up with the intern site to ensure there are no additional questions and identify implemented recommendations. Follow up provides additional information and encouragement to finalize the projects and capture the environmental and economic benefits.

Total Recommended Project Savings

Business identifier*	Intern or Assessment	Nitrogen (lb)	Phosphorous (Ib)	Wastewater effluent, product solids (BOD,	Water reduction (gal)	Energy (kWh or therms)	Annual Savings (\$)
B1	Intern	12,800	1,300	190,500	30,000,000	N/A	\$1,176,000
B2	Assessment	N/A	See B2 Intern**	N/A	N/A	N/A	N/A
B2	Intern	N/A	1,040	N/A	101,800,000	3,900 therms	\$22,500
B3	Assessment	N/A	See B3 Intern**	N/A	N/A	N/A	N/A
В3	Intern	N/A	4,650	439,600 BOD; 240,000 TSS	750,000	N/A	\$199,300
B4	Assessment	N/A	N/A	N/A	N/A	N/A	N/A
B5	Assessment	N/A	1,700	113,000 BOD; 60,000 TSS	N/A	N/A	\$47,600
B6	Assessment	N/A	N/A	N/A	N/A	N/A	N/A
B7	Assessment	N/A	N/A	N/A	N/A	N/A	N/A
B8	Assessment	See B8 Intern**	See B8 Intern**	See B8 Intern**	See B8 Intern**	See B8 Intern* *	See B8 Intern**
B8	Intern	600	30	14,370	2,900,000	365,000 kWh	\$63,400
B9	Assessment	N/A	N/A	N/A	N/A	N/A	N/A

Total Implemented Project Savings

Business* identifier	Intern or Assessment	Nitrogen (Ib)	Phosphorous (lb)	Wastewater effluent, product solids (BOD)	Water reduction (gal)	Energy (kWh or therms)	Annual Savings (\$)
B1	Intern	12,800	1,300	190,500	30,000,000***	N/A	\$552,000***
B2**	Assessment	N/A	N/A	N/A	N/A	N/A	N/A
B2	Intern	N/A	TBD	N/A	480,000	TBD	\$4,300
B3**	Assessment	N/A	N/A	N/A	N/A	N/A	N/A
B3	Intern	N/A	TBD	TBD	200,000	N/A	\$1,000
B4	Assessment	N/A	N/A	N/A	N/A	N/A	N/A
B5	Assessment	TBD	TBD	TBD	N/A	N/A	TBD
B6	Assessment	N/A	N/A	N/A	N/A	N/A	N/A
B7	Assessment	N/A	N/A	N/A	N/A	N/A	N/A
B8**	Assessment	N/A	N/A	N/A	N/A	N/A	N/A
B8	Intern	600	30	14,370	TBD	18,000 kWb	\$15,300
B9	Assessment	N/A	N/A	N/A	N/A	N/A	N/A

*B# refers to the business engaged in the project

**Recommended savings carried over from preliminary assessment to intern project at Sites B2, B3 and B8. Assessments are critical to developing successful relationships and effective projects.

***Implemented annual savings values updated for both the Final Report and Fifth Update tables (MnTAP staff follow-up learned of implementation in Q4 2021).

ACTIVITY 3 Title: Share Results Achieve and Replication Opportunity Across Minnesota

Description: Develop a process for conducting similar analysis through example case studies, assessment tools and lessons learned for broad dissemination to facilities across Minnesota for additional site engagement. Share information through publications, presentations and webinars targeting wastewater facility staff, city managers, industries and organizations that discharge high wastewater load.

ACTIVITY 3 ENRTF BUDGET: \$20,000

Outcome	Completion Date
1. At least 2 success stories published	4/30/2022
2. At least 2 presentations at sector specific events	4/30/2022
3. 1 webinar presented live and recorded for future viewing	4/30/2022

First Update March 1, 2020

Ou	tcome progress	Completion Status
1.	At least 2 success stories published • MnTAP Executive Summary published in <i>MnTAP Solutions 2019</i> <u>http://www.mntap.umn.edu/download/163/solutions/16315/2019-</u> <u>solutions.pdf</u>	Target completion date: 4/30/2022 Status: In progress
2.	At least 2 presentations at sector specific events • Kerry – Rochester, MN. Intern Presentation at MnTAP 2019 Symposium <u>http://www.mntap.umn.edu/download/304/noah-siem/16178/noah-siem-kerry-ingredients-presentation-2019.pdf</u>	Target completion date: 4/30/2022 Status: In progress
3.	1 webinar presented live and recorded for future viewing	Target completion date: 4/30/2022 Status: Not Started

Second Update September 1, 2020

Ou	tcome progress	Completion Status
1.	 At least 2 success stories published MnTAP Executive Summary published in <i>MnTAP Solutions 2019</i> <u>http://www.mntap.umn.edu/download/163/solutions/16315/2019-</u> <u>solutions.pdf</u> 2 additional MnTAP Executive Summaries in progress. Drafts completed and final versions to be published by December 2020. 	Target completion date: 4/30/2022 Status: In progress
2.	 At least 2 presentations at sector specific events Kerry – Rochester, MN. Intern Presentation at MnTAP 2019 Symposium <u>http://www.mntap.umn.edu/download/304/noah-siem/16178/noah-siem-kerry-ingredients-presentation-2019.pdf</u> 	Target completion date: 4/30/2022 Status: In progress

Outcome progress	Completion Status
 2 Intern Project presentations at MnTAP 2020 Virtual Symposium http://www.mntap.umn.edu/download/330/matthew-landauer-minnesota-specialty-yeast-presentation-2020.pdf http://www.mntap.umn.edu/download/331/mason-balster/17308/mason-balster-august-schell-presentation-2020.pdf 1 presentation planned for MN Water Resources Virtual Conference – October 20, 2020 	
3. 1 webinar presented live and recorded for future viewing	Target completion date: 4/30/2022 Status: Not Started

Third Update March 1, 2021

Outcome progress	Completion Status
 At least 2 success stories published MnTAP Executive Summary published in <i>MnTAP Solutions 2019</i> <u>http://www.mntap.umn.edu/download/163/solutions/16315/2019-</u> <u>solutions.pdf</u> Two MnTAP Executive Summaries for 2020 Intern Projects complete and published in <i>MnTAP Solutions 2020</i> <u>http://www.mntap.umn.edu/download/163/solutions/17489/2020-</u> <u>solutions.pdf</u> 	Target completion date: 4/30/2022 Status: Complete
 At least 2 presentations at sector specific events Kerry – Rochester, MN. Intern Presentation at MnTAP 2019 Symposium http://www.mntap.umn.edu/download/304/noah-siem/16178/noah- siem-kerry-ingredients-presentation-2019.pdf 2 Intern Project presentations at MnTAP 2020 Virtual Symposium http://www.mntap.umn.edu/download/330/matthew- landauer/17309/matthew-landauer-minnesota-specialty-yeast- presentation-2020.pdf http://www.mntap.umn.edu/download/331/mason- balster/17308/mason-balster-august-schell-presentaion-2020.pdf Presentation completed at the MN Water Resources Virtual Conference – October 20, 2020. Abstract provided on page 43 in the following document: https://ccaps.umn.edu/documents/CPE- Conferences/Water/2020WRCBookofAbstracts.pdf 	Target completion date: 4/30/2022 Status: Complete
3. 1 webinar presented live and recorded for future viewing	Target completion date: 4/30/2022 Status: Not Started

Fourth Update September 1, 2021

Outcome progress	Completion Status
 At least 2 success stories published MnTAP Executive Summary published in <i>MnTAP Solutions 2019</i> <u>http://www.mntap.umn.edu/download/163/solutions/16315/2019-</u> <u>solutions.pdf</u> Two MnTAP Executive Summaries for 2020 Intern Projects complete and published in <i>MnTAP Solutions 2020</i> <u>http://www.mntap.umn.edu/download/163/solutions/17489/2020-</u> <u>solutions.pdf</u> One MnTAP Executive Summary complete and will be published in <i>MnTAP</i> <i>Solutions 2021</i> by November 1, 2021 (direct link will be provided in the March 2022 update). 	Target completion date: 4/30/2022 Status: Complete
 At least 2 presentations at sector specific events Kerry – Rochester, MN. Intern Presentation at MnTAP 2019 Symposium http://www.mntap.umn.edu/download/304/noah-siem/16178/noah- siem-kerry-ingredients-presentation-2019.pdf 2 Intern Project presentations at MnTAP 2020 Virtual Symposium http://www.mntap.umn.edu/download/330/matthew- landauer/17309/matthew-landauer-minnesota-specialty-yeast- presentation-2020.pdf http://www.mntap.umn.edu/download/331/mason- balster/17308/mason-balster-august-schell-presentation-2020.pdf Rochester Meat Company – Rochester, MN. Intern Presentation at MnTAP 2021 Virtual Symposium (direct link to presentation to be provided in the March 2022 update). 	Target completion date: 4/30/2022 Status: Complete
 3. 1 webinar presented live and recorded for future viewing MnTAP project team is targeting February 2022 for the live webinar A preliminary concept has been drafted which will be confirmed and developed in Q4 2021 	Target completion date: 4/30/2022 Status: Not Started

Fifth Update March 1, 2022

Outcome progress	Completion Status
 At least 2 success stories published MnTAP Executive Summary published in <i>MnTAP Solutions 2019</i> <u>http://www.mntap.umn.edu/download/163/solutions/16315/2019-solutions.pdf</u> Two MnTAP Executive Summaries for 2020 Intern Projects complete and published in <i>MnTAP Solutions 2020</i> <u>http://www.mntap.umn.edu/download/163/solutions/17489/2020-solutions.pdf</u> MnTAP Executive Summary published in <i>MnTAP Solutions 2021</i> <u>http://www.mntap.umn.edu/wp-content/uploads/simple-file-list/Intern/2020-2029/2021/Executive-Summary/Rochester-Meat-Executive-Summary.pdf</u> 	Target completion date: 4/30/2022 Status: Complete

Outcome progress	Completion Status
 At least 2 presentations at sector specific events Kerry – Rochester, MN. Intern Presentation at MnTAP 2019 Symposium http://www.mntap.umn.edu/download/304/noah-siem/16178/noah-siem-kerry-ingredients-presentation-2019.pdf Intern Project presentations at MnTAP 2020 Virtual Symposium http://www.mntap.umn.edu/download/330/matthew-landauer/17309/matthew-landauer-minnesota-specialty-yeast-presentation-2020.pdf Rochester Meat Company – Rochester, MN. Intern Presentation at MnTAP 2021 Virtual Symposium http://www.mntap.umn.edu/wp-content/uploads/simple-file-list/Intern/2020-2029/2021/Presentations/Rochester-Meat-Final-Presentation.pdf 	Target completion date: 4/30/2022 Status: Complete
 3. 1 webinar presented live and recorded for future viewing MnTAP project team presented a live webinar on February 15, 2022 A recording will be featured on the MnTAP website by April 2022 	Target completion date: 4/30/2022 Status: Complete

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

Outcome progress	Completion Status
 At least 2 success stories published Complete – see previous updates 	Target completion date: 4/30/2022 Status: Complete
 2. At least 2 presentations at sector specific events Complete – see previous updates 	Target completion date: 4/30/2022 Status: Complete
 3. 1 webinar presented live and recorded for future viewing Live webinar recording featured on the MnTAP website: <u>http://www.mntap.umn.edu/focusareas/water/nutrientreduction/</u> 	Target completion date: 4/30/2022 Status: Complete

The MnTAP Intern Program provides an opportunity to create case studies that feature the recommendations, technical approach to solutions and results from each project. There were four intern projects. Each intern project created an executive summary case study and a public presentation at the respective annual MnTAP Intern Symposium. The MnTAP Intern executive summaries served as an important recruiting tool for communities and businesses to participate in the program. Seeing the results that can be achieved has motivated additional sites to seek opportunities to reduce their nutrient discharge to local wastewater treatment facilities as a way to save cost and improve environmental outcomes.

MnTAP hosted a live webinar on February 15, 2022. The webinar featured two wastewater treatment sites, City of Rochester Water Reclamation Plant and the Hutchinson Wastewater Treatment Facility highlighting their

perspective on the program. Summaries of the projects at two businesses, Rochester Meats in Rochester, MN and Minnesota Specialty Yeast in Hutchinson, MN were also presented. Representatives from both Rochester facilities participated as speakers for the webinar. Both speakers provided interesting perspectives that addresses the challenges they face, but also the value in collaboration between wastewater facilities and businesses. A recording of the webinar has been posted to the MnTAP Facebook site.

IV. DISSEMINATION:

Description: General project information, general technical information, sign up mechanism to participate in the evaluation, publications and other project related information will be included in a series of web pages under the MnTAP POTW pages http://www.mntap.umn.edu/industries/facility/potw/ as a new subpage dedicated to project activities. Periodic updates of project progress and publicly available results will be published in the MnTAP monthly electronic newsletter, ENews, and bi-annual print and electronic publication, Source, along with feature articles on the project web page. Access to these communication pieces will be through the current MnTAP publication web pages http://www.mntap.umn.edu/resources/publications/. All MnTAP resources are freely distributed for use in replicating and advancing the work.

Intern project information will be posted on the MnTAP Intern Program web pages for company solicitation, and student recruiting <u>http://www.mntap.umn.edu/interns/</u>. Intern project results will be posted under MnTAP Intern Past Projects <u>http://www.mntap.umn.edu/interns/pastprojects/</u> and in the annual print and electronic intern project summary publication, Solutions <u>http://www.mntap.umn.edu/resources/publications/solutions/</u>.

Webinar materials that are presented as part of the project will be posted under MnTAP Resources and Tools on the MnTAP Webinars pages <u>http://www.mntap.umn.edu/resources/webinars/</u> for future viewing and sharing.

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 <u>ENRTF Acknowledgement Guidelines</u>.

First Update March 1, 2020

MnTAP has established a project webpage for the Upstream Nutrient Reduction project: http://www.mntap.umn.edu/focusareas/water/nutrientreduction/

Through this link, communities and businesses can complete an online form to be contacted by MnTAP staff for assistance.

In addition to the project webpage, the following project promotions and summaries have been completed to date:

- September 2019: MnTAP ENews electronic newsletter
- January 2020: Email to GreenStep Cities Coordinators Subject: Best Practice 20 MnTAP Assistance with Wastewater Nutrient Reduction
- Kerry Rochester Intern Project Executive Summary MnTAP Solutions 2019, pg. 20-21 http://www.mntap.umn.edu/download/163/solutions/16315/2019-solutions.pdf
- Periodic project promotion via MnTAP Twitter account <u>https://twitter.com/mntap_umn?lang=en</u>

Second Update September 1, 2020

Project promotions and summaries as of September 2020:

- 2020 Intern Projects at Minnesota Specialty Yeast and August Schell Brewing:
 - Project abstracts and presentations from the 2020 MnTAP Symposium located at <u>http://www.mntap.umn.edu/interns/pastprojects/2020-2/</u>
 - Executive Summaries to be posted online and in the MnTAP Solutions 2020 Publication (these will be finalized, approved and published by December 2020).
- MnTAP presentation planned for 2020 MN Water Resources Conference (Virtual) October 20th, 2020
 - Presentation will be posted following the event, MnTAP staff to present on October 20th at 4 PM
 Session III, Track E (see https://conference.umn.edu/minnesota-water-resources-conference/2020-WRC-program-10-20-2020)

Third Update March 1, 2021

Project summaries and dissemination – October 2020 through February 2021:

- 2020 Intern Projects at Minnesota Specialty Yeast and August Schell Brewing *MnTAP Solutions 2020*
 - Executives Summaries posted online and published in print version of *MnTAP Solutions 2020*, pg. 10-11 and pg. 20-21

http://www.mntap.umn.edu/download/163/solutions/17489/2020-solutions.pdf

- $\circ~$ ENRTF Logo acknowledged on Page 4 of the MnTAP Solutions 2020 publication.
- ProFood World, an international print and digital publication for the food and beverage industries, featured both LCCMR-supported MnTAP Intern Projects from 2020:
 - <u>https://www.profoodworld.com/sustainability/article/21232614/mntap-identifies-</u> sustainability-improvements-for-august-schell-brewing-co
 - <u>https://www.profoodworld.com/sustainability/article/21259569/yeast-processor-decreases-phosphorous-and-cooling-water-usage</u>
 - The LCCMR is acknowledged in these two articles. Addition of the ENRTF logo has been requested and is pending.
- MnTAP staff presented at the 2020 MN Water Resources Virtual Conference October 20, 2020
 - Title: *Minimizing Wastewater Nutrient Pollution Through POTW and Industrial Technical Assistance*
 - Abstract provided on page 43 in the following document: <u>https://ccaps.umn.edu/documents/CPE-Conferences/Water/2020WRCBookofAbstracts.pdf</u>
 - The final presentation slides were submitted for posting to the conference archives, but have not yet been featured online. MnTAP staff will check with the conference planning staff and will link to this presentation on the mntap.umn.edu webpage.

Fourth Update September 1, 2021

Project promotions and summaries - March 2021 through August 2021:

- MnTAP Intern Symposium 2021 live broadcast event featuring the LCCMR-sponsored intern project at Rochester Meat Company.
 - A recording of the live event will be available by October 1, 2021, posted to the mntap.umn.edu webpage. ENTRF Logo acknowledged as featured sponsor during the program.
 - The project executive summary will be published in *MnTAP Solutions 2021*. Both the executive summary and presentation will also be posted to the MnTAP webpage (direct link to be provided in the March 2022 update, which will be found under 'Past Projects' on the MnTAP webpage: http://www.mntap.umn.edu/interns/pastprojects/

 ProFood World, an international print and digital publication for the food and beverage industries, presented a video spotlight that featured both LCCMR-supported MnTAP Intern Projects from 2020: <u>https://www.profoodworld.com/TakeFive/video/21366384/facilities-optimize-costsaving-sustainability-with-mntap-digital-innovation-production-amid-the-covid19-pandemic</u>

Fifth Update March 1, 2022

Project promotions and summaries – September 2021 through February 2022:

- MnTAP Intern Symposium 2021 recording of the live event available at: <u>http://www.mntap.umn.edu/interns/symposium/</u>
- MnTAP Intern at Rochester Meat Company summary available at: <u>http://www.mntap.umn.edu/wp-content/uploads/simple-file-list/Intern/2020-2029/2021/Executive-Summary/Rochester-Meat-Executive-Summary.pdf</u>
- MnTAP Webinar completed February 15th, 2022 (1-hour event with Q&A)
 - Title Reducing Wastewater Nutrient Impacts & Costs: Solutions Through Collaboration & Upstream Source Reduction
 - Promotion for the event conducted via direct outreach (phone/email), as well as MnTAP Enewsletters for December 2021 and January 2021. Newsletter content can be accessed at: <u>http://www.mntap.umn.edu/resources/publications/source/</u>
 - Recording available by April 2022, with the access link provided in the final project report.
- MnTAP Upstream Nutrient Reduction Operator Guide (in-progress with targeted completion of April 2022)

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

Since nutrient pollution in wastewater can be a challenge for many treatment facilities and treatment costs to meet nutrient permit levels can be a significant drain on resources for communities across Minnesota, MnTAP compiled the strategies developed and tested through this project in the document "Nutrient Reduction Guide for Minnesota Wastewater Treatment Facility Staff: Community Outreach and Engagement." Mitigating incoming nutrient loads upstream, at their points of origin, can be a complementary strategy to minimize these costs and ensure a healthier environment. The goal of the guide is to provide wastewater operators and community leaders with a framework for identifying and addressing opportunities to reduce nutrient pollution at the source and save of treatment costs.

Project promotions and summaries – March 2022 through June 2022:

- MnTAP Webinar, Reducing Wastewater Nutrient Impacts & Costs: Solutions Through Collaboration & Upstream Source Reduction – posted to project webpage: http://www.mntap.umn.edu/focusareas/water/nutrientreduction/
- MnTAP Upstream Nutrient Reduction Operator Guide, PDF available on MnTAP webpage at: http://www.mntap.umn.edu/wp-content/uploads/simple-file-list/Water/OperatorGuide_final.pdf
- MnTAP *IMPACT 2021* MnTAP annual report, summary and full report available at: http://www.mntap.umn.edu/resources/publications/source/june2022/#impact

V. ADDITIONAL BUDGET INFORMATION:

A. Personnel and Capital Expenditures

Explanation of Capital Expenditures Greater Than \$5,000: none

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

Enter Total Actual Personnel Hours for entire duration	Divide total personnel hours by 2,080 hours in 1 yr
of project: 5,598	= TOTAL FTE: 2.69

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

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

VI. PROJECT PARTNERS:

A. Partners outside of project manager's organization receiving ENRTF funding None

B. Partners outside of project manager's organization NOT receiving ENRTF funding

Joel Peck, Municipal Liason MPCA

City and site management partnerns will be engaged at time program starts

Minnesota Rural Water Association wastewater treatment staff

VII. LONG-TERM- IMPLEMENTATION AND FUNDING:

This proposal delivers demonstrated industrial wastewater effluent nutrient reductions and quantifies impact on downstream wastewater treatment performance and nutrient release to surface waters. Once developed and documented, these strategies can be replicated throughout the state by incorporation into existing and future programs that assist local communities and water/wastewater operations.

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
- 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. 2019 Budget Spreadsheet -Final Legal Citation: M.L. 2019, First Special Session, Chp. 4, Art. 2, Sec. 2, Subd. 04c Project Manager: Laura Babcock Project Title: Wastewater Nutrient Reduction through Industrial Source Reduction Assistance Organization: University of Minnesota

Project Length and Completion Date: 3 yrs, June 30, 2022

Project Budget: \$200,000



ENVIRONMENT AND NATURAL RESOURCES TRUST FUND BUDGET Budget Amount Spent Balance BUDGET ITEM	Today's Date: August 15, 2022						
BUDGET ITEM Image: Subscript of the second sec	ENVIRONMENT AND NATURAL RESOURCES TRUST FUND BUDGET		Budget	Amount Spent		Balance	
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COLUMN TOTAL \$ 200,000 \$ 183,124 \$ 16,87		\$	-	\$	-	\$	-
	COLUMN TOTAL	\$	200,000	\$	183,124	\$	16,876

OTHER FUNDS CONTRIBUTED TO THE PROJECT	Status (secured or pending)	Budget		Budget		Budget		Budget		Budget		Budget		Budget		Budget		Budget		Budget		Spent	Balance
Non-State: Private contribution to Intern Program	Secured	\$	12,000	\$ 12,000	\$ -																		
State: Rent allocation for FTE associated with project	Secured	\$	12,960	\$ 12,456	\$ 504																		
In kind: University overhead expenses, 26%	Secured	\$	52,000	\$ 47,612	\$ 4,388																		

PAST AND CURRENT ENRTF APPROPRIATIONS	Amount legally obligated but not yet spent	Budget	Spent	Balance
Current appropriation: none		\$-	\$-	\$-
Past appropriations: none		\$-	\$-	\$-

