**2005 Project Abstract**
For the Period Ending June 30, 2007

**TITLE:** Recycling Treated Municipal Wastewater for Industrial Water Use
**PROJECT MANAGER:** Bryce Pickart, P.E.
**ORGANIZATION:** Metropolitan Council, Environmental Services
**ADDRESS:** 390 Robert Street N., St. Paul, MN 55101-1805
**WEB SITE ADDRESS:** www.metrocouncil.org
**FUND:** Environment and Natural Resources Trust Fund
**LEGAL CITATION:** ML 2005, 1ST Special Session, Chp. 1, Sec. 11, Subd. 7(d)

**APPROPRIATION AMOUNT:** $300,000

Overall Project Outcome and Results

Recycled treated municipal wastewater is an emerging non-potable water supply for Minnesota industries. Economic development, water supply limitations, and environmental regulations will increasingly drive the need to find alternative water supplies. Recycling treated municipal wastewater for industrial water use is feasible and, in some situations, cost competitive with other water supplies. Implementation issues are addressable. Recycling treated municipal wastewater can conserve water resources and support industries and economic development

Non-power industries in Minnesota use 442 million gallons per day (mgd) of water from their own permitted supplies. The quantity of treated municipal wastewater available statewide, estimated at 425 mgd, could fill a portion of this use. However, industries and wastewater plants are not always close to each other. Over half of the treated municipal wastewater, 255 mgd, is generated in the Twin Cities while industrial water demand in this area is estimated at 75 mgd.

Wastewater treatment technologies are available to meet the highest levels of water quality required by industries and protect public health. Treatment needs range from minimal additional disinfection to significant additional treatment. Typically, hardness and salt reduction would be required.

Recycled wastewater costs can be competitive with other water supplies for some industries, especially at capacities of 1 mgd or greater. Systems of this size would likely serve one large or several smaller industries or multiple recycled wastewater users, industrial and non-industrial.

Regulatory, industry, and broader-based stakeholders advised more public education to move recycling from unknown to accepted and positive. The current case-by-case regulatory approach matches the existing permit requests but unknowns associated with this approach may deter some projects. Addressing industry concerns regarding liability and providing economic incentives beyond the market value of water versus treated wastewater would support new recycling projects. Next steps could include demonstration projects with unilateral, partnered, or other approaches.

The study's results are presented in the report, "Recycling Municipal Wastewater for Industrial Water Use." This report will be posted on the Metropolitan Council website by September 1, 2007.

Project Results Use and Dissemination

The information the study developed has been used by state agencies and industries to evaluate and promote, as appropriate, the use of recycled wastewater as a water source for industries. Examples include:

- Metropolitan Council staff presented preliminary findings to an ethanol industry stakeholder meeting sponsored by the Minnesota Pollution Control Agency

- Department of Natural Resources staff used information to make recommendations to the Public Facilities Administration to provide grant funds for a project to demonstrate the use of recycled wastewater in an ethanol production plant.
- Stakeholder industries to evaluate if using recycled wastewater is feasible in their particular case.

The project results will also be disseminated in technical presentations, such as the Conference on the Environment in early November 2007 co-sponsored by the Central States chapter of the Water Environment Foundation and Air and Waste Management. Project results will be disseminated to the general public through the Metropolitan Council newsletters and website.

# LCMR 2005 Work Program Update Report

**Date of Report:** June 30, 2007
**LCMR Final Work Program Report**
**Date of Work program Approval:** June 14, 2005
**Project Completion Date:** June 30, 2007

**I. PROJECT TITLE:** Recycling Treated Municipal Wastewater for Industrial Water Use

**Project Manager:** Bryce Pickart
**Affiliation:** Metropolitan Council, Environmental Services Division
**Mailing Address:** 390 Robert St. North
**City / State / Zip:** St. Paul, MN 55101
**Telephone Number:** 651-602-1091
**E-mail Address:** bryce.pickart@metc.state.mn.us
**FAX Number:** 651-602-1183
**Web Page address:** www.metrocouncil.org

**Location:** Seven-County Metropolitan Area with emphasis on treated water from the Empire Wastewater Treatment Plant, which will be conveyed to Mississippi River in Rosemount, convenient to Pine Bend industrial area.

| | | |
|---|---|---|
| **Total Biennial LCMR Project Budget:** | **LCMR Appropriation:** | $ 300,000.00 |
| | **Minus Amount Spent:** | $ 273,694.15 |
| | **Equal Balance:** | $ 26,305.85 |

**Legal Citation: ML 2005, First Special Session, [Chap. 1], Sec.[11], Subd. 7(d).**

**Appropriation Language:**

7(d) Recycling Treated Municipal Wastewater for Industrial Water Use
$150,000 the first year and $150,000 the second year are from the trust fund to the commissioner of natural resources for an agreement with the Metropolitan Council to determine the feasibility of recycling treated municipal wastewater for industrial use, characterize industrial water demand and quality, and determine the costs to treat municipal wastewater to meet specific industrial needs.

## II. FINAL PROJECT RESULTS:

Recycled treated municipal wastewater is an emerging non-potable water supply for Minnesota industries. Economic development, water supply limitations, and environmental regulations will increasingly drive the need to find alternative water supplies. Recycling treated municipal wastewater for industrial water use is feasible and, in some situations, cost competitive with other water supplies. Implementation issues are addressable. Recycling treated municipal wastewater can conserve water resources and support industries and economic development.

Non-power industries in Minnesota use 442 million gallons per day (mgd) of water from their own permitted supplies. The quantity of treated municipal wastewater available statewide, estimated at 425 mgd, could fill a portion of this use. However, industries and wastewater plants are not always close to each other. Over half of the treated municipal wastewater, 255 mgd, is generated in the Twin Cities while industrial water demand in this area is estimated at 75 mgd.

Wastewater treatment technologies are available to meet the highest levels of water quality required by industries and protect public health. Treatment needs range from minimal additional disinfection to significant additional treatment. Typically, hardness and salt reduction would be required.

Recycled wastewater costs can be competitive with other water supplies for some industries, especially at capacities of 1 mgd or greater. Systems of this size would likely serve one large or several smaller industries or multiple recycled wastewater users, industrial and non-industrial.

Regulatory, industry, and broader-based stakeholders advised more public education to move recycling from unknown to accepted and positive. The current case-by-case regulatory approach matches the existing permit requests but unknowns associated with this approach may deter some projects. Addressing industry concerns regarding liability and providing economic incentives beyond the market value of water versus treated wastewater would support new recycling projects. Next steps could include demonstration projects with unilateral, partnered, or other approaches.

## IV. OUTLINE OF PROJECT RESULTS*:*

**Result 1:** Industrial Water Use

**Description:**
Characterize industrial water use quantity and quality by standard industrial categories. Identify typical source (groundwater vs. surface water) and type/cost of water supply/treatment by standard industrial categories. Supplement with information specific to seven-county metropolitan area, such as power plants, refineries, chemical plants, pulp/paper processing plants, grain processing plants, and MCES-permitted industrial dischargers. Identify the most critical and common water quality parameters for various types of industrial uses, such as chlorides, hardness, and ammonia, which are important for cooling water use.

$100,000 for contracted engineering services. MCES will provide information on MCES permitted industrial dischargers. MPCA and MDNR will also provide information from their permits data base.

| | | |
|---|---|---|
| **Summary Budget Information for Result 1:** | **LCMR Budget** | $ 100,000 |
| | **Balance** | $ 0 |

**Completion Date:** June 30, 2006

**Final Report Summary:**

- Industries in Minnesota use 2,882 million gallons per day (mgd) of water from their own permitted supplies. Non-power industries in Minnesota use 442 mgd of water from their own permitted supplies. Of this water demand, the majority is for the mining and paper industries in northern Minnesota. Demand for groundwater supplies in 2004 was 60 mgd. The quantity of treated municipal wastewater available statewide, estimated at 425 mgd day, could fill a portion of this use.

- On a watershed-by-watershed basis, each watershed in Minnesota produces enough wastewater to supply the industrial groundwater demand in that watershed. However, industries and wastewater plants are not always close to each other. For example, over half of the treated municipal wastewater generated in the state, 255 mgd, is generated in the Twin Cities while industrial water demand in this area is estimated at 75 million gallons per day.

- Additional results are documented in the report titled, "Recycling Treated Municipal Wastewater for Industrial Water Use."

**Result 2:** Municipal Wastewater Treatment

**Description:**
Prior to formal initiation of the proposed study, MCES will conduct a literature search to identify current practices in the U.S. and elsewhere regarding municipal wastewater re-use by industries. This information will be used to refine the work plan.

Compare treated municipal wastewater quality to industrial water quality requirements. Identify additional wastewater characterization needs, such as chlorides and hardness, and implement a sampling/analysis program at MCES plants. Determine additional treatment needs by industrial user category. Identify feasible treatment technologies. Estimate capital and operating costs. Compare to current industrial water supply/treatment costs (Result 1).

Analyze implementation feasibility issues, including: (1) feasibility of municipal wastewater treatment system to meet various industrial water quality needs; (2) advantages and disadvantages of treatment by the municipal utility versus the industrial user; and (3) benefits and costs of a demonstration project.

$176,500 for contracted engineering and laboratory services. $23,500 for MCES Lab Services for sampling and analytical services. MCES will provide information on MCES-permitted industrial dischargers. MPCA and MDNR will also provide information from their permits data base.

| | | |
|---|---|---|
| **Summary Budget Information for Result 2:** | **LCMR Budget** | $ 200,000 |
| | **Balance** | $ 26,305.85 |

**Completion Date:** April 30, 2007

**Final Report Summary:**
- Wastewater treatment technologies are available to meet the highest levels of water quality required by industries and protect public health. Treatment needs range from

minimal additional disinfection for industries such as mining, sand and gravel washing, and once-through cooling, to significant additional treatment for industries such as non-metals production. Typically, hardness and salt reduction would be required.

- Recycled wastewater costs can be competitive with other water supplies for some industries, especially at capacities of 1 mgd or greater. Systems of this size would likely serve one large or several smaller industries or multiple recycled wastewater users, industrial and non-industrial.

- The cost of a treated wastewater supply for industrial water use will depend on the effluent quality from the specific wastewater treatment plant and the requirements of the particular industry. For industries with water quality needs similar to the sand and gravel washing, costs are estimated at $1.35 per 1000 gallons (assuming a 5-mile transmission distance from wastewater treatment plant to industry site). Costs for the petroleum and ethanol production industries were estimated at $2.40 to $5.00 per 1000 gallons (assuming a 5-mile transmission distance from wastewater treatment plant to industry site). Costs for once-through cooling and recirculating cooling for power production were estimated at $1.35 to $3.75 and $2.40 to $5.00 per 1000 gallons, respectively (assuming a 5-mile transmission distance from wastewater treatment plant to industry site). Additional cost information is contained in the full project report.

- Regulatory, industry, and broader-based stakeholders agreed that recycling wastewater was “the right thing to do.” They advised more public education to move recycling from unknown to accepted and positive. The current case-by-case regulatory approach matches the existing permit requests but unknowns associated with this approach may deter some projects. Addressing industry concerns regarding liability and providing economic incentives beyond the market value of water versus treated wastewater would support new recycling projects.

- Next steps could include demonstration projects with unilateral, partnered, or other approaches. A wastewater utility may unilaterally make treated wastewater available at a quality useable by various industries. In a “partnered” project, a partnered group with representatives from industry, water, wastewater, community, and regulatory sectors would walk hand-in-hand through the planning, design, and construction phases of a project.

- Additional results are documented in the report titled, “Recycling Treated Municipal Wastewater for Industrial Water Use”

- The funding balance remaining of $26,305.85 is due to cost savings related to the wastewater characterization at MCES plants. In Result 2, the project identified a number of analytical tests to characterize wastewater. Most analytical tests needed for the characterization are routinely done by MCES and so anticipated costs were less than originally estimated.

## V. TOTAL LCMR PROJECT BUDGET:

**All Results: Personnel: $**
**All Results: Equipment: $**
**All Results: Development: $**
**All Results: Acquisition: $**
**All Results: Other: $** $176,500 for Contracted Engineering Services
$23,500 for laboratory services for sampling/analysis program by MCES at MCES wastewater treatment plants. Funds only will be spent on analytical work not typically done in the course of MCES' regular plant monitoring.

**TOTAL LCMR PROJECT BUDGET: $** 300,000

### Explanation of Capital Expenditures Greater Than $3,500:

## VI. OTHER FUNDS & PARTNERS:

### A. Project Partners:

1. Minnesota Pollution Control Agency: Provide information on existing permitted discharges. Determine regulatory approach that would be applied to industry and municipality.

2. Minnesota Office of Environmental Assistance: Provide advice on how to structure implementation of water re-use.

3. Minnesota Department of Natural Resources: Provide information on existing permitted water withdrawal. Provide guidance on integrating water re-use with state's approach to conserving water resources.

4. Minnesota Department of Employees and Economic Development: Provide assistance in analyzing implementation issues.

5. University of Minnesota: Potentially provide engineering assistance on water treatment technology assessment (part of contracted engineering services under Result 2).

6. Minnesota Department of Health: Provide information on drinking water supplies and health affects.

7. Minnesota Department of Agriculture: Provide information on agricultural and irrigation uses.

### B. Other Funds being Spent during the Project Period:

MCES and its Project Partners will contribute their staff time as in kind contributions to the project, estimated as follows:

| | |
|---|---|
| MCES | $100,000 3 persons part-time for 15 months |
| Project | 50,000 (specific contributions to be determined prior to July 1, 2005) |

| | |
|---|---|
| Partners | _____ |
| Total | $150,000 |

**C. Required Match (if applicable):**

**D. Past Spending:** $5,000 (MCES Staff Time)

**E. Time:** July 1, 2005 to June 30, 2007

## VII. DISSEMINATION:

## VIII. REPORTING REQUIREMENTS:

Periodic work program progress reports will be submitted not later than January 2006, July 2006, and January 2007. A final work program report and associated products will be submitted by June 30, 2007.

## IX. RESEARCH PROJECTS:

**Attachment A: Budget Detail for 2005 Projects - Summary and a Budget page for each partner (if applicable)**

**Proposal Title:** *Recycling Treated Municipal Wastewater for Industrial Water Use, Proposal #7d W-04*

**Project Manager Name:** Bryce J. Pickart, P.E.

**LCMR Requested Dollars: $***300,000*

**1) See list of non-eligible expenses, do not include any of these items in your budget sheet**

**2) Remove any budget item lines not applicable**

| **2005 LCMR Proposal Budget** | **Result 1 Budget:** | **Amount Spent (6/30/07)** | **Balance (6/30/07)** | **Result 2 Budget:** | **Result 2 Budget Amended (8/24/06)** | **Amount Spent (6/30/07)** | **Balance (6/30/07)** | |
|---|---|---|---|---|---|---|---|---|
| | *Industrial Water Use* | | | *Municipal Wastewater Treatment* | *Municipal Wastewater Treatment* | | | |
| **BUDGET ITEM** | | | | | | | | **TOTAL FOR BUDGET ITEM** |
| **PERSONNEL: Staff Expenses, wages, salaries** *– Be specific on who is paid $, to do what? Make each person paid a separate line item* | | | | | | | | |
| **PERSONNEL: Staff benefits** *– Be specific; list benefits for each person on a separate line item* | | | | | | | | |
| **Contracts** | | | | | | | | |
| **Professional/technical** *with Craddock Consulting Engineers for Engineering Services ** | **$100,000** | **0.00** | **0.00** | **$200,000** | **$170,000** | **$102,677.31** | **$0.00** | **270,000** |
| **Professional/technical** *with Pace Analytical, Inc. for laboratory services* | | | | | **$6,500** | **$510.00** | **$4,380.00** | **6,500** |
| **Other contracts** *(with whom?, for what?) list out: personnel, equipment, etc.* | | | | | | | | |
| **Printing** | | | | | | | | |
| **Other Supplies** *(list specific categories)* | | | | | | | | |
| *MCES Lab Services for Sampling and Analytcial Program* | | | | | **23,500** | **$1,574.15** | **$21,925.85** | **23,500** |
| **Travel expenses in Minnesota** | | | | | | | | |
| **COLUMN TOTAL** | **$100,000** | **0.00** | **0.00** | **$200,000** | **$200,000** | **$104,761.46** | **$26,305.85** | **300,000** |

*** Engineering firm will be selected through competitive**