Minnesota Clean Water Revolving Fund

Cost and Effectiveness Guidance

I. Introduction

The Federal Water Pollution Control Act (FWPCA) was amended on June 10, 2014, to include a requirement under Section 602 (b)(13) that any recipient of Clean Water Revolving Fund (CWRF) assistance must complete a **Cost and Effectiveness Analysis** for any project with signed loan agreements after October 1, 2015.

> (13) beginning in fiscal year 2016, the State will require as a condition of providing assistance to a municipality or inter-municipal, interstate, or State Agency that the recipient of such assistance certify, in a manner determined by the Governor of the State, that the recipient –
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> > (A) has studied and evaluated the cost and effectiveness of the processes, materials, techniques, and technologies for carrying out the proposed project or activity for which assistance is sought under this title; and
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> > (B) has selected to the maximum extent practicable, a project or activity that maximizes the potential for efficient water use, reuse, recapture, and conservation and energy conservation, taking into account -
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> > (i) the cost of constructing the project or activity;
> > (ii) the cost of operating and maintaining the project or activity over the life of
> > (iii) the life of the project or activity; and
> > (iv) the cost of replacing the project or activity

The U.S. Environmental Protection Agency (EPA) has provided State CWRF program staff with interpretive guidance documents to assist with implementing this requirement. On January 6, 2015, the EPA published a memorandum[i] with additional supplemental information on section 602(b)(13). This document identified the State has discretion to decide how an assistance recipient will certify that it has completed the required cost and effectiveness analysis and that it has selected to the maximum extent practicable, a project or activity that maximizes the potential for water and energy conservation, as appropriate.

To address this section 602(b)(13) requirement, the Minnesota Pollution Control Agency (MPCA) first created a certification form dated January 28, 2015, to state the section language directly[ii]. The current practice with this MPCA certification form has allowed the project recipient's consulting professional engineer to use their best professional judgement when making the statement or signing the certification form. This MPCA guidance document will further assist the consulting professional engineer with completing the cost and effectiveness analysis during the project Facilities Plan process, prior to signing off on the MPCA certification form.

II. Asset Management related to Facilities Plan discussion

Asset Management is a tool that can help inform the project Facilities Plan process. For a project owner, an Asset Management system can help inform project needs identification by showing the age of the individual system asset and the current condition or status of an asset. Asset Management systems or inventories can assist the project owner in determining which system components and equipment have remaining life that can be retained as a part of a project, which components and equipment need replacement, and may assist the owner with describing possible salvage values of components.

If a project owner has an existing Asset Management document or tool, a copy or summary of it should be located in the Facilities Plan. If the Asset Management tool is an electronic management system, a sample page of the Asset Management electronic system should be attached and referenced in the Facilities Plan and identified as a sample of the owner's Asset Management system.

The Minnesota Public Facilities Authority and the MPCA strongly encourage municipalities to have an Asset Management system. Some costs related to the development of an Asset Management system may be fundable as a part of a CWRF construction loan.

For project owners currently without an Asset Management system, there are resources available to help develop such a system.

The Minnesota Rural Water Association recently published Asset Management information on their website. Two documents are available: (1) Asset Management Introduction and (2) Asset Management for Wastewater (Stabilization Ponds) Systems {in an Excel template}. Links to those two documents are located at: http://mrwa.com/assetmgmt.html.

The EPA has an Asset Management guidance document for Small Water Systems that may be a useful reference for developing a small wastewater facilities Asset Management system. The current webpage location for this document is: http://tinyurl.com/zwhsdbg.

The EPA also has an Asset Management tool available to download called Check Up Program for Small Systems at: https://www.epa.gov/dwcapacity/information-check-program-small-systems-cupss-asset-management-tool.

III. Cost and Effectiveness Analysis

A cost effectiveness comparison of alternatives has been a requirement of the Minnesota CWRF program for many years, as part of the Facilities Plan for Wastewater Treatment Systems process for a project. The wastewater Facilities Plan must include information on the initial analysis of a project owner's identified needs, and the alternatives explored for meeting the objectives set out by that owner within any given goals and constraints while maximizing the federal, state, and local objectives for potential for water and energy efficiencies. The Facilities Plan must also identify the chosen project alternative selected by the owner and give the supporting reasons for selecting that alternative.

For CWRF wastewater collection and treatment projects, Minnesota Rule (Minn. R.) 7077.0272, subp. 2 describes the required contents of a Facilities Plan and includes subp. 2.D. "an analysis of all feasible treatment alternatives that are capable of meeting the applicable effluent, water quality and public health requirements for 20 years". Minn. R. 7077.0272, subp. 2(1) goes on to require a cost effectiveness comparison of the alternatives considered, and is narratively described as a present worth analysis of all capital costs, annual operation and maintenance costs, equipment replacement costs, and salvage values.

Another way to depict this common engineering analysis calculation was shown in an EPA interpretive guidance memorandum dated April 17, 2015[iii]. This EPA guidance document cited an Oregon state program reference[iv] which shows an equation that will be adopted and modified slightly here using the Minnesota Rule cost effective language:

> The present worth (PW) for each technically feasible alternative is calculated as the sum of the capital cost (C) plus the present worth uniform series of annual operation and maintenance costs (USPW {O & M}) plus equipment replacement costs (ER) minus the single payment present worth of the salvage values (SPPW {S}) or shown as:
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> PW = C + (USPW {O & M}) + ER – (SPPW {S})

The change required by the FWPCA Section 602 (b)(13) adds the word **"and"** to the analysis, calling it a cost **"and"** effectiveness. What does this mean for Minnesota projects?

In short, it means added detail to the required cost **"and"** effectiveness analysis will need to be included in a project Facilities Plan.

IV. Cost Analysis

A Cost Analysis is to be completed for all wastewater projects and should include consideration of these items.

A. Energy conservation opportunities

Energy assessments for the electrical use components of a project should be completed at least preliminarily during the Facilities Plan process. This may be done for separate project types and/or portions of a project. Collection system projects should consider the electrical use at lift stations and pump types given the overall system design. This should be for both lift stations within the collection system as well as the main pumping station transporting the wastewater to the treatment facility.

Treatment facilities should assess energy usage throughout the plant complex. This could include mechanical facilities aeration energy use, mixing energy, solids handling energy use (transfer, mixing, aeration), and possible energy capture and reuse from solids processing.

For any existing electrical equipment that is proposed to be reused in a project or remain in service, energy audits should be considered to identify opportunities for possible energy savings. Similar to the energy assessments, components should be reviewed for their purpose and need, and determinations should be made if more efficient electrical components could be used to improve energy efficiency at the facility.

The state of Minnesota's Buildings, Benchmarks & Beyond (B3) suite of tools has a wastewater treatment energy evaluation process within B3 Sustainable Buildings (SB) 2030 called B3 SB 2030 Wastewater Treatment Plant (WWTP) Review, including WWTP energy performance metrics in B3 Benchmarking.

The B3 Benchmarking tool provides an on line platform to track energy performance and help determine efficiency at existing WWTPs.

Learn more about B3 Benchmarking: https://mn.b3benchmarking.com/

Learn more about B3 Benchmarking & WWTPs: http://mn.b3benchmarking.com/WastewaterTreatmentPlants.

Access the B3 Benchmarking tool: https://mn.b3benchmarking.com/Request-Access.

The B3 SB 2030 WWTP Review is an energy review process and set of minimum energy conservation measures (ECM) that should be considered for WWTP designs. B3 SB 2030 WWTP Review may apply to certain wastewater projects. An MPCA SB 2030 exemption form is available to determine if the B3 SB 2030 WWTP Review applies. For more information, see Section III.D. or to learn more about the B3 SB 2030 WWTP Review go to: http://www.b3mn.org/.

Energy audits conducted by the local gas provider, electric utility, professional engineer, or the Minnesota Technical Assistance Program (MnTAP) may be able to help with efforts to optimize energy use. Other possible resources or references for energy conservation information are available from the Water Environment Federation[v] and on the MNTAP webpage at: http://www.mntap.umn.edu/POTW/energy.html.

B. Renewable energy opportunities

The Cost Analysis should also consider renewable energy opportunities such as solar, wind, biogas, combined heat and power, etc. as a means of reducing the energy profile and providing a more reliable energy source in times of power outages. There may be rebate offers by public utilities to help finance the installation of renewable energy systems.

C. Water conservation opportunities

The Cost Analysis should also consider water conservation opportunities. Using less water within a project area can have an impact on the wastewater facilities in that project area. The Cost and Effectiveness Analysis should consider water conservation opportunities, including:

i. Water reuse options. This option would be most appropriate in facilities planning for wastewater treatment facilities projects, as the treatment facility eventual design would be impacted by the type of treatment required for the possible water reuse opportunities. For example, are there industries, recreational locations (golf courses, parks, fields etc.), agricultural producers, or landscaping locations in the project area or near the project service area that may be interested in partnering on a water reuse project?

   A Water Reuse Analysis section should be in the Facilities Plan clearly so it is very easy to document the option has been considered by the project.

   If water reuse is not analyzed as an alternative, the project Facilities Plan should include a brief statement on the justification for this decision. These would typically be sewer pipe or forcemain replacement projects that do not include work not related to the wastewater treatment process, which typically must be addressed to facilitate water reuse. However, sewer extension projects may be candidates for possible water reuse projects, especially extensions to new industrial park growth areas where water reuse may be a possible industrial plant water source or where landscape watering or irrigation may be considered.

ii. Water efficient devices. This is an option that may reduce overall water use within a project service area, and thereby reduce the wastewater flow volume that must be treated. This water conservation opportunity should be considered for both collection system and wastewater treatment projects as installing water efficient devices in residential homes, commercial businesses or industries can have the potential positive impact of reducing flows in the sewer pipes and reducing flows needed to be treated at the wastewater treatment facility.

iii. Use of or replacement of water meters. Similar to using water efficient devices, addressing water meters in the project service area may reduce overall water use within a project service area simply by raising the user's awareness of the volume and cost, and thereby reduce the wastewater flow that must be treated. This water conservation opportunity should be considered for both collection system and wastewater treatment projects as installing or replacing water meters at residential homes, commercial businesses, or industries can have the potential positive impact of reducing flows in the sewer pipes and reducing flows needed to be treated at the wastewater treatment facility. Costs related to installation or replacement of water meters may be fundable as a part of a CWRF construction loan.

iv. Water audits and conservation plans. Water audits, particularly with large water system users in the distribution system may locate flows of water that become wastewater that may be mitigated or reduced that can have positive impacts on the wastewater collection system and the treatment facilities. Similarly, implementing a water conservation plan (this may tie in with a Water Reuse option, for example) may have a positive impact on the wastewater collection system and the treatment facilities. For ideas to consider with this option, an information resource available in Minnesota is through the University of Minnesota at MNTAP: http://www.mntap.umn.edu/ and the specific water conservation webpage link is at: http://www.mntap.umn.edu/POTW/water.html.

D. B3 Sustainable Building (SB) 2030 Wastewater Treatment Plant Review

The B3 SB 2030 WWTP Review is an energy review process and set of minimum energy conservation measures (ECM) that should be considered for wastewater treatment plant designs using tools established under Minn. Stat. § 216B.241.

Learn more about B3 SB 2030 WWTP Review: https://www.b3mn.org/

An MPCA SB 2030 exemption form is available to determine if the B3 SB 2030 WWTP Review applies. All nonexempt wastewater treatment plants will need to participate in the SB 2030 WWTP Review.

V. Other Factors/Nonmonetary Analysis

(To be completed for all new wastewater treatment facilities with design average wet weather {AWW} flow of greater than 100,000 gallons per day and significant upgrades meaning work on three or more major treatment units for any wastewater treatment facilities with a design AWW flow of greater than 1 million gallons per day).

In addition to cost analysis factors, there are also nonmonetary or non-cost factors that may be considered during project facilities planning. These factors can most certainly change depending on the type of wastewater facilities project the owner is proposing. Some nonmonetary factors may also have monetary or costs associated with them. This portion of the project analysis should be limited to considering the nonmonetary discussion or consideration of those factors or items. Some of these factors are listed below and the project consulting engineer and owner have flexibility in determining if these or other items should be considered for an individual project.

A. National, regional, state, and local priorities

i. The CWRF is available to assist sustainable and climate resilient infrastructure projects, for example safeguarding water infrastructure from risks of climate change and extreme weather events. The Facilities Plan should address the extent to which sustainability and climate resilience have been considered. For information on these subjects, EPA has information on their webpage at:

https://www.epa.gov/sustainability/learn-about-sustainability#what
https://www.epa.gov/sustainable-water-infrastructure/effective-utility-management-practices
https://www.epa.gov/crwu/build-climate-resilience-your-utility

ii. The Facilities Plan should address the water quality objectives of the project. For collection system projects, this may be insuring that the sewer system is capable of transporting all the wastewater in the service area to the treatment plant for final treatment that meets the effluent limits in the owners permit, or maybe addressing past bypass issues during wet weather events as examples. For treatment facilities, it may be how the project is addressing current or new effluent limits.

iii. Consolidation/regionalization. Are there opportunities to consider collaborating in a consolidation or regionalization project for treatment facilities with other nearby communities or housing areas? In some cases, this alternative may involve nonmonetary considerations, such as benefiting the local technical

and managerial capacity to operate the system, obtaining more favorable discharge locations or facilitating a water reuse option. If the owner already is a "regional" facility, this should be identified in the Facilities Plan.

B. Technical factors

i. The project location and project physical aspects may raise some nonmonetary considerations. Examples could include minimizing impacts on residents of the community or reducing the amount of land needed for the wastewater treatment facility site.

ii. Project reliability may raise some nonmonetary considerations for a project alternative. This may be particularly true for small communities. In Minnesota, an example of this would be that a large number of small communities use stabilization pond systems for their treatment technology because that type of treatment process has been shown to be very reliable. The treatment alternatives considered for a particular location should consider this issue. This should not be confused with MPCA treatment plant component reliability requirements.

iii. Project feasibility and operability may also raise some nonmonetary issues to consider when analyzing alternatives. For example, can the project owner reasonably expect to find qualified candidates for operations and maintenance staff in the local area or reasonably expect to contract for operation and maintenance services for the planned project? Is it a specialized technology that may take more operator time and take time away from other expected job responsibilities? Is the technology flexible and adaptable to future conditions, like changes in influent wastewater quality or quantity from a new or expanded industrial user?

C. Environmental factors

i. The potential opportunity for a project to implement or enhance possible water conservation practices, water reuse, and/ or water recapture may have nonmonetary related consideration or aspects for a project alternative. Discuss this in the Facilities Plan as appropriate for a project.

ii. Potential implementation of energy conservation practices, including the use of alternative energy sources may have nonmonetary related issues to consider for a project. Discuss this in the Facilities Plan as appropriate for the project.

iii. Opportunities to recover and recycle or reuse other resources may have non-cost related considerations to identify for a project alternative. Good examples of this may include nutrient recapture from the wastewater stream for possible reuse. The most common practice is land applying biosolids in cooperation with landowners to use the nitrogen and phosphorus in crop uptake to assist with growing agricultural crops. More recent practices include struvite (phosphorus) harvesting or nitrogen harvesting for fertilizers have been put in to practice in some parts of the United States. Discuss this in the Facilities Plan as appropriate for the project.

iv. The use of green infrastructure components within a project proposal may have nonmonetary considerations. Discuss this in the Facilities Plan as appropriate for the project.

v. There may be other environmental impacts of a project that may have nonmonetary considerations. Examples may be land use impacts, impact to wildlife and/or habitat, impacts to wetlands or other critical water bodies, or impacts on air/water quality. Discuss this in the Facilities Plan as appropriate for the project.

D. Socioeconomic factors

i. There may be nonmonetary related considerations for certain industries using or served by public infrastructure by the type of project. Discuss this in the Facilities Plan as appropriate for a project.

ii. Nonmonetary considerations may be a part of local trend or demographics affecting the need or demand for a project. Discuss this in the Facilities Plan as appropriate for a project.

iii. Environmental justice issues may have nonmonetary related issues or considerations for a project. Discuss this in the Facilities Plan as appropriate for a project.

iv. Project acceptability or affordability may have nonmonetary types of considerations for a project. Discuss this in the Facilities Plan as appropriate for a project.

VI. Integrating Cost and Effectiveness Analysis

(To be completed for all new wastewater treatment facilities with design AWW flow of greater than 100,000 gallons per day and significant upgrades meaning work on three or more major treatment units for any wastewater treatment facilities with a design AWW flow of greater than 1 million gallons per day).

This is the recommended method or series of steps to integrate the Cost and Effectiveness Analysis into projects including the Cost Analysis and Other Factors/Nonmonetary Analysis portions of the review of alternatives.

A. Display a summary table of the results of the present worth cost analysis of each of the alternatives studied during the Facilities Plan process that are capable of meeting the needs identified.

B. Describe narratively or summarize in a table the Other Factors/Nonmonetary Analysis for each alternative studied.

C. Assign a numeric weighting factor to both the Present Worth Cost Analysis and the Other Factors/Nonmonetary Analysis for each of the project alternatives.

D. Summarize the weighting factors of both the Present Worth Cost Analysis and the Other Factors/Nonmonetary Analysis in one single table and identify how the weighting factors will be used to assist in making a decision on selecting a project alternative.

E. Choose a selected project alternative. The Facilities Plan narrative should describe how both the Present Worth Cost Analysis and the Other Factors Analysis each shaped the reasoning behind selecting the implementation of this alternative. It is very important to note that Minn. R. 7077.0272 subp. 2.F. does not require selecting the lowest cost alternative for the project. The project owner is given latitude to select a project alternative that meets their identified needs and addresses the analysis of each of factors identified in this guidance document as appropriate for the individual project.

A reference to consider when integrating a Cost and Effectiveness Analysis is available from the Natural Resource Defense Council at: https://www.nrdc.org/sites/default/files/wat_16012504a.pdf.

References:

[i] EPA, Interpretive Guidance for Certain Amendments in the Water Resources Reform and Development Act to Titles I, II, V, and VI of the Federal Water Pollution Control Act, January 6, 2015, https://www.epa.gov/sites/production/files/2015-04/documents/water_resources_reform_and_development_act_guidance.pdf

[ii] MPCA Cost and Effectiveness Certification Form: https://www.pca.state.mn.us/sites/default/files/wq-wwtp2-46.doc

[iii] EPA, Supplemental Information of Implementing Section 602(b)(13), April 17, 2015

[iv] Preparing Wastewater Planning Documents and Environmental Reports for Public Utilities Financed by Oregon Infrastructure Finance Authority, Oregon Department of Environmental Quality, Rural Community Assistance Corporation, United States Department of Agriculture, May 21 and 22, 2013, http://www.deq.state.or.us/wq/loans/docs/FacilitiesPlansGuidelines.pdf

[v] Water Environment Federation, Energy Conservation in Water and Wastewater Facilities, Manual of Practice No. 32, 2009