7356-01

Village of Northport, Leelanau County Water System Improvements
Summary of Components Qualifying for Green Project Reserve
April 2013

Executive Summary and Overview of the Project

The *2012 Clean Water and Drinking Water State Revolving Fund 10% Green Project Reserve: Guidance for Determining Project Eligibility*, indicates that a number of project components in the Village of Northport Water System Improvements Project are eligible for "principal forgiveness", or a reduction in the loan capital amount.

As presented in the DWRF Project Plan dated March 2013, the Village of Northport has committed to design and install water system improvements including supply, distribution, and controls system improvements to serve the Village of Northport water system customers. The primary objectives of this project include providing a remote water system control and monitoring system.

The selected alternative incorporates several green components that will provide environmental benefits. The recommended alternative is in keeping with the Village's commitment to provide reliable water service while pursuing innovative, environmentally protective and cost effective technologies.
Pursuant to the criteria outlined in the Guidance, the selected alternative exhibits *Green Project* benefits through improvements through innovative design and energy. The project components meet the requirements of an eligible project under the following decision criteria of the Guidance Document:

> *2.4-1 "Water Efficiency can be accomplished through water saving elements or reducing water consumption."*
> *2.4-2: "Water efficiency projects should deliver equal or better services with less net water use…*
> *2.4-3: "Efficient water use has the added benefit of reducing the amount of energy required by a drinking water system, since less water would need to be treated and transported…"*
> *2.4-4: "Proper water infrastructure management should address where water losses could be occurring in the system and fix or avert them. This could be achieved, for example, by making operational changes or replacing aging infrastructure.*
> *3.5-1: Energy efficient retrofits, upgrades or new pumping systems*
> *3.5-7: "Automated and remote control systems (SCADA) that achieve substantial energy savings"*

Based on the GPR guidelines as published, the following items should be considered GPR eligible:

	Item	Amount
1.	Alternative D1 – New Well at Existing Well 3 Site	$293,000
2.	Alternative E1 – Rose, Third, & Mill St Watermain	$262,400
3.	Alternative F2 – Remote SCADA System	$10,000
	Estimated Construction Costs:	$565,400
	Construction Contingencies (10%):	$56,500
	Undeveloped Details (10%):	$56,500
	Total GPR Eligible Construction Cost:	**$678,400**

The project components require business case examples in order to be considered under the decision criteria identified above. A discussion of specific business case examples for the proposed project is as follows:

1. **Distribution Pipe Replacement to reduce water loss, prevent watermain breaks, and improve system efficiency**

   The Village has calculated that they lose upwards of 38% of the water delivered to the system. Some of the water loss can be attributed to accounting and billing issues and flushing volumes. Without conducting a comprehensive leak detection program, it is difficult to determine the water losses that can be attributed to individual components of the distribution system. However, the Village does not doubt that a significant portion of the water loss can be attributed to leaking water mains. The original distribution system was constructed in the 1930's and pipe with frequent bolted joints was used in the installation. This pipe has been observed during repairs of the watermain and during construction of the municipal sewer to have leaking joints. Although the Village is replacing approximately 3.1% of their total pipe inventory, the project targets the oldest and most problematic areas of watermain where known leakage is occurring. The proposed watermain replacement will replace approximately 8% of these original old watermains installed around 1950. However, it is believed that this portion of the watermain is primarily responsible for the excessive amounts of water loss in the system. It is estimated that this work may reduce leakage by up to 23%. It is likely that failures and leaking will increase if replacement does not take place.

   Assuming an average pumping volume of 30 MGY, the Village will conserve approximately 6,600,000 million gallons of water per year by reducing water loss by 23%. Based on the current O, M, & R costs, the cost to pump 1,000 gallons of water is approximately $5.93. The estimated cost savings from reduction in water loss is $40,917 per year. The present worth of the estimated cost savings over 20 years is $535,300.

   In addition to addressing water loss in the system, increased efficiency of the distribution system will be achieved by replacing undersized and aging mains. Larger diameter watermain will have a higher efficiency than existing undersized mains. Also, new pipe will have a higher C factor which reduces friction losses of the system and increases efficiency. Existing 2 inch galvanized main on Mill Street has a C factor of approximately 90. Existing 4 inch cast iron watermain on Rose and Third Street have a C factor of approximately 100. New 8 inch ductile iron watermain installed in these locations will have a C factor of 120. Finally, providing looped systems provides additional flow paths which further decreases friction losses in the pipe.

   The existing pipe will be replaced with either new PVC or Ductile Iron watermain meeting current AWWA standards.

2. **Installation of a New High Efficiency Drinking Water Production Well**

   The proposed project includes replacement of Well 1 with a new energy efficient production well. Existing Well 1 was constructed in 1933, or 80 years ago. The existing pump is rated at 190 GPM. Because of the age of the well and the known issues with reduction in pumping capacity, it is highly likely that the gravel pack and/or screen are deteriorated and decreasing pumping efficiency. When first installed, the well produced 220 GPM. Currently, the well is producing 150 GPM. Therefore, an additional 68% loss in efficiency is assumed for the well pump. New high efficiency pumps and motors will

be specified for the project which will further decrease energy consumption. A comparison of standard and high efficiency pumps is as follows:

1. **Efficiency of the Standard Wells & Motors:**
   (pump efficiency) x (motor efficiency) = wire to water efficiency.
   74.5% x 89% = 66.3%

   Efficiency of Proposed Wells & Motors:
   (pump efficiency) x (motor efficiency) = wire to water efficiency.
   85.5% x 95% = 81.2%

   Comparison of Standard Pump & Motors to Proposed Pump & Motors:
   81.2%/ 66.3% = 1.23

2. **Efficiency of the Existing Well & Motor:**
   (pump efficiency) x (motor efficiency) = wire to water efficiency.
   60% x 65% = 39%

   Note: Efficiency data is not available for these motors as they were installed in 1933. Due to the age of the motor and because the existing pump capacity is decreasing, the pump motor efficiency is assumed at 65% and the pump efficiency is assumed to be 60%.

   Efficiency of Proposed Wells & Motors:
   (pump efficiency) x (motor efficiency) = wire to water efficiency.
   85.5% x 95% = 81.2%

   Comparison of Existing Pump & Motors to Premium Pump & Motors:
   81.2%/ 39% = 2.08

   By replacing Well 1 with high efficiency pumps and motors, the system will reduce energy use by 23% over standard pumps and motors and 108% over the existing pump and motor. This level of efficiency exceeds the minimum 20% required for pumps and motors to be included in the Green Project Reserve.

3. **SCADA Enhancements**

The proposed project includes enhancement of the existing Village control system. The project will provide a web based HMI server that will allow remote access to the Village controls by the water system operators. The system operators will have the ability to more closely monitor water use trends, identify leaks and system issues in a more timely manner, and optimize efficiency of the system operations.

Drinking Water Revolving Fund
Green Project Reserve Qualification Template

Applicant: Village of Northport Project No: _____
Project Name: Northport DWRF Project Plan

Identify by page number from the project plan, or attach excerpts, where water efficiency or energy efficiency improvement justification is provided or discussed to support the need for the recommended green project reserve component: Pages 4, 5, 9, 10, 12, and discussion regarding water loss and efficiency in GPR Summary Memo located in the front of the DWRF Project Plan.

Please ensure all requested information is provided to enable an assessment by the Michigan Department of Environmental Quality (DEQ) of whether the project or project component can qualify for funding from the green project reserve.

Meter Replacements with Conventional Meters

1. Over the last five years, water lost or unaccounted for in the system has averaged _____ gallons per year and is _____ percent of the water produced each year.
2. Identify the source of this information (i.e. water audit, water conservation study, production and billing records):_____
3. Identify the portion of the water loss that is likely due to inaccurate meters:_____
4. The expected reduction in water loss by installing replacement traditional water meters in all or a portion of the system is _____gallons per year, reducing the water loss percentage to _____.
5. It takes _____kilowatt hours (kWh) of electricity to produce and distribute 1,000 gallons of water. At a cost of $_____per kWh, the estimated annual electrical cost for the water loss due to inaccurate meters based on the five-year average is $_____.
6. Based on the average cost per year for the loss and the estimated cost of_____ for replacing the meters, the project will pay for itself in _____months/years.
7. Attached all relevant data and calculations that were used to provide answers to these questions.

Water Main Replacement

1. Over the last ten years, 10 water main breaks have occurred on the water mains that are proposed for replacement, an average of 0.41 breaks/mile/year.

2. Identify the length, diameter, age and type of pipe to be replaced: Rose Street: 510 feet of 4 inch cast iron pipe approximately 65 years old; Third Street: 170 feet of 4 inch cast iron pipe approximately 65 years old; Mill Street: 600 feet of 2 inch galvanized pipe approximately 65 years old.

3. Each break is estimated to result in the average loss of 100,000 gallons of water, calculated to total 100,000 gallons/year of water lost for those water mains.

4. Present the data indicating how this is a significant source of water loss in the system and how the pipes proposed for replacement are likely to generate the greatest return in leak reduction. The water loss for the Village of Northport was 11,534,056 gallons in 2012. The proposed mains to be replaced are approximately 8% of the original distribution system installed around 1950. The sections of watermain on Rose, Third, and Mill have been the most problematic, have been observed to have leaking joints, and are known to be a major contributor to water loss in the Village. It is anticipated that up to 23% of the Village's water loss may be attributable to these sections of watermain.

5. The energy savings from pumping/delivering water through the new water mains versus the old ones is estimated at 14,090 KwH/year. * Total electrical usage for 2012 with 38% water loss was 61,274 KwH. Assuming a 23% reduction in water loss, the anticipated reduction would be 14090 KwH/yr.

6. Describe the condition of the replaced mains with respect to friction/head loss etc from tuberculation or other deterioration issues. As appropriate, identify if the soils are corrosive and contributing to the deterioration/breaks or leaks in the mains, and how the replacement mains are designed to address future corrosion:
The mains proposed to be replaced have a higher friction loss coefficient due to the age and diameter of the piping. By increasing the diameter of the pipe and installing new mains, the efficiency of the pipes will be increased. It is estimated that the existing 4 inch watermain has a C factor of 100, new 8 inch ductile iron watermain will have a C factor of 120.

7. Total projects costs for the water main replacement component of the project are $393,300.

8. Identify the source of data used for these calculations: Village of Northport DPW records

Submitted by:

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Name

April 23, 2013
Date

Project Engineer
Title