

DWRF 7363-01

## Marquette Green Funding

### Total Green Costs

Green Costs = \$804,878.00 Lakeshore Blvd. watermain replacement and extension  
= \$61,199.50 Brule Rd. watermain costs

Lakeshore Blvd. + Brule Rd. = \$804,878.00 + \$61,199.50 = \$866,077.50

Total Green Construction = \$866,077.50

Total Green Construction    \$866,077.50  
Total Construction    =    \$866,077.50    = 100%

Percent \* Loan Total = 100% \* \$965,000 = \$965,000

Total Green Costs = \$965,000

### Green Principle Forgiveness

Total Green Costs \* GPR Forgiveness = \$965,000 \* 40% = \$386,000

Total Principle Forgiveness = \$386,000



**Drinking Water Revolving Fund  
Green Project Reserve Qualification Template**

Applicant: City of Marquette Project No: DWRF-7285-01

Project Name: Water Main Replacement and Water Loss Reduction

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: F-02B-1 through F02C-4, F-06E-1 through F-06E-4 and See Attached.

Please ensure all requested information is provided to enable an assessment by the Michigan Department of Natural Resources and Environment (DNRE) of whether the project or project component can qualify for funding from the green project reserve.

**Meter Replacements with Conventional Meters (Not Relevant for this Project Plan)**

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, 5 water main/services breaks have occurred on the water mains that are proposed for replacement, an average of 0.5 breaks/mile/year.
2. Identify the length, diameter, age and type of pipe to be replaced: Replacement of approximately 4500 feet of water main (4 inch 1918 sand cast piping and 4 inch 1954 CI piping) on lakeshore Blvd., 46 water services, and the placement of 3500 feet of cross country water main.

Brule Road work includes replacement of the existing 6"CI 1966 and 1957 water main with 600 LF of 8" D.I. water main from Joliet Road to Radisson Drive and 10 water services.



- Each break is estimated to result in the average loss of 4,000 gallons of water, calculated to total 2,000 gallons/year of water lost for those water mains. Please see attached concerning the water loss due to the let run conditions caused by the dead end main and water quality issues.
- 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. Please see attached concerning the water loss due to the let run conditions caused by the dead end main and water quality issues.
- The energy savings from pumping/delivering water through the new water mains versus the old ones is estimated at \_\_\_\_\_ Kwh/year.

The Lakeshore Blvd. (Island Beach Road) water main is part of the Lincoln Tank pressure district. This means the pressure is regulated by the Lincoln tank level. The supply of water to the tank, and consequently to the pressure district, is from the high lift pumps at the water plant. Because the Island Beach Road water main is not a main arterial between the water plant and the Lincoln tank, there will be essentially no electrical power savings as part of this water main replacement project. Please see attached concerning the water loss due to the let run conditions caused by the dead end main and water quality issues.

- 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:

Both water mains in Brule Road and Lakeshore Blvd. (Island Beach Road) are many decades old and made of cast iron. Water main segments found in both locations during many repairs, show considerable tuberculation inside the pipes. The resulting C factors from our calibrated computer flow model are around 50 for both sites. The value of 50 shows a very dilapidated condition. The new mains will result in C factors of 110.

The water mains in both locations show evidence of corrosion on the outside. This is especially true of the main in Brule Road. The soils in the Shiras Hills area are known to be corrosive. The existing water mains are made of cast iron and are not coated with a protective surface. The new water mains will be protected by an asphaltic coating.

- Total projects costs for the water main replacement component of the project are:

McClellan Avenue Extension—Fair Avenue to Wright Street (\$446,000 DWRP) *ineligible for fees*

3000 Block of Lakeshore Blvd. - Peter White Drive to West Dead End and from Lakeshore Blvd. to Powder Mill Road (~~\$1,649,000 DWRP~~) 1,729,000

Brule Road – Radisson Drive to Joliet Drive (~~\$200,000 DWRP~~) 153,000

*total 1,882,000*

- Identify the source of data used for these calculations: Water & Sewer Improvements SRF III Final Project Plan for the City of Marquette.

Submitted by:

Name Keith W. Livingston

Date 5-6-10

Title City Engineer





the Superior location

[www.mqtcty.org](http://www.mqtcty.org)

April 29, 2010

Michael A. Cox, Senior Project Manager  
Revolving Loan and Operator Certification Section  
Water Bureau  
Michigan Department of Natural Resources and Environment  
P.O. Box 30273  
Lansing, Michigan 48909-3777

RE: Green Project Reserve Funding-Qualifications for the City of Marquette

Dear Mr. Cox,

The purpose of this letter is to provide documentation to be used for the basis of determining if the City of Marquette, DWRP Project No. 7285-01, qualifies for the green project reserve funding under the ARRA for our 2011 projects. These projects will replace 5,100 feet of 4-inch and 6-inch unlined cast iron mains that have a history of breaks, insufficient flows, and in one case water quality/water waste issues. The following information was used to make this determination as well as the attached document.

The city has developed a 20-year comprehensive infrastructure replacement plan to prioritize the replacement of water and sewer lines. This project will address some of the highest priority water main replacements based on age and condition. The city reports an average of 20 main breaks a year, primarily in the portions of the system still containing sand cast iron mains. Many of these mains are corroded and contain deposition that has significantly reduced the carrying capacity while at the same time, increasing the friction losses and energy necessary to deliver water through them, as illustrated in the accompanying photograph.

Over the last 5 years, Marquette has reported system-wide water losses ranging from 16% to 23% of the total volume delivered to the system. System losses in excess of 15% are generally considered unacceptable in the waterworks industry. For 2008, the total volume of water lost was in excess of 230,000,000 gallons, or the equivalent of 23.32% of the total water pumped. Please see the attached document.

It is difficult to assign unaccounted water losses to specific areas of the distribution system without conducting a comprehensive leak detection program. However, there is little doubt that leakage is greatest in the older, unlined cast iron piping and in those areas due to soils reactivity. It can be seen from the attached document that the area along Lakeshore Boulevard has



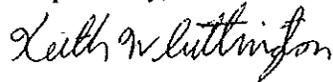
accounted water losses based on the let run policy of the City of Marquette to improve water quality in that area. Although Marquette is only replacing 1% of their total pipe inventory in this next phase, they are replacing antiquated piping, piping subject to soil reactivity, or providing a looped system to avoid costly let run scenarios to maintain water quality. These areas are all subject to the most frequent catastrophic failures and are likely to experience the highest percentage of leaks and water waste.

Therefore, it is expected that the replacement of these targeted mains will decrease the city's lost water to a much greater extent than the percentage of the city's total pipe inventory they represent. Every 1% reduction in lost water equates to 2,300,000 gallons based on the 2008 records. Given the condition of these mains, the city should realize double or even triple this proportional savings.

The new mains will also have an improved C factor as compared to the existing unlined cast iron pipes. Therefore, the city estimates there will be a significant energy savings from pumping water through the new mains versus the old ones.

We appreciate your recognition and welcome the possibility of being accepted for this new round of subsidies. I would be glad to answer any questions and can be contacted at (906) 225-8979.

Respectfully,



Keith Whittington  
City Engineer/Street Administrator

cc: File  
Curt Goodman, Water Treatment/Waste Water Treatment Superintendent  
L. Mike Angeli, Acting City Manager





## the Superior location

[www.mqtcty.org](http://www.mqtcty.org)

Drinking Water Revolving Fund  
American Recovery and Reinvestment Act (ARRA)  
Green Reserve Qualification

Applicant City of Marquette

Project No: DWRF-7285-01

Project Name: Water Main Replacement

The City of Marquette is seeking SRF & DWRF funding for the 2011 funding year. The projects that are schedule are primarily replacement of aged, undersized water mains, providing looping for an existing dead end water main, and the placement of sewer main for residents who are currently being serviced by septic fields. With the SRF/DWRF program, the City of Marquette has proceeded to develop a 20 year comprehensive plan to maintain an aggressive infrastructure replacement program. The 5 year part of this plan had been approved by the City of Marquette and the State of Michigan in April Of 2009.

As part of the American Recovery and Reinvestment Act (ARRA) it is our understanding that information is needed to justify of whether the project(s) component can qualify for funding from the green reserve established/required in the ARRA.

Any questions should be directed to Keith Whittington: 906-225-8979 or [kwhittington@mqtcty.org](mailto:kwhittington@mqtcty.org)

### Water Main Replacement

#### Project (s) Summary:

**Lakeshore Boulevard Project:** Replacement of approximately 4500 feet of water main, 46 water services, and the placement of 3500 feet of x-country water main.

The fire flows and the piping servicing the residents along this section of Lakeshore Boulevard are dependent on 4 inch 1918 sand cast piping and 4 inch 1954 CI piping. This project will upsize the existing pipe to 8 inch D.I. piping and loop the water main through the LSI property to the water main that ends north of the River Park Sports Complex near Powder Mill Road. The placement of this water main will lower the friction lose, increase fire flows, residential flows, and replace aged pipe. Since the flood of 2003 it has shown the importance of having redundancy in the water system. A looped system will guarantee a source of water for the residents if one leg of the system goes down.



The present fire flow rate at the intersection of Lakeshore Blvd. and Peter White Drive is approximately 300 gpm. At the far west end of Lakeshore Blvd. the existing fire flow is approximately 175 gpm.

As you can see, these existing values do not meet the flows recommended to provide sufficient fire protection in this area.

Another issue, and just as important, is the water quality in this area. This area has had a long history of water quality issues due to the long residence time (how long water sits in the pipe) and minimal velocities of water in the existing piping. Over the years numerous complaints of rusty water discharge and low to zero chlorine residual have been voiced to City officials. The rusty water discharge is caused by corrosion byproducts from inside the old cast iron pipes that have settled in the long dead end main. This is especially the situation near the west end of Lakeshore Boulevard where normal domestic flows are minimal. Anytime there is a higher demand on the system such as hydrant use or domestic uses the corrosion deposits that have settled in the pipe are dislodged and suspended in the water and end up in the piping servicing the resident's homes. This discoloration is generally an aesthetic issue, with a slight taste making the water unpleasant to drink. There have been issues with laundry being discolored and ruined due to this discoloration.

More of a concern than the discoloration is the amount of chlorine residual left in the water as it reaches this area of the City. Chlorine residual is the amount of chlorine remaining in the water supply at that particular location. Chlorine is used to kill bacteria, including disease-causing organisms and the nuisance organism, iron bacteria. A water system that has a low or zero residual could compromise the safety of the drinking water in that system. In addition, when the water becomes discolored it further decreases the effectiveness of the chlorine for disinfection.

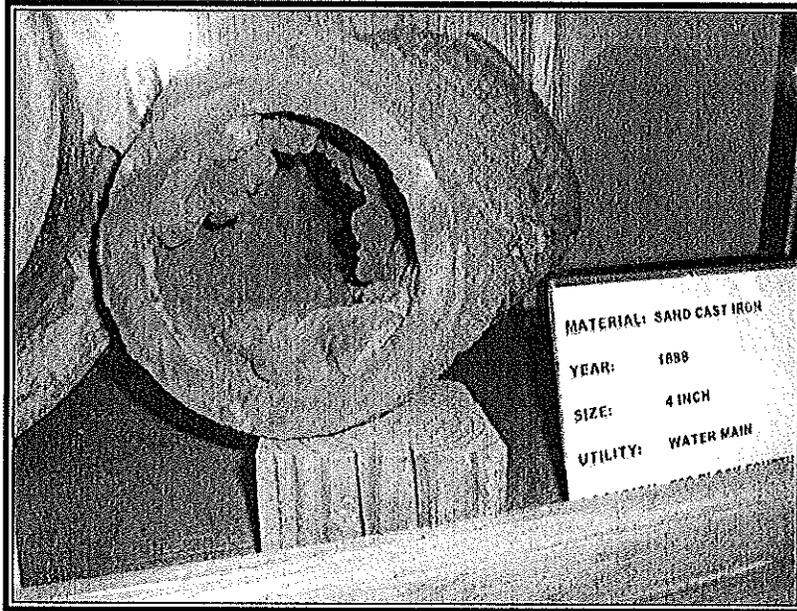
To help alleviate the chlorine residual problem and provide an acceptable level of water quality, the City installed a hose bib several decades ago at the west end of Lakeshore Blvd. which is presently flowing into the adjacent wetlands. This was recently measured to be flowing at 17 gpm. The annual cost to the City for this "let-run", at \$1.20 per hundred cubic feet for production and pumping, is approximately \$14,335 per year. We must keep in mind that the current let-run is based on the existing 4 inch piping. We will be required to replace the existing piping with new 8 inch diameter piping per the MDNRE. The placement of an 8 inch water main will quadruple the volume of water in the system and ultimately increase the cost of the let-run procedure if the system is not looped.

**Brule Road Project:** Work includes replacement of the existing 6"CI 1966 and 1957 water main with 600 LF of 8" D.I. water main from Joliet Road to Radisson Drive. The existing water mains are being replaced with larger diameter piping and with lower friction lose material to increase fire flows and improve overall system efficiency. This is just the first phase of the whole system in this area that requires an increase in the size of the water main to increase fire and domestic flows.

Since 1992 Brule Road from Hennipen Road to Radisson Drive has seen five main/service breaks. This is due to the silty/clayey soils in this area that were not removed during the initial construction and the existing water main materials. The water main will be installed with the proper granular material as recommended by the DNRE. Galvanized water services will be replaced with new materials to avoid breaks and decrease the friction loses.

The photo below shows the condition a typical water main being replaced. The benefits of these infrastructure improvements will reduce water main failure, improve over all system efficiency and increase fire flows for the safety of the residents.





Water Loss

Over the last 10 years, the City of Marquette has had over 200 water main breaks with an average of 20 main breaks a year. While each water main break results in water loss, it is difficult to estimate the actual water loss for each break. Every water main break has unique characteristics (diameter, pressure, etc.) affecting the volume of the water loss.

**City of Marquette Water Supply  
Water Supply Volume as Treated and Billed  
Fiscal Years Ended June 30, 2004 Through 2008**

	Fiscal Years Ended June 30				
<u>Water Supply Volume (1)</u>	<u>2004</u>	<u>2005</u>	<u>2006</u>	<u>2007</u>	<u>2008</u>
Treated.....	1,423,075	1,387,447	1,425,933	1,352,710	1,341,265
Billed .....	<u>1,181,329</u>	<u>1,131,515</u>	<u>1,196,630</u>	<u>1,101,835</u>	1,028,450
Unaccounted (2).....	<u>241,746</u>	<u>255,932</u>	<u>229,303</u>	<u>250,875</u>	<u>312,185</u>
Unaccounted as a Percent of Treated .....	16.98 %	18.45 %	16.09 %	18.55 %	23.32 %

(1) Measured in 100 cubic feet.

(2) Unaccounted water volume is due primarily to flushing of lines, pressure releases during routine maintenance, line loss, water main breaks and slow meters.

Source: City of Marquette

Submitted by:

Keith W. Livingston  
Name

4-29-10  
Date

City Engineer  
Title