

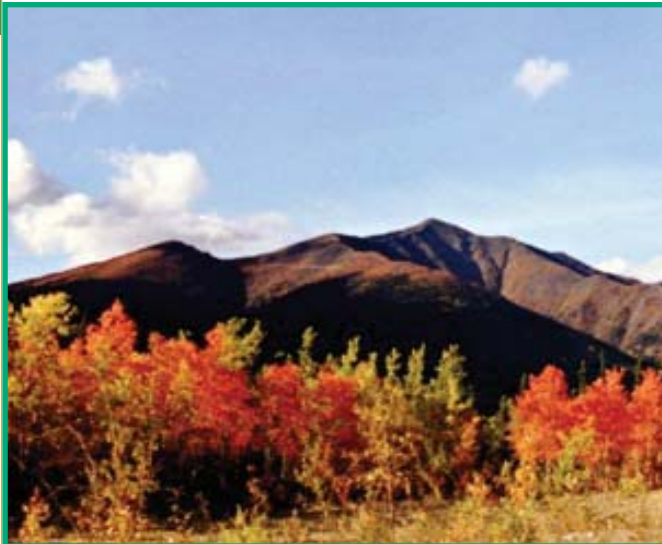
# Northern municipality warms to geothermal solution

## *Village of Mayo, Yukon*

### **Geothermal Heat Extraction and Distribution in the Village of Mayo (GMEF 5400)**

Date project completed: March 2006 / Total project value: \$500,000 / GMF grant: \$250,000

- Energy consumption profiled
- In-situ acid injection system recommended
- Savings of \$24,000 per year estimated
- New recreation centre planned



A view of Mount Haldane from the Village of Mayo.

### **Overview**

The Village of Mayo entered into a joint venture agreement with the Energy Solutions Centre of the Yukon Territory to determine the feasibility of using the Mayo aquifer as a geothermal heat utility. The study investigated the sustainability of the aquifer, methods of recharging or discharging water, the effectiveness of various heat pump technologies, and the suitability of the existing infrastructure to support distribution. The selected solution will save over \$24,000 in annual heating costs. It is also anticipated to improve air quality during the winter heating season, which could reduce municipal costs associated with air quality-related health problems by up to 50 per cent.

### **Project team**

Village of Mayo  
Energy Solutions Centre  
Stantec Inc.  
Gartner Lee Limited  
Spiegel Skillen & Associates

### **Context**

A geothermal heating system was installed in the Village of Mayo in 1987 and 1988, with assistance from the Yukon Alternative Energy Loan Program. The system consisted of an underground, insulated loop with two warm water wells, a heat pump to extract the heat, and a pipe network to several community buildings. Due to declining performance, cost and other factors, the system was decommissioned a year after it was installed. The Village now uses its heating system to preheat domestic cold water to 5°C through a heat exchanger to prevent freezing in the reservoir. In the last several years, water flow rates from the warm water wells have declined steadily due to a buildup of naturally occurring minerals in the well casing and well screen.

### **Approach**

The Energy Solutions Centre and the Village of Mayo commissioned Stantec Inc. to study the feasibility of re-establishing the existing warm water distribution system to heat buildings in the village.

The consultants gathered information on the existing well system and the facilities that would receive the heat, including the type of construction, the extent of window glazing, and the existing equipment.

### **Federation of Canadian Municipalities GREEN MUNICIPAL FUND**

The Green Municipal Fund (GMF) is a unique national program that provides low-interest loans and grants, builds capacity, and shares knowledge to support municipal governments and their partners in developing communities that are more environmentally, socially and economically sustainable.

Since it was first commissioned, the existing well system has been plagued with declining performance, scale buildup and reduced flows. The Energy Solutions Centre hired Gartner Lee Limited to study the two warm water wells that would be used and propose ongoing maintenance options.

The consultants developed an energy audit and demand-side energy assessment report that highlighted the energy consumed by the village pumphouse, the RCMP Detachment, RCMP housing, the Village office, the pool and the pool change rooms. With these energy use profiles, the consultants determined the anticipated energy savings from the geothermal warm water well heating system.

The consultants developed a business case for implementing the geothermal warm water well heating system. Three design alternatives were proposed to determine the best and most efficient way to distribute heat to the village facilities. Spiegel Skillen & Associates, a Kelowna-based quantity surveyor, was hired to determine the capital cost of implementing the three alternatives.

The development of a pre-engineering schematic design concluded the feasibility study.

## Results

The following three applications were proposed to use the warm water from the artesian wells to implement a district heating system:

- Closed-loop warm water distribution to all facilities with distributed heat pumps;
- Closed-loop warm water distribution to all facilities with distributed heat pumps, except for the pool and change room facility; and
- Central heat pump with hot water distribution to all facilities.

The second option was selected. It features an in-situ acid injection system to resolve the problem of mineral buildup that hampered the previous system. The system will save the Village over \$24,000 per year in heating costs and has an estimated payback period of 19.5 years.

The existing domestic cold water preheating system will remain as it is, except for the way in which the warm water from the artesian wells is discharged back to the river. Currently, the warm water circulates throughout the heating distribution system. Under the proposed system, the distribution piping to the Village offices would be converted into a closed circulating loop. The underground piping would have to be modified to connect the new heat pump loop to this closed loop and to re-direct the well water discharging to the river.

## Lessons learned

While geothermal heat has great advantages, there are inevitable costs to carrying out projects of this kind in northern and isolated communities, explains Colin McDowell at the Energy Solutions Centre. "For a small community like Mayo, one is always trying to keep costs down, but the costs tend to escalate, because of having to bring in resources from outside the community."

## Next steps

The Village is planning to build a new recreation centre. As of fall 2006, the Village was investigating the option of providing geothermal heat to the new centre, either in addition to or instead of the buildings that were originally planned as part of the project. Once this work is completed, the Village will seek funding for constructing the system.

## Contacts

### Project contact

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## Additional resources

For other GMF projects of this type or category, or from this municipality, province or territory, please contact FCM's Capacity Building Program, Energy Campaign, at 613-241-5221 or at [energy@fcm.ca](mailto:energy@fcm.ca). For the complete project report, please visit the FCM Centre for Sustainable Community Development website at [www.sustainablecommunities.fcm.ca](http://www.sustainablecommunities.fcm.ca).

## Federation of Canadian Municipalities GREEN MUNICIPAL FUND

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