
# ASSOCIATION OF MANITOBA MUNICIPALITIES
# MANITOBA MUNICIPAL ENERGY, WATER AND WASTE
# WATER EFFICIENCY PROJECT
# TOWN OF SWAN RIVER
# FINAL REPORT
# JUNE 2006

KGS GROUP

KONTZAMANIS ▪ GRAUMANN ▪ SMITH ▪ MACMILLAN INC.
*CONSULTING ENGINEERS & PROJECT MANAGERS*

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*CONSULTING ENGINEERS & PROJECT MANAGERS*

June 30, 2006

File No. 05-1285-01-1000.11

Association of Manitoba Municipalities
1910 Saskatchewan Avenue West
Portage la Prairie, Manitoba
R1N 0P1

ATTENTION: Mr. Tyler MacAfee

RE: Municipal Energy, Water, and Wastewater
Efficiency Study for the Town of Swan River – Final Report

Dear Mr. MacAfee:

Enclosed is the Final Report of the Manitoba Municipal Energy, Water and Wastewater Efficiency Study for the Town of Swan River.

Included with this submission are 10 hard copies (3 in colour, 7 in black and white) of the report and 10 copies on compact disk in PDF format with searchable text functionality, as requested in the "Request for Proposal". The PDF file consists of the entire report, including the Executive Summary, Sections 1 to 16, and Appendix A to G.

We thank you for giving us the opportunity to work on this project and look forward to continuing this work with the other Municipalities.

Yours Truly,

R. B. Bodnar, P.Eng.
Senior Mechanical Engineer/ Department Head

RBB/MG/af


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# EXECUTIVE SUMMARY

The objective of this study was to determine energy, water, and wastewater efficiency opportunities that could enable the Town of Swan River to reduce operating costs, conserve resources, and reduce greenhouse gas emissions.

An energy and water efficiency audit was conducted on twelve buildings in the Town of Swan River. An audit was also done on the water distribution and wastewater collection systems. Throughout the course of these audits, water, wastewater, and energy efficiency opportunities were analyzed to determine the Town's potential for energy and water savings. The saving opportunities were separated into the following categories:

- Lighting – Replacing the interior and/or exterior lighting with more energy efficient lights and fixtures.
- Envelope – This involves measures that would reduce the heat loss through the building's windows, doors, walls, and roof.
- Motors- Replacing low efficiency motors with higher efficiency motors.
- HVAC- Improving current heating, ventilating and air conditioning systems.
- Process Equipment: Potential upgrades to ice plants and water / waste water treatment plants
- Water – Replacing high flow water fixtures with water efficient fixtures.

Table E1 shows the energy and water consumption for each of the buildings for the period from October 2004 to October 2005. This year was selected as it represents a typical year for energy and water consumption. In addition, the most recent year was selected since the conditions of the buildings throughout this time most closely resemble the buildings' current conditions. Six of the buildings included in this audit use electricity exclusively for energy while the other six buildings use both electricity and natural gas. The "Energy Density" column in this table is the total energy consumed in the building divided by the area of the building. This is useful in comparing the energy consumption among the different buildings in Swan River. The pie chart displays the percentage of total energy density for each of the buildings. It ranges from a high of 20.7% for the Water Treatment Plant and the Lift Station #1 to a low of 1.5% for the Library.

Tables E2 (a) and (b) show overall energy and water saving opportunities for all twelve buildings in the Town of Swan River. These tables also include approximate product and installation prices for each measure, both with and without incentives (refer to Appendix D for a list of Manitoba Hydro incentives) and simple payback years. The "Simple Payback Years" column is the overall payback period and may vary for individual buildings.

From the energy saving opportunities table (Table E2(a)) it can be seen that the total potential for energy savings in all twelve buildings is 655,824 kWh, or 28% of the current total energy consumption.

The water saving opportunities table (Table E2(b)) shows the percent water savings, water savings in litres/year and cost savings. The percentages shown in this table indicate percent water savings that would result from replacing the current water fixtures in all of the buildings with water efficient fixtures. The water savings in litres per year are based on estimates of the various buildings' occupancies. The cost of water is taken as $0.168 per cubic meter.

The results and recommendations from the water and wastewater audit are shown in Section 16 of this report. From the water system audit, it was determined that Swan River's Water Treatment Plant produced a total of 860,732 $m^3$ of water from January, 2004 to September, 2005, while only 715,369 $m^3$ of this water was consumed. The remaining 145,363 $m^3$ of water is considered water losses due to either leakage in the system, inaccurate water meters, or unauthorized water use. Reducing the water losses will reduce chemical costs required for water treatment, reduce electrical energy consumed by the pumps, and extend the life of the facility.

The sewer system in Swan River is for sanitary sewer flow only. There are four lift stations throughout the collection system that pump collected wastewater to the Town's main lift station. The main lift station then pumps the wastewater to the Town's lagoon. From analyzing the results of the daily flow of wastewater through the main lift station, it was determined that the total infiltration for this system is well below the normal permissible limit of infiltration and inflow that can normally be expected from typical groundwater infiltration sources. With such a low level of infiltration, infiltration and inflow reduction methods will not likely be cost-effective.

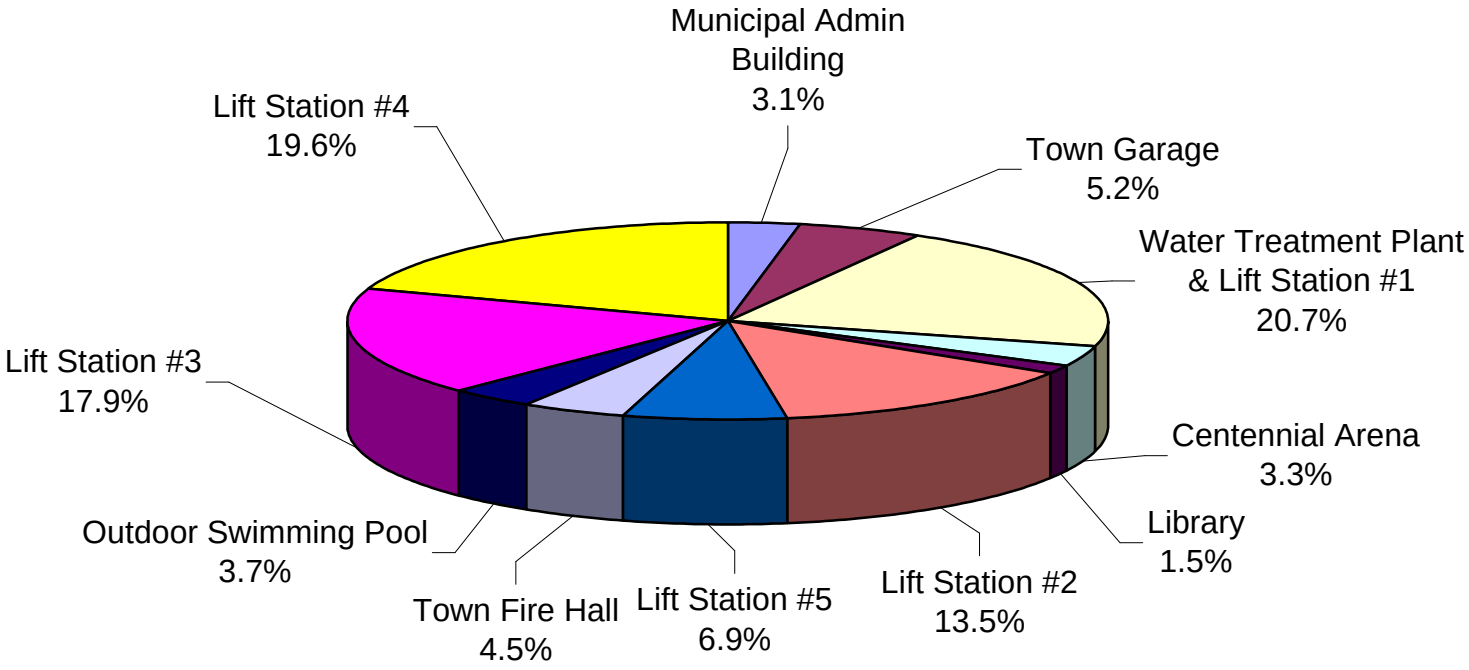
In addition to energy, water, and cost savings, other benefits would result from implementing the saving opportunities recommended throughout this report:

- Reduction in $CO_2$ emissions resulting in reduced contribution to climate change– the percent reduction is shown at the bottom of each of the energy saving opportunity tables.
- Lowered maintenance costs – (e.g. replacing the current lights with longer lasting bulbs).
- Improved physical comfort – (e.g. reducing infiltration into buildings).
- Delayed need to increase water and wastewater treatment plant capacities.

**Table E1 Energy Consumption for the Period from October 2004 – October 2005**

| Site | Energy Density (kWh/$m^2$) | % of Total Energy Density | Area ($m^2$) | Electricity | | Natural Gas | | TOTAL ENERGY | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | kWh | Cost | kWh | Cost | kWh | Cost |
| Municipal Admin Building | 281 | 3.1% | 372 | 104,400 | $6,950 | 0 | $0 | 104,400 | $6,950 |
| Town Garage | 469 | 5.2% | 637 | 104,640 | $7,090 | 193,981 | $8,009 | 298,621 | $15,099 |
| Water Treatment Plant & Lift Station #1 | 1,857 | 20.7% | 257 | 322,920 | $19,473 | 154,318 | $7,626 | 477,238 | $27,099 |
| Lift Station #2 | 1,210 | 13.5% | 9 | 11,240 | $1,054 | 0 | $0 | 11,240 | $1,054 |
| Lift Station #3 | 1,603 | 17.9% | 9 | 14,890 | $1,301 | 0 | $0 | 14,890 | $1,301 |
| Lift Station #4 | 1,758 | 19.6% | 9 | 16,336 | $1,398 | 0 | $0 | 16,336 | $1,398 |
| Lift Station #5 | 622 | 6.9% | 9 | 5,780 | $668 | 0 | $0 | 5,780 | $668 |
| Centennial Arena | 300 | 3.3% | 3,398 | 871,780 | $53,577 | 147,130 | $6,486 | 1,018,910 | $60,063 |
| Outdoor Swimming Pool | 330 | 3.7% | 498 | 14,840 | $1,329 | 149,267 | $7,402 | 164,107 | $8,731 |
| Town Fire Hall | 405 | 4.5% | 307 | 65,600 | $4,630 | 58,691 | $2,761 | 124,291 | $7,391 |
| Library | 134 | 1.5% | 610 | 44,240 | $3,201 | 37,396 | $1,872 | 81,636 | $5,073 |
| **Totals** | | | | 1,576,666 | $100,671 | 740,783 | $34,156 | 2,317,449 | $134,827 |

## Percentage of Total Energy Density for Buildings in Swan River



## Table E2 (a) Summary of Energy Saving Opportunities for all 12 Buildings in Swan River



| Description | Qty | Installed Cost/Unit ($) | | | Total Cost** ($) | | Estimated Annual Savings | | Simple Payback Years**** | | Related Buildings |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Material (NI*) | Material (WI*) | Labour | NI* | WI* | kWh | $*** | NI* | WI* | |
| **LIGHTING & PARKING LOT CONTROLLERS** | | | | | | | | | | | |
| Replace exterior incandescent lamps with high-pressure sodium lights. | 2 | $130 | $93 | $130 | $593 | $507 | 657 | $39 | 15.0 | 12.9 | Municipal Administration Building. |
| Replace incandescent exit sign with LED module. | 6 | $50 | $5 | $80 | $889 | $581 | 1,419 | $85 | 10.4 | 6.8 | Arena & Outdoor Swimming Pool. |
| When 4' x 2 T12 fluorescent ballasts burn out, replace them with T8 ballast and tubes. | 92 | $41 | $21 | $0 | $4,320 | $2,222 | 8,158 | $490 | 8.8 | 4.5 | Municipal Administration Building, Water Treatment Plant, Arena & Town Fire Hall. |
| When 6' x 2 T12 fluorescent ballasts burn out, replace them with T8 ballast and tubes. | 55 | $44 | $17 | $0 | $2,774 | $1,050 | 11,924 | $716 | 3.9 | 1.5 | Arena, Outdoor Swimming Pool & Town Fire Hall. |
| Replace incandescents with compact fluorescents. | 25 | $15 | $10 | $13 | $798 | $656 | 6,167 | $370 | 2.2 | 1.8 | Arena. |
| When interior incandescents burn out, replace them with compact fluorescents. | 21 | $13 | $8 | $0 | $311 | $192 | 1,350 | $81 | 3.8 | 2.4 | Municipal Administration Building, Lift Station #4 & Outdoor Swimming Pool. |
| When 200W incandescents require replacement, replace them with compact fluorescents. | 11 | $20 | $15 | $0 | $251 | $188 | 418 | $25 | 10.0 | 7.5 | Lift Station #2, Lift Station #3, Lift Station #4 & Lift Station #5. |
| Replace 200W incandescents with metal halides. | 12 | $300 | $225 | $300 | $8,208 | $7,182 | 7,171 | $431 | 19.1 | 16.7 | Arena. |
| Install sensors on lights. | 8 | $75 | $75 | $50 | $1,140 | $1,140 | 11,576 | $695 | 1.6 | 1.6 | Arena. |
| Install photocell on exterior lights. | 1 | $25 | $25 | $65 | $103 | $103 | 108 | $6 | 15.8 | 15.8 | Outdoor Swimming Pool. |
| Install occupancy sensors for lighting. | 2 | $75 | $75 | $50 | $285 | $285 | 297 | $18 | 16.0 | 16.0 | Library. |
| Install parking lot controllers. | 2 | $100 | $75 | $150 | $570 | $513 | 960 | $58 | 9.9 | 8.9 | Municipal Administration Building. |
| **Lighting & Parking Lot Controllers Subtotal** | | | | | **$20,242** | **$14,619** | **50,206** | **$3,014** | | | |

**Table E2 (a) Summary of Energy Saving Opportunities for all 12 Buildings in Swan River** 

| Description | Qty | Installed Cost/Unit ($) | | | Total Cost** ($) | | Estimated Annual Savings | | Simple Payback Years**** | | Related Buildings |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Material (NI*) | Material (WI*) | Labour | NI* | WI* | kWh | $*** | NI* | WI* | |
| **ENVELOPE** | | | | | | | | | | | |
| Weather-strip pedestrian doors. | 25 | $15 | $15 | $50 | $1,853 | $1,853 | 37,139 | $2,117 | 0.9 | 0.9 | Municipal Administration Building, Town Garage, Lift Station #2, Lift Station #3, Arena, Outdoor Swimming Pool & Town Fire Hall. |
| Caulk pedestrian doors. | 18 | $5 | $5 | $25 | $616 | $616 | 8,434 | $470 | 1.3 | 1.3 | Town Garage, Arena, Outdoor Swimming Pool & Town Fire Hall. |
| Weather-strip vehicle doors. | 8 | $100 | $100 | $200 | $2,736 | $2,736 | 22,884 | $1,046 | 2.6 | 2.6 | Town Garage & Town Fire Hall. |
| Caulk vehicle doors. | 7 | $5 | $5 | $25 | $239 | $239 | 10,505 | $480 | 0.5 | 0.5 | Town Garage & Town Fire Hall. |
| Caulk windows. | 9 | $5 | $5 | $13 | $185 | $185 | 2,690 | $132 | 1.4 | 1.4 | Town Garage, Outdoor Swimming Pool & Town Fire Hall. |
| Replace windows. | 24 | $742 | $592 | $179 | $25,176 | $21,089 | 19,742 | $1,167 | 21.6 | 18.1 | Municipal Administration Building, Lift Station #2, Lift Station #3, Arena, Outdoor Swimming Pool & Town Fire Hall. |
| Upgrade wall insulation | 1 | $9,280 | $7,530 | $9,280 | $21,158 | $19,163 | 10,588 | $484 | 43.7 | 39.6 | Town Fire Hall. |
| When repairing roof, upgrade roof insulation to R-40. | 2 | $8,725 | $7,515 | $2,490 | $12,785 | $11,406 | 25,029 | $1,402 | 9.1 | 8.1 | Municipal Administration Building & Town Fire Hall. |
| Upgrade ceiling and wall insulation of referee room. | 1 | $2,400 | $1,560 | $2,400 | $5,472 | $4,514 | 25,207 | $1,513 | 3.6 | 3.0 | Arena. |
| **Envelope Subtotal** | | | | | **$70,219** | **$61,801** | **162,218** | **$8,811** | | | |
| **HVAC** | | | | | | | | | | | |
| Install programmable thermostat; setback temp to 15°C (59°F). | 9 | $300 | $300 | $300 | $6,156 | $6,156 | 39,835 | $1,923 | 3.2 | 3.2 | Municipal Administration Building, Town Garage, Water Treatment Plant & Town Fire Hall. |
| Reduce temperature setting to 10°C (50°F). | 4 | $0 | $0 | $0 | $0 | $0 | 6,170 | $370 | 0.0 | 0.0 | Lift Station #2, Lift Station #3, Lift Station #4 & Lift Station #5. |
| Reduce temperature setting to 15°C (59°F). | 1 | $0 | $0 | $0 | $0 | $0 | 643 | $39 | 0.0 | 0.0 | Outdoor Swimming Pool. |
| Install timeclock on HRV. | 3 | $100 | $100 | $75 | $599 | $599 | 21,841 | $1,268 | 0.5 | 0.5 | Municipal Administration Building, Town Garage & Arena. |

**Table E2 (a) Summary of Energy Saving Opportunities for all 12 Buildings in Swan River** 

| Description | Qty | Installed Cost/Unit ($) | | | Total Cost** ($) | | Estimated Annual Savings | | Simple Payback Years**** | | Related Buildings |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Material (NI*) | Material (WI*) | Labour | NI* | WI* | kWh | $*** | NI* | WI* | |
| Install programmable thermostats (to control HRV as well); setback temp to 15°C (59°F) in winter and setforward temp to 24°C (75°F) in the summer. | 3 | $150 | $150 | $100 | $855 | $855 | 36,860 | $2,027 | 0.4 | 0.4 | Library. |
| Install countdown timer on greasehood exhaust fan. | 1 | $100 | $100 | $75 | $200 | $200 | 3,326 | $200 | 1.0 | 1.0 | Arena. |
| Replace bdds with motorized dampers (medium). | 6 | $300 | $300 | $300 | $4,104 | $4,104 | 14,506 | $699 | 5.9 | 5.9 | Town Garage, Outdoor Swimming Pool & Town Fire Hall. |
| Replace bdds with motorized dampers (large). | 3 | $400 | $400 | $400 | $2,736 | $2,736 | 13,859 | $633 | 4.3 | 4.3 | Town Garage. |
| Install a solar wall. | 1 | $35,275 | $21,380 | $20,300 | $63,356 | $47,515 | 84,871 | $3,879 | 16.3 | 12.3 | Water Treatment Plant. |
| When pool heaters require replacement, replace them with high efficiency pool heaters. | 2 | $2,914 | $2,914 | $0 | $6,644 | $6,644 | 22,390 | $1,023 | 6.5 | 6.5 | Outdoor Swimming Pool. |
| Install geothermal heating system. | 1 | $40,000 | $40,000 | $25,000 | $74,100 | $74,100 | 171,689 | 7,846 | 9.4 | 9.4 | Town Garage |
| **HVAC Subtotal** | | | | | **$158,748** | **$142,908** | **415,908** | **$19,901** | | | |
| **HOT WATER** | | | | | | | | | | | |
| Install instantaneous water heater.***** | 5 | $300 | $300 | $500 | $4,560 | $4,560 | 6,367 | $382 | 11.9 | 11.9 | Municipal Administration Building, Town Garage, Town Fire Hall & Library. |
| Insulate hot water piping. | 4 | $50 | $50 | $50 | $456 | $456 | 1,861 | $112 | 4.1 | 4.1 | Municipal Administration Building, Town Garage, Town Fire Hall & Library. |
| Insulate hot water piping. | 1 | $100 | $100 | $100 | $228 | $228 | 932 | $56 | 4.1 | 4.1 | Outdoor Swimming Pool. |
| Install water efficient metering faucets. | 14 | $309 | $309 | $150 | $7,326 | $7,326 | 3,363 | $205 | 35.7 | 35.7 | Town Garage, Arena & Library. |

## Table E2 (a) Summary of Energy Saving Opportunities for all 12 Buildings in Swan River



| Description | Qty | Installed Cost/Unit ($) | | | Total Cost** ($) | | Estimated Annual Savings | | Simple Payback Years**** | | Related Buildings |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Material (NI*) | Material (WI*) | Labour | NI* | WI* | kWh | $*** | NI* | WI* | |
| Install water efficient showerheads. | 27 | $21 | $21 | $50 | $2,185 | $2,185 | 7,550 | $487 | 4.5 | 4.5 | Arena & Outdoor Swimming Pool. |
| Replace tap with spring loaded tap. | 21 | $125 | $125 | $50 | $4,190 | $4,190 | 7,418 | $479 | 8.8 | 8.8 | Arena. |
| **Water Subtotal** | | | | | **$18,945** | **$18,945** | **27,492** | **$1,721** | | | |

| TOTALS | Energy (kWh) | Cost ($) | $CO_2$ (Tonnes) |
|---|---|---|---|
| **Existing Annual Consumption/Cost/Emissions** | 2,317,450 | $134,827 | 179.97 |
| **Estimated Annual Savings** | 655,824 | $33,448 | 70.06 |
| **Percent Savings** | 28% | 25% | 39% |

* NI = Cost does not include incentive, WI = Cost includes incentive.
** The total cost column includes 14% taxes.
*** The cost assigned to electricity is 0.06004 $/kWh (rate was taken from Manitoba Hydro's website) and the cost of natural gas is taken as 0.0457 $/kWh (as of November 1, 2005).
**** This is the overall payback period and may vary for individual buildings (refer to tables throughout report for payback years for a specific building).
***** Discounted to include the cost of replacement hot water tank in 10 years.

## Table E2 (b) Summary of Water Saving Opportunities for the Town of Swan River

| Description | Qty | Installed Cost/Unit ($) | | Total Cost* ($) | Annual Water Savings (%) | Annual Water Savings (L) | Annual Cost Savings ($) | Related Buildings |
|---|---|---|---|---|---|---|---|---|
| | | Material | Labour | | | | | |
| Install water efficient dual flush toilets. | 24 | $284 | $150 | $11,861 | 70% | 388,261 | $65 | Municipal Administration Building, Town Garage, Arena, Outdoor Swimming Pool, Town Fire Hall & Library. |
| Install water efficient metering faucets. | 23 | $309 | $150 | $12,035 | 80% | 108,250 | $18 | Municipal Administration Building, Town Garage, Arena, Outdoor Swimming Pool, Town Fire Hall & Library. |
| Install water efficient urinals. | 5 | $344 | $200 | $3,101 | 60% | 73,111 | $12 | Town Garage, Outdoor Swimming Pool, Town Fire Hall and Library. |
| Replace auto flush urinals with water efficient urinals. | 3 | $344 | $200 | $1,860 | 77% | 383,674 | $64 | Arena. |
| Install water efficient showerheads. | 27 | $21 | $21 | $50 | 29% | 201,486 | $34 | Arena and Outdoor Swimming Pool. |
| Install spring-loaded faucets. | 21 | $125 | $125 | $50 | 30% | 197,955 | $33 | Arena. |

* The total cost column includes 14% taxes.

## MMEP AUDITORS

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## MMEP PARTNERS

Association of Manitoba Municipalities
Manitoba Hydro
Manitoba Conservation
Agriculture and Agri-Food Canada - Prairie Farm Rehabilitation Administration
Manitoba Culture, Heritage, and Tourism

## FUNDING

Federation of Canadian Municipalities/Green Municipal Fund
Sustainable Development Innovations Fund

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Additional support for the MMEP Project is provided by Manitoba Conservation, Sustainable Development Innovations Fund.

## ACKNOWLEDGEMENTS

KGS Group and the MMEP partners gratefully acknowledge the valuable contributions the following people have made in providing their time, helpful suggestions, and participation in this energy and water efficiency project:

- Lawrence Hart, Chief Administrative Officer
- Eric Arp (Municipal Administration Building)
- Kelly Filipchuck (Town Garage)
- Mike Ramsay (Water Treatment Plant & Sewage Lift Stations)
- Dalton Hawkins (Centennial Arena & Outdoor Swimming Pool)
- Lew McClurg (Town Fire Hall)
- June McKenzie (Library)

## COPYRIGHT

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## LIST OF APPENDICES

# 1.0 INTRODUCTION

## 1.1 BACKGROUND

Energy and water conservation is becoming more important as environmental concerns grow and energy costs increase. For this reason it is important to perform energy, water, and wastewater efficiency audits to identify practical efficiency improvement opportunities and determine the capital costs and payback periods associated with these implementations.

An energy and water efficiency audit was conducted on twelve buildings in the Town of Swan River to determine how to reduce both energy and water consumption in each of these buildings. In addition, the water distribution and wastewater collection systems were audited to determine what opportunities exist for improving the systems' efficiencies.

## 1.2 OBJECTIVE

The objective of this study was to determine energy, water, and waste water efficiency opportunities that could enable the Town of Swan River to reduce operating costs, conserve resources, and reduce greenhouse gas emissions. All twelve buildings in the Town of Swan River were analyzed separately and the results are presented in separate sections throughout this report. The Water Treatment Plant and the Lift Station #1, however, were included in the same chapter since these buildings share electrical service. The water and wastewater systems are discussed in Section 16.

## 1.3 METHODOLOGY

The buildings were toured on April 11 and 12, 2005 by Mr. Ray Bodnar, P.Eng. and on October 28, 2005 by Mr. Tibor Takach, P.Eng., both of KGS Group Consulting Engineers and Project Managers. Tibor toured the Water Treatment Plant and the five Sewage Lift Stations to study the water and wastewater systems while Ray toured the other six buildings to perform the water and energy efficiency audits. The water and energy efficiency audits involved a walkthrough of each of the buildings to determine the current condition of the building's envelope (walls, roof,

windows, and doors), lighting, water fixtures, heating, ventilation and air conditioning (HVAC) systems, and motors.

During the building tours, the auditors met with Swan River's Chief Administrative Officer Lawrence Hart to discuss the study objectives for identifying energy, water, and wastewater saving opportunities, and to provide information on existing incentive programs. At this time, it was determined that although there are no immediate plans for new facilities or major renovations, there are plans for a new Municipal Office Building, a new Wellness Centre, and an expansion of the water treatment system in the near future. While auditing the buildings, whenever possible, on-site training was done to inform the staff on energy and/or water saving opportunities in specific buildings and to point out maintenance issues where applicable.

Using the information collected during the audit, available drawings of the buildings, historical weather data, and the hydro bills from the past 12 months, calculations were performed to determine how each of the buildings are consuming energy and water. Several assumptions were made throughout these calculations including occupancies, room temperatures, and envelope conditions (see Inventory Sheets in Appendix A). When no drawings were available, wall/roof R-values were assumed based on discussions with site personnel or based on knowledge of other buildings of similar type/age to the building surveyed.

Energy Saving Opportunities (ESOs) were developed for each building and are presented in tables throughout this report showing energy savings, cost savings, installation costs, and simple payback periods. Simple payback periods are calculated as the total installation cost divided by the annual cost savings. The installation costs include the material costs, both with and without incentives (see Appendix D for list of Manitoba Hydro incentives), and the labour costs for the installation using standard contractor rates. The total energy savings, the percent energy savings, and the associated costs are presented at the end of each ESO table. It should be noted that the energy savings and capital cost estimates are preliminary. For complex measures such as geothermal heating/cooling and major building envelope upgrades, a more detailed investigation would be required to confirm capital and installation costs for this system.

An environmental benefit that results from reducing energy consumption is a reduction in $CO_2$ emissions. $CO_2$ is a greenhouse gas and thus contributes to global warming. By reducing

natural gas and electrical energy consumption, $CO_2$ emissions are reduced. At the bottom of each ESO table, the total $CO_2$ reduction resulting from the energy savings is shown. This was calculated using a $CO_2$ emissions calculator produced by Natural Resources Canada.

Many of the ESOs have low installed costs and payback periods of less than two years. Once the implementation phase begins, these ESOs are the most attractive measures. However, in order to maximize long-term savings and efficiencies for the buildings, implementation of the more capital-intensive measures with the longer payback periods is necessary. These items will become more attractive as energy costs increase in the future. It is recommended that the savings associated with the short payback ESOs be reinvested annually as a means to help finance the more expensive options.

Water Saving Opportunities (WSOs) are also presented in this report. The WSOs include installing water efficient sink faucets, toilets, urinals, and showers. The water savings are shown as percentages of the current fixtures water consumption and in litres per year (based on estimates of the building's occupancy). Cost savings were also calculated and are shown for individual buildings throughout the report.

The water and wastewater systems in the Town of Swan River were analyzed and results and recommendations are discussed in Section 16 of this report. In addition to an overview of the water and wastewater systems, several recommendations are made to help the Town monitor water consumption and losses and reduce operating costs.

# 2.0 MUNICIPAL ADMINISTRATION BUILDING

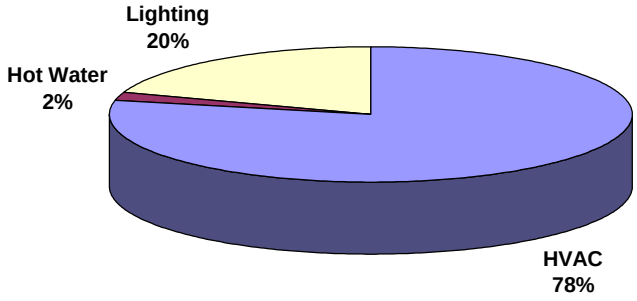
## 2.1 BACKGROUND

The Municipal Administration Building, constructed in the 1940s, is a 4,000 square foot structure with masonry exterior walls and drywall interior. This building has a flat tar and gravel roof with R-12 insulation. A council chamber and an office are located on the main floor of this building while the basement contains another office and is also used for file storage. The Municipal Administration Building is occupied Monday to Friday, 8:30am – 4:30pm.


**Photo 1 – Municipal Administration Building**

This building uses electricity exclusively for heating, lighting, cooling, and hot water. A heat recovery ventilator (HRV) is used to pre-heat the intake air to the main office with exhaust air from the office. This saves approximately 50% of the energy required to heat this ventilation air in the winter. From October 2004 – October 2005, the total electrical energy consumption was 104,400 kWh. The majority of this energy was used for heating as can be seen in the following pie chart.

**Energy Breakdown (% of Total kWh)
for the Municipal Administration Building**




The washrooms in the Municipal Administration Building contain a total of 3 toilets and 3 sinks. A 175-litre electric hot water heater heats the water for this facility. The energy used for hot water heating was calculated based on estimates of the current hot water consumption and includes the energy required to makeup for heat losses from the storage tank.

## 2.2 ENERGY AND WATER SAVING OPPORTUNITIES

Tables 1 and 2 show a summary of both the energy and water saving opportunities for the Municipal Administration Building. The following assumptions were made in determining the annual savings:

- The Municipal Administration Building is occupied from Monday – Friday, 8:30am – 4:30pm.
- The temperature of the building is maintained at 21°C (70°F).
- For the purpose of water consumption, the typical occupancy is taken as 6.
- The outdoor lights are on 12 hours per day year round.
- The heat recovery ventilator is assumed to run continuously (24 hours every day).

## Table 1 Energy Saving Opportunities for the Municipal Administration Building

| Description | Qty | Installed Cost/Unit ($) | | | Total Cost** ($) | | Estimated Annual Savings | | Simple Payback Years | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Material (NI*) | Material (WI*) | Labour | NI* | WI* | kWh | $*** | NI* | WI* |
| **LIGHTING & PARKING LOT CONTROLLERS** | | | | | | | | | | |
| Replace exterior incandescent lamps with high-pressure sodium lights. | 2 | $130 | $93 | $130 | $593 | $507 | 657 | $39 | 15.0 | 12.9 |
| When 4' x 2 T12 fluorescent ballasts burn out, replace them with T8 ballast and tubes. | 70 | $41 | $21 | $0 | $3,287 | $1,691 | 5,678 | $341 | 9.6 | 5.0 |
| When interior incandescents burn out, replace them with compact fluorescents. | 5 | $13 | $8 | $0 | $74 | $46 | 749 | $45 | 1.6 | 1.0 |
| Install parking lot controllers. | 2 | $100 | $75 | $150 | $570 | $513 | 960 | $58 | 9.9 | 8.9 |
| **Lighting & Parking Lot Controllers Subtotal** | | | | | **$4,524** | **$2,757** | **8,044** | **$483** | | |
| **ENVELOPE** | | | | | | | | | | |
| Weather-strip pedestrian doors. | 5 | $15 | $15 | $50 | $371 | $371 | 7,102 | $426 | 0.9 | 0.9 |
| Replace basement windows. | 3 | $350 | $285 | $160 | $1,744 | $1,522 | 519 | $31 | 55.9 | 48.8 |
| When repairing roof, upgrade roof insulation to R-40. | 1 | $4,500 | $3,980 | $1,500 | $6,840 | $6,247 | 17,969 | $1,079 | 6.3 | 5.8 |
| **Envelope Subtotal** | | | | | **$8,955** | **$8,140** | **25,591** | **$1,536** | | |
| **HVAC** | | | | | | | | | | |
| Install programmable thermostat; setback temp to 15°C (59°F). | 1 | $300 | $300 | $300 | $684 | $684 | 7,116 | $427 | 1.6 | 1.6 |
| Install timeclock on HRV. | 1 | $100 | $100 | $75 | $200 | $200 | 9,479 | $569 | 0.4 | 0.4 |
| **HVAC Subtotal** | | | | | **$884** | **$884** | **16,596** | **$996** | | |
| **HOT WATER** | | | | | | | | | | |
| Install instantaneous water heater.**** | 1 | $300 | $300 | $500 | $912 | $912 | 1,395 | $84 | 10.9 | 10.9 |
| Insulate hot water piping. | 1 | $50 | $50 | $50 | $114 | $114 | 465 | $28 | 4.1 | 4.1 |
| **Water Subtotal** | | | | | **$1,026** | **$1,026** | **1,860** | **$112** | | |

| TOTALS | Energy (kWh) | Cost ($) | $CO_2$ (Tonnes) |
|---|---|---|---|
| **Existing Annual Consumption/Cost/Emissions** | 104,400 | $6,950 | 3.11 |
| **Estimated Annual Savings** | 52,008 | $3,123 | 1.55 |
| **Percent Savings** | 50% | 45% | 50% |

* NI = Cost does not include incentive, WI = Cost includes incentive.
** The total cost column includes 14% taxes.
*** The cost assigned to electricity is 0.06004 $/kWh (rate was taken from Manitoba Hydro's website).
**** Discounted to include the cost of replacement water tank in 10 years.

**Table 2 Water Saving Opportunities for the Municipal Administration Building**

| Description | Qty | Installed Cost/Unit ($) | | Total Cost* ($) | Annual Water Savings (%) | Annual Water Savings (L) | Annual Cost Savings ($) |
|---|---|---|---|---|---|---|---|
| | | Material | Labour | | | | |
| Install water efficient metering faucets. | 3 | $309 | $150 | $1,570 | 80% | 6,989 | $1 |
| Install water efficient dual flush toilets. | 3 | $284 | $150 | $1,484 | 70% | 50,614 | $9 |

* The total cost column includes 14% taxes.

## 2.3 GENERAL RECOMMENDATIONS

### Lighting & Parking Lot Controllers

The lighting analysis summary for the Municipal Administration Building is shown in Appendix B, Table B.1.3. The best opportunity for energy savings in terms of lighting is to replace the T12 fluorescents with T8s. It is recommended that this upgrade be done when the T12 ballasts burn out and require replacement. T8s are slim, high efficient lamps that generate more light per watt than conventional lighting. These lamps are an excellent replacement for T12s, which are expected to become obsolete by year 2010. Another opportunity for energy savings is to replace the indoor incandescent bulbs with energy efficient compact fluorescents. Consideration should also be given to replacing the exterior incandescents with high-pressure sodium lights to save energy.

Installing parking lot controllers on the car plugs in the parking lot would save 50% of the current energy consumed by car's block heaters throughout the winter. Parking lot controllers save energy by adjusting the power to the car plug depending on the outdoor temperature. The energy savings calculated above for this upgrade is based on the assumption that these plugs are used 50 days/year.

### Envelope

The two front doors, the two back doors, and the side door to this building require new weather-stripping. This upgrade would cost very little to implement and would drastically reduce the cold air infiltration into the building throughout the winter.

The basement windows are old, 2-pane windows. The energy savings that would result from replacing these windows are shown in Table 1. The payback for this recommendation is high due to the high capital cost.

The insulation in the roof is approximately R-12. When the roof requires replacement, this insulation should be upgraded to R-40. Table B.1.4 in Appendix B shows details of these calculations.

**HVAC**

Installing a programmable thermostat for the rooftop unit and programming it such that the temperature is reduced to 15°C (59°F) when the building is unoccupied would save in energy required for heating.

Another energy saving opportunity is to install a timeclock on the heat recovery ventilator (HRV). This would allow the HRV to be programmed to run during occupied times only and shut off during evenings and weekends. With the HRV running 75% less, large energy savings result from a reduction in energy required to heat the ventilation air.

**Water**

Replacing the water heater with an instantaneous water heater would eliminate the energy required to make-up for heat losses from the storage tank. Another benefit of an instantaneous water heater is that they last much longer and will thus save in the cost of a replacement water heater every 10 years. Another recommendation is to insulate the hot water piping to reduce heat losses.

Table 2 above shows the water savings and cost savings that would result from replacing the current fixtures with water efficient fixtures. More detailed calculations can be found in Table B.1.5 in Appendix B.

# 3.0 TOWN GARAGE

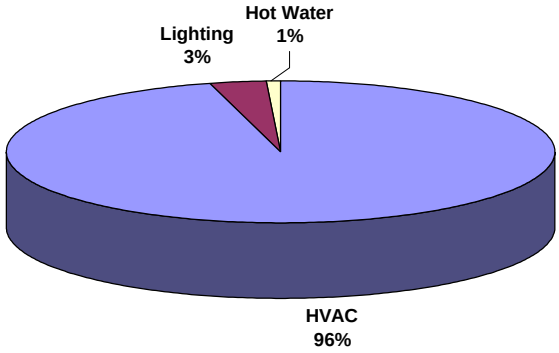
## 3.1 BACKGROUND

The Town Garage is a 6,860 square foot pre-engineered building constructed in 1974. The walls and roof of this building are metal clad with R-16 and R-30 insulation, respectively. In addition to the garage used for vehicle storage and maintenance, this building has a stock room, a washroom, and an office on the mezzanine. The Town Garage is occupied Monday to Friday, 7:30am – 4:30pm.


**Photo 2 – Town Garage**

The garage is heated using radiant gas heaters in the shop and electric baseboards and force-flows in the office. There is a heat recovery ventilator to pre-heat the intake air to the office with the building's exhaust air. The annual natural gas and electrical energy consumption for the Town Garage in the previous year was 193,981 kWh and 104,640 kWh, respectively. The pie chart below shows the portions of the total energy consumption used for lighting, water heating, and building heat. Since the lighting is all energy efficient T8s, the energy consumption for lighting is quite low.

**Energy Breakdown (% of Total kWh)
for the Town Garage**




The washroom in the Town Garage contains a total of 1 toilet, 1 sink, and 1 urinal. An electric hot water heater heats the water for this facility. The energy used for hot water heating was calculated based on estimates of the current hot water consumption and includes the energy required to makeup for heat losses from the storage tank.

## 3.2 ENERGY AND WATER SAVING OPPORTUNITIES

Tables 3 and 4 show a summary of energy and water saving opportunities for the Town Garage. The following assumptions were made in the analysis:

- The garage is occupied from Monday to Friday, 7:30am – 4:30pm.
- The temperature of the garage is maintained at 21°C (70°F).
- For the purpose of water consumption, the typical occupancy of the garage is 5.
- The HRV is assumed to be running from 7:30am – 4:30pm, 7 days per week.

## Table 3 Energy Saving Opportunities for the Town Garage

| Description | Qty | Installed Cost/Unit ($) | | | Total Cost** ($) | | Estimated Annual Savings | | Simple Payback Years | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Material (NI*) | Material (WI*) | Labour | NI* | WI* | kWh | $*** | NI | WI |
| **ENVELOPE** | | | | | | | | | | |
| Weather-strip pedestrian doors. | 2 | $15 | $15 | $50 | $74 | $74 | 3,156 | $144 | 0.5 | 0.5 |
| Weather-strip vehicle doors. | 3 | $100 | $100 | $200 | $1,026 | $1,026 | 12,942 | $591 | 1.7 | 1.7 |
| Caulk pedestrian doors. | 2 | $5 | $5 | $25 | $68 | $68 | 1,010 | $46 | 1.5 | 1.5 |
| Caulk vehicle doors. | 2 | $5 | $5 | $25 | $68 | $68 | 4,141 | $189 | 0.4 | 0.4 |
| Caulk windows. | 3 | $5 | $5 | $13 | $62 | $62 | 707 | $32 | 1.9 | 1.9 |
| **Envelope Subtotal** | | | | | **$1,298** | **$1,298** | **21,956** | **$1,003** | | |
| **HVAC** | | | | | | | | | | |
| Replace 24-hour timeclock for HRV with 7-day timeclock. | 1 | $100 | $100 | $75 | $200 | $200 | 3,049 | $139 | 1.4 | 1.4 |
| Replace intake bdds with motorized dampers. | 3 | $300 | $300 | $300 | $2,052 | $2,052 | 8,315 | $380 | 5.4 | 5.4 |
| Replace exhaust fan bdds with motorized dampers. | 3 | $400 | $400 | $400 | $2,736 | $2,736 | 13,859 | $633 | 4.3 | 4.3 |
| Install programmable thermostats; setback temp to 15°C (59°F). | 4 | $300 | $300 | $300 | $2,736 | $2,736 | 8,524 | $390 | 7.0 | 7.0 |
| Install geothermal heating system. | 1 | $40,000 | $40,000 | $25,000 | $74,100 | $74,100 | 171,689 | $7,846 | 9.4 | 9.4 |
| **HVAC Subtotal** | | | | | **$81,824** | **$81,824** | **205,437** | **$9,388** | | |
| **HOT WATER** | | | | | | | | | | |
| Replace hot water tank with an instantaneous water heater.**** | 1 | $300 | $300 | $500 | $912 | $912 | 1,455 | $87 | 10.4 | 10.4 |
| Insulate hot water piping. | 1 | $50 | $50 | $50 | $114 | $114 | 465 | $28 | 4.1 | 4.1 |
| Install water efficient metering faucet. | 1 | $309 | $309 | $150 | $523 | $523 | 267 | $17 | 30.4 | 30.4 |
| **Water Subtotal** | | | | | **$1,549** | **$1,549** | **2,187** | **$133** | | |

| TOTALS | Energy (kWh) | Cost ($) | $CO_2$ (Tonnes) |
|---|---|---|---|
| Existing Annual Consumption/Cost/Emissions | 298,621 | $15,099 | 37.94 |
| Estimated Annual Savings | 229,580 | $10,524 | 27.6 |
| Percent Savings | 77% | 70% | 73% |

* NI = Cost does not include incentive, WI = Cost includes incentive.
** The total cost column includes 14% taxes.
*** The cost assigned to electricity is 0.06004 $/kWh (rate was taken from Manitoba Hydro's website) and the cost of natural gas is taken as 0.0457 $/kWh (as of November 1, 2005).
**** Discounted to include cost of replacement water tank in 10 years.

**Table 4 Water Saving Opportunities for the Town Garage**

| Description | Qty | Installed Cost/Unit ($) | | Total Cost* ($) | Annual Water Savings (%) | Annual Water Savings (L) | Annual Cost Savings ($) |
|---|---|---|---|---|---|---|---|
| | | Material | Labour | | | | |
| Install water efficient dual flush toilets. | 1 | $284 | $150 | $494 | 70% | 18,991 | $3 |
| Install water efficient metering faucets. | 1 | $309 | $150 | $523 | 80% | 7,114 | $1 |
| Install water efficient urinals. | 1 | $344 | $200 | $620 | 60% | 20,007 | $3 |

* The total cost column includes 14% taxes.

## 3.3 GENERAL RECOMMENDATIONS

### Envelope

The two pedestrian doors and the three vehicle doors have very poor weather-stripping and no caulking. It is recommended that all these doors be both weather-stripped and caulked to reduce the cold air infiltrating through the cracks around these doors.

The three windows in this building are triple-pane but there is no caulking around the frames. Caulking the frames would reduce the infiltration with a very short payback period. Details on calculations for energy savings with upgrading the building's envelope can be found in Appendix B, Table B.2.4.

### HVAC

The heat recovery ventilator (HRV) in the office currently has a 24-hour timeclock. This allows them to program the HRV to run from 7:30am – 4:30pm daily. A better alternative for this HRV is to replace the 24-hour timeclock with a 7-day timeclock that will give them the option of turning the HRV off during weekends. The energy savings and payback period for this upgrade is shown in Table 3.

The backdraft dampers on the intakes and exhausts are leaky and continuously allow cold air to enter the building throughout the winter. Consideration should be given to replacing these backdraft dampers with motorized dampers that provide a better seal when they are closed.

Another opportunity is to install programmable thermostats that are programmed such that the temperature is automatically setback to 15°C (59°F) during unoccupied times.

A geothermal heating system was investigated for this facility. The existing heating system would be replaced with water-to-air heat pumps connected to a closed loop ground source system. The ground loop is needed as a heat exchanger to pull and return heat from the ground. If desired, this system could also be used for cooling. A geothermal heat pump is one of the most energy efficient and environmentally friendly electric heating and cooling systems available.

**Water**

Installing an instantaneous water heater would eliminate the energy required to offset the heat losses from the hot water tank. Savings would also result from insulating the hot water piping and replacing the sink faucets with water efficient metering faucets.

The water analysis summary is shown in Table B.2.5 in Appendix B. Replacing the high flow fixtures with water efficient fixtures would save between 60 and 80% of their current water consumption.

# 4.0 WATER TREATMENT PLANT & LIFT STATION #1

## 4.1 BACKGROUND

The Water Treatment Plant consists of an older section, a new section, and a raw water pumphouse. The total area of the plant is just under 2,400 square feet. The plant houses all the process equipment necessary to pump the raw water through the treatment system and distribute it to the town.

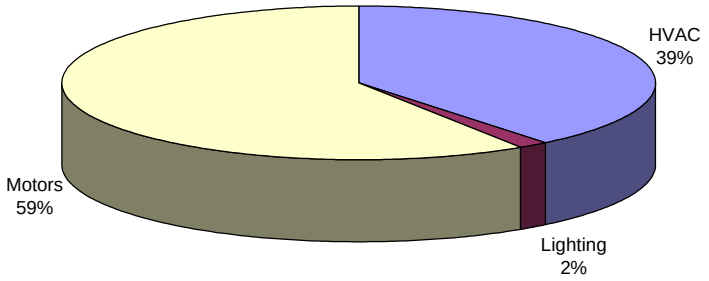

**Photo 3 – Water Treatment Plant**

Lift Station #1 is the town's main lift station. The four other lift stations pump wastewater to this station from where it is pumped to the town's lagoon. This station was constructed in approximately 1974 of concrete block walls with a split face brick exterior. This station is occupied for approximately 30 minutes every day.


**Photo 4 – Lift Station #1**

The Water Treatment Plant uses electricity for lighting and to run the motors and natural gas for heating. The Lift Station #1 uses electricity exclusively for lighting, heating, and to run the motors. This lift station shares its electrical service with the Water Treatment Plant. In the previous year, the total electrical energy consumed by the two facilities was 322,920 kWh and the total natural gas consumed to run the boiler in the Water Treatment Plant was 154,318 kWh. The breakdown of the total energy consumption for the two facilities is shown in the following pie chart. Since the lighting in these facilities has been upgraded to energy efficient lighting, the percentage of energy used for lighting is low.

**Energy Breakdown (% of Total kWh)
for the Water Treatment Plant & Lift Station #1**




There is no hot water at either of these facilities.

## 4.2 ENERGY AND WATER SAVING OPPORTUNITIES

Table 5 shows the energy saving opportunities for the Water Treatment Plant and the Lift Station #1. The following assumptions were made in the calculations:

- The Water Treatment Plant is occupied Monday to Friday, from 8am to 4pm.
- The Lift Station #1 is occupied for ½ an hour every day.
- The temperature of the Water Treatment Plant is maintained at 21°C (70°F).
- The temperature of the Lift Station #1 is 16°C (60.8°F).
- The exterior lights are on 12 hours per day year round.

**Table 5 Energy Saving Opportunities for the Water Treatment Plant & Lift Station #1**

| Description | Qty | Installed Cost/Unit ($) | | | Total Cost** ($) | | Estimated Annual Savings | | Simple Payback Years | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Material (NI*) | Material (WI*) | Labour | NI* | WI* | kWh | $*** | NI | WI |
| **LIGHTING** | | | | | | | | | | |
| When T12 ballasts burn out, replace them with T8 ballasts and tubes. | 4 | $41 | $21 | $0 | $188 | $97 | 324 | $19 | 9.6 | 5.0 |
| **Lighting Subtotal** | | | | | **$188** | **$97** | **324** | **$19** | | |
| **HVAC** | | | | | | | | | | |
| Install a solar wall on south side of building. | 1 | $35,275 | $21,380 | $20,300 | $63,356 | $47,515 | 84,871 | $3,879 | 16.3 | 12.3 |
| Install programmable thermostat; setback temp to 15°C (59°F). | 1 | $300 | $300 | $300 | $684 | $684 | 17,718 | $810 | 0.8 | 0.8 |
| **HVAC Subtotal** | | | | | **$64,040** | **$48,199** | **102,589** | **$4,688** | | |

| TOTALS | Energy (kWh) | Cost ($) | $CO_2$ (Tonnes) |
|---|---|---|---|
| Existing Annual Consumption/Cost/Emissions | 477,238 | $27,099 | 37.32 |
| Estimated Annual Savings | 102,914 | $4,708 | 18.43 |
| Percent Savings | 22% | 17% | 49% |

* NI = Cost does not include incentive, WI = Cost includes incentive.
** The total cost column includes 14% taxes.
*** The cost assigned to electricity is 0.06004 $/kWh (rate was taken from Manitoba Hydro's website) and the cost of natural gas is taken as 0.0457 $/kWh (as of November 1, 2005).

## 4.3 GENERAL RECOMMENDATIONS

### Lighting

The lighting analysis results for the Water Treatment Plant and the Lift Station #1 can be found in Appendix B, Table B.3.3. The majority of the lighting in these buildings is energy efficient lighting. The only opportunity for energy savings is to replace the T12 fluorescent lamps with T8 ballasts and tubes.

### Envelope

The envelope of this building is in excellent condition; therefore, there are no recommendations for upgrades.

**HVAC**

One option that was investigated for the Water Treatment Plant was to install a solar wall on the south face of this building to pre-heat the intake air. The solar wall covers the entire south surface of the building and uses free heating from the sun to heat the make up air. In addition, the solar wall also reduces building heat loss during the winter. On the south wall, heat lost to the cavity between the building and the exterior metal panels of the solar wall is captured by the incoming air and returned to the building. The energy savings that would result from installing the solar wall are shown in Table 5.

Another opportunity for this building is to install a programmable thermostat and setback the temperature to 15°C (59°F) during unoccupied times. This would reduce the heating requirements for this building by over 10%.

# 5.0 LIFT STATION #2

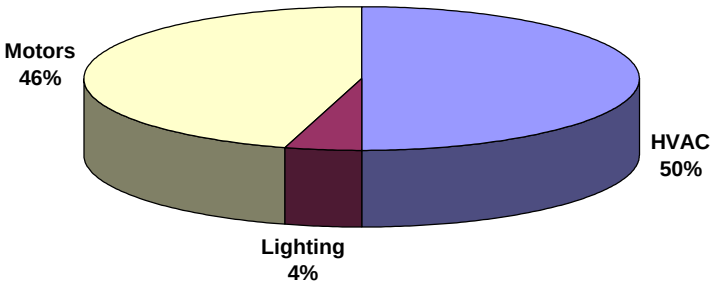
## 5.1 BACKGROUND

The Lift Station #2 is a 100 square foot building with brick exterior and interior walls. This station consists of an open process area with a wetwell located beneath the building. There are two 5-hp pumps at this station that pump the town's wastewater to Lift Station #1. This station is occupied for approximately 30 minutes every day.


**Photo 5 – Lift Station #2**

Lift Station #2 uses electricity exclusively for lighting, heating, ventilation, and to run the pumps. From October 2004 to October 2005, the total electricity consumed by this station was 11,240 kWh. The pie chart below shows the breakdown of energy consumption for this building.

**Energy Breakdown (% of Total kWh)
for the Lift Station #2**




The only water fixture in this facility is a ¾" cold water hose bibb located in the drywell.

## 5.2 ENERGY AND WATER SAVING OPPORTUNITIES

Table 6 shows the energy saving opportunities for the Lift Station #2. The following assumptions were made in the calculations:

- Lift Station #2 is occupied for ½ an hour every day.
- The temperature of this facility is maintained at 16°C (60.8°F).

**Table 6 Energy Saving Opportunities for the Lift Station #2**

| Description | Qty | Installed Cost/Unit ($) | | | Total Cost** ($) | | Estimated Annual Savings | | Simple Payback Years | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Material (NI*) | Material (WI*) | Labour | NI* | WI* | kWh | $*** | NI* | WI* |
| **LIGHTING** | | | | | | | | | | |
| When incandescents in wetwell require replacement, replace them with compact fluorescents. | 3 | $20 | $15 | $0 | $68 | $51 | 122 | $7 | 9.4 | 7.0 |
| **Lighting Subtotal** | | | | | **$68** | **$51** | **122** | **$7** | | |
| **ENVELOPE** | | | | | | | | | | |
| Weather-strip pedestrian door. | 1 | $15 | $15 | $50 | $74 | $74 | 1,840 | $110 | 0.7 | 0.7 |
| Replace broken window. | 1 | $300 | $250 | $200 | $570 | $513 | 295 | $18 | 32.2 | 29.0 |
| **Envelope Subtotal** | | | | | **$644** | **$587** | **2,135** | **$128** | | |
| **HVAC** | | | | | | | | | | |
| Reduce temperature setting to 10°C (50°F). | 1 | $0 | $0 | $0 | $0 | $0 | 1,644 | $99 | 0.0 | 0.0 |
| **HVAC Subtotal** | | | | | **$0** | **$0** | **1,644** | **$99** | | |

| TOTALS | Energy (kWh) | Cost ($) | $CO_2$ (Tonnes) |
|---|---|---|---|
| **Existing Annual Consumption/Cost/Emissions** | 11,240 | $1,054 | 0.34 |
| **Estimated Annual Savings** | 3,900 | $234 | 0.12 |
| **Percent Savings** | 35% | 22% | 36% |

* NI = Cost does not include incentive, WI = Cost includes incentive.
** The total cost column includes 14% taxes.
*** The cost assigned to electricity is 0.06004 $/kWh (rate was taken from Manitoba Hydro's website).

## 5.3 GENERAL RECOMMENDATIONS

### Lighting

The only recommendation for this facility in terms of lighting is to replace the incandescents in the wetwell area with compact fluorescents when they burn out.

### Envelope

The pedestrian door to this building has no door sweep to prevent cold air from seeping under the door. It is recommended to install either weather-stripping or a door sweep under the door to reduce the infiltration in the winter. Another opportunity is to replace the dual pane window with a triple pane window. This window currently has very little resistance to heat transfer as it is damaged.

### HVAC

Another recommendation that would save energy at no extra cost is to reduce the temperature setting from 16°C (60.8°F) to 10°C (50°F).

# 6.0 LIFT STATION #3

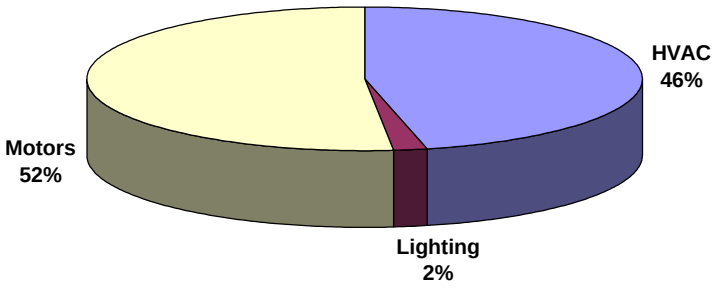
## 6.1 BACKGROUND

Similar to Lift Station #2, Lift Station #3 is a 100 square foot building with brick exterior and interior walls. This station holds two 5-hp pumps that pump the town's wastewater to Lift Station #1.


**Photo 6 – Typical Lift Station**

This building uses electricity exclusively for heating, ventilation, lighting, and to power the motors. A total annual energy consumption of 14,890 kWh was consumed in the previous year. The following pie chart shows the energy breakdown for the Lift Station #3.

**Energy Breakdown (% of Total kWh)
for the Lift Station #3**




The only water fixture in this facility is a ¾" cold water hose bibb located in the wetwell.

## 6.2 ENERGY SAVING OPPORTUNITIES

Table 7 below shows a summary of the energy saving opportunities for Lift Station #3. The following assumptions were made in the calculations:

- The building is occupied for a ½ hour every day.
- The temperature is maintained at 16°C (60.8°F).

**Table 7 Energy Saving Opportunities for the Lift Station #3**

| Description | Qty | Installed Cost/Unit ($) | | | Total Cost** ($) | | Estimated Annual Savings | | Simple Payback Years | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Material (NI*) | Material (WI*) | Labour | NI* | WI* | kWh | $*** | NI* | WI* |
| **LIGHTING** | | | | | | | | | | |
| When incandescents in wetwell require replacement, replace them with compact fluorescents. | 3 | $20 | $15 | $0 | $68 | $51 | 122 | $7 | 9.4 | 7.0 |
| **Lighting Subtotal** | | | | | **$68** | **$51** | **122** | **$7** | | |
| **ENVELOPE** | | | | | | | | | | |
| Weather-strip pedestrian door. | 1 | $15 | $15 | $50 | $74 | $74 | 1,840 | $110 | 0.7 | 0.7 |
| Replace window. | 1 | $450 | $350 | $200 | $741 | $627 | 239 | $14 | 51.7 | 43.8 |
| **Envelope Subtotal** | | | | | **$815** | **$701** | **2,079** | **$125** | | |
| **HVAC** | | | | | | | | | | |
| Setback temperature to 10°C (50°F). | 1 | $0 | $0 | $0 | $0 | $0 | 2,017 | $121 | 0.0 | 0.0 |
| **HVAC Subtotal** | | | | | **$0** | **$0** | **2,017** | **$121** | | |

| TOTALS | Energy (kWh) | Cost ($) | $CO_2$ (Tonnes) |
|---|---|---|---|
| **Existing Annual Consumption/Cost/Emissions** | 14,890 | $1,301 | 0.44 |
| **Estimated Annual Savings** | 4,217 | $253 | 0.13 |
| **Percent Savings** | 28% | 19% | 29% |

* NI = Cost does not include incentive, WI = Cost includes incentive.
** The total cost column includes 14% taxes.
*** The cost assigned to electricity is 0.06004 $/kWh (rate was taken from Manitoba Hydro's website).

### Lighting

The only recommendation for this facility in terms of lighting is to replace the incandescents in the wetwell area with compact fluorescents when they burn out. Since the lighting is used so infrequently, the savings are low for this upgrade.

### Envelope

The pedestrian door to this building has no door sweep to prevent cold air from seeping under the door. It is recommended to install either weather-stripping or a door sweep under the door to reduce the infiltration in the winter. This would reduce the energy required to heat the infiltration air with a short payback period. Another opportunity with a much longer payback period is to replace the dual pane window with a triple pane window.

### HVAC

Another recommendation that would save energy at no extra cost is to reduce the temperature setting from 16°C (60.8°F) to 10°C (50°F) in the winter.

# 7.0 LIFT STATION #4

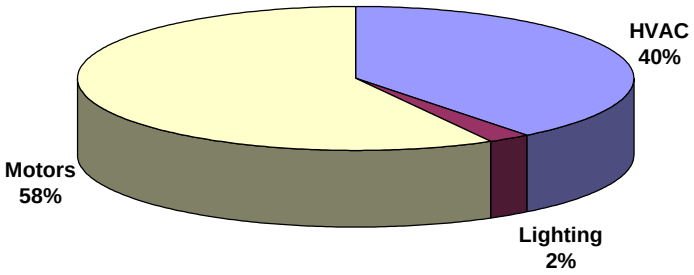
## 7.1 BACKGROUND

The Lift Station #4, located on Elm Street, is a 100 square foot building consisting of an open process area with a wetwell located underneath the building. This station has two 15-hp pumps used to pump wastewater to the Lift Station #1.


**Photo 7 – Lift Station #4**

This station uses electricity for lighting, heating, ventilation, and to run the pump motors. The total electricity consumed by this station from October 2004 – October 2005 was 16,336 kWh. This total energy is split between lighting, HVAC, and motors as shown in the pie chart below.

**Energy Breakdown (% of Total kWh)
for the Lift Station #4**




The only water fixture in this station is a cold water hose bibb located in the drywell.

## 7.2 ENERGY AND WATER SAVING OPPORTUNITIES

Table 8 shows the energy saving opportunities for the Lift Station #4. The following assumptions were made in the analysis:

- The Lift Station #4 is occupied daily for ½ an hour.
- The temperature of this station is maintained at 16°C (60.8°F).

**Table 8 Energy Saving Opportunities for the Lift Station #4**

| Description | Qty | Installed Cost/Unit ($) | | | Total Cost** ($) | | Estimated Annual Savings | | Simple Payback Years | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Material (NI*) | Material (WI*) | Labour | NI* | WI* | kWh | $*** | NI* | WI* |
| **LIGHTING** | | | | | | | | | | |
| When 150W incandescent in main process area requires replacement, replace it with a compact fluorescent. | 1 | $13 | $8 | $0 | $15 | $9 | 20 | $1 | 12.1 | 7.4 |
| When incandescent lights in drywell require replacement, replace them with compact fluorescents. | 2 | $20 | $15 | $0 | $46 | $34 | 53 | $3 | 14.4 | 10.8 |
| **Lighting Subtotal** | | | | | **$60** | **$43** | **73** | **$4** | | |
| **HVAC** | | | | | | | | | | |
| Setback temperature to 10°C (50°F). | 1 | $0 | $0 | $0 | $0 | $0 | 1,887 | $113 | 0.0 | 0.0 |
| **HVAC Subtotal** | | | | | **$0** | **$0** | **1,887** | **$113** | | |

| TOTALS | Energy (kWh) | Cost ($) | $CO_2$ (Tonnes) |
|---|---|---|---|
| **Existing Annual Consumption/Cost/Emissions** | 16,336 | $1,398 | 0.49 |
| **Estimated Annual Savings** | 1,960 | $118 | 0.06 |
| **Percent Savings** | 12% | 8% | 12% |

* NI = Cost does not include incentive, WI = Cost includes incentive.
** The total cost column includes 14% taxes.
*** The cost assigned to electricity is 0.06004 $/kWh (rate was taken from Manitoba Hydro's website).

## 7.3 GENERAL RECOMMENDATIONS

### Lighting

The recommendations for this facility in terms of lighting are to replace the incandescents in the main process area and in the drywell with compact fluorescents when they burn out. Since the lighting is used so infrequently, the savings are low for these upgrades.

### HVAC

Another recommendation that would save energy at no extra cost is to reduce the temperature setting from 16°C (60.8°F) to 10°C (50°F) in the winter.

# 8.0 LIFT STATION #5

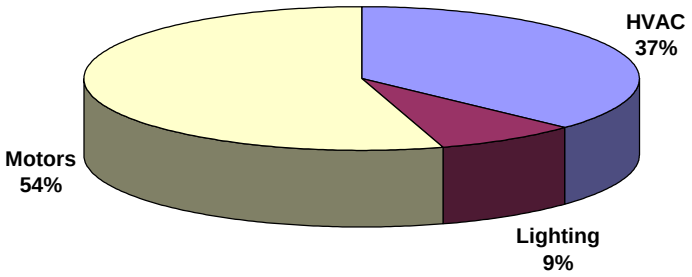
## 8.1 BACKGROUND

The Lift Station #5, located on Dixie Road, is a 100 square foot brick building. Similar to the other lift stations, there is a main process area and a wetwell with two 5-hp pumps located underneath the building.


**Photo 8 – Typical Lift Station**

In the previous year, Lift Station #5 consumed 5,780 kWh of electricity for lighting, hvac, and to power the pump motors. The breakdown of this energy is shown in the following pie chart.

**Energy Breakdown (% of Total kWh)
for the Lift Station #5**




## 8.2 ENERGY AND WATER SAVING OPPORTUNITIES

Table 9 shows the energy saving opportunities for the Lift Station #5. The following assumptions were made in the analysis:

- The Lift Station #5 is occupied for 30 minutes every day.
- The temperature of this facility is maintained at 16°C (60.8°F).

**Table 9 Energy Saving Opportunities for the Lift Station #5**

| Description | Qty | Installed Cost/Unit ($) | | | Total Cost** ($) | | Estimated Annual Savings | | Simple Payback Years | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Material (NI*) | Material (WI*) | Labour | NI* | WI* | kWh | $*** | NI* | WI* |
| **LIGHTING** | | | | | | | | | | |
| When incandescents in wetwell area require replacement, replace them with compact fluorescents. | 3 | $20 | $15 | $0 | $68 | $51 | 122 | $7 | 9.4 | 7.0 |
| **Lighting Subtotal** | | | | | **$68** | **$51** | **122** | **$7** | | |
| **HVAC** | | | | | | | | | | |
| Setback temperature to 10°C (50°F). | 1 | $0 | $0 | $0 | $0 | $0 | 622 | $37 | 0.0 | 0.0 |
| **HVAC Subtotal** | | | | | **$0** | **$0** | **622** | **$37** | | |

| TOTALS | Energy (kWh) | Cost ($) | $CO_2$ (Tonnes) |
|---|---|---|---|
| **Existing Annual Consumption/Cost/Emissions** | 5,780 | $668 | 0.17 |
| **Estimated Annual Savings** | 744 | $45 | 0.02 |
| **Percent Savings** | 13% | 7% | 12% |

* NI = Cost does not include incentive, WI = Cost includes incentive.
** The total cost column includes 14% taxes.
*** The cost assigned to electricity is 0.06004 $/kWh (rate was taken from Manitoba Hydro's website).

## 8.3 GENERAL RECOMMENDATIONS

### Lighting

The only recommendation for this facility in terms of lighting is to replace the incandescents with compact fluorescents when they burn out. Since the lighting is used so infrequently, the savings are low for this upgrade.

### HVAC

Another recommendation that would save energy at no extra cost is to reduce the temperature setting from 16°C (60.8°F) to 10°C (50°F) in the winter.

# 9.0 CENTENNIAL ARENA

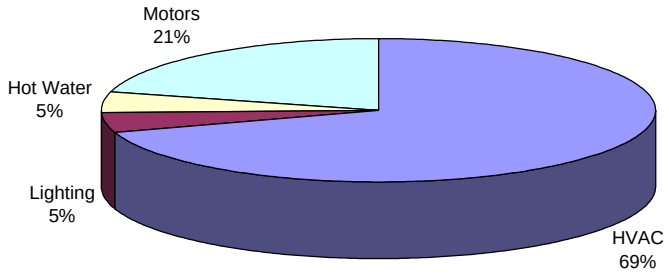
## 9.1 BACKGROUND

The Centennial Arena, constructed in 1967, is a 36,576 square foot building. In 1988, a new entranceway and waiting area were constructed and in 1999, the locker rooms and offices were added on. More recently, in 2005, a new ice plant was installed and a zamboni room was added on. The Arena now consists of an ice rink, change rooms, a concession, a viewing area, an ice plant room and a zamboni room. The rink is used 7 days/week from August to April and for 4 weekends throughout the summer.

**Photo 10 – Centennial Arena**

The Arena uses natural gas for heating the rink area, and electricity for lighting, hot water, heating (aside from the rink), and to run the mechanical equipment. There is a heat recovery ventilator in the dressing rooms that pre-heats the intake air with the exhaust air. The total natural gas and electrical energy consumed in the previous year was 147,130 kWh and 871,780 kWh, respectively. The largest portion of energy is used for heating as can be seen in the pie chart below. However, the ice plant motors also consume a significant portion of the annual energy consumption.

**Energy Breakdown (% of Total kWh)
for the Centennial Arena**




The washrooms in the Centennial Arena contain a total of 11 toilets, 11 sinks, and 3 urinals. There are also 21 showers in the dressing rooms. In addition to the water consumed by the water fixtures, a large portion of the annual water consumption is used to flood the rink. There are five gas water heaters that heat the water for this facility. The energy used for hot water heating was calculated based on estimates of the current hot water consumption and includes the energy required to makeup for heat losses from the storage tanks.

## 9.2 ENERGY AND WATER SAVING OPPORTUNITIES

Tables 10 and 11 show a summary of both the energy and water saving opportunities for the Centennial Arena. The following assumptions were made in determining the annual savings:

- The arena is occupied from the August to April for approximately 112 hours per week and for 4 weekends throughout the summer.
- The temperature of the rink area is maintained at –6.7°C (20°F) and the other areas are maintained at 21°C (70°F).
- For the purpose of water consumption, the typical occupancy of the arena is taken as 30.
- The exit lamps are on 24 hours per day year round and the outdoor lights are on 12 hours per day year round.
- The heat recovery ventilator is assumed to be on for 24 hours/day from August to April.

## Table 10 Energy Saving Opportunities for the Centennial Arena

| Description | Qty | Installed Cost/Unit ($) | | | Total Cost** ($) | | Estimated Annual Savings | | Simple Payback Years | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Material (NI*) | Material (WI*) | Labour | NI* | WI* | kWh | $*** | NI | WI |
| **LIGHTING** | | | | | | | | | | |
| When 6' x 2 T12 fluorescent ballasts require replacement, replace them with T8 ballasts and tubes. | 22 | $44 | $17 | $0 | $1,110 | $420 | 7,012 | $421 | 2.6 | 1.0 |
| When 4' x 2 T12 fluorescent ballasts require replacement, replace them with T8 ballasts and tubes. | 8 | $41 | $21 | $0 | $376 | $193 | 1,243 | $75 | 5.0 | 2.6 |
| Replace 100W incandescents with compact fluorescents. | 16 | $15 | $10 | $13 | $511 | $420 | 4,590 | $276 | 1.9 | 1.5 |
| Replace 60W incandescents with compact fluorescents. | 9 | $15 | $10 | $13 | $287 | $236 | 1,578 | $95 | 3.0 | 2.5 |
| Replace 200W incandescents in rink with metal halides. | 12 | $300 | $225 | $300 | $8,208 | $7,182 | 7,171 | $431 | 19.1 | 16.7 |
| Install sensors on lights. | 8 | $75 | $75 | $50 | $1,140 | $1,140 | 11,576 | $695 | 1.6 | 1.6 |
| Replace incandescent exit signs with LED modules. | 5 | $50 | $5 | $80 | $741 | $485 | 1,183 | $71 | 10.4 | 6.8 |
| **Lighting Subtotal** | | | | | **$12,372** | **$10,075** | **34,352** | **$2,062** | | |
| **ENVELOPE** | | | | | | | | | | |
| Weather-strip pedestrian doors. | 9 | $15 | $15 | $50 | $74 | $74 | 12,784 | $768 | 0.1 | 0.1 |
| Caulk pedestrian doors. | 9 | $5 | $5 | $25 | $308 | $308 | 4,091 | $246 | 1.3 | 1.3 |
| Replace 5' x 4' rink windows with triple pane windows. | 13 | $1,000 | $800 | $200 | $17,784 | $14,820 | 16,819 | $1,010 | 17.6 | 14.7 |
| Upgrade ceiling and wall insulation of referee room. | 1 | $2,400 | $1,560 | $2,400 | $5,472 | $4,514 | 25,207 | $1,513 | 3.6 | 3.0 |
| **Envelope Subtotal** | | | | | **$23,638** | **$19,716** | **58,901** | **$3,536** | | |
| **HVAC** | | | | | | | | | | |
| Install countdown timer on greasehood exhaust fan. | 1 | $100 | $100 | $75 | $200 | $200 | 3,326 | $200 | 1.0 | 1.0 |
| Install timeclock on HRV. | 1 | $100 | $100 | $75 | $200 | $200 | 9,313 | $559 | 0.4 | 0.4 |
| **HVAC Subtotal** | | | | | **$399** | **$399** | **12,639** | **$759** | | |
| **HOT WATER** | | | | | | | | | | |
| Install water efficient metering faucet. | 11 | $309 | $309 | $150 | $5,756 | $5,756 | 2,628 | $158 | 36.5 | 36.5 |
| Install water efficient showerheads. | 21 | $21 | $21 | $50 | $1,700 | $1,700 | 7,073 | $456 | 3.7 | 3.7 |
| Replace shower taps with spring loaded taps. | 21 | $125 | $125 | $50 | $4,190 | $4,190 | 7,418 | $479 | 8.8 | 8.8 |
| **Water Subtotal** | | | | | **$11,645** | **$11,645** | **17,119** | **$1,093** | | |

| TOTALS | Energy (kWh) | Cost ($) | $CO_2$ (Tonnes) |
|---|---|---|---|
| Existing Annual Consumption/Cost/Emissions | 1,018,910 | $60,063 | 52.39 |
| Estimated Annual Savings | 123,011 | $7,451 | 4.84 |
| Percent Savings | 12% | 12% | 9% |

* NI = Cost does not include incentive, WI = Cost includes incentive.
** The total cost column includes 14% taxes.
*** The cost assigned to electricity is 0.06004 $/kWh (rate was taken from Manitoba Hydro's website) and the cost of natural gas is taken as 0.0457 $/kWh (as of November 1, 2005).

**Table 11 Water Saving Opportunities for the Centennial Arena**

| Description | Qty | Installed Cost/Unit ($) | | Total Cost* ($) | Annual Water Savings (%) | Annual Water Savings (L) | Annual Cost Savings ($) |
|---|---|---|---|---|---|---|---|
| | | Material | Labour | | | | |
| Install water efficient dual flush toilets. | 11 | $284 | $150 | $5,436 | 70% | 230,948 | $39 |
| Install water efficient metering faucets. | 11 | $309 | $150 | $5,756 | 80% | 70,118 | $12 |
| Install water efficient urinals. | 3 | $344 | $200 | $1,860 | 77% | 383,674 | $64 |
| Install water efficient showerheads. | 21 | $21 | $21 | $50 | 29% | 188,742 | $32 |
| Install spring-loaded faucets. | 21 | $125 | $125 | $50 | 30% | 197,955 | $33 |

* The total cost column includes 14% taxes.

## 9.3 GENERAL RECOMMENDATIONS

### Lighting

The lighting analysis summary for the Arena is shown in Appendix B, Table B.8.3. Significant energy savings would result from replacing the incandescent lights with compact fluorescents and from replacing the T12 fluorescents with T8s when the T12 ballasts burn out. Another energy saving opportunity for lighting is to install occupancy sensors on the lights in the viewing area, locker rooms, and offices. This would ensure that the lights are on only when these rooms are occupied. The incandescent exit signs should also be considered for replacement with LEDs. LED exit signs consume 10% of the energy of an incandescent sign.

### Envelope

Aside from the rink walls and roof, which have only R-7 insulation, the remaining exterior walls and roof of the arena have R-20 and R-40 insulation, respectively, and do not need to be upgraded. Although the insulation surrounding the rink area is poor, the rink is maintained at

such a low temperature that it is not worthwhile to upgrade the insulation. The referee room in the rink area, however, which also has very little insulation (~R2) should be considered for an upgrade. Since this room is maintained warm while the rink area is cold, insulating the three walls and ceiling that are exposed to the rink would result in significant savings in heating requirements for this room.

Nine of the pedestrian doors to the arena have poor weather-stripping and no caulking. These doors should be sealed with new weather-stripping and caulking to reduce the cold air infiltration throughout the winter. Another opportunity is to replace the rink windows with triple pane windows and provide metal guards to protect the glass from hockey pucks.

**HVAC**

Energy saving opportunities for the arena's heating, ventilating, and air conditioning systems include installing a countdown timer on the greasehood exhaust fan and a timeclock on the heat recovery ventilator (HRV). In order to calculate the energy savings associated with these upgrades, some assumptions were required. It was assumed that with a countdown timer that automatically shuts the greasehood exhaust fan off after a specified duration, the exhaust fan would run 5 hours less every week. For the HRV, it was assumed that it currently runs 24 hours a day from August to April. With a timeclock it could be programmed to run during occupied times only.

**Motors**

The arena's ice plant was installed in 2005 and has energy efficient motors. Therefore no upgrades are recommended for the system. An indoor condenser located in the rink helps to reclaim waste heat from the ice plant.

**Water**

Table 11 above shows the water savings and cost savings that would result from replacing the current fixtures with water efficient fixtures. More detailed calculations can be found in Table B.8.5 in Appendix B.

The automatic flush urinals are assumed to consume 5 gallons of water every 20 minutes, regardless of occupancy. Replacing these with water efficiency urinals would reduce the water consumed by these urinals by 77%. Another opportunity is to replace the showerheads with water efficient showerheads and install spring loaded taps to prevent the showers from being left on. Energy savings due to a reduction in hot water consumption with water efficient showers and sink faucets are shown in Table 10.

**Other Opportunities**

The following is a list of energy saving opportunities for the ice plant that would help reduce annual costs associated with ice production:

- Natural ventilation of the rink in the winter, when the outdoor temperature is between –5°C and –15°C saves energy by reducing the run time of the refrigeration equipment.
- Ensure that the water used for flooding is pure – salts lower the freezing point of water and air in water acts like an insulation, making it harder for the brine in the slab to freeze the top layer of the ice.
- Keep the ice thin (1 inch thick) because excessive ice thickness increases the load on the compressor. Shaving ice helps to reduce the ice thickness and removes concentrations of impurities.
- Maintain the brine at a specific gravity of 1.2 to 1.22 for optimum energy use and maintain the brine temperature as high as possible.
- Significant amounts of energy can be saved by recovering heat from the refrigeration equipment and using it for flood water heating, space heating, domestic water heating, or ice melting.

For additional information, refer to the Manitoba Hydro “Guidelines for Operators of Manitoba’s Rinks and Arenas”, available for downloading from the following website:

http://www.hydro.mb.ca/power_smart_for_business/recreation_manitoba_rinks.pdf

# 10.0 OUTDOOR SWIMMING POOL

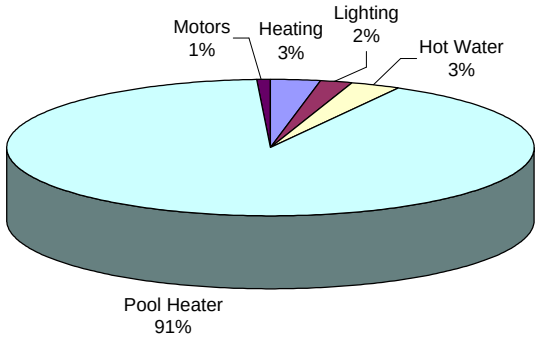
## 10.1 BACKGROUND

The Outdoor Swimming Pool, built in 1973, consists of a 1,916 square foot building for the change rooms and pool office, a 336 square foot mechanical building, and a 3,444 square foot swimming pool. The swimming pool is used from June to August and the change rooms are used year round for the arena in the winter and the pool in the summer.

**Photo 10 – Outdoor Swimming Pool**

The annual natural gas and electrical energy consumption for the Curling Rink in the previous year was 149,267 kWh and 14,840 kWh, respectively. Electricity was used for lighting, heating, and hot water and the pool heater used natural gas. The pie chart below shows the portions of the total energy consumption used for lighting, water heating, and building heat.

**Energy Breakdown (% of Total kWh)
for the Outdoor Swimming Pool**




The washrooms in the change rooms contain a total of 4 toilets, 4 sinks, 1 urinal, and 6 showers. Two 454 Litre electric hot water heaters heat the water for this facility. The energy used for hot water heating was calculated based on estimates of the current hot water consumption and includes the energy required to makeup for heat losses from the storage tank.

## 10.2 ENERGY AND WATER SAVING OPPORTUNITIES

Tables 12 and 13 show a summary of energy and water saving opportunities for the Outdoor Swimming Pool. The following assumptions were made in the analysis:

- In June, the swimming pool is open from 9am – 10pm 5 days/week and in July and August the pool is open Monday-Friday from 7am – 10pm and 1pm – 10pm on weekends.
- The temperature of the change rooms is maintained at 21°C (70°F) year round.
- For the purpose of water consumption, the average occupancy of the pool is 5.
- The exit lamps are on 24 hours per day year round and the outdoor lights are on 12 hours per day year round.

## Table 12 Energy Saving Opportunities for the Outdoor Swimming Pool

| Description | Qty | Installed Cost/Unit ($) | | | Total Cost** ($) | | Estimated Annual Savings | | Simple Payback Years | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Material (NI*) | Material (WI*) | Labour | NI* | WI* | kWh | $*** | NI | WI |
| **LIGHTING** | | | | | | | | | | |
| When 6' x 2 T12 ballasts require replacement, replace them with T8 ballasts and tubes. | 12 | $44 | $17 | $0 | $605 | $229 | 981 | $59 | 10.3 | 3.9 |
| When 100W incandescents require repacement, replace them with compact fluorescents. | 15 | $13 | $8 | $0 | $222 | $137 | 581 | $35 | 6.4 | 3.9 |
| Replace incandescent exit sign with LED module. | 1 | $50 | $5 | $80 | $148 | $97 | 237 | $14 | 10.4 | 6.8 |
| Install photocell on outdoor light. | 1 | $25 | $25 | $65 | $103 | $103 | 108 | $6 | 15.8 | 15.8 |
| **Lighting Subtotal** | | | | | **$1,078** | **$565** | **1,907** | **$114** | | |
| **ENVELOPE** | | | | | | | | | | |
| Replace 4' x 3' windows with triple pane windows. | 2 | $500 | $380 | $200 | $1,596 | $1,322 | 628 | $38 | 42.3 | 35.0 |
| Weather-strip pedestrian doors. | 4 | $15 | $15 | $50 | $296 | $296 | 5,682 | $341 | 0.9 | 0.9 |
| Caulk pedestrian doors. | 4 | $5 | $5 | $25 | $137 | $137 | 1,818 | $109 | 1.3 | 1.3 |
| Caulk windows. | 2 | $5 | $5 | $13 | $41 | $41 | 636 | $38 | 1.1 | 1.1 |
| **Envelope Subtotal** | | | | | **$2,070** | **$1,797** | **8,765** | **$526** | | |
| **HVAC** | | | | | | | | | | |
| When pool heaters require replacement, replace them with high efficiency pool heaters. | 2 | $2,914 | $2,914 | $0 | $6,644 | $6,644 | 22,390 | $1,023 | 6.5 | 6.5 |
| Replace bdds with motorized dampers. | 2 | $300 | $300 | $300 | $1,368 | $1,368 | 2,495 | $150 | 9.1 | 9.1 |
| Turn down temperature to 15°C (59°F) when unoccupied. | 0 | $0 | $0 | $0 | $0 | $0 | 643 | $39 | 0.0 | 0.0 |
| **HVAC Subtotal** | | | | | **$8,012** | **$8,012** | **25,528** | **$1,212** | | |
| **HOT WATER** | | | | | | | | | | |
| Insulate hot water piping. | 1 | $100 | $100 | $100 | $228 | $228 | 932 | $56 | 4.1 | 4.1 |
| Install water efficient showerheads. | 6 | $21 | $21 | $50 | $486 | $486 | 478 | $31 | 15.8 | 15.8 |
| **Water Subtotal** | | | | | **$714** | **$714** | **1,409** | **$87** | | |

| TOTALS | Energy (kWh) | Cost ($) | $CO_2$ (Tonnes) |
|---|---|---|---|
| Existing Annual Consumption/Cost/Emissions | 164,107 | $8,731 | 27.24 |
| Estimated Annual Savings | 37,609 | $1,939 | 4.47 |
| Percent Savings | 23% | 22% | 16% |

* NI = Cost does not include incentive, WI = Cost includes incentive.
** The total cost column includes 14% taxes.
*** The cost assigned to electricity is 0.06004 $/kWh (rate was taken from Manitoba Hydro's website) and the cost of natural gas is taken as 0.0457 $/kWh (as of November 1, 2005).

**Table 13 Water Saving Opportunities for the Outdoor Swimming Pool**

| Description | Qty | Installed Cost/Unit ($) | | Total Cost* ($) | Annual Water Savings (%) | Annual Water Savings (L) | Annual Cost Savings ($) |
|---|---|---|---|---|---|---|---|
| | | Material | Labour | | | | |
| Install water efficient dual flush toilets. | 4 | $284 | $150 | $1,977 | 70% | 8,732 | $1 |
| Install water efficient metering faucets. | 4 | $309 | $150 | $2,093 | 80% | 3,271 | $1 |
| Install water efficient urinals. | 1 | $344 | $200 | $620 | 60% | 9,200 | $2 |
| Install water efficient showerheads. | 6 | $21 | $21 | $50 | 29% | 12,744 | $2 |

* The total cost column includes 14% taxes.

## 10.3 GENERAL RECOMMENDATIONS

### Lighting

The lighting analysis summary table is shown in Appendix B as Table B.9.3. For the indoor lighting, it is recommended that when the T12 ballasts burn out, they be replaced with T8 ballasts and tubes. T8s are much more efficient than T12s and the T12s are expected to be obsolete by the year 2010. The interior incandescents should also be replaced with energy efficient compact fluorescents when they burn out.

It is recommended that a photocell be installed on the outdoor pool light to ensure that this light is turned off throughout the day.

The incandescent exit sign consumes 90% more energy than an LED exit sign would consume. Since this sign is on 24 hours a day, it is recommended that it be replaced with an LED.

**Envelope**

The pedestrian doors to the change room building have very poor stripping and no caulking. It is recommended to install new weather-stripping on these doors and to caulk the doorframes. This would reduce the cold air infiltrating through the cracks around these doors throughout the winter. Another opportunity shown in Table 12 is to replace the windows with triple pane windows. This opportunity has a long payback period due to the high capital cost. If the windows are not replaced due to the high payback period, the frames around these windows should at least be caulked to provide a tight seal.

**HVAC**

To save energy in heating, the thermostats should be setback to 15°C (59°F) when the building is not used. Another opportunity is to replace the backdraft dampers on the washroom exhausts with motorized dampers. This would reduce the amount of cold air leaking through the dampers in the wintertime.

When the pool heater requires replacement, consideration should be given to installing a 95% efficient heater. This would save approximately 15% of the current energy required to heat the pool.

**Water**

Insulating the hot water piping would reduce heat losses from this piping and thus save in annual energy consumption.

The water analysis summary is shown in Table B.9.5 in Appendix B. Replacing the high flow fixtures with water efficient fixtures would save between 29 and 80% of their current water consumption.

# 11.0 TOWN FIRE HALL

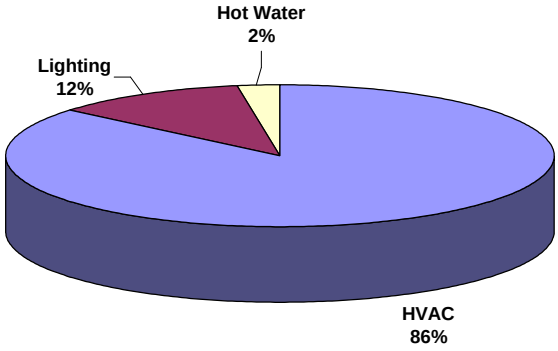
## 11.1 BACKGROUND

The Town Fire Hall, built in 1974, is a 3,300 square foot building with metal clad exterior walls. The fire hall is used to store fire trucks and contains a small office. This building is occupied Monday to Friday, 8am to 5pm.


**Photo 11 – Town Fire Hall**

The Town Fire Hall is heated using gas radiant heaters and electric unit heaters are used as backup. The total natural gas consumed by these radiant heaters in the previous year was 58,691 kWh and the electricity consumed for lighting, hot water, and backup heating totaled 65,600 kWh. The pie chart below shows the portions of the total energy consumption used for lighting, water heating, and building heat.

**Energy Breakdown (% of Total kWh)**
**for the Town Fire Hall**




The washrooms in the Town Fire Hall contain a total of 2 toilets, 2 sinks, and 2 urinals. A 272 Litre electric hot water heater heats the water for this facility. The energy used for hot water heating was calculated based on estimates of the current hot water consumption and includes the energy required to makeup for heat losses from the storage tank.

## 11.2 ENERGY AND WATER SAVING OPPORTUNITIES

Tables 14 and 15 show a summary of energy and water saving opportunities for the Town Fire Hall. The following assumptions were made in the analysis:

- The Fire Hall is occupied from Monday to Friday, 8am – 5pm.
- The temperature of the fire hall is maintained at 21°C (70°F).
- For the purpose of water consumption, the typical occupancy of the Fire Hall is 6.
- The outdoor lights are on 12 hours per day year round.

## Table 14 Energy Saving Opportunities for the Town Fire Hall

| Description | Qty | Installed Cost/Unit ($) | | | Total Cost** ($) | | Estimated Annual Savings | | Simple Payback Years | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Material (NI*) | Material (WI*) | Labour | NI* | WI* | kWh | $*** | NI | WI |
| **LIGHTING** | | | | | | | | | | |
| When 4'x2 T12 fluorescent ballasts burn out, replace them with T8 ballasts and tubes. | 10 | $41 | $21 | $0 | $47 | $24 | 913 | $55 | 0.9 | 0.4 |
| When 6'x2 T12 fluorescent ballasts burn out, replace them with T8 ballasts and tubes. | 21 | $44 | $17 | $0 | $50 | $19 | 3,931 | $236 | 0.2 | 0.1 |
| **Lighting Subtotal** | | | | | **$97** | **$43** | **4,844** | **$291** | | |
| **ENVELOPE** | | | | | | | | | | |
| Weather-strip pedestrian doors. | 3 | $15 | $15 | $50 | $74 | $74 | 4,735 | $216 | 0.3 | 0.3 |
| Weather-strip vehicle doors. | 5 | $100 | $100 | $200 | $1,710 | $1,710 | 9,943 | $454 | 3.8 | 3.8 |
| Caulk pedestrian doors. | 3 | $5 | $5 | $25 | $103 | $103 | 1,515 | $69 | 1.5 | 1.5 |
| Caulk vehicle doors. | 5 | $5 | $5 | $25 | $171 | $171 | 6,363 | $291 | 0.6 | 0.6 |
| Caulk windows. | 4 | $5 | $5 | $13 | $82 | $82 | 1,347 | $62 | 1.3 | 1.3 |
| Replace 32" x 48" windows with triple pane windows. | 4 | $500 | $400 | $200 | $3,192 | $2,736 | 1,241 | $57 | 56.3 | 48.2 |
| Upgrade wall insulation. | 1 | $9,280 | $7,530 | $9,280 | $21,158 | $19,163 | 10,588 | $484 | 43.7 | 39.6 |
| When replacing roof, upgrade roof insulation. | 1 | $4,225 | $3,535 | $990 | $5,945 | $5,159 | 7,059 | $323 | 18.4 | 16.0 |
| **Envelope Subtotal** | | | | | **$32,435** | **$29,198** | **42,791** | **$1,956** | | |
| **HVAC** | | | | | | | | | | |
| Replace bdd with motorized damper. | 1 | $300 | $300 | $300 | $684 | $684 | 3,696 | $169 | 4.0 | 4.0 |
| Install programmable thermostats; setback temp to 15°C (59°F). | 3 | $300 | $300 | $300 | $2,052 | $2,052 | 6,476 | $296 | 6.9 | 6.9 |
| **HVAC Subtotal** | | | | | **$2,736** | **$2,736** | **10,172** | **$465** | | |
| **HOT WATER** | | | | | | | | | | |
| Replace hot water tank with an instantaneous water heater.**** | 2 | $300 | $300 | $500 | $1,824 | $1,824 | 2,122 | $127 | 14.3 | 14.3 |
| Insulate hot water piping. | 1 | $50 | $50 | $50 | $114 | $114 | 465 | $28 | 4.1 | 4.1 |
| **Water Subtotal** | | | | | **$1,938** | **$1,938** | **2,588** | **$155** | | |

| TOTALS | Energy (kWh) | Cost ($) | $CO_2$ (Tonnes) |
|---|---|---|---|
| Existing Annual Consumption/Cost/Emissions | 124,291 | $7,390 | 12.50 |
| Estimated Annual Savings | 60,395 | $2,867 | 9.73 |
| Percent Savings | 49% | 39% | 78% |

* NI = Cost does not include incentive, WI = Cost includes incentive.
** The total cost column includes 14% taxes.
*** The cost assigned to electricity is 0.06004 $/kWh (rate was taken from Manitoba Hydro's website) and the cost of natural gas is taken as 0.0457 $/kWh (as of November 1, 2005).

**Table 15 Water Saving Opportunities for the Town Fire Hall**

| Description | Qty | Installed Cost/Unit ($) | | Total Cost* ($) | Annual Water Savings (%) | Annual Water Savings (L) | Annual Cost Savings ($) |
|---|---|---|---|---|---|---|---|
| | | Material | Labour | | | | |
| Install water efficient dual flush toilets. | 2 | $284 | $150 | $988 | 70% | 27,129 | $5 |
| Install water efficient metering faucets. | 2 | $309 | $150 | $1,047 | 80% | 8,237 | $1 |
| Install water efficient urinals. | 2 | $344 | $200 | $1,240 | 60% | 20,007 | $3 |

* The total cost column includes 14% taxes.

## 11.3 GENERAL RECOMMENDATIONS

### Lighting

The indoor lighting for this facility consists of 6' and 4' T12 fluorescent lamps. When the ballasts for these lights burn out and require replacement, it is recommended that they be replaced with T8 lamps and ballasts. T8s are slim, energy efficient lamps that produce more light per watt than T12s. In addition, the T12s are expected to become obsolete by the year 2010 and will no longer be available. The lighting analysis summary table is shown in Appendix B as Table B.10.3.

### Envelope

There are several opportunities for energy savings in terms of the fire hall's envelope. The pedestrian and vehicle doors have poor weather-stripping and no caulking around the doorframes. To reduce the cold air infiltrating through the cracks around these doors in the winter, it is recommended to install new weather-stripping and to caulk the doorframes.

The windows in this building are old 2 pane sliders. The energy savings that would result from upgrading these windows to triple pane are shown in Table 14 above. A more cost-effective way to reduce the heat losses through these windows is to caulk the frames. This would result in energy savings with a very short payback period.

The walls and roof of this building have R-12 and R-20 insulation, respectively. Upgrading the wall insulation to R-20 and the roof insulation to R-40 would reduce heat losses from this building and save in heating requirements throughout the winter. The recommendation for roof insulation is to upgrade it to R-40 when the roof is being replaced.

**HVAC**

The exhaust fan for the fire hall currently uses a leaky backdraft damper to prevent the outdoor air from entering the building when the fan is shut off. One recommendation is to replace this backdraft damper with a motorized damper that would provide a tighter seal and thus reduce infiltration.

Another opportunity for energy savings is to install programmable thermostats. These thermostats should be set such that the temperature of the hall is reduced to 15°C (59°F) when the building is unoccupied.

**Water**

Consideration should be given to replacing the hot water tank with an instantaneous water heater. This would eliminate the energy required to make up for heat losses from the storage tank. Another recommendation that would help to reduce heat losses is to insulate the hot water piping.

The water analysis summary is shown in Table B.10.5 in Appendix B. Replacing the high flow fixtures with water efficient fixtures would save between 60 and 80% of their current water.

# 12.0 LIBRARY

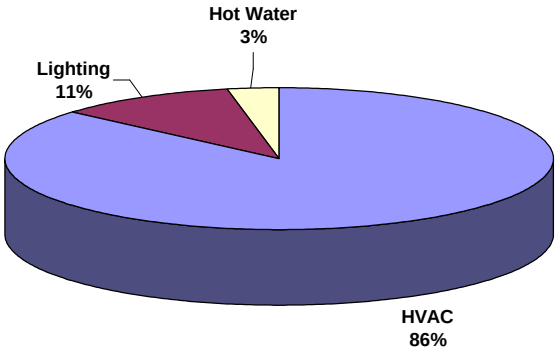
## 12.1 BACKGROUND

The Library is a 6,563 square foot building consisting of an old section in the back, and a new addition in the front. The addition was constructed in 2001, at which time the entire building was upgraded to current standards. The walls and roof have R-20 and R-40 insulation, respectively, and the windows and doors are in excellent condition. The Library is occupied Monday to Saturday from 10:30am to 5pm, in addition to Tuesday and Thursday evenings.

**Photo 12 – Library**

The Library is heated using 3 high efficiency gas furnaces and is cooled in the summertime with 4-ton air conditioning units. In 2001, a heat recovery ventilator was installed to pre-heat the intake air with the building's exhaust air. The annual natural gas and electrical energy consumption for the library in the previous year was 37,396 kWh and 44,240 kWh, respectively. The pie chart below shows the portions of the total energy consumption used for lighting, water heating, and building heat.

**Energy Breakdown (% of Total kWh)
for the Library**




The washrooms in the library contain a total of 3 toilets, 2 sinks, and 1 urinal. A 175 hot water heater heats the water for this facility. The energy used for hot water heating was calculated based on estimates of the current hot water consumption and includes the energy required to makeup for heat losses from the storage tank.

## 12.2 ENERGY AND WATER SAVING OPPORTUNITIES

Tables 16 and 17 show a summary of energy and water saving opportunities for the library. The following assumptions were made in the analysis:

- The library is occupied for 43 hours per week.
- The temperature of the library is maintained at 21°C (70°F).
- For the purpose of water consumption, the typical occupancy of the library is 10.

## Table 16 Energy Saving Opportunities for the Library

| Description | Qty | Installed Cost/Unit ($) | | | Total Cost** ($) | | Estimated Annual Savings | | Simple Payback Years | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Material (NI*) | Material (WI*) | Labour | NI* | WI* | kWh | $*** | NI | WI |
| **LIGHTING** | | | | | | | | | | |
| Install occupancy sensors for lighting in washrooms. | 2 | $75 | $75 | $50 | $143 | $143 | 297 | $18 | 8.0 | 8.0 |
| **Lighting Subtotal** | | | | | **$143** | **$143** | **297** | **$18** | | |
| **HVAC** | | | | | | | | | | |
| Install programmable thermostats (to control HRV as well); setback temp to 15°C (59°F) in winter and setforward temp to 24°C (75°F) in the summer. | 3 | $150 | $150 | $100 | $855 | $855 | 36,860 | $2,027 | 0.4 | 0.4 |
| **HVAC Subtotal** | | | | | **$855** | **$855** | **36,860** | **$2,027** | | |
| **HOT WATER** | | | | | | | | | | |
| Replace hot water tank with an instantaneous water heater.**** | 1 | $300 | $300 | $500 | $912 | $912 | 1,395 | $84 | 10.9 | 10.9 |
| Insulate hot water piping. | 1 | $50 | $50 | $50 | $114 | $114 | 465 | $28 | 4.1 | 4.1 |
| Install water efficient metering faucet. | 2 | $309 | $309 | $150 | $1,047 | $1,047 | 469 | $30 | 34.6 | 34.6 |
| **Water Subtotal** | | | | | **$2,073** | **$2,073** | **2,329** | **$142** | | |

| TOTALS | Energy (kWh) | Cost ($) | $CO_2$ (Tonnes) |
|---|---|---|---|
| Existing Annual Consumption/Cost/Emissions | 81,636 | $5,073 | 8.03 |
| Estimated Annual Savings | 39,486 | $2,187 | 3.11 |
| Percent Savings | 48% | 43% | 39% |

* NI = Cost does not include incentive, WI = Cost includes incentive.
** The total cost column includes 14% taxes.
*** The cost assigned to electricity is 0.06004 $/kWh (rate was taken from Manitoba Hydro's website) and the cost of natural gas is taken as 0.0457 $/kWh (as of November 1, 2005).
**** Discounted to include the cost of replacement water tank in 10 years.

## Table 17 Water Saving Opportunities for the Library

| Description | Qty | Installed Cost/Unit ($) | | Total Cost* ($) | Annual Water Savings (%) | Annual Water Savings (L) | Annual Cost Savings ($) |
|---|---|---|---|---|---|---|---|
| | | Material | Labour | | | | |
| Install water efficient dual flush toilets. | 3 | $284 | $150 | $1,483 | 70% | 51,847 | $9 |
| Install water efficient metering faucets. | 2 | $309 | $150 | $1,047 | 80% | 12,522 | $2 |
| Install water efficient urinals. | 1 | $344 | $200 | $620 | 60% | 23,897 | $4 |

* The total cost column includes 14% taxes.

## 12.3 GENERAL RECOMMENDATIONS

### Lighting

The lighting for the library consists of T8 energy efficient fluorescent lamps, outdoor flood lights on photocells, and energy efficient LED exit signs. Since the lighting is already energy efficient, the only opportunity for energy savings is to install occupancy sensors on the lights in the washrooms. This will save energy by shutting off the lights when unoccupied. The lighting analysis summary table is shown in Appendix B as Table B.11.3.

### Envelope

As previously mentioned the windows, doors, walls, and roof of this building are in excellent condition. Therefore, there are no energy saving opportunities in terms of the building's envelope.

### HVAC

An excellent opportunity for the library is to install programmable thermostats that are also capable of controlling the run time of the heat recovery ventilator (HRV). In the wintertime, these thermostats will help save energy by automatically reducing the temperature setting to 15°C (59°F) and turning off the HRV when the building is unoccupied. Turning the HRV off saves energy by eliminating the ventilation air and thus the energy required to heat the ventilation air. In the summertime, these thermostats should be programmed such that when the building is unoccupied, the temperature is set forward to 24°C (74°F) thus reducing the cooling load.

### Water

Replacing the hot water tank with an instantaneous water heater would save energy by eliminating heat losses from the storage tank. Other opportunities for hot water savings include insulating the hot water piping and replacing the sink faucets in the washrooms with water efficient metering faucets.

The water analysis summary is shown in Table B.11.5 in Appendix B. Replacing the high flow fixtures with water efficient fixtures would save between 60 and 80% of their current water consumption.

# 13.0 GENERAL UPGRADES AND MAINTENANCE RECOMMENDATIONS FOR REDUCING ENERGY AND WATER CONSUMPTION

The following energy and water saving opportunities exist in many buildings including those toured in this study. The saving opportunities are generic in nature and include both capital upgrades (Sections 13.1 to 13.5) and maintenance activities (Section 13.6) that will result in energy / water savings for all the buildings.

## 13.1 LIGHTING AND ELECTRICAL

**Light Switches** – Place signs or stickers adjacent to switches to remind occupants to shut off switches when leaving rooms unoccupied. Occupancy sensors can be provided to shut off lights automatically when not in use. Timers can also be used in a similar fashion.

**Fluorescent Lighting Systems** – T12 lights should be upgraded to premium T8 or T5 electronic ballasts and lamps. This may be done when current T12 ballasts need replacement or in a planned retrofit program. T12 light fixtures will become obsolete by 2010. Use cold-weather rated ballasts for retrofits in areas where the temperature is below 15°C (59°F). When selecting T8 electronic ballasts, please refer to Manitoba Hydro's Power Smart Lighting program for current listings of eligible ballasts. Contact Manitoba Hydro for details.

**EXIT Signs** – Replace all incandescent exit signs with 3W LED signs.

**Incandescent Bulbs** – All incandescent bulbs should be converted to compact fluorescents. Compact fluorescent bulbs last approximately 10 times longer than incandescents and save up to 75% of the energy costs.

**Exterior Lights** – Compact fluorescent bulbs do not function at low temperatures, therefore, the exterior lights should be replaced with high-pressure sodium lighting. High-pressure sodium lights are the most energy efficient type of lighting available today. Savings of approximately 50% would result from replacing exterior incandescent fixtures with these high-pressure sodium lights. Photo cells should be considered for automatically shutting off outdoor lights during day light conditions.

**Parking Lot Controllers** – Parking lot controllers save energy by automatically adjusting the power at the car plugs depending on the outside temperature.

**Motors –** When installing new motors, consider using premium efficiency as opposed to standard efficiency motors.

**Other Recommendations** - Dispose of all fluorescent lamps and ballasts through a recycling company to reduce toxins entering the landfills.

Refer to Appendix D for a list of Manitoba Hydro's Power Smart incentives and listings of other incentive programs.

## 13.2 BUILDING ENVELOPE

**Window/Door Infiltration –** Seal drafts on windows and doors. This can be done by installing or upgrading weather-stripping, or with removable silicone caulking such as “Draft Stop” or “Peel and Seal” around the frames. Doors with high usage should be inspected twice per year for damaged weather stripping.

**Window/Door Replacement** – Windows and doors with low R-values should be considered for replacement. Manitoba Hydro offers incentives for new windows.

**Wall / Roof Insulation** – The wall insulation in older buildings typically has a resistance of R-12 or less. Large energy savings would result from upgrading this insulation to R-20. Similarly, roof insulation should be upgraded to R40. In addition to the energy savings, upgrading insulation also extends the life of a building by avoiding the rotting of wood framing from the development of mould and mildew in the walls. Vapour barriers in walls can also be upgraded at the same time to reduce infiltration. Upgrading insulation is typically quite costly. When this is done, more insulation will pay dividends in the future.

**Electrical Outlets** – Install draft-reducing foam pads in all electrical receptacles.

## 13.3 HEATING, VENTILATION, AND AIR CONDITIONING

**Temperature Control** – Use programmable electronic thermostats where appropriate. Use the recommended “set-back” and “set forward” temperatures during unoccupied periods. A 6°C “set-back” over a 12 hour period can reduce heating costs by 8%. Reduce room temperature at night in the winter to as low as comfort conditions permit (typically 15°C in occupied buildings) and 10°C in unoccupied buildings). Terminate ventilation during un-occupied periods.

**Furnaces –** Replace standard efficiency furnaces with premium efficiency furnaces. Old standard efficiency furnaces can be as low as 60% efficient. Replacing these with 95% efficient furnaces would save 35% of the annual energy consumed for heating.

**Air Conditioning** – Reduce the cooling load on the air conditioner by keeping the facility a few degrees warmer and using fans at workstations to augment cooling of personnel. Provide an economizer to supply “free cooling” when it is cool outside and air conditioning is required.

Remove or insulate wall or window-mounted air conditioners for the winter season.

When replacing condensing units or rooftop units, install high efficiency units.

**$CO_2$ Sensors** – Install $CO_2$ sensors to control ventilation. $CO_2$ sensors monitor the level of carbon dioxide in the air. Once the level exceeds an accepted limit, the ventilation system will turn on. This will ensure that the room is ventilated only when required and will thus save in energy required for heating and/or cooling.

**Vehicle Emission Sensors** – For garages and fire halls, a vehicle emission sensor will monitor the level of vehicle emissions in the air and could be set up to control the ventilation such that

the room is ventilated only when required. This is an energy saving feature and provides increased safety for occupants.

**Motorized Dampers** – Backdraft dampers on intake and exhaust ducts are often leaky and let cold air into the building on windy days. Insulated motorized dampers provide a better seal when they are closed and drastically reduce the cold air infiltration into the building throughout the winter.

**Heating Recovery Ventilators (HRVs)** – An HRV moves stale contaminated air from inside the building to outside while at the same time it draws fresh air from outside and distributes it throughout the building. When intake and exhaust air pass through the HRV they do not mix. In the wintertime, the air passes on either side of an aluminum heat exchange core, which transfers heat from the outgoing air to the incoming air. In the summertime, the HRV works in reverse and transfers heat from the incoming air to the exhaust air.

**Solar Wall** – Another option for pre-heating ventilation air is to install a solar wall. A solar wall is installed on the south wall of the building and uses free heating from the sun to heat the make up air. In addition, a solar wall reduces building heat losses during the winter. Heat lost to the cavity between the building and the exterior metal panels of the solar wall is captured by the incoming air and returned to the building. In summer, the solar wall is ventilated naturally thus reducing the wall temperature, which saves air conditioning energy costs.

**Geothermal Heating** - A geothermal heat pump is one of the most energy efficient heating and cooling systems available. Compared to electrical heat, a heat pump decreases energy consumption by 50 – 70%. In the wintertime, the heat pump moves heat from the earth into your building and in the summertime the heat is moved from inside the building back into the earth. Geothermal systems are most effective in arenas where they are used to make ice. The waste heat obtained from ice making can be used to heat a nearby building using little energy.

**HVAC Ductwork** – Seal duct joints with duct tape to reduce losses of heated or cooled air where the ducts traverse cold or hot areas respectively. Insulate ductwork passing through unconditioned spaces.

**Thermostat Equipped Electric Baseboard Heaters** – Mark the thermostat “normal” setting to provide a visual cue as to when they are on or set too high.

### 13.4 WATER CONSUMPTION

Excessive water usage wastes energy, increases water / sewage treatment costs and further risks damage to the environment.

**Toilet Tanks –** Install flush volume reduction devices in existing toilet tanks to reduce the quantity of water used per flush by about 25%. “Early closing flapper valves” are inexpensive and are easily installed**.**

**Toilets –** When replacing older toilets or installing new ones, use high efficiency, dual-flush volume models that use either 6 L (1.6 Imp. gal.) or 3 L (0.8 Imp. gal.) per flush. These toilets reduce water usage by over 70% compared with the traditional 13 L, and by 40% over a "low flush" 6 L toilet. Refer to the toilet and drainline reports on the Canadian Water and Wastewater Association (CWWA) website for advice in selecting a toilet that will perform well.

**Urinals** – Waterless urinals function on gravity flow and use absolutely no water. These urinals resemble conventional wall-hung urinals but do not require a water supply or a flush valve.

**Hot Water** – In facilities where large volumes of hot water are not required, set the hot water tank thermostat to 55°C (131°F). A reduction from 60°C to the recommended value of 55°C saves approximately 3% of the energy related to hot water generation. Insulate the first 2 meters (6 ft) of the cold water line and as much of the hot water distribution lines as practical, particularly where hot water lines traverse cold spaces.

**Shower Controls** – In facilities where large amounts of water are used, consider retrofitting single actuator, short cycle (adjustable), self-closing control valves, with pressure-balancing temperature controls to reduce water consumption. These controls limit flow and allow for a preset water temperature (recommended 40°C) for the showers in order to reduce water heating costs and wastage of water.

**Auto-Shut Off Fixtures** - Consider using spring loaded fixtures that automatically shut off water flow in public areas.

**Tankless Water Heaters** – Consider replacing the hot water storage tanks with instantaneous water heaters to avoid storage tank losses and save energy.

### 13.5 ICE RINKS

**Ventilate Rink** - Natural ventilation of the rink in the winter saves energy by reducing the run time of the compressors/heat pumps.

**Quality of Ice** - Ensure that the water used for flooding is pure – salts lower the freezing point of water and air in water acts like an insulation, making it harder for the glycol in the slab to freeze the top layer of the ice.

**Ice Thickness** - Keep the ice thin (1 inch thick) because excessive ice thickness increases the load on the compressor. Shaving ice helps to reduce the ice thickness and removes concentrations of impurities.

**Melt Ice Outdoors** - When shaving ice, take the ice shavings outside to be melted as opposed to melting the shavings in a heated area of the building. This will eliminate the energy consumed to melt this ice.

**High Efficiency Boilers** – Use high efficiency boilers for zamboni water heating. Annual energy savings for zamboni water heating of up to 30% can be achieved by upgrading to high efficiency boiler systems.

**Specific Gravity of Brine** - Maintain the brine at a specific gravity of 1.2 to 1.22 for optimum energy use and maintain the brine temperature as high as possible.

**Heat Recovery** - Significant amounts of energy can be saved by recovering heat from the refrigeration equipment and using it for flood water heating, space heating, domestic water heating, or ice melting.

## 13.6 MAINTENANCE

Maintenance activities are important to ensure that the equipment in a building is operating efficiently and to reduce the potential for future equipment breakdown. One option is to hire a maintenance contractor to perform inspections four times annually to clean, lubricate, test, and adjust the building's HVAC equipment.

The following is a list of HVAC maintenance procedures that should be performed two to four times annually:

### Heating/Ventilation Systems

- Change filters
- Inspect belts
- Inspect and clean heating coils
- Inspect operation of blower
- Inspect and lubricate motor and fan bearings
- Inspect and lubricate fresh air, exhaust air, and return air dampers

### Air Conditioning/Ice Plant Systems

- Clean outdoor condensers
- Clean filters
- Check refrigerant and oil levels
- Inspect ice plant and refrigerant piping for leaks
- Inspect and lubricate brine pumps
- Inspect and lubricate motorized and back draft dampers
- Inspect A/C operation and adjust as required

# 14.0 IMPLEMENTATION OF ENERGY AND WATER SAVING OPPORTUNITIES

## 14.1 IMPLEMENTATION

The energy and water saving opportunities suggested in this report range from simply changing a light bulb to installing a geothermal heating system. Some of the simpler recommended upgrades can be completed in-house while others would require hiring a contractor to complete the work. Major renovation projects will require a consulting engineer to design and help implement the upgrade. The various energy/water saving opportunities discussed throughout this report are separated into three levels of implementation: (1) in-house implementations, (2) contractor implementations, and (3) consulting engineer implementations. The following sections discuss which upgrades fall into each of these three categories.

### In-House Implementations

Some of the energy saving opportunities can be completed in-house. Replacing the incandescent light bulbs with compact fluorescent bulbs involves simply replacing the bulb and could easily be done by one of the building's maintenance personnel. Installing weather-stripping around the doors and sealing the windows could also be done in-house. For the saving opportunities that involve replacing the doors, some could be done in-house while for others, such as the vehicle doors, it is best to hire a contractor.

### Contractor Implementations

The majority of the energy saving opportunities will require a contractor. In terms of lighting, replacing the T12s with T8s involves replacing the ballast as well as the bulbs. An electrician should be hired to complete this function. Replacing the exterior incandescent lights with high-pressure sodium lights and replacing the exit incandescent lamps with LED modules involve replacing the fixture and will therefore require an electrician.

Upgrades on a building's envelope not mentioned in the "In-House Implementations" section should be done by a contractor. This includes replacing windows and vehicle doors, and upgrading the wall and/or roof insulation.

In terms of HVAC, a contractor should be hired to install programmable thermostats and motorized dampers.

Electricians should be hired to replace motors with high-efficiency motors.

For the water saving opportunities involving installing water efficient fixtures, a contractor will likely be required. Insulating the hot water tank, and installing an instantaneous water heater will also require a contractor.

**Consulting Engineer Implementations**

The only energy saving opportunities for the Town of Swan River that require a consultant to implement is the geothermal heating system in the Town Garage and the solar wall for the Water Treatment Plant. The geothermal heating system will require a detailed site investigation, bore hole testing, and energy modeling of the building to properly size the geothermal system.

Consulting services should also be considered for any major upgrades to building and services.

## 14.2 FINANCING

There are several incentive programs listed in Appendix D of this report that will help finance the implementation of the energy and water saving opportunities. In the "Energy Saving Opportunity" tables throughout this report, the capital costs are listed both with and without incentives. The incentives in these tables are from Manitoba Hydro's Power Smart Incentives and apply to energy efficient lighting and windows, wall insulation upgrades, and geothermal heating systems. For more information on these incentives, contact your local Manitoba Hydro Energy Services Coordinator or the contact listed in Table D.1.

Table D.2 lists other incentive programs that are available for energy saving upgrades. These programs are:

- Energy Innovators Initiative: Energy Retrofit Assistance (ERA)
- Municipal Rural Infrastructure Fund (MRIF)
- Renewable Energy Development Initiative (REDI)

- Community Places Program
- Sustainable Development Innovations Fund (SDIF)

For further information on these programs refer to the website listed in the table.

Members of the Association of Manitoba Municipalities also have the option of purchasing products and services in bulk at reduced prices through the Municipality Trading Company of Manitoba Limited. Details of this can be found in Appendix G of this report.

## 14.3 POLITICAL FRAMEWORK

### General Municipal Environment in Manitoba

In Manitoba, municipal elections are set every 4 years. The next municipal election will be in October 2006, which may mean that some councils will see a change in members. However, we do not expect this to have a major impact on the plans to implement the recommendations of this report.

There are currently no Provincial or Federal targets or goals set that municipalities must achieve. 'Green Projects' have become common in Manitoba and often programs like the Municipal Rural Infrastructure Fund (MRIF) targets such projects. Details of this program are included in Appendix D of this report. Manitoba has been a leader in energy efficiency and many municipalities have partnered with other levels of government and companies like Manitoba Hydro on innovative projects. We believe the MMEP project is an excellent example of an innovative project and believe all of the participating communities are receptive to innovative ideas because they have agreed to participate.

A recent trend in municipal government has been toward longer-term planning. This is seen with the recent changes to the provincial Planning Act and the requirements for community sustainability plans in the New Deal agreement. The recommendations in this report certainly complement this direction.

**Political Environment in Swan River**

The Town of Swan River has several plans for new facilities in the future. The knowledge gained from this efficiency study will therefore be useful in future development projects. The following projects are expected to occur in Swan River the near future:

- The construction of a new Municipal Office to replace the existing building. The existing Municipal Office is outdated and too small. This project is likely to take place in 5 years.
- A new Wellness Centre is in the early planning stage but likely won't proceed for a few years.
- Cochrane Engineering is completing a study into the expansion of their wastewater treatment system including a new lagoon or a new wastewater treatment plant.

The saving opportunities discussed throughout this report can be implemented into these new projects, resulting in energy and water efficient buildings.

The Chief Administrative Officer of Swan River expressed a great deal of interest in this study and in implementing some of the more cost-effective measures in the coming year. The Town has already shown its interest in building environmentally friendly infrastructure. This was evident in the upgrades made to the Water Treatment Plant, the Library, and the installation of heat recovery ventilators in the Municipal Administration Building, the Town Garage, the Arena, and the Library.

A potential barrier that could affect the implementation of the opportunities discussed throughout this report is a change in council members. It is important that the information gained here be passed on as new members enter the council and current members leave.

# 15.0 PERFORMANCE VERIFICATION

Following the implementation of the recommended energy and water saving opportunities, it is important to continuously monitor the annual energy consumption to keep a record of the resulting energy savings.

Appendix F contains a spreadsheet and graph for each of the buildings audited. These spreadsheets should be used as a tool to monitor the energy consumption on a monthly basis. The first five columns in each spreadsheet are for year 2004-2005 and have already been completed.

Following the implementation of the measures discussed in this report, the energy consumption should be recorded. The year headings may need to be re-entered, depending on when the implementations are completed. The monthly electrical energy consumption in kWh taken from the building's electricity bill should be recorded in the "Billed Elec. Energy" column and the monthly gas consumption in $m^3$ should be recorded in the "Billed Natural Gas" column. The monthly energy consumption for heating depends on the outdoor temperatures for that month. The "Billed Energy Consumption" is therefore normalized to the year 2004-2005 such that a fair comparison can be made.

The normalized energy consumption is determined as follows:

$$NEC = TEC \times (\%\ Energy\ Used\ \ for\ Heating) \times \left( \frac{HDD(present)}{HDD(2004-2005)} \right) + TEC \times (1 - \%\ Energy\ Used\ \ for\ Heating)$$

Where *NEC* is the Energy Normalized to year 2004-2005, *TEC* is the total energy consumption and *HDD* is the heating degree-days.

The heating degree-days (HDD) for a given day are the number of Celsius degrees that the mean temperature is below 18°C. This data can be found for Swan River on the following website:

http://www.climate.weatheroffice.ec.gc.ca/climateData/dailydata_e.html?timeframe=2&Prov=CA&StationID=10188&Year=2005&Month=8&Day=29

Once the “Billed Elec Energy”, the “Billed Natural Gas”, and “HDD” columns are filled in, the “Energy Normalized to 2004-2005” column is automatically calculated and the graph is updated. From this graph, the energy consumption can be monitored on a monthly basis to ensure that the upgrades are resulting in a reduction in energy consumption.

# 16.0 WATER DISTRIBUTION AND WASTEWATER COLLECTION AUDIT

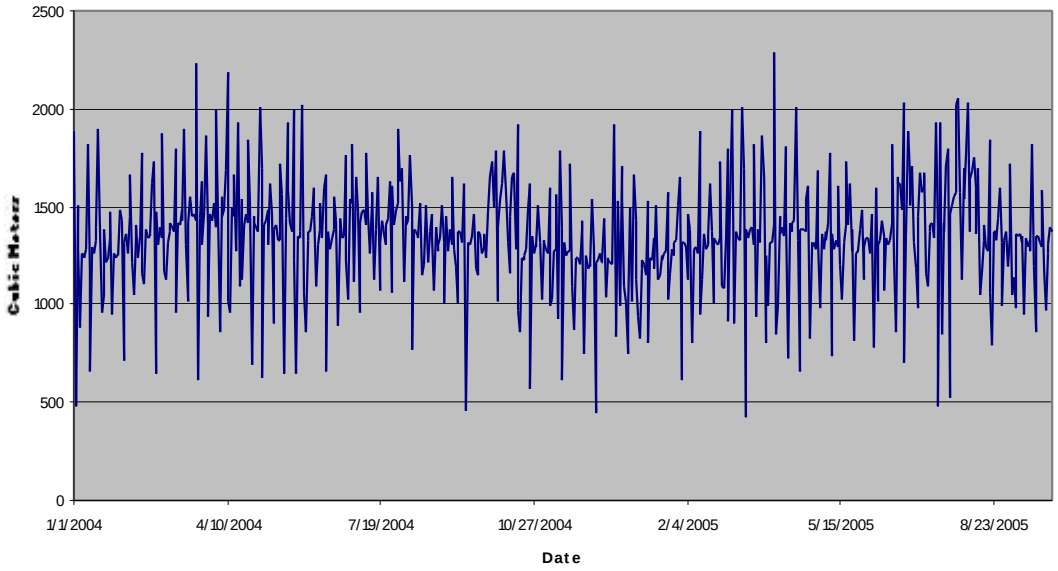
## 16.1 WATER DISTRIBUTION SYSTEM OVERVIEW

The Town of Swan River constructed a water treatment and distribution system in 1974, with an original design capacity of 30 L/s for the water treatment plant. The water treatment plant went through a major upgrade in 2002.

The raw water pump house pumps water to the water treatment plant where it is treated by manganese green sand filtration, iron sequestration, and final chlorination. After treatment, fluoride is added to the water in the form of hydrofloursilicic acid. Based on data provided, the average amount of water entering the distribution system at the water treatment plant for the period from January 2004 through September 2005 was approximately 1,347 $m^3$ per day with a maximum day flow of approximately 1,821 $m^3$. From this data, the average water produced per capita is approximately 334.1 Lpcd.

Chart 1 shows the amount of treated water entering the distribution system on a daily basis for the period from January 2004 through September 2005.

**Chart 1 Daily Water Production**



Water is stored in two reservoirs located at the water treatment plant. The larger reservoir has a storage capacity of approximately 2,273 $m^3$, while the smaller reservoir has a storage capacity of approximately 1,137 $m^3$. According to operation staff, the reservoirs usually work in series, but the Town does have the ability to bypass either one or all of the reservoirs if needed for maintenance.

The original distribution system was built at the same time as the water treatment plant, in 1974. According to information provided, the distribution system is approximately 39,469 m (129,490 ft) in length. Table 18 lists the type and length of piping used in the water distribution system.

**Table 18 Distribution System Piping**

| Type of Pipe | Length (m) |
|---|---|
| Cast Iron | 12,375 |
| PVC C-900 | 10,317 |
| Asbestos Concrete | 14,079 |
| Ductile Iron (Bell-Tite) | 2,697 |

Table 19 lists the amount of water consumed through metered use, as well as the amount of water entering the distribution system, the amount of water used for backwashing, and the amount of raw water entering the plant, based on information received from operation staff, on a quarterly basis.

**Table 19 Water Consumption and Production by Quarter**

| Quarter Ending | Water Consumption ($m^3$) | Water Distribution ($m^3$) | Backwash Water ($m^3$) | Raw Water Intake ($m^3$) |
|---|---|---|---|---|
| April 1, 2004 | 98,612 | 121,973 | 5,377 | 133,503 |
| July 1, 2004 | 106,513 | 127,111 | 5,915 | 137,113 |
| October 1, 2004 | 105,936 | 127,013 | 6,573 | 139,511 |
| January 1, 2005 | 81,281 | 118,035 | 5,439 | 127,416 |
| April 1, 2005 | 88,623 | 115,925 | 6,286 | 126,097 |
| July 1, 2005 | 111,117 | 123,324 | 6,090 | 132,984 |
| October 1, 2005 | 123,286 | 127,351 | 6,212 | 138,316 |
| **Total** | 715,369 | 860,732 | 41,892 | 934,940 |

The chemical use per quarter for the period from January 2004 through September 2005 is listed in Table 20.

**Table 20 Chemical Use Per Quarter**

| Quarter Ending | Chlorine (lbs) | Calgon C-5 (lbs) | KMNO4 (kg) | Fluoride (lbs) |
|---|---|---|---|---|
| April 1, 2004 | 1,232 | 876.5 | 300 | 1,138.5 |
| July 1, 2004 | 1,290 | 704.5 | 250 | 1,216.5 |
| October 1, 2004 | 1,260 | 881 | 300 | 979.5 |
| January 1, 2005 | 984 | 861 | 350 | 983.5 |
| April 1, 2005 | 1,084.5 | 721 | 325 | 1,144 |
| July 1, 2005 | 1,279 | 641.5 | 325 | 1,153 |
| October 1, 2005 | 1,272.5 | 620 | 250 | 1,187 |
| **Total** | 8,402 | 5,305.5 | 2,100 | 7,802 |

The cost of electricity at the raw water pump house and the water treatment plant per quarter for the period from January 2004 through September 2005 is listed in Table 21.

**Table 21 Cost of Electricity Per Quarter**

| Quarter Ending | Wells | Water Treatment Plant |
|---|---|---|
| April 1, 2004 | $1,255.94 | $3,170.18 |
| July 1, 2004 | $1,387.73 | $3,729.90 |
| October 1, 2004 | $1,341.14 | $3,518.26 |
| January 1, 2005 | $1,302.67 | $3,771.55 |
| April 1, 2005 | $1,387.03 | $3,534.32 |
| July 1, 2005 | $1,412.71 | $3,686.13 |
| October 1, 2005 | $1,457.88 | $3,705.80 |
| **Total** | $9,545.09 | $25,116.14 |

The annual operating and maintenance costs for the water treatment and distribution system vary depending on the number of breaks in the system and the time of year in which these breaks occur. The Town spends approximately $15,000 annually on chemicals used to treat the water, such as chlorine gas, potassium permanganate, hydrofloursilicic acid, and Calgon C-5. Table 22 lists the annual operation and maintenance costs for the system, including chemical costs.

**Table 22 Annual Operation and Maintenance Costs**

| Year | Cost |
|---|---|
| 1996 | $121,593.03 |
| 1997 | $95,490.26 |
| 1998 | $83,869.66 |
| 1999 | $114,870.75 |
| 2000 | $64,500.97 |
| 2001 | $75,250.52 |
| 2002 | $98,257.46 |
| 2003 | $102,632.64 |
| 2004 | $70,170.29 |

From Table 22, the average annual cost for operation and maintenance of the water treatment and distribution systems is approximately $92,000 per year.

Combining all of this data, the cost associated with the Town of Swan River's unaccounted-for water loss can be calculated, as shown in Table 23.

**Table 23 Unaccounted-For Water Loss Cost**

| Unaccounted-For Water Loss (m3) | |
|---|---|
| | January 2004 - September 2005 |
| Total Water Produced | 860,732 |
| Total Water Sold | 715,369 |
| Authorized Unmetered Water Use[1] | 9,092 |
| Meter Inaccuracies[2] | 23,649 |
| Total Unaccounted-For Water Loss | 112,622 |
| Percent Unaccounted-For Water Loss | 13.1% |
| Unit Cost per Cubic Meter[3] | $0.168 |
| Cost of Unaccounted-For Water Loss | $18,920.55 |

[1] Based on information obtained from operation staff that indicated approximately 2,000,000 imperial gallons of water are used annually for authorized non-metered purposes, such as main flushing.
[2] Based on the probable amount of water loss estimated using typical accuracy figures published by the American Water and Wastewater Association (AWWA) journal for meters with plastic components that are 10 years old.
[3] Based on the operation and maintenance costs from 2004 and using the average operation and maintenance costs of $92,000 per year for 2005.

Based on information provided, the Town lost approximately $18,900 due to unaccounted-for water loss over the period from January 2004 through September 2005. This loss corresponds to an annual loss of approximately $10,800. This amount may not be completely accurate, since the error on the distribution meter was unknown, and the overall error on the client water meters was estimated. If the distribution water meter did not have an accuracy of 100%, the

value for the amount of water produced would be higher, yielding a larger value for the total unaccounted-for water loss, and thus a higher cost for this loss. If, on the other hand, it was found that the client water meters were more accurate than the typical 10-year-old water meter with plastic components, the value for the amount of water sold would increase, thus decreasing the amount of unaccounted-for water loss and the associated cost of this loss.

**Water Meters**

An Endress & Hauser Promag W water meter measures the amount of raw water that enters the water treatment plant. There is an Endress and Hauser Promag 53 water meter that measures the amount of water used during filter backwashing, and a magnetic water meter used to measure the amount of water entering the distribution system.

Data provided shows that there are currently 1,541 water meters located throughout the distribution system that measure water consumption on a per client basis. According to operation staff, approximately half of the water meters have been changed out in the last 10 years. Table 24 shows the client water meter breakdown by size of the meter.

**Table 24 Water Meter Breakdown by Size**

| Meter Size | 5/8" | 3/4" | 1" | 1/5" | 2" | 3" | Total |
|---|---|---|---|---|---|---|---|
| Number of Meters | 1451 | 26 | 29 | 27 | 5 | 3 | 1541 |

**Pumps**

There are three raw water pumps located in the raw water pump house that draw water into the treatment plant. The backwash pump and the three distribution pumps are located within the water treatment plant. Table 25 lists the relevant available pump data for the water treatment and distribution system.

**Table 25 Water Pump Data**

| Function | Motor Size (hp) | Pump/Motor Manufacturer |
|---|---|---|
| Backwash Pump | 10 | U.S. Motors |
| Distribution Pump 1 | 30 | Peerless |
| Distribution Pump 2 | 25 | U.S. Motors |
| Distribution Pump 3 | 25 | U.S. Motors |
| Raw Water Pump 1 | 15 | Pleuger |
| Raw Water Pump 2 | 15 | Pleuger |
| Raw Water Pump 3 | NR | Grundfos |

### Water Rates

Based on information provided, meters are read and clients are charged for water usage quarterly. The billing rate for water is $5.50 per 1,000 imperial gallons, or approximately $1.21 per cubic meter of water consumed.

### Maintenance Programs

According to operation staff, the Town actively replaces between 152.4 and 304.8 m (500 and 1,000 ft) of distribution piping per year, depending on budgets and priorities. The Town currently installs PVC C-900 piping whenever it replaces any distribution piping. Also, the water treatment plant facility and equipment are inspected daily when the daily water meter reading is taken. Any problems that arise are dealt with as soon as possible.

Table 26 lists the number of breaks per year for the past 5 years. The system averages just over 4 breaks per year over these five years.

**Table 26 Water Main Breaks Per Year**

| Year | Number of Breaks |
|---|---|
| 2005 | 2 |
| 2004 | 4 |
| 2003 | 8 |
| 2002 | 6 |
| 2001 | 2 |
| 2000 | 4 |

For a more detailed look at the main breaks over the period of the water audit, Table 27 lists the location where main breaks have occurred and the dates when they occurred over the period from January 2004 through September 2005.

**Table 27 Water Main Break Information**

| Location | Date |
|---|---|
| 900 Main Street | March 22, 2004 |
| 312 Heyes Street East | April 19, 2004 |
| MH 358 Heyes Street East | July 23, 2004 |
| 804 Main Street | August 3, 2004 |
| 612 Main Street | July 25, 2005 |
| 900 Main Street | June 20, 2005 |

Client water meters are replaced as required. Data provided indicates that many meters were replaced over the past 5 years as the Town moved to using meters with remote readouts. The accuracy of the meters, however, is only evaluated if a problem is detected, and there is no formal program for testing meter accuracy.

## 16.2 WATER DISTRIBUTION SYSTEM AUDIT RESULTS

In general, community water rates should be set at a level that covers the cost of supplying water to clients including treating the water, distributing the water, maintaining the treatment and distribution systems, and replacing key pumping and process equipment. However, reducing the amount of water lost can have an impact on the overall cost of water treatment.

By reducing water loss, the Town will realize savings through reduced chemical costs related to treating the water, and reduced electrical costs associated with a reduction in the amount of pumping required to supply the water. Over a long-term prospect, the overall life of the facility and major process components can be extended, reducing the replacement frequency and equipment maintenance requirements.

A program for checking client water meter accuracy can also increase revenues for the Town by ensuring that customers are being billed for the actual amount of water they use. This program will not actually change the amount of water a client uses, it simply allows the Town to bill for

the correct amount and recover production costs that would otherwise be attributed to unaccounted-for water loss.

### 16.2.1 Unaccounted-For Water Loss

As calculated from the data supplied by the Town of Spring Valley, the Town has an unaccounted-for water loss of approximately 13.1% over the period from January 2004 through September 2005, based on the amount of water entering the distribution system and the amount of water consumed by clients.

There are several factors that could account for this water loss:

**Leakage**

Every distribution system experiences some amount of leakage. According to Environment Canada, municipalities that have an unaccounted-for water loss exceeding 10 to 15 percent find that a leak detection program is cost-effective. Environment Canada goes on to report that some studies have shown that for every $1.00 spent in communities with leak detection programs, up to $3.00 can be saved. Since Spring Valley is on the cusp of the 10 to 15 percent range, it is recommended that the Town develop a leak detection program for use in the near future.

**Meter Accuracy**

It is important to check not only client water meters, but the water meter at the treatment plant as well. If the production water meter is inaccurate, the Town will not have reliable data on the amount of water it is treating and sending to the distribution system. This can lead to problems when trying to assess the amount of unaccounted-for water leaving the system, as more water would be leaving the system than would actually be recorded.

As for the client water meters, ensuring client water meters are accurate will increase revenues for the Town if these meters had previously been under reading, since clients will be paying for the actual amount of water used. Accurate client meters will also allow the Town to better assess the amount of unaccounted-for water leaving the system, since water that would be

unaccounted-for if the meters were inaccurate would actually be included in water consumption data.

If the Town is not fully aware of the amount of water lost from the system, it is much more difficult to develop a leakage prevention program.

**Other**

Other sources of unaccounted-for water loss include water main breaks and water main flushing. It is recommended that the Town keep track of the estimates on the amount of water lost when breaks or flushing occur. This will increase the accuracy of any water audit performed in the future.

### 16.2.2 Maintenance Program

As mentioned before, it is important to check not only client water meters, but the water meters at the treatment plant as well. If the production water meter is inaccurate, the Town will not have reliable data on the amount of water it is treating. This can lead to problems when trying to assess the amount of unaccounted-for water leaving the system, as more water will be leaving the system than is actually recorded.

As for the client water meters, ensuring they are accurate will increase revenues for the Town since clients will be paying for the actual amount of water used. Accurate client meters will also allow the Town to better assess the amount of unaccounted-for water leaving the system, since water that would be unaccounted-for if the meters were inaccurate would actually be included in water consumption data. The average accuracy of a 5-year-old water meter with plastic components, according to an article published in the American Water and Wastewater Association (AWWA) journal, is approximately 98.3%. Since the Town replaced many of the client water meters within the past 5 years to accommodate remote readouts, it is assumed that they are measuring water consumption quite accurately. It is recommended that the Town develop a program for determining the accuracy of client water meters in the future to ensure water consumption records remain accurate.

Since the Town is not fully aware of the amount of water lost from the system, it is much more difficult to develop a leakage prevention program.

**Possible Cost Savings**

According to information received, the Town of Swan River's water treatment and distribution system appears to be run fairly efficiently. Although it is possible for the Town to reduce the amount of unaccounted-for water loss in the system, Swan River's unaccounted for water loss of 13.1% falls in the 10-15% range where a leakage detection and prevention program may not be economically advisable.

Approximately 4.9% of the water processed at the water treatment plant is used for backwashing the filters. This value falls within the accepted range of 1-6%, so minimal savings would be expected from changing the backwash procedure. However, the backwashing procedure could still be fine-tuned and inspected to ensure that it is optimized.

## 16.3 WASTEWATER COLLECTION SYSTEM OVERVIEW

The Town of Swan River constructed a sewage collection and treatment system in the 1950s. The collection system is approximately 32,981 m in length. According to data provided, there are 370 manholes located throughout the collection system, which allow access for any maintenance that is required. The type of piping used in the collection system is given in Table 28.

**Table 28 Wastewater Collection Piping**

| Type | Length (m) |
|---|---|
| Clay Pipe | 12,085 |
| Concrete Pipe | 5,657 |
| Cast Iron Pipe | 198 |
| PVC SDR35 | 14,945 |
| HDPE | 96 |

There are four minor lift stations throughout the collection system. These lift stations are located on Elm Street, Dixie Road, Heyes Street, and 6$^{th}$ Avenue North. These four lift stations

pump collected wastewater to the main lift station located on Ross Street. The Ross Street lift station then pumps the wastewater to the Town's lagoon.

The current lagoon has a capacity of 307,875 $m^3$, but according to data received, the Town is currently in the process of doing a study to determine their options for upgrading or replacing the lagoon system. According to operation staff, the options that are available to the Town are constructing either a new lagoon, or a mechanical/biological plant.

The sewage collection system is for sanitary sewer flow only. Storm water is diverted through a separate system; however, there are many weeping tile systems that do discharge into the sanitary sewer system. According to operation staff, weeping tiles can no longer be connected to the sanitary sewer system.

The average annual cost of operating and maintaining the collection and treatment system is $75,000. Of this $75,000, approximately $15,000 is spent on cleaning and televising the sewer system, and $50,000 is spent on repairing any breaks that may occur in the system.

**Pumps**

All of the sewage collection and treatment system pumps are located within their respective lift stations. Table 29 provides the available relevant pump data.

**Table 29 Lift Station Pump Data**

| Function | Motor Size (hp) | Manufacturer |
|---|---|---|
| Ross Street SLS Pump 1 | 30 | Crane Demming |
| Ross Street SLS Pump 2 | 30 | BCP Ltd. |
| 6th Avenue SLS Pump 1 | 5 | BBC Brown |
| 6th Avenue SLS Pump 2 | 5 | BBC Brown |
| Dixie Road SLS Pump 1 | 5 | Flygt |
| Dixie Road SLS Pump 2 | 5 | Flygt |
| Heyes Street SLS Pump 1 | 5 | Powerbloc Leroy |
| Heyes Street SLS Pump 2 | 5 | BBC Brown |
| Elm Street SLS Pump 1 | 15 | Morris |
| Elm Street SLS Pump 2 | 15 | Morris |

**Sewer Rates**

Sewage rates are included in the quarterly water bills. The rate structure is given in Table 23 in the Water Distribution System Overview.

**Maintenance Programs**

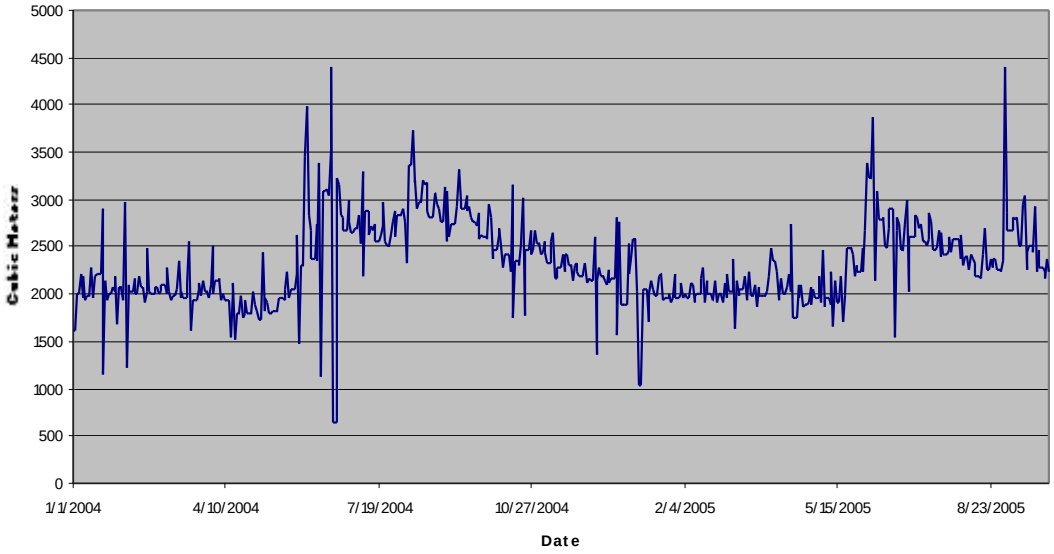
Approximately one third of the sewer is flushed per year, meaning that the entire system is flushed every 3 years. Also, sewer lines are replaced at the same time as the water lines. When sewer lines are replaced, the Town installs SDR 35 PVC piping.

## 16.4 SEWER SYSTEM AUDIT RESULTS

Since Swan River operates a sewer system that is not designed to collect storm water or runoff, it is expected that there will not be a large discrepancy in the volume of water pumped to the lagoon over the course of a year. Some infiltration and inflow should be expected, since, as mentioned in the water audit section, all systems are prone to at least some amount of leakage. These infiltration and inflow variations will be caused by problems such as precipitation entering the system through manholes, and groundwater entering the system through leaks in the piping.

Since all of the wastewater flows through the Ross Street lift station, the total volume of wastewater flowing through the system was estimated as the amount of wastewater flowing through the Ross Street lift station. Chart 2 shows the daily flow of wastewater through the Ross Street lift station for the period from January 2004 through September 2005. For weekends where no data was recorded, Monday's volume reading was averaged over three days to include both Saturday and Sunday, as well as Monday.

**Chart 2 Daily Wastewater Flows**




As can be seen in Chart 2, the system experienced a minor increase in flow around June and July in both 2004 and 2005. From this result, it can be assumed that the sewer system is experiencing some inflow and infiltration. The total infiltration and inflow for the Town of Swan River, as calculated from the data provided, is approximately 406.2 l/cm•km•day (liters per centimeter of equivalent pipe diameter per kilometer of pipe in the collection system per day). Published data states that there is a normal permissible limit of 1,394 l/cm•km•day of infiltration and inflow that can normally be expected from typical groundwater infiltration sources. If a system is below this value of 1,394, then normal infiltration and inflow reduction methods tend to cost more to implement than they save in pumping and treatment costs. Since Swan River's inflow and infiltration rate is less than the 1,394 value, infiltration and inflow reduction methods will not likely be cost effective.

**Maintenance Program**

The Town may wish to start a scheduled maintenance program, such as actively replacing old pipe, to help minimize potential problems with the sewer system and to spread out the cost of repairing and replacing old piping.

Routine maintenance should be conducted on lift station pumps to inspect, remove blockages, check wear, etc. It is easier and cheaper to replace the impellers of a pump than continue pumping at a reduced rate for an extended period of time.

## 16.5 PUBLIC EDUCATION

Providing public education will create a better understanding of the water and wastewater treatment systems. If residents are aware of the processes and costs involved with treating and distributing drinking water and collecting and treating sewage, they will be more accepting of cost reduction efforts. A program that highlights the environmental and monetary benefits of water use reduction can help the community gain support for initiatives such as installing water meters, low flush toilets, or water saving shower heads; fixing leaky taps and toilets; only watering lawns once per week; and using drip irrigation for trees and shrubs.

### Recommendations

It is recommended that the Town:

- Develop a program for assessing the accuracy of client water meters in the future to ensure the Town's water consumption data remains accurate.
- Develop a program for scheduled leak detection of the water distribution system.
- Estimate the amount of water lost due to water main breaks, or flushing of the system.
- Continue determining the annual unaccounted-for water loss percentage to determine when a leakage prevention program would be justified.
- Develop a routine maintenance program for the lift station pumps to ensure they continue to work at an efficient level.
- Provide public education as discussed in Section 16.5.

# APPENDIX A

# INVENTORY SHEETS

# TABLE OF CONTENTS – APPENDIX A

# BUILDING INSPECTION INVENTORY
**Revision 2**

| | | |
|---|---|---|
| **Municipality: Swan River** | | **Date: April 11, 2006** |
| **Toured By: Ray Bodnar, Lawrence Hart** | | **Construction Date: 1940s** |
| **Building: Municipal Administration Building** | | **Renovations: Some wall insulation added on main floor and in basement.** |
| **Address: 135 – 5th Avenue North** | | |
| **L x W x H: 80' x 50' x 12'** | **Area: 4,000 ft$^2$ (371.61 m$^2$)** | |
| **Building Capacity: 6** | | |
| **Building Floor Plan: Office and council chambers on main floor, basement is for file storage and 1 office.** | | **Occupied Times: Monday-Friday, 8:30am – 4:30pm** |

| **ARCHITECHTURAL/STRUCTURAL** |
|---|
| **Wall type/R-value:** Masonry exterior with drywall inside. 6" walls. |
| **Roof Type/R-value:** Flat tar and gravel roof, approx R-12. |
| **Door Type/weather stripping:** Back door needs stripping (1), side door has poor stripping (1), front doors need stripping (2). |
| **Window type/caulking:** 3 pane 1985 windows in good shape on main floor. Old 2 pane windows in basement (34" x 28" – 3). Window caulking is good. |
| **Other:** |
| **MECHANICAL** |
| **Heating System:** Electric baseboards and forceflow heaters. Note – 2 roof exhaust fans. |
| **Cooling System:** Window A/Cs in offices. 1 3 ton RTU for main office, approx 6 yrs old c/w economizer. |
| **Ventilation System:** Exhaust fan in council chamber and in washrooms. HRV for offices. Exhaust fan in basement c/w BDD. |
| **HVAC Controls**: Standard stats on all baseboards. 1 Heat/Cool for RTU. No timer on HRV, runs continuously. |
| **HVAC Maintenance/Training:** |
| **Water Supply System:** |
| **Domestic Hot Water System:** 175 Litre electric water tank. No pipe insulation. |
| **Water Fixtures:** 3 sinks, 3 toilets – high flow. |

| ELECTRICAL |
| --- |
| **Indoor Lighting:** 4' x 2 T12s (40W) – 70.  5 – 100W Incandescents. |
| **Outdoor Lighting**: 6 Flood lights, 2 incandescents, 1 back light hps on photocell. |
| **Exit Signs**: Good ones |
| **Motors**: |
| **Parking Lot Plugs**: 2 |
| **OTHER BUILDING SYSTEMS** |
| |
| **PROCESS SYSTEMS** |
| |
| **BUILDING SERVICES (Hydro, Gas, Oil, Water, etc.)** |
| |
| **NOTES** |
| |

# BUILDING INSPECTION INVENTORY
**Revision 2**

| | | |
|---|---|---|
| **Municipality: Swan River** | | **Date: April 11, 2006** |
| **Toured By: Ray Bodnar, Kelly Filipchuck** | | **Construction Date: 1974** |
| **Building: Town Garage** | | **Renovations: Roof redone, 4" Styrofoam added.** |
| **Address: 440 Valey Road** | | |
| **L x W x H: 98' x 70' x 16'** | **Area: 6,860 ft2 (637.31 m2)** | |
| **Building Capacity: 5** | | |
| **Building Floor Plan: Vehicle storage and stock room, office on mezzanine. Vehicle maintenance.** | | **Occupied Times: 7:30 am – 4:30 pm Monday – Friday** |

| **ARCHITECHTURAL/STRUCTURAL** |
|---|
| **Wall type/R-value:** Pre-engineered building, metal walls and roof. 4" fiberglass, approx R-16. |
| **Roof Type/R-value:** 4" fiberglass + 4" Styrofoam, approx R-30. |
| **Door Type/weather stripping:** 2 -14' x 14', 1 – 12' x 14', 2 pedestrian doors. No caulking, poor stripping. |
| **Window type/caulking:** 1-3 pane window, 32" x 24" no caulking. 2 – 3 pane windows, 28" x 28" very leaky around frames. |
| **Other:** |
| **MECHANICAL** |
| **Heating System:** Electric forceflows and baseboards in office, radiant gas heaters in shop – highly rated. Ceiling fans. |
| **Cooling System:** Window A/C in office. |
| **Ventilation System:** HRV for mezzanine office c/w 24 hr timeclock. Welding hood exhaust c/w BDD intakes (1) – leaks air 18" x 18". 3 – 18" x 18" intakes with leaky BDD, 3 – exhaust ducts down to floor. |
| **HVAC Controls**: Standard stats. |
| **HVAC Maintenance/Training:** |
| **Water Supply System:** |
| **Domestic Hot Water System:** 184 Litre 3000W electric tank. No pipe insulation. |
| **Water Fixtures:** 1 toilet, 1 sink, 1 urinal – high flow. |

| ELECTRICAL |
| --- |
| **Indoor Lighting**: T8 lighting |
| **Outdoor Lighting:** |
| **Exit Signs:** None |
| **Motors:** |
| **Parking Lot Plugs:** On demand controller. |
| **OTHER BUILDING SYSTEMS** |
| Gas boiler for pressure washing. |
| **PROCESS SYSTEMS** |
| |
| **BUILDING SERVICES (Hydro, Gas, Oil, Water, etc.)** |
| |
| **NOTES** |
| |

# BUILDING INSPECTION INVENTORY
**Revision 2**

| | |
|---|---|
| **Municipality:** Swan River | **Date:** October 28, 2005 |
| **Toured By:** Darren Peel | **Construction Date:** Approximately 1974 |
| **Building:** Water Treatment Plant | **Renovations:** |
| **Address:** 1422 Ross Street | The entire facility was recently upgraded |
| **L x W x H:** See Below — **Area:** 220 m2 | |
| **Building Capacity:** | |
| **Building Floor Plan:**<br>Irregular: New building area is 16 m x 6.9 m x 6.39m (high)<br>Old building area is 10.4m x 10.5m x 3.76m (high)<br>Height of the building varies depending on area. | **Occupied Times:** |

**ARCHITECHTURAL/STRUCTURAL**

Wall type/R-value:

- Split face concrete block interior wall construction; split face brick exterior details
- Wall construction new addition: 190 mm concrete block; air/vapour barrier; 75 mm rigid insulation; 90 mm split face concrete block.

Roof Type/R-value:

- Roof construction: modified bitumen cap sheet; modified bitumen base sheet; 2-layers 3 thick recovery board; 2-layers 50 thick rigid insulation; 12.5 thick gypsum board; metal decking.

Door Type/weather stripping:

- 1 - Filter Gallery Exterior Door: 900x2150x45 thermally broken frame insulated with window.
- 1 - Existing Pump Room Exterior Door: 900x2134x45; dual window; insulated door; thermally broken frame.
- 4 - Existing Pump Rom Exterior Doors: 914x2134x45; solid insulated metal door; thermally broken frame.
- 1 – Loading Dock Overhead Door: 2530x2600 insulated steel overhead door

Window type/caulking:

- 1 – 2000x1210; dual pane; sealed window unit with anodized aluminum frame;
- 1 – 600x610; dual pane; sealed window unit pressed steel frame;
- 1 – 1016x1210; single pane tempered window unit in anodized frame.

Other:

**MECHANICAL**

Heating System:

- Veissmann Atola-ECD 180; 149 kW gross output; water glycol boiler; Max. boiler temp. 120°C; 88°C supply temp; 77°C return temp.
- Interior temperature maintained at 20°C during winter months.

Cooling System:

- None present

Ventilation System:

-

HVAC Controls:

-

HVAC Maintenance/Training:

Water Supply System:

- Domestic for Town distribution system

Domestic Hot Water System:

- N/A

Water Fixtures:

- 1" washwater hose bibb

**ELECTRICAL**

Indoor Lighting:

- 27 – high efficiency; Thomas, Vapourtite; dual lamp, 120 V overhead lighting
- 4 – 50W; Thomas Daybright CLI; 120 V units.
- 4 – existing dusl lamp fluorescent light units; standard efficiency

Outdoor Lighting:

- 8 – Exterior soffit lights; Thomas McPhilbin 986 Aisle; 50 W; 120 V units
- 5 – Exterior Wall Pak; Thomas Daybright WLD; 50W; 120 V unit
- 1 – Exterior Thomas Daybright CLI; 50 W; 120 V unit.

Exit Signs:

- None

Motors:

Parking Lot Plugs:

- None

**OTHER BUILDING SYSTEMS**

**PROCESS SYSTEMS**

**Raw Water Pumps:**

- Pump #1: 15 hp; 30 L/s; 208 V; submersible pump;
- Pump #2: 15 hp, 30 L/s, 208 V; submersible pump;
- Pump #3: 40 hp, 208 V; submersible pump.

**Main Distribution Pumps**

**Distribution Pump P1:**

- Pump: vertical turbine pump rated at 30 L/s @ 414 kPa
- 25 hp; 1770 rpm, sf 1.15, 60 hz, 575 V; 3 phase; 93% nominal efficiency; 29 amp; code G; design B; US Electric Motor; Frame 286TPA.
- Fixed speed; soft start/stop.

**Distribution Pump P2:**

- Pump: Vertical turbine pump rated at 44.2 L/s @ 414 kPa
- 30 hp; 1770 rpm, sf 1.15, 60 hz, 575 V; 3 phase; 93% nominal efficiency; 29 amp; code G; design B; US Electric Motor; Frame 286TPA.
- VFD

**Distribution Pump P3:**

- Pump: Vertical turbine pump rated at 32.6 L/s @ 414 kPa
- 30 hp; 1770 rpm, sf 1.15, 60 hz, 575 V; 3 phase; 93% nominal efficiency; 29 amp; code G; design B; US Electric Motor; Frame 286TPA.
- Fixed speed; soft start/stop.

**Backwash Pump:**

- Vertical turbine pump rated at 60 L/s
- 10 hp; 1760 rpm; sf 1.15; 60 hz, 3 phase; 9.52 A; Code G; Design B; Nominal Efficiency 90.2 %; Model B401; Frame 215 TP.
- Fixed speed; soft start/stop.

**Distribution Flow Meter:**

- Magnetic flow meter – model to be determined

**Raw Water Flow Meter:**

- E&H Promag W, magnetic flow meter.

**Backwash Flow Meter:**

- E&H Promag 53, magnetic flow meter

**Fire Pump Motor:**

- Diesel fired Cummins fire pump

**Process Valves:**

- Electrically actuated air valves throughout the water treatment plant.

**Water Disinfection:**

- Trojan UV Swift – inline ultraviolet disinfection unit

**Backwash Air Blowers:**

- Raw Backwash Blower #1 - Arzen Delta blower; 10 hp, Toshiba motor; Type 1KK; 1735 rpm; Frame 215T; 9.7 A; SF 1.15; nominal efficiency 89.5
- Blower #2 – Arzen Delta blower; 5 hp; Tyoe 1K; 575 V; 5 A; 3 phase; 1725 rpm; SF 1.15; nom. Eff. 87.5%.

**Chemical Feed Pumps:**

- 4 – LMI diaphragm pumps, 115 V.

**See attached list for complete equipment listing**

**BUILDING SERVICES (Hydro, Gas, Oil, Water, etc.)**

- Main service provided from water treatment plant

**NOTES**

- Distribution system pressure is maintained at 70 psi

# BUILDING INSPECTION INVENTORY
**Revision 2**

| | | |
|---|---|---|
| **Municipality:** Swan River | | **Date:** October 28, 2005 |
| **Toured By:** Darren Peel | | **Construction Date:** 1974 |
| **Building:** Raw Water Pumphouse | | **Renovations:** |
| **Address:** Ross Street | | Some renovations in 2002 |
| **L x W x H:** 2m x 2m | **Area:** 4 m2 | |
| **Building Capacity:** | | |
| **Building Floor Plan:**<br>Open square process floor | | **Occupied Times:**<br>Daily for approx. ½ hour |

**ARCHITECHTURAL/STRUCTURAL**

Wall type/R-value:

- 2x4 wall construction, Plywood interior, vapour barrier; insulated
- Metal clad exterior

Roof Type/R-value:

- 2x4 construction; metal clad exterior

Door Type/weather stripping:

- 36" metal, insulated, exterior door; weather stripping appeared in good shape; door sweep present

Window type/caulking:

- No widows in building

Other:

**MECHANICAL**

Heating System:

- Chromalox suspended , coil type unit heater. Wattage could not be observed. Assumed to be 3 kW
- Interior temperature maintained at 15-18°C during winter months.

Cooling System:

- 5200 BTU/hr wall mounted AC unit

Ventilation System:

- None

HVAC Controls:

-

HVAC Maintenance/Training:

Water Supply System:

- N/A

Domestic Hot Water System:

- N/A

Water Fixtures:

- N/A

**ELECTRICAL**

Indoor Lighting:

- 1 – 2 lamp high efficiency fluorescent light fixture

Outdoor Lighting:

- 1 – 70 W metal halide system above doorway

Exit Signs:

- None

Motors:

- VFD drives on well pumps

Parking Lot Plugs:

- None

**OTHER BUILDING SYSTEMS**

**PROCESS SYSTEMS**

**Need to get pump information from Swan River.**

- 1 – 40 hp, 2870 rpm, 126 max. amp; 200V, cosθ 0.88. No rated capacity noted
- 1 – 15 hp, 230 V; 42 A; 3 phase; 60 hz; 3500 rpm; S.F. 1.15; single stage submersible pump rated at 500 gpm @ 80' TDH
- 1 – 15hp, 208 V; 54 A; 60 hz; 3475 rpm; 3 phase; S.F 1.15 submersible pump. No rated capacity noted.

**BUILDING SERVICES (Hydro, Gas, Oil, Water, etc.)**

- 400A; 208 V main power supply

**NOTES**

# BUILDING INSPECTION INVENTORY
**Revision 2**

| | | |
|---|---|---|
| **Municipality:** Swan River | | **Date:** October 28, 2005 |
| **Toured By:** Darren Peel | | **Construction Date:** Approximately 1974 |
| **Building:** Lift Station #1 | | **Renovations:** |
| **Address:** 1420 Ross Street | | No significant changes in recent past |
| **L x W x H:** 4m x 8.2m | **Area**: 32.7 m2 | |
| **Building Capacity:** | | |
| **Building Floor Plan:** | | **Occupied Times:** Daily for approx. ½ hour |

**ARCHITECHTURAL/STRUCTURAL**

Wall type/R-value:

- Concrete block interior wall construction; split face brick exterior details
- Vermiculite (?) insulation blown in brick interior

Roof Type/R-value:

- Built-up tar and gravel roof construction

Door Type/weather stripping:

- 36” metal, insulated, exterior door; weather stripping appeared in good shape; door sweep present

Window type/caulking:

- No widows in building

Other:

**MECHANICAL**

Heating System:

- Chromalox suspended , coil type unit heater. Wattage could not be observed.
- Interior temperature maintained at 15-18°C during winter months.

Cooling System:

- None present

Ventilation System:

- 1 – Greenheck; ½ hp, 230V, 1725 rpm, 4.5 A, drywell ventilation fan
- 1 – Greenheck; 1/3 hp 230 V, 1725 rpm drywell ventilation fan
- 12” x 32” make-up air intake, partially clogged

HVAC Controls:

HVAC Maintenance/Training:

Water Supply System:

- Domestic for Town distribution system

Domestic Hot Water System:

- N/A

Water Fixtures:

- ¾” washwater hose bibb located in wetwell.
- No metering on hose bibb

**ELECTRICAL**

Indoor Lighting:

- 2 – 300 W incandescent lighting fixtures in main process area
- 4 – 300W incandescent fixtures in drywell area.

Outdoor Lighting:

- 1 – 70 W metal halide system above doorway

Exit Signs:

- None

Motors:

Parking Lot Plugs:

- None

**OTHER BUILDING SYSTEMS**

- Sewage effluent is metered with a Fisher Porter magnetic flow meter. Meter is suspected of being out by approximately 30%

**PROCESS SYSTEMS**

**2 – 30HP Pumps – 1 Crane Demming, 1 BCP Ltd.**

**Milltronics level control in lift station**

**On/off operation no VFD's or soft start/stop**

**BUILDING SERVICES (Hydro, Gas, Oil, Water, etc.)**

- Main service provided from water treatment plant

**NOTES**

# BUILDING INSPECTION INVENTORY
**Revision 2**

| | | |
|---|---|---|
| **Municipality:** Swan River | | **Date:** October 28, 2005 |
| **Toured By:** Darren Peel | | **Construction Date:** |
| **Building:** Lift Station #2 | | **Renovations:** |
| **Address:** 314 6th Avenue | | No significant changes in recent past |
| **L x W x H:** 10' x 10' x 10' | **Area:** 100 ft2 | |
| **Building Capacity:** | | |
| **Building Floor Plan:** | | **Occupied Times:** |
| Open process area with wetwell located beneath building | | Daily for approx. ½ hour |

**ARCHITECHTURAL/STRUCTURAL**

Wall type/R-value:

- Brick exterior and interior wall construction

Roof Type/R-value:

- Built-up tar and gravel roof construction

Door Type/weather stripping:

- 36" metal, insulated, exterior door; weather stripping appeared in good shape; no door sweep

Window type/caulking:

- 27" x 27" dual pane window; small hole in window and cracked
- 27" x 27" boarded up and insulated opening at former window location. 2 x 4 framing and plywood exterior and interior sheeting.
- 27" x 54" boarded up and insulated opening at former window location. 2 x 4 framing and plywood exterior and interior sheeting.

Other:

**MECHANICAL**

Heating System:

- 5 kW; coil type; suspended unit heater
- Temperature maintained at 15-18°C during winter months

Cooling System:

- None present

Ventilation System:

- 1 – 400W wetwell ventilation fan.

HVAC Controls:

HVAC Maintenance/Training:

Water Supply System:

- Domestic (note: no water service currently available at this location)

Domestic Hot Water System:

- N/A

Water Fixtures:

- ¾" washwater hose bibb located in drywell (not presently used).
- No metering on hose bibb

**ELECTRICAL**

Indoor Lighting:

- 2 - 60 W incandescent lighting fixtures in main process area
- 2 to 4 incandescent fixtures in wetwell area. Wattage unknown. Suspect 300W.

Outdoor Lighting:

- 1 – 70 W metal halide system above doorway

Exit Signs:

- None

Motors:

Parking Lot Plugs:

- None

**OTHER BUILDING SYSTEMS**

**PROCESS SYSTEMS**

**2 – 5hp BBC Brown pumps**

**Milltronics level control in lift station**

**On/off operation no VFD's or soft start/stop**

**BUILDING SERVICES (Hydro, Gas, Oil, Water, etc.)**

- 240V, 100 A main service

**NOTES**

# BUILDING INSPECTION INVENTORY
**Revision 2**

| | |
|---|---|
| **Municipality:** Swan River | **Date:** October 28, 2005 |
| **Toured By:** Darren Peel | **Construction Date:** Late 60's to early 70's |
| **Building:** Lift Station #3 | **Renovations:** |
| **Address:** 315 Heyes Street | No significant changes in recent past |
| **L x W x H:** 10' x 10' x 10' **Area:** 100 ft2 | |
| **Building Capacity:** | |
| **Building Floor Plan:** | **Occupied Times:** |
| Open process area with wetwell located beneath building | Daily for approx. ½ hour |

| **ARCHITECHTURAL/STRUCTURAL** |
|---|
| Wall type/R-value: |
| • Brick exterior and interior wall construction |
| Roof Type/R-value: |
| • Built-up tar and gravel roof construction |
| Door Type/weather stripping: |
| • 36" metal, insulated, exterior door; weather stripping appeared in good shape; no door sweep |
| Window type/caulking: |
| • 27" x 54" dual pane window; wood framing |
| Other: |

| **MECHANICAL** |
|---|
| Heating System: |
| • 3 kW; coil type; suspended unit heater |
| • Interior temperature maintained at 15-18°C during winter months. |
| Cooling System: |
| • None present |
| Ventilation System: |
| • Unknown but small fan located in duct. |
| HVAC Controls: |
| • |
| HVAC Maintenance/Training: |
| Water Supply System: |
| • Domestic for Town distribution system |
| Domestic Hot Water System: |
| • N/A |
| Water Fixtures: |
| • ¾" washwater hose bibb located in wetwell. |
| • No metering on hose bibb |

**ELECTRICAL**

Indoor Lighting:

- 2 - 60 W incandescent lighting fixtures in main process area
- 2 to 4 incandescent fixtures in wetwell area. Wattage unknown. Suspect 300W.

Outdoor Lighting:

- 1 – 70 W metal halide system above doorway

Exit Signs:

- None

Motors:

Parking Lot Plugs:

- None

**OTHER BUILDING SYSTEMS**

**PROCESS SYSTEMS**

**2 – 5hp pumps – Powerbloc Leroy and BBC Brown**

**Milltronics level control in lift station**

**On/off operation no VFD's or soft start/stop**

**BUILDING SERVICES (Hydro, Gas, Oil, Water, etc.)**

- 240V, 100 A main service

**NOTES**

# BUILDING INSPECTION INVENTORY
**Revision 2**

| | | |
|---|---|---|
| **Municipality:** Swan River | | **Date:** October 28, 2005 |
| **Toured By:** Darren Peel | | **Construction Date:** |
| **Building:** Sewage Lift Station #4 | | **Renovations:** |
| **Address:** 565 Elm Street (565 3rd Ave N) | | No significant changes in recent past |
| **L x W x H:** 10' x 10' x 10' | **Area:** 100 ft2 | |
| **Building Capacity:** | | |
| **Building Floor Plan:**<br>Open process area with wetwell located beneath building | | **Occupied Times:**<br>Daily for approx. ½ hour |

**ARCHITECHTURAL/STRUCTURAL**

Wall type/R-value:

- Concrete block wall construction interior wall; vermiculite blown in insulation; split face concrete block exterior.

Roof Type/R-value:

- Built-up tar and gravel roof constuction

Door Type/weather stripping:

- 36" metal, insulated, exterior door; weather stripping appeared in good shape; door sweep present and in good shape

Window type/caulking:

- No windows in building

Other:

**MECHANICAL**

Heating System:

- 5 kW; coil type; suspended unit heater
- Temperature is maintained at 15-18°C during winter months

Cooling System:

- None present

Ventilation System:

- Greenheck; ¼ hp; 1075 rpm; 7.2 A; single phase; 60 hz; supplier is E.H. Price Ltd.
- Ventilation system services drywell only. Makeup air is obtained from main floor process area.

HVAC Controls:

-

HVAC Maintenance/Training:

Water Supply System:

- Domestic water from distribution system

Domestic Hot Water System:

- N/A

Water Fixtures:

- ¾" washwater hose bibb located in drywell.
- No metering on hose bibb

**ELECTRICAL**

Indoor Lighting:

- 150 W incandescent lighting in main process area
- One or two incandescent fixtures in drywell. Wattage unknown

Outdoor Lighting:

- 1 – 70 W metal halide system above doorway

Exit Signs:

- None

Motors:

Parking Lot Plugs:

- None

**OTHER BUILDING SYSTEMS**

**PROCESS SYSTEMS**

**2 – 15 HP Morris pumps**

**BUILDING SERVICES (Hydro, Gas, Oil, Water, etc.)**

- 240V, 200 main service

**NOTES**

# BUILDING INSPECTION INVENTORY
**Revision 2**

| | | |
|---|---|---|
| **Municipality:** Swan River | | **Date:** October 28, 2005 |
| **Toured By:** Darren Peel | | **Construction Date:** |
| **Building:** Lift Station #5 | | **Renovations:** |
| **Address:** 417 Dixie Road | | No significant changes in recent past |
| **L x W x H:** 10' x 10' x 10' | **Area:** 100 ft2 | |
| **Building Capacity:** | | |
| **Building Floor Plan:** | | **Occupied Times:** |
| Open process area with wetwell located beneath building | | Daily for approx. ½ hour |

| **ARCHITECHTURAL/STRUCTURAL** |
|---|
| Wall type/R-value:<br>• Brick exterior and interior wall construction |
| Roof Type/R-value:<br>• Built-up tar and gravel roof construction |
| Door Type/weather stripping:<br>• 36" metal, insulated, exterior door; weather stripping appeared in good shape. |
| Window type/caulking:<br>• 27" x 54" dual pane window; wood framing. |
| Other: |
| **MECHANICAL** |
| Heating System:<br>• 5 kW; coil type; suspended unit heater<br>• Temperature maintained at 15-18°C during winter months |
| Cooling System:<br>• None present |
| Ventilation System:<br>• |
| HVAC Controls: |
| HVAC Maintenance/Training: |
| Water Supply System:<br>• Domestic (note: no water service currently available at this location) |
| Domestic Hot Water System:<br>• N/A |
| Water Fixtures:<br>• ¾" washwater hose bibb located in drywell (not presently used).<br>• No metering on hose bibb |

**ELECTRICAL**

Indoor Lighting:

- 2 - 60 W incandescent lighting fixtures in main process area
- 2 to 4 incandescent fixtures in wetwell area. Wattage unknown. Suspect 300W.

Outdoor Lighting:

- 1 – 70 W metal halide system above doorway

Exit Signs:

- None

Motors:

Parking Lot Plugs:

- None

**OTHER BUILDING SYSTEMS**

**PROCESS SYSTEMS**

**2 – 5hp BBC Brown pumps**

**Milltronics level control in lift station**

**On/off operation no VFD's or soft start/stop**

**BUILDING SERVICES (Hydro, Gas, Oil, Water, etc.)**

- 240V, 100 A main service

**NOTES**

# BUILDING INSPECTION INVENTORY
**Revision 2**

| | |
|---|---|
| **Municipality: Swan River** | **Date: April 11, 2006** |
| **Toured By: Ray Bodnar, Dalton Hawkins** | **Construction Date: 1967** |
| **Building: Centennial Arena** | **Renovations: Entrance addition and waiting area in 1988, locker room and offices in 1999, zamboni room and new ice plant in 2005.** |
| **Address: 221 9th Avenue North** | |
| **L x W x H: 216' x 120' + 120' x 48' + 42' x 40' + 49' x 44' + 55' x 12'.** / **Area: 36,576 ft2 (3398 m2)** | |
| **Building Capacity: 200** | |
| **Building Floor Plan: Ice rink, change rooms, concessions, viewing area, shares common entrance and offices with pool in the summer.** | **Occupied Times: August – April: 8am – Midnight, 7 days/week. 4 weekends in the summer for events.** |

| **ARCHITECHTURAL/STRUCTURAL** |
|---|
| **Wall type/R-value:** Rink is R-7 (kept at 20 F). Other areas are R-20 (kept at 70F). |
| **Roof Type/R-value: Rink is R-7.** Other areas are R-40. |
| **Door Type/weather stripping:** Some doors are new and good condition. 9 doors have no caulking and poor stripping. |
| **Window type/caulking:** Good windows to outside. There are 13 – 5' x 4' single pane plexiglass windows to view rink (puck proof). |
| **Other:** |
| **MECHANICAL** |
| **Heating System:** Electric baseboards in offices, unit heaters in changing rooms (electric), radiant gas heaters in rink used infrequently, forceflows in reception. |
| **Cooling System:** None |
| **Ventilation System:** Grease exhaust in concessions on manual switch, no mua. HRV in dressing rooms. 2 large rink exhaust fans, no intake. Zamboni room exhaust fan c/w BDD. Compressor room exhaust fan c/w BDD and motorized intake damper. |
| **HVAC Controls:** Standard stats and integral stats all over make setbacks difficult. |
| **HVAC Maintenance/Training:** Good maintenance. |
| **Water Supply System:** Town supply |
| **Domestic Hot Water System:** 2 – large electric water heaters for change rooms – 120 gallon. |
| **Water Fixtures:** 3 urinals on auto flush (continuous), 11 toilets (13.2lpf), 11 sinks, 21 showers –all very high flow. |

| ELECTRICAL |
| --- |
| **Indoor Lighting:** Several T8s in building with some compact fluorescents. T12s: 6' x 2 – 22. T12s 4' x 2 -8. Incandescents: 100W – 16, 200W – 18 in rink, 60W – 9. |
| **Outdoor Lighting:** OK |
| **Exit Signs:** New Type |
| **Motors:** |
| **Parking Lot Plugs**: 2 plugs |
| **OTHER BUILDING SYSTEMS** |
| Can use rink exhaust fans to make ice – no intakes. Dehumidifier for rink in summer. Ice dumping outside. 3 large Electric water heaters for Zamboni c/w water treatment system – 120gal (27kW), 2 – 120gal (18kW). |
| **PROCESS SYSTEMS** |
| 10HP Ice plant indoor condenser for heat reclaim.<br>25HP Brine pump high efficiency.<br>5HP Spray pump for outdoor condenser.<br>2 fan outdoor condenser. – Ice plant new in 2005.<br>Ice temperature sensor. |
| **BUILDING SERVICES (Hydro, Gas, Oil, Water, etc.)** |
| |
| **NOTES** |
| |

# BUILDING INSPECTION INVENTORY
**Revision 2**

| | | |
|---|---|---|
| **Municipality: Swan River** | | **Date: April 12, 2006** |
| **Toured By: Ray Bodnar, Dalton Hawkins** | | **Construction Date: 1973** |
| **Building: Outdoor Swimming Pool** | | **Renovations: Dressing rooms used in winter for arena. Pool changerooms kept at 70F all winter.** |
| **Address: 221 9th Avenue North** | | |
| **L x W x H: 58' x 28' + 4' x 15'** | **Area: 1916 ft2 (178 m2)** | |
| **Building Capacity:** | | |
| **Building Floor Plan: Change rooms, outdoor pool and wading pool, mechanical building.** | | **Occupied Times: June 9am – 10pm, 5 days.**<br>**July and Aug – 7am – 10pm, 5 days, 1pm – 10pm, weekends.** |

| **ARCHITECHTURAL/STRUCTURAL** |
|---|
| **Wall type/R-value:** 6" walls, metal clad exterior and plywood interior. |
| **Roof Type/R-value: Metal deck flat roof.** |
| **Door Type/weather stripping:** 4 pedestrian door, no caulking, very poor stripping – large gaps. |
| **Window type/caulking:** 2 – 4' x 3' 2 pane old wood frame windows, no caulking. |
| **Other:** No heat or ventilation in mechanical room. |
| **MECHANICAL** |
| **Heating System:** Electric forceflows and baseboard in office and washrooms with wall stats (2). Electric unit heaters In change rooms and reception (3) plus baseboards – too many stats. |
| **Cooling System:** None |
| **Ventilation System**: 2 washroom exhaust fans ducted with BDD – 12" x 12" |
| **HVAC Controls:** Standard stats – too many for setbacks |
| **HVAC Maintenance/Training:** |
| **Water Supply System:** |
| **Domestic Hot Water System**: 2 – 120 gal electric tanks, 18kW. Little pipe insulation. |
| **Water Fixtures:** 4 toilets (13.2 lpf), 4 sinks, 1 urinal, 6 showers. |

| ELECTRICAL |
| --- |
| **Indoor Lighting:** 12 – 6' x 2 T12s, 9- 100W incandescents + 6 in mechanical building. |
| **Outdoor Lighting:** Outdoor light on mechanical building on all day. |
| **Exit Signs**: 1 old one, 1 good one. |
| **Motors:** |
| **Parking Lot Plugs**: None |
| **OTHER BUILDING SYSTEMS** |
| Pool pump and water lines inside concrete pit. 1 heated all winter 4' x 9' x 5' deep, 2.5" Styrofoam on top. Water leaking on electric construction heater!! |
| **PROCESS SYSTEMS** |
| 2 – Haywood standard eff pool boilers – H400, approx 80MBH each. Main pool pump = 7.5 HP, 208 V, 87.5% Eff. Kiddie pool – 1HP pump. |
| **BUILDING SERVICES (Hydro, Gas, Oil, Water, etc.)** |
| |
| **NOTES** |
| |

# BUILDING INSPECTION INVENTORY
**Revision 2**

| | | |
|---|---|---|
| **Municipality: Swan River** | | **Date: April 11, 2006** |
| **Toured By: Ray Bodnar, Lew McClurg** | | **Construction Date: 1974** |
| **Building: Town Fire Hall** | | **Renovations: None** |
| **Address: 700 1st Street North** | | |
| **L x W x H: 66' x 50' x 16'** | **Area: 3,300 ft2 (306.6 m2)** | |
| **Building Capacity: 6** | | |
| **Building Floor Plan: Truck storage (5 trucks), plus small office.** | | **Occupied Times: Monday – Friday, 8-5pm** |

| |
|---|
| **ARCHITECHTURAL/STRUCTURAL** |
| **Wall type/R-value:** R-12 |
| **Roof Type/R-value:** R-20 |
| **Door Type/weather stripping**: Poor stripping on ped doors, no caulking (3). No caulking on vehicle doors, stripping 6/10 – 10'x10', 10'x12', 14'x14'x3. |
| **Window type/caulking:** 4 – 32" x 48" old 2 pane slider – very poor, good caulking. |
| **Other:** |
| **MECHANICAL** |
| **Heating System:** Gas radiant heaters in truck bay (3) and 3 electric unit heaters for backup. Ceiling fan. |
| **Cooling System:** None |
| **Ventilation System:** Wall exhaust fan c/w leaky bdd – 20"x20". No intake. |
| **HVAC Controls:** Setback stats for electric unit heaters (not used), standard stats for radiant heaters (3). |
| **HVAC Maintenance/Training:** |
| **Water Supply System:** |
| **Domestic Hot Water System:** 272 Liter electric water heater, 5500W. No pipe insulation. |
| **Water Fixtures:** 2 sinks, 2 toilets, 2 urinals – high flow. |

| ELECTRICAL |
| --- |
| **Indoor Lighting:** 21 – 6'x2 T12s, 10 – 4'x2 T12s (40W) |
| **Outdoor Lighting**: 9 outdoor lights |
| **Exit Signs:** None |
| **Motors:** |
| **Parking Lot Plugs:** |
| **OTHER BUILDING SYSTEMS** |
| |
| **PROCESS SYSTEMS** |
| |
| **BUILDING SERVICES (Hydro, Gas, Oil, Water, etc.)** |
| |
| **NOTES** |
| |

# BUILDING INSPECTION INVENTORY
**Revision 2**

| | | |
|---|---|---|
| **Municipality: Swan River** | | **Date: April 11, 2006** |
| **Toured By: Ray Bodnar, June McKenzie** | | **Construction Date: New Addition in 2002** |
| **Building: Library** | | **Renovations: Major renovation and addition in 2002, entire building upgraded to current standards.** |
| **Address: 610 1st Street North** | | |
| **L x W x H: 60' x 40' + 92' – 6" x 45'** | **Area: 6562.5 ft2 (610m2)** | |
| **Building Capacity:25** | | |
| **Building Floor Plan: Open library and office. Building is in first class condition and impeccably clean.** | | **Occupied Times: Mon – Sat 10:30am – 5pm. Tues and Thursday, 7pm-9pm** |

| **ARCHITECHTURAL/STRUCTURAL** |
|---|
| **Wall type/R-value:** R20 walls |
| **Roof Type/R-value**: R40 roof |
| **Door Type/weather stripping:** Excellent condition |
| **Window type/caulking:** Good 3 pane and efficient 2 pane – 1991. |
| **Other:** |
| **MECHANICAL** |
| **Heating System:** 3 high efficiency gas furnaces. |
| **Cooling System:** 3 – 4 ton A/C units in 2001. 10 SEER. Lennox value series condensers – check SEER. |
| **Ventilation System:** New HRV 2001, 800cfm lifebreath. |
| **HVAC Controls:** Standard heat cool stats. |
| **HVAC Maintenance/Training:** Filters are clean |
| **Water Supply System:** |
| **Domestic Hot Water System**: 175 liter, 3000W water tank. No pipe insulation. |
| **Water Fixtures:** 1 urinal (3.8 lpf), 3 toilets (13.2 lpf), 2 sinks. |

| ELECTRICAL |
| --- |
| **Indoor Lighting**: Add occupancy sensors to washrooms (2). 3 – 4' x 2 T8 type. T8 lighting – many ballasts failed in first few years. |
| **Outdoor Lighting:** 4 flood lights on photocell. |
| **Exit Signs:** Good |
| **Motors:** |
| **Parking Lot Plugs:** 2 |
| **OTHER BUILDING SYSTEMS** |
| |
| **PROCESS SYSTEMS** |
| |
| **BUILDING SERVICES (Hydro, Gas, Oil, Water, etc.)** |
| |
| **NOTES** |
| |

# APPENDIX B

# TABLES TO CALCULATE ENERGY SAVINGS

# TABLE OF CONTENTS – APPENDIX B

**Table B.1.1 Annual Energy Consumption for Municipal Administration Building**

| | Energy Consumption (kWh) | % of Total Energy Consumption |
|---|---|---|
| HVAC | 81,677 | 78% |
| Hot Water | 2,222 | 2% |
| Lighting | 20,501 | 20% |
| **Total** | **104,400** | |

## Table B.1.2 - Electricity Usage for Municipal Administration Building

| | Consumption Data | | | Calculated Costs | | |
|---|---|---|---|---|---|---|
| **Month (2004-2005)** | **Maximum KVA** | **Billed KVA** | **Energy (kWh)** | **Demand Charge** | **Energy Charge** | **Total Charge** |
| October | 0 | 0 | 4,320 | $0 | $253 | $307 |
| November | 0 | 0 | 7,320 | $0 | $429 | $507 |
| December | 0 | 0 | 12,600 | $0 | $708 | $825 |
| January | 0 | 0 | 18,720 | $0 | $944 | $1,094 |
| February | 0 | 0 | 14,640 | $0 | $787 | $915 |
| March | 0 | 0 | 11,040 | $0 | $647 | $755 |
| April | 0 | 0 | 10,320 | $0 | $605 | $716 |
| May | 0 | 0 | 5,520 | $0 | $331 | $396 |
| June | 0 | 0 | 5,760 | $0 | $346 | $412 |
| July | 0 | 0 | 4,560 | $0 | $274 | $330 |
| August | 0 | 0 | 5,640 | $0 | $339 | $404 |
| September | 0 | 0 | 3,960 | $0 | $238 | $289 |
| **TOTALS** | | **0** | **104,400** | **$0** | **$5,899** | **$6,950** |

**Notes**

There is no charge for the first 50 KVA of monthly demand; a charge of $8.32 is applied to each KVA above 50.

The Total Charge column includes the energy charge, the demand charge, the monthly basic charge, and 14% taxes.

**Table B.1.3 - Lighting Analysis Summary for Municipal Administration Building**

| Description | Quantity | Current Conditions | | After Improvements | |
|---|---|---|---|---|---|
| | | Annual Energy Consumption (kWh) | Annual Cost | Annual Energy Consumption (kWh) | Annual Cost |
| 4' T12 Fluorescents - Convert to T8s (70x2). | 140 | 14,269 | $857 | 8,590 | $516 |
| 100W Incandescent - Convert to compact fluorescent. | 5 | 1,040 | $62 | 291 | $17 |
| Outdoor flood lights - no upgrade recommended. | 6 | 1,577 | $95 | 1,577 | $95 |
| Outdoor Incandescents - Convert to High Pressure Sodium | 2 | 1,314 | $79 | 657 | $39 |
| Outdoor high pressure sodium - no upgrade recommended. | 1 | 329 | $20 | 329 | $20 |
| LED Exit Signs - no upgrade recommended. | 2 | 53 | $3 | 53 | $3 |
| Parking lot plugs - Install parking lot controllers. | 4 | 1,920 | $115 | 960 | $58 |
| **TOTALS** | | **20,501** | **$1,231** | **12,456** | **$748** |

| | |
|---|---|
| **Annual Energy Savings (kWh)** | **8,044** |
| **Annual Cost Savings** | **$483** |
| **Percent Annual Energy Savings** | **39%** |

These calculations are assuming that this building is occupied for 8 hours/day, 5 days a week.

The outdoor lights are assumed to be on 12 hours per day, 365 days per year.

**Table B.1.4 (a) Window and Door Replacement Calculations for Municipal Administration Building**

| Description | Existing | | | | New | | | Savings | |
|---|---|---|---|---|---|---|---|---|---|
| | Area ($ft^2$) | R-Value ($^oF\ ft^2hr/BTU$) | Annual Heat Loss (kWh) | Cost | R-Value ($^oF\ ft^2hr/BTU$) | Annual Heat Loss (kWh) | Cost | Energy (kWh) | Cost |
| Replace 2 pane windows in basement with triple pane windows. | 19.83 | 2.000 | 764 | $46 | 6.25 | 244 | $15 | 519 | $31 |
| **TOTALS** | | | **764** | **$46** | | **244** | **$15** | **519** | **$31** |

**Table B.1.4 (b) Window and Door Infiltration Calculations for Municipal Administration Building**

| Description | Crack Length (ft) | Crack Width (in) | Leakage on typical door (cfm) | Leakage on these doors (cfm) | Annual Heat Loss (BTU) | Annual Heat Loss (kWh) | Cost |
|---|---|---|---|---|---|---|---|
| Weather-strip pedestrian doors. | 25 | 0.05 | 125 | 85 | 24,233,313 | 7,102 | $426 |
| **TOTALS** | | | | | | **7,102** | **$426** |

**Table B.1.4 (c) Upgrade Wall/Roof Insulation for the Municipal Administration Building**

| Description | Existing | | | | New | | | Savings | |
|---|---|---|---|---|---|---|---|---|---|
| | Area ($ft^2$) | R-Value ($^oF\ ft^2hr/BTU$) | Annual Heat Loss (kWh) | Cost | R-Value ($^oF\ ft^2hr/BTU$) | Annual Heat Loss (kWh) | Cost | Energy (kWh) | Cost |
| Upgrade Roof Insulation to R40. | 4000 | 12.000 | 25,671 | $1,541 | 40.00 | 7,701 | $462 | 17,969 | $1,079 |
| **TOTALS** | | | **25,671** | **$1,541** | | **7,701** | **$462** | **17,969** | **$1,079** |

The office is assumed to be kept at 21 $^oC$.

The crack lengths are taken as a quarter the perimeter of the door

**Table B.1.5 - Water Usage for Municipal Administration Building**

| Fixtures | Qty | Est. # of Uses/Hr/ Fixture | Est. # of Uses/Yr | Current Flow (LPF or LPC) | Current Water Usage (L/Yr) | New Flow (LPF or LPC) | New Water Usage (L/Yr) | Water Saved (L/Yr) | Hot Water Savings (kWh) | Cost Savings |
|---|---|---|---|---|---|---|---|---|---|---|
| **Main Floor Washroom** | | | | | | | | | | |
| Sinks | 3 | 0.9 | 5,460 | 1.60 | 8,736 | 0.32 | 1,747 | 6,989 | 262 | $16 |
| Toilets | 3 | 0.9 | 5,460 | 13.25 | 72,345 | 3.98 | 21,731 | 50,614 | NA | NA |
| **Total** | | | | | **81,081** | | **23,478** | **57,603** | **262** | **$16** |

| Frequency at Which Fixtures are Used | | | |
|---|---|---|---|
| | **Females** | **Males** | **Totals** |
| Number of People | 3 | 3 | |
| Number of Toilet Uses/day | 3 | 4 | |
| Number of Toilets | 3 | 3 | |
| Toilet Uses/hour/fixture | 0.375 | 0.5 | 0.875 |
| Number of Sinks | 3 | 3 | |
| Number of Sink Uses/day | 3 | 4 | |
| Sink Uses/hr/fixture | 0.375 | 0.5 | 0.875 |

| Current Hot Water Usage (kWh) | | |
|---|---|---|
| **Fixture** | **L/Yr** | **kWh** |
| Sinks | 8,736 | 327 |
| **Total** | | **327** |

The current sinks are assumed to consume 2.5 gpm and the new sinks are 0.5 gpm

The current toilets are assumed to use 3.5 gallons per flush and the new dual flush toilets use either 1.6 or 0.8 gallons per flush.

**Table B.1.6 Energy Savings with Heating, Ventilating, and Air Conditioning for Municipal Administration Building**

| Description | % of Time Unoccupied | Heating Degree Days below 61 F | Heating Degree Days below 59 F | Current Energy Used to Heat (kWh) | Energy Savings (kWh) |
|---|---|---|---|---|---|
| Setback Thermostats to 59 F | 76.26% | 10949.0 | 9300.42 | 61,258 | 7,033 |

| Description | CFM | Current Heat Loss (kWh) | New Heat Loss (kWh) | Energy Savings (kWh) |
|---|---|---|---|---|
| Install timer on HRV. | 300 | 12,473 | 2,994 | 9,479 |

**Table B.2.1 - Energy Breakdown for Town Garage**

| | Energy Consumption (kWh) | % of Total Energy Consumption |
|---|---|---|
| HVAC | 286,149 | 96% |
| Lighting | 10,184 | 3% |
| Hot Water | 2,289 | 1% |
| **Total** | **298,621** | |

### Table B.2.2 (a) - Electricity Usage for Town Garage

| | Consumption Data | | | Calculated Costs | | |
|---|---|---|---|---|---|---|
| Month (2004-2005) | Maximum KVA | Billed KVA | Energy (kWh) | Demand Charge | Energy Charge | Total Charge |
| October | 24 | 0 | 1,800 | $0 | $105 | $145 |
| November | 24 | 0 | 10,680 | $0 | $626 | $738 |
| December | 47 | 0 | 13,560 | $0 | $745 | $874 |
| January | 43 | 0 | 16,200 | $0 | $847 | $990 |
| February | 43 | 0 | 14,640 | $0 | $787 | $922 |
| March | 46 | 0 | 10,320 | $0 | $605 | $714 |
| April | 31 | 0 | 10,320 | $0 | $605 | $725 |
| May | 25 | 0 | 6,480 | $0 | $389 | $469 |
| June | 24 | 0 | 7,200 | $0 | $432 | $518 |
| July | 18 | 0 | 4,440 | $0 | $267 | $329 |
| August | 18 | 0 | 4,800 | $0 | $288 | $354 |
| September | 20 | 0 | 4,200 | $0 | $252 | $313 |
| **TOTAL** | | **0** | **104,640** | **$0** | **$5,947** | **$7,090** |

### Table B.2.2 (b) - Natural Gas Consumption for Town Garage

| Month (2004-2005) | Gas ($m^3$) | Gas (kWh) | Total Charge |
|---|---|---|---|
| November | 1649.94 | 17,076 | $835 |
| December | 2248.90 | 23,275 | $1,128 |
| January | 4345.29 | 44,972 | $2,151 |
| February | 2567.80 | 26,576 | $1,283 |
| March | 3457.93 | 35,789 | $1,718 |
| April | 1325.49 | 13,718 | $677 |
| May | 1150.80 | 11,910 | -$55 |
| June | 471.41 | 4,879 | $206 |
| July | 155.29 | 1,607 | -$124 |
| August | 532.42 | 5,510 | $166 |
| September | 108.15 | 1,119 | -$177 |
| October | 729.30 | 7,548 | $201 |
| **TOTAL** | **18,743** | **193,981** | **$8,009** |

**Notes**

The Total Charge column includes the energy charge, the demand charge, the monthly basic charge, and 14% taxes.

**Table B.2.3 - Lighting Analysis Summary for Town Garage**

| Description | Quantity | Current Conditions | | After Improvements | |
|---|---|---|---|---|---|
| | | Annual Energy Consumption (kWh) | Annual Cost | Annual Energy Consumption (kWh) | Annual Cost |
| 8' T8 Fluorescents (40x2) - no upgrade recommended. | 80 | 10,184 | $611 | 10,184 | $611 |
| **TOTALS** | | **10,184** | **$611** | **10,184** | **$611** |

| | |
|---|---|
| **Annual Energy Savings (kWh)** | **0** |
| **Annual Cost Savings** | **$0** |
| **Percent Annual Energy Savings** | **0%** |

These calculations are based on the assumptions that the garage is occupied for 45 hours/week.

**Table B.2.4 (a) Window and Door Infiltration Calculations for Town Garage**

| Description | Crack Length (ft) | Crack Width (in) | Leakage on typical door (cfm) | Leakage on these doors (cfm) | Annual Heat Loss (BTU) | Annual Heat Loss (kWh) | Cost |
|---|---|---|---|---|---|---|---|
| Weatherstrip pedestrian doors. | 10 | 0.05 | 125 | 34 | 10,770,361 | 3,156 | $144 |
| Weatherstrip vehicle doors. | 41 | 0.05 | 125 | 140 | 44,158,481 | 12,942 | $591 |
| Caulk pedestrian doors. | 40 | 0.005 | 10 | 11 | 3,446,516 | 1,010 | $46 |
| Caulk vehicle doors. | 164 | 0.005 | 10 | 45 | 14,130,714 | 4,141 | $189 |
| Caulk windows. | 28 | 0.005 | 10 | 8 | 2,412,561 | 707 | $32 |
| **TOTALS** | | | | | | **16,098** | **$144** |

The crack lengths around the doors is taken as a quarter of the perimeter.

The temperature is maintained at 21°C (70°F).

**Table B.2.5 - Water Usage for Town Garage**

| Fixtures | Qty | Est. # of Uses/Hr/Fixture | Est. # of Uses/Yr | Current Flow (LPF or LPC) | Current Water Usage (L/Yr) | New Flow (LPF or LPC) | New Water Usage (L/Yr) | Water Saved (L/Yr) | Hot Water Savings (kWh) | Cost Savings |
|---|---|---|---|---|---|---|---|---|---|---|
| Sinks | 1 | 2.4 | 5,558 | 1.60 | 8,892 | 0.32 | 1,778 | 7,114 | 267 | $16 |
| Toilets | 1 | 0.9 | 2,048 | 13.25 | 27,129 | 3.98 | 8,139 | 18,991 | NA | NA |
| Urinals | 1 | 1.5 | 3,510 | 9.50 | 33,345 | 3.80 | 13,338 | 20,007 | NA | NA |
| **Total** | | | | | **69,366** | | **23,255** | **46,111** | **267** | **$16** |

| Frequency at Which Fixtures are Used | | | |
|---|---|---|---|
| | **Females** | **Males** | **Totals** |
| Number of People | 1 | 4 | |
| Number of Toilet Uses/day | 3 | 1 | |
| Number of Toilets | 1 | 1 | |
| Toilet Uses/hour/fixture | 0.38 | 0.50 | 0.88 |
| Number of Urinal Uses/day | 0 | 3 | |
| Number of Urinals | 0 | 1 | |
| Urinal Uses/hour/fixture | 0 | 1.50 | 1.50 |
| Number of Sinks | 1 | 1 | |
| Number of Sink Uses/day | 3 | 4 | |
| Sink Uses/hr/fixture | 0.38 | 2.00 | 2.38 |

| Current Hot Water Usage (kWh) | | |
|---|---|---|
| **Fixture** | **L/Yr** | **kWh** |
| Sinks | 8,892 | 333 |
| **Total** | | **333** |

The high flow toilets consume 3.5 gallons per flush and the water efficient toilets consume 1.5 / 0.8 gpf
The high flow sinks consume 2.5 gallons per minute and the water efficient sinks consume 0.5 gpm
The urinals consume 2.5 gallons per flush and the water efficient urinals consume 1 gallon per flush

**Table B.2.6 Energy Savings with Heating, Ventilating, and Air Conditioning for Town Garage**

| Description | Quantity | Heating Efficiency | HDD below 70 F | Flow Rate (cfm) | Heat Loss (kWh) |
|---|---|---|---|---|---|
| Replace intake BDDs with motorized dampers. | 3 | 90% | 10,949 | 30 | 8,315 |
| Replace exhaust BDDs with motorized dampers. | 3 | 90% | 10,949 | 50 | 13,859 |
| Replace 24 hour timer on HRV with 7 day timer. | 1 | 90% | 10,949 | 300 | 3,049 |

| Description | % of Time Unoccupied | HDD below 70 F | HDD below 59 F | Current Energy Used to Heat | Heat Savings (kWh) |
|---|---|---|---|---|---|
| Setback thermostats to 15°C (59°F). | 73.29% | 10,949 | 9,300 | 77,250 | 8,524 |

| Description | Annual Energy Savings (kWh) | Annual Cost Savings ($) | Installation Cost | Simple Payback Years |
|---|---|---|---|---|
| Install geothermal heating system. | 171,689 | $7,846 | $74,100 | 9.44 |

**Table B.3.1 - Energy Breakdown for Water Treatment Plant and Lift Station #1**

| | Energy Consumption (kWh) | % of Total Energy Consumption |
|---|---|---|
| HVAC | 186,430 | 39% |
| Lighting | 8,369 | 2% |
| Motors | 282,439 | 59% |
| **Total** | **477,238** | |

**Table B.3.2 (a) - Electricity Usage for Water Treatment Plant and Lift Station #1**

| | Consumption Data | | | Calculated Costs | | |
|---|---|---|---|---|---|---|
| Month (2004-2005) | Maximum KVA | Billed KVA | Energy (kWh) | Demand Charge | Energy Charge | Total Charge |
| October | 88 | 38 | 28,440 | $316 | $1,184 | $1,735 |
| November | 86 | 36 | 23,040 | $300 | $1,058 | $1,572 |
| December | 78 | 28 | 27,360 | $233 | $1,159 | $1,612 |
| January | 71 | 21 | 29,160 | $175 | $1,201 | $1,593 |
| February | 78 | 28 | 28,080 | $233 | $1,176 | $1,631 |
| March | 75 | 25 | 23,760 | $208 | $1,075 | $1,487 |
| April | 69 | 19 | 33,120 | $158 | $1,294 | $1,691 |
| May | 71 | 21 | 23,760 | $175 | $1,102 | $1,481 |
| June | 88 | 38 | 26,280 | $316 | $1,164 | $1,712 |
| July | 99 | 49 | 25,200 | $408 | $1,138 | $1,787 |
| August | 68 | 18 | 28,080 | $150 | $1,208 | $1,573 |
| September | 75 | 25 | 26,640 | $208 | $1,173 | $1,599 |
| **TOTAL** | | **346** | **322,920** | **$2,879** | **$13,930** | **$19,473** |

**Table B.3.2 (b) - Natural Gas Consumption for Water Treatment Plant**

| Month (2004-2005) | Gas ($m^3$) | Gas (kWh) | Total Charge |
|---|---|---|---|
| November | 1591.70 | 16,474 | $807 |
| December | 2895.01 | 29,963 | $1,443 |
| January | 2284.95 | 23,649 | $1,145 |
| February | 1566.75 | 16,215 | $795 |
| March | 1777.49 | 18,397 | $898 |
| April | 948.37 | 9,815 | $493 |
| May | 1114.75 | 11,537 | $574 |
| June | 415.95 | 4,305 | $233 |
| July | 174.70 | 1,808 | $116 |
| August | 488.05 | 5,051 | $269 |
| September | 501.91 | 5,195 | $275 |
| October | 1150.80 | 11,910 | $577 |
| **TOTAL** | **14,910** | **154,318** | **$7,626** |

**Notes**

The Total Charge column includes the energy charge, the demand charge, the monthly basic charge, and 14% taxes.

**Table B.3.3 - Lighting Analysis Summary for Water Treatment Plant and Lift Station #1**

| Description | Quantity | Current Conditions | | After Improvements | |
|---|---|---|---|---|---|
| | | Annual Energy Consumption (kWh) | Annual Cost | Annual Energy Consumption (kWh) | Annual Cost |
| **Lift Station #1** | | | | | |
| 300W Incandescent lights - convert to compact fluorescents. | 6 | 329 | $20 | 85 | $5 |
| 70W Metal halide - no upgrade recommended. | 1 | 13 | $1 | 13 | $1 |
| **Water Treatment Plant** | | | | | |
| High efficiency fluorescent lamps - no upgrade recommended. | 54 | 3,707 | $223 | 3,707 | $223 |
| 50W Interior Daybright - no upgrade recommended. | 4 | 416 | $25 | 416 | $25 |
| T12 Fluorescents - Replace with T8 lamps and ballasts. | 8 | 815 | $49 | 491 | $29 |
| 50W Exterior soffit lights - no upgrade recommended. | 8 | 1,752 | $105 | 1,752 | $105 |
| 50W Exterior wall packs - no upgrade recommended. | 5 | 1,095 | $66 | 1,095 | $66 |
| 50W Exterior Daybright - no upgrade recommended. | 1 | 219 | $13 | 219 | $13 |
| **Raw Water Pumphouse** | | | | | |
| T8 Fluorescents - no upgrade recommended. | 2 | 11 | $1 | 11 | $1 |
| 70W Metal halide - no upgrade recommended. | 1 | 13 | $1 | 13 | $1 |
| **TOTALS** | | **8,369** | **$502** | **7,801** | **$468** |

| | |
|---|---|
| **Annual Energy Savings (kWh)** | **568** |
| **Annual Cost Savings** | **$34** |
| **Percent Annual Energy Savings** | **7%** |

The Lift Station #1 is assumed to be occupied for 0.5 hours every day.

The Water Treatment Plant is assumed to be occupied continuously.

The Raw Water Pumphouse is assumed to be occupied for 0.5 hours every day.

**Table B.3.4 Energy Savings with Heating, Ventilating, and Air Conditioning for Water Treatment Plant and Lift Station #1**

| Description | % of Time Unoccupied | HDD below 70 F | HDD below 59 F | Current Energy Used to Heat | Heat Savings (kWh) |
|---|---|---|---|---|---|
| Setback thermostats to 15°C (59°F). | 76.26% | 10,949 | 9,300 | 154,318 | 17,718 |

| Description | CFM | Current Heat Loss (kWh) | New Heat Loss (kWh) | Energy Savings (kWh) |
|---|---|---|---|---|
| Install solar wall. | 1500 | 124,729 | 39,858 | 84,871 |

**Table B.3.5 Energy Consumption for Motors in Water Treatment Plant and Lift Station #1**

| Description | Rated HP | Required HP | # of hours | Current Motors | | | |
|---|---|---|---|---|---|---|---|
| | | | | Eff. | Actual HP | kW | kWh |
| **Water Treatment Plant** | | | | | | | |
| Raw Water Pump 1 | 15 | 12 | 2,555 | 90% | 13.33 | 9.94 | 25,404 |
| Raw Water Pump 2 | 15 | 12 | 2,555 | 90% | 13.33 | 9.94 | 25,404 |
| Raw Water Pump 3 | 40 | 32 | 2,555 | 90% | 35.56 | 26.51 | 67,743 |
| Distribution Pump 1 | 25 | 20 | 2,555 | 93% | 21.51 | 16.04 | 40,973 |
| Distribution Pump 2 | 30 | 24 | 2,555 | 93% | 25.81 | 19.24 | 49,168 |
| Distribution Pump 3 | 30 | 24 | 2,555 | 93% | 25.81 | 19.24 | 49,168 |
| Backwash Pump | 10 | 8 | 450 | 90% | 8.89 | 6.63 | 2,983 |
| Backwash Air Blower 1 | 10 | 8 | 450 | 90% | 8.94 | 6.67 | 2,999 |
| Backwash Air Blower 2 | 5 | 4 | 450 | 88% | 4.57 | 3.41 | 1,534 |
| Chemical Feed Pumps (4) | 1 | 0.8 | 2,555 | 90% | 0.89 | 0.66 | 1,694 |
| **Lift Station #1** | | | | | | | |
| Crane Demming Pump | 30 | 24 | 730 | 85% | 28.24 | 21.06 | 15,370 |
| BCP Pump | 30 | 24 | 730 | 85% | 28.24 | 21.06 | 15,370 |
| **TOTAL** | | | | | | | **282,439** |

**Table B.4.1 Annual Energy Consumption for Lift Station #2**

| | Energy Consumption (kWh) | % of Total Energy Consumption |
|---|---|---|
| HVAC | 5,624 | 50% |
| Lighting | 493 | 4% |
| Motors | 5,123 | 46% |
| **Total** | **11,240** | |

**Table B.4.2 - Electricity Usage for Lift Station #2**

| | Consumption Data | | | Calculated Costs | | |
|---|---|---|---|---|---|---|
| **Month (2004-2005)** | **Maximum KVA** | **Billed KVA** | **Energy (kWh)** | **Demand Charge** | **Energy Charge** | **Total Charge** |
| October | 0 | 0 | 540 | $0 | $32 | $61 |
| November | 0 | 0 | 910 | $0 | $53 | $86 |
| December | 0 | 0 | 1,530 | $0 | $90 | $127 |
| January | 0 | 0 | 2,490 | $0 | $146 | $191 |
| February | 0 | 0 | 1,490 | $0 | $87 | $124 |
| March | 0 | 0 | 1,700 | $0 | $100 | $139 |
| April | 0 | 0 | 1,070 | $0 | $63 | $97 |
| May | 0 | 0 | 840 | $0 | $50 | $83 |
| June | 0 | 0 | 160 | $0 | $10 | $36 |
| July | 0 | 0 | 130 | $0 | $8 | $34 |
| August | 0 | 0 | 240 | $0 | $14 | $42 |
| September | 0 | 0 | 140 | $0 | $8 | $35 |
| **TOTALS** | | **0** | **11,240** | **$0** | **$661** | **$1,054** |

**Notes**

There is no charge for the first 50 KVA of monthly demand; a charge of $8.32 is applied to each KVA above 50.

The Total Charge column includes the energy charge, the demand charge, the monthly basic charge, and 14% taxes.

**Table B.4.3 - Lighting Analysis Summary for Lift Station #2**

| Description | Quantity | Current Conditions | | After Improvements | |
|---|---|---|---|---|---|
| | | Annual Energy Consumption (kWh) | Annual Cost | Annual Energy Consumption (kWh) | Annual Cost |
| 60W Incandescent lighting fixtures - replace with compact fluorescents. | 2 | 22 | $1 | 6 | $0 |
| Incandescent lighting in wetwell area - replace with compact fluorescents. | 3 | 164 | $10 | 43 | $3 |
| Outdoor metal halide - no upgrade recommended. | 1 | 307 | $18 | 307 | $18 |
| **TOTALS** | | **493** | **$30** | **355** | **$21** |

| | |
|---|---|
| **Annual Energy Savings (kWh)** | **138** |
| **Annual Cost Savings** | **$8** |
| **Percent Annual Energy Savings** | **28%** |

These calculations are assuming that the lift station is occupied for 0.5 hours/day.

The outdoor lights are assumed to be on 12 hours per day, 365 days per year.

**Table B.4.4 (a) Window and Door Replacement Calculations for Lift Station #2**

| Description | Existing | | | | New | | | Savings | |
|---|---|---|---|---|---|---|---|---|---|
| | Area ($ft^2$) | R-Value ($^oF\ ft^2hr/BTU$) | Annual Heat Loss (kWh) | Cost | R-Value ($^oF\ ft^2hr/BTU$) | Annual Heat Loss (kWh) | Cost | Energy (kWh) | Cost |
| Replace 27" x 27" broken window with triple pane window. | 5.06 | 1.000 | 351 | $21 | 6.25 | 56 | $3 | 295 | $18 |
| **TOTALS** | | | **351** | **$21** | | **56** | **$3** | **295** | **$18** |

**Table B.4.4 (b) Window and Door Infiltration Calculations for Lift Station #2**

| Description | Crack Length (ft) | Crack Width (in) | Leakage on typical door (cfm) | Leakage on these doors (cfm) | Annual Heat Loss (BTU) | Annual Heat Loss (kWh) | Cost |
|---|---|---|---|---|---|---|---|
| Weather-strip bottom of pedestrian door. | 3 | 0.1 | 300 | 25 | 6,278,661 | 1,840 | $110 |
| **TOTALS** | | | | | | **1,840** | **$110** |

The lift station is assumed to be kept at 16°C.

**Table B.4.5 Energy Savings with Heating, Ventilating, and Air Conditioning for Lift Station #2**

| Description | % of Time Unoccupied | Heating Degree Days below 61 F | Heating Degree Days below 50 F | Current Energy Used to Heat (kWh) | Energy Savings (kWh) |
|---|---|---|---|---|---|
| Setback Thermostats to 59 F | 100.00% | 9850.0 | 6970.5 | 5,624 | 1,644 |

**Table B.4.6 Energy Consumption for Motors in Lift Station #2**

| Description | Rated HP | Required HP | # of hours | Current Motors | | | |
|---|---|---|---|---|---|---|---|
| | | | | Eff. | Actual HP | kW | kWh |
| BBC Brown Pump 1 | 5 | 4 | 730 | 85% | 4.71 | 3.51 | 2,562 |
| BBC Brown Pump 2 | 5 | 4 | 730 | 85% | 4.71 | 3.51 | 2,562 |
| **TOTAL** | | | | | | | **5,123** |

**Table B.5.1 Annual Energy Consumption for Lift Station #3**

| | Energy Consumption (kWh) | % of Total Energy Consumption |
|---|---|---|
| HVAC | 6,898 | 46% |
| Lighting | 307 | 2% |
| Motors | 7,685 | 52% |
| **Total** | **14,890** | |

**Table B.5.2 - Electricity Usage for Lift Station #3**

| | Consumption Data | | | Calculated Costs | | |
|---|---|---|---|---|---|---|
| **Month (2004-2005)** | **Maximum KVA** | **Billed KVA** | **Energy (kWh)** | **Demand Charge** | **Energy Charge** | **Total Charge** |
| October | 0 | 0 | 810 | $0 | $47 | $79 |
| November | 0 | 0 | 920 | $0 | $54 | $86 |
| December | 0 | 0 | 1,610 | $0 | $94 | $133 |
| January | 0 | 0 | 2,400 | $0 | $141 | $185 |
| February | 0 | 0 | 2,180 | $0 | $128 | $171 |
| March | 0 | 0 | 1,830 | $0 | $107 | $147 |
| April | 0 | 0 | 1,740 | $0 | $102 | $142 |
| May | 0 | 0 | 900 | $0 | $54 | $87 |
| June | 0 | 0 | 1,030 | $0 | $62 | $96 |
| July | 0 | 0 | 320 | $0 | $19 | $47 |
| August | 0 | 0 | 870 | $0 | $52 | $85 |
| September | 0 | 0 | 280 | $0 | $17 | $44 |
| **TOTALS** | | **0** | **14,890** | **$0** | **$877** | **$1,301** |

**Notes**

There is no charge for the first 50 KVA of monthly demand; a charge of $8.32 is applied to each KVA above 50.

The Total Charge column includes the energy charge, the demand charge, the monthly basic charge, and 14% taxes.

**Table B.5.3 - Lighting Analysis Summary for Lift Station #3**

| Description | Quantity | Current Conditions | | After Improvements | |
|---|---|---|---|---|---|
| | | Annual Energy Consumption (kWh) | Annual Cost | Annual Energy Consumption (kWh) | Annual Cost |
| 60W Incandescent lighting fixtures - replace with compact fluorescents. | 2 | 22 | $1 | 6 | $0 |
| Incandescent lighting in wetwell area - replace with compact fluorescents. | 3 | 164 | $10 | 43 | $3 |
| Outdoor metal halide - no upgrade recommended. | 1 | 307 | $18 | 307 | $18 |
| **TOTALS** | | **493** | **$30** | **355** | **$21** |

| | |
|---|---|
| **Annual Energy Savings (kWh)** | **138** |
| **Annual Cost Savings** | **$8** |
| **Percent Annual Energy Savings** | **28%** |

These calculations were made assuming that this lift station is occupied for 0.5 hours/day.

The outdoor lights are assumed to be on 12 hours per day, 365 days per year.

**Table B.5.4 (a) Window and Door Replacement Calculations for Lift Station #3**

| Description | Existing | | | | New | | | Savings | |
|---|---|---|---|---|---|---|---|---|---|
| | Area ($ft^2$) | R-Value ($^oF\ ft^2hr/BTU$) | Annual Heat Loss (kWh) | Cost | R-Value ($^oF\ ft^2hr/BTU$) | Annual Heat Loss (kWh) | Cost | Energy (kWh) | Cost |
| Replace 27" x 54" broken window with triple pane window. | 10.13 | 2.000 | 351 | $21 | 6.25 | 112 | $7 | 239 | $14 |
| **TOTALS** | | | **351** | **$21** | | **112** | **$7** | **239** | **$14** |

**Table B.5.4 (b) Window and Door Infiltration Calculations for Lift Station #3**

| Description | Crack Length (ft) | Crack Width (in) | Leakage on typical door (cfm) | Leakage on these doors (cfm) | Annual Heat Loss (BTU) | Annual Heat Loss (kWh) | Cost |
|---|---|---|---|---|---|---|---|
| Weather-strip bottom of pedestrian door. | 3 | 0.1 | 300 | 25 | 6,278,661 | 1,840 | $110 |
| **TOTALS** | | | | | | **1,840** | **$110** |

The lift station is assumed to be kept at 16°C.

**Table B.5.5 Energy Savings with Heating, Ventilating, and Air Conditioning for Lift Station #3**

| Description | % of Time Unoccupied | Heating Degree Days below 61 F | Heating Degree Days below 50 F | Current Energy Used to Heat (kWh) | Energy Savings (kWh) |
|---|---|---|---|---|---|
| Setback Thermostats to 50 F | 100.00% | 9850.0 | 6970.5 | 6,898 | 2,017 |

**Table B.5.6 Energy Consumption for Motors in Lift Station #3**

| Description | Rated HP | Required HP | # of hours | Current Motors | | | |
|---|---|---|---|---|---|---|---|
| | | | | Eff. | Actual HP | kW | kWh |
| Powerbloc Leroy Pump 1 | 5 | 4 | 1,095 | 85% | 4.71 | 3.51 | 3,843 |
| BBC Brown Pump 2 | 5 | 4 | 1,095 | 85% | 4.71 | 3.51 | 3,843 |
| **TOTAL** | | | | | | | **7,685** |

**Table B.6.1 Annual Energy Consumption for Lift Station #4**

| | Energy Consumption (kWh) | % of Total Energy Consumption |
|---|---|---|
| HVAC | 6,454 | 40% |
| Lighting | 407 | 2% |
| Motors | 9,475 | 58% |
| **Total** | **16,336** | |

**Table B.6.2 - Electricity Usage for Lift Station #4**

| | Consumption Data | | | Calculated Costs | | |
|---|---|---|---|---|---|---|
| **Month (2004-2005)** | **Maximum KVA** | **Billed KVA** | **Energy (kWh)** | **Demand Charge** | **Energy Charge** | **Total Charge** |
| October | 0 | 0 | 449 | $0 | $26 | $55 |
| November | 0 | 0 | 1,252 | $0 | $73 | $109 |
| December | 0 | 0 | 1,747 | $0 | $102 | $142 |
| January | 0 | 0 | 2,894 | $0 | $170 | $218 |
| February | 0 | 0 | 2,221 | $0 | $130 | $173 |
| March | 0 | 0 | 2,065 | $0 | $121 | $163 |
| April | 0 | 0 | 1,901 | $0 | $111 | $153 |
| May | 0 | 0 | 1,176 | $0 | $71 | $106 |
| June | 0 | 0 | 1,377 | $0 | $83 | $119 |
| July | 0 | 0 | 417 | $0 | $25 | $54 |
| August | 0 | 0 | 379 | $0 | $23 | $51 |
| September | 0 | 0 | 458 | $0 | $27 | $56 |
| **TOTALS** | | **0** | **16,336** | **$0** | **$963** | **$1,398** |

**Notes**

There is no charge for the first 50 KVA of monthly demand; a charge of $8.32 is applied to each KVA above 50.

The Total Charge column includes the energy charge, the demand charge, the monthly basic charge, and 14% taxes.

**Table B.6.3 - Lighting Analysis Summary for Lift Station #4**

| Description | Quantity | Current Conditions | | After Improvements | |
|---|---|---|---|---|---|
| | | Annual Energy Consumption (kWh) | Annual Cost | Annual Energy Consumption (kWh) | Annual Cost |
| 150W Incandescent in main process area - convert to compact fluorescent. | 1 | 27 | $2 | 7 | $0 |
| Incandescent fixture in drywell - convert to compact fluorescent. | 2 | 73 | $4 | 20 | $1 |
| Outdoor metal halide - no upgrade recommended. | 1 | 307 | $18 | 307 | $18 |
| **TOTALS** | | **407** | **$24** | **334** | **$20** |

| | |
|---|---|
| **Annual Energy Savings (kWh)** | **73** |
| **Annual Cost Savings** | **$4** |
| **Percent Annual Energy Savings** | **18%** |

These calculations were made assuming that the Lift Station #4 is occupied for 0.5 hours/day.

The outdoor lights are assumed to be on 12 hours per day, 365 days per year.

**Table B.6.4 Energy Savings with Heating, Ventilating, and Air Conditioning for Lift Station #4**

| Description | % of Time Unoccupied | Heating Degree Days below 61 F | Heating Degree Days below 50 F | Current Energy Used to Heat (kWh) | Energy Savings (kWh) |
|---|---|---|---|---|---|
| Setback Thermostats to 50 F | 100.00% | 9850.0 | 6970.5 | 6,454 | 1,887 |

**Table B.6.5 Energy Consumption for Motors in Lift Station #4**

| Description | Rated HP | Required HP | # of hours | Current Motors | | | |
|---|---|---|---|---|---|---|---|
| | | | | Eff. | Actual HP | kW | kWh |
| Powerbloc Leroy Pump 1 | 15 | 12 | 450 | 85% | 14.12 | 10.53 | 4,737 |
| BBC Brown Pump 2 | 15 | 12 | 450 | 85% | 14.12 | 10.53 | 4,737 |
| **TOTAL** | | | | | | | **9,475** |

**Table B.7.1 Annual Energy Consumption for Lift Station #5**

| | Energy Consumption (kWh) | % of Total Energy Consumption |
|---|---|---|
| HVAC | 2,129 | 37% |
| Lighting | 493 | 9% |
| Motors | 3,158 | 55% |
| **Total** | **5,780** | |

## Table B.7.2 - Electricity Usage for Lift Station #5

| | Consumption Data | | | Calculated Costs | | |
|---|---|---|---|---|---|---|
| **Month (2004-2005)** | **Maximum KVA** | **Billed KVA** | **Energy (kWh)** | **Demand Charge** | **Energy Charge** | **Total Charge** |
| October | 0 | 0 | 0 | $0 | $0 | $0 |
| November | 0 | 0 | 960 | $0 | $56 | $114 |
| December | 0 | 0 | 0 | $0 | $0 | $0 |
| January | 0 | 0 | 1,120 | $0 | $66 | $125 |
| February | 0 | 0 | 0 | $0 | $0 | $0 |
| March | 0 | 0 | 960 | $0 | $56 | $114 |
| April | 0 | 0 | 0 | $0 | $0 | $0 |
| May | 0 | 0 | 1,020 | $0 | $61 | $121 |
| June | 0 | 0 | 0 | $0 | $0 | $0 |
| July | 0 | 0 | 1,040 | $0 | $62 | $97 |
| August | 0 | 0 | 0 | $0 | $0 | $0 |
| September | 0 | 0 | 680 | $0 | $41 | $97 |
| **TOTALS** | | **0** | **5,780** | **$0** | **$343** | **$668** |

**Notes**

There is no charge for the first 50 KVA of monthly demand; a charge of $8.32 is applied to each KVA above 50.

The Total Charge column includes the energy charge, the demand charge, the monthly basic charge, and 14% taxes.

**Table B.7.3 - Lighting Analysis Summary for Lift Station #5**

| Description | Quantity | Current Conditions | | After Improvements | |
|---|---|---|---|---|---|
| | | Annual Energy Consumption (kWh) | Annual Cost | Annual Energy Consumption (kWh) | Annual Cost |
| 60W Incandescent lighting fixtures - replace with compact fluorescents. | 2 | 22 | $1 | 6 | $0 |
| Incandescent lighting in wetwell area - replace with compact fluorescents. | 3 | 164 | $10 | 43 | $3 |
| Outdoor metal halide - no upgrade recommended. | 1 | 307 | $18 | 307 | $18 |
| **TOTALS** | | **493** | **$30** | **355** | **$21** |

| | |
|---|---|
| **Annual Energy Savings (kWh)** | **138** |
| **Annual Cost Savings** | **$8** |
| **Percent Annual Energy Savings** | **28%** |

These calculations are assuming that this building is occupied for 8 hours/day, 5 days a week.

The outdoor lights are assumed to be on 12 hours per day, 365 days per year.

**Table B.7.4 Energy Savings with Heating, Ventilating, and Air Conditioning for Lift Station #5**

| Description | % of Time Unoccupied | Heating Degree Days below 61 F | Heating Degree Days below 50 F | Current Energy Used to Heat (kWh) | Energy Savings (kWh) |
|---|---|---|---|---|---|
| Setback Thermostats to 50 F | 100.00% | 9850.0 | 6970.5 | 2,129 | 622 |

**Table B.7.5 Energy Consumption for Motors in Lift Station #5**

| Description | Rated HP | Required HP | # of hours | Current Motors | | | |
|---|---|---|---|---|---|---|---|
| | | | | Eff. | Actual HP | kW | kWh |
| Flygt Pump 1 | 5 | 4 | 450 | 85% | 4.71 | 3.51 | 1,579 |
| Flygt Pump 2 | 5 | 4 | 450 | 85% | 4.71 | 3.51 | 1,579 |
| **TOTAL** | | | | | | | **3,158** |

**Table B.8.1 - Energy Breakdown for Centennial Arena**

| | Energy Consumption (kWh) | % of Total Energy Consumption |
|---|---|---|
| HVAC | 711,886 | 70% |
| Lighting | 47,862 | 5% |
| Hot Water | 46,204 | 5% |
| Motors | 212,958 | 21% |
| **Total** | **1,018,910** | |

**Table B.8.2 (a) - Electricity Usage for the Centennial Arena**

| | Consumption Data | | | Calculated Costs | | |
|---|---|---|---|---|---|---|
| Month (2004-2005) | Maximum KVA | Billed KVA | Energy (kWh) | Demand Charge | Energy Charge | Total Charge |
| October | 234 | 184 | 69,360 | $1,531 | $2,141 | $4,353 |
| November | 258 | 208 | 71,080 | $1,731 | $2,181 | $4,627 |
| December | 275 | 225 | 97,120 | $1,872 | $2,791 | $5,483 |
| January | 296 | 246 | 99,260 | $2,047 | $2,841 | $5,739 |
| February | 318 | 268 | 110,240 | $2,230 | $3,097 | $6,240 |
| March | 299 | 249 | 93,640 | $2,072 | $2,709 | $5,617 |
| April | 296 | 246 | 96,360 | $2,047 | $2,773 | $5,677 |
| May | 218 | 168 | 63,160 | $1,398 | $2,065 | $4,132 |
| June | 188 | 138 | 38,540 | $1,148 | $1,464 | $3,137 |
| July | 94 | 44 | 21,040 | $366 | $1,036 | $1,454 |
| August | 89 | 39 | 17,160 | $324 | $905 | $1,225 |
| September | 312 | 262 | 94,820 | $2,180 | $2,839 | $5,892 |
| **TOTAL** | | **2277** | **871,780** | **$18,945** | **$26,842** | **$53,577** |

**Table B.8.2 (b) - Natural Gas Consumption for the Centennial Arena**

| Month (2004-2005) | Gas ($m^3$) | Gas (kWh) | Total Charge |
|---|---|---|---|
| November | 1651.208 | 17,090 | $836 |
| December | 1039.377 | 10,757 | $538 |
| January | 4511.337 | 46,691 | $2,232 |
| February | 1183.12 | 12,245 | $608 |
| March | 3376.131 | 34,942 | $1,678 |
| April | 685.546 | 7,095 | $365 |
| May | 516.003 | 5,340 | -$52 |
| June | 291.173 | 3,014 | $120 |
| July | 103.201 | 1,068 | -$61 |
| August | 309.602 | 3,204 | $120 |
| September | 106.886 | 1,106 | -$68 |
| October | 442.288 | 4,578 | $172 |
| **TOTAL** | **14,216** | **147,130** | **$6,486** |

**Notes**

The Total Charge column includes the energy charge, the demand charge, the monthly basic charge, and 14% taxes.

**Table B.8.3 - Lighting Analysis Summary for the Centennial Arena**

| Description | Quantity | Current Conditions | | After Improvements | |
|---|---|---|---|---|---|
| | | Annual Energy Consumption (kWh) | Annual Cost | Annual Energy Consumption (kWh) | Annual Cost |
| T8 fluorescent lamps - no upgrade recommended. | 24 | 2,821 | $169 | 2,821 | $169 |
| 6' x 2 T12 fluorescent lamps (22) - convert to T8 fluorescents. | 44 | 14,374 | $863 | 7,362 | $442 |
| 4' x 2 T12 fluorescent lamps (8) - convert to T8 fluorescents. | 16 | 3,123 | $188 | 1,880 | $113 |
| 100W Indoor incandescents - convert to compact fluorescents. | 16 | 6,374 | $383 | 1,785 | $107 |
| 60W Indoor incandescents - convert to compact fluorescents. | 9 | 2,151 | $129 | 574 | $34 |
| 200W Incandescents in Rink- convert to metal halides. | 18 | 14,342 | $861 | 7,171 | $431 |
| Outdoor lights - no upgrade recommended. | 10 | 2,628 | $158 | 2,628 | $158 |
| LED Exit Signs - no upgrade recommended. | 6 | 158 | $9 | 158 | $9 |
| Incandescent exit signs - upgrade to LEDs. | 5 | 1,314 | $79 | 131 | $8 |
| Parking lot plugs. | 2 | 576 | $35 | 576 | $35 |
| Install sensors on lights. | 8 | 14,470 | $869 | 2,894 | $174 |
| **TOTALS** | | **47,862** | **$2,874** | **25,086** | **$1,506** |

| | |
|---|---|
| **Annual Energy Savings (kWh)** | **22,776** |
| **Annual Cost Savings** | **$1,367** |
| **Percent Annual Energy Savings** | **48%** |

The arena is assumed to be occupied from August to April, 8am - midnight, 7 days/week.

**Table B.8.4 (a) Window and Door Replacement Calculations for Centennial Arena**

| Description | Existing | | | | New | | | Savings | |
|---|---|---|---|---|---|---|---|---|---|
| | Area ($ft^2$) | R-Value ($^oF\ ft^2hr/BTU$) | Annual Heat Loss (kWh) | Cost | R-Value ($^oF\ ft^2hr/BTU$) | Annual Heat Loss (kWh) | Cost | Energy (kWh) | Cost |
| Replace 5' x 4' rink windows and provide metal guards (13). | 260.00 | 1.000 | 20,023 | $1,202 | 6.25 | 3,204 | $192 | 16,819 | $1,010 |
| **TOTALS** | | | **20,023** | **$1,202** | | **3,204** | **$192** | **16,819** | **$1,010** |

**Table B.8.4 (b) Window and Door Infiltration Calculations for Centennial Arena**

| Description | Crack Length (ft) | Crack Width (in) | Leakage on typical door (cfm) | Leakage on these doors (cfm) | Annual Heat Loss (BTU) | Annual Heat Loss (kWh) | Cost |
|---|---|---|---|---|---|---|---|
| Weatherstrip pedestrian doors (9). | 45 | 0.05 | 125 | 154 | 43,619,963 | 12,784 | $768 |
| Caulk pedestrian doors (9). | 180 | 0.005 | 10 | 49 | 13,958,388 | 4,091 | $246 |
| **TOTALS** | | | | | | **12,784** | **$768** |

**Table B.8.4 (c) Wall/Roof Insulation Upgrade Calculations for Centennial Arena**

| Description | Existing | | | | New | | | Savings | |
|---|---|---|---|---|---|---|---|---|---|
| | Area ($ft^2$) | R-Value ($^oF\ ft^2hr/BTU$) | Annual Heat Loss (kWh) | Cost | R-Value ($^oF\ ft^2hr/BTU$) | Annual Heat Loss (kWh) | Cost | Energy (kWh) | Cost |
| Upgrade insulation in ceiling of referee's room. | 300.00 | 2.000 | 12,661 | $760 | 20.00 | 3,208 | $193 | 9,453 | $568 |
| Upgrade insulation in walls of referee's room. | 500.00 | 2.000 | 21,101 | $1,267 | 20.00 | 5,347 | $321 | 15,754 | $946 |
| **TOTALS** | | | **33,762** | **$2,027** | | **8,555** | **$514** | **25,207** | **$1,513** |

The crack lengths around the doors is taken as a quarter of the perimeter.
The temperature is maintained at 21°C (70°F) except the rink area is maintained at an average of -6.7°C (20°F).

**Table B.8.5 - Water Usage for Centennial Arena**

| Fixtures | Qty | Est. # of Uses/Hr/Fixture | Est. # of Uses/Yr | Current Flow (LPF or LPC) | Current Water Usage (L/Yr) | New Flow (LPF or LPC) | New Water Usage (L/Yr) | Water Saved (L/Yr) | Hot Water Savings (kWh) | Cost Savings |
|---|---|---|---|---|---|---|---|---|---|---|
| Sinks | 11 | 1.3 | 54,780 | 1.60 | 87,648 | 0.32 | 17,530 | 70,118 | 2,628 | $158 |
| Toilets | 11 | 0.6 | 24,900 | 13.25 | 329,925 | 3.98 | 98,978 | 230,948 | NA | NA |
| Urinals | 3 | 2.5 | 29,880 | Auto | 497,218 | 3.80 | 113,544 | 383,674 | NA | NA |
| Showers | 21 | 0.1 | 9,960 | 66.25 | 659,850 | 47.30 | 471,108 | 188,742 | 7,073 | $424 |
| **Total** | | | | | **1,574,641** | | **701,159** | **873,482** | **9,701** | **$582** |

| Frequency at Which Fixtures are Used | | | |
|---|---|---|---|
| | **Females** | **Males** | **Totals** |
| Number of People | 10 | 20 | |
| Number of Toilet Uses/day | 3 | 1 | |
| Number of Toilets | 11 | 11 | |
| Toilet Uses/hour/fixture | 0.34 | 0.23 | 0.57 |
| Number of Urinal Uses/day | 0 | 3 | |
| Number of Urinals | 0 | 3 | |
| Urinal Uses/hour/fixture | 0 | 2.50 | 2.50 |
| Number of Sinks | 11 | 11 | |
| Number of Sink Uses/day | 3 | 4 | |
| Sink Uses/hr/fixture | 0.34 | 0.91 | 1.25 |
| Number of Showers | 21 | 21 | |
| Number of Shower Uses/day | 20 | 20 | |
| Shower Uses/hr/fixture | 0.06 | 0.06 | 0.12 |

| Current Hot Water Usage (kWh) | | |
|---|---|---|
| **Fixture** | **L/Yr** | **kWh** |
| Sinks | 87,648 | 3,285 |
| Showers | 659,850 | 24,727 |
| **Total** | | **28,012** |

The high flow toilets consume 3.5 gallons per flush and the water efficient toilets consume 1.5 / 0.8 gpf
The high flow sinks consume 2.5 gallons per minute and the water efficient sinks consume 0.5 gpm
The automatic flush urinals are assumed to consume 5 gallons every 20 minutes.
The current showers are assumed to use 3.5 gpm and the new showers use 2.5 gpm

**Table B.8.6 Energy Savings with Heating, Ventilating, and Air Conditioning for Centennial Arena**

| Description | Quantity | Heating Efficiency | HDD below 70 F | Flow Rate (cfm) | Energy Savings (kWh) |
|---|---|---|---|---|---|
| Provide countdown timer for concessions exhaust fan. | 1 | 100% | 10,949 | 2000 | 3,326 |
| Put HRV on timer in locker room. | 1 | 100% | 10,949 | 400 | 9,313 |

**Notes**
It is assumed that a timer on the exhaust fan will reduce the run time of the exhaust fan by 5 hours every week from Aug to Apr.
It is assumed that the HRV currently runs continuously from Aug-Apr and a timer will reduce it's run time to during occupied times only.

**Table B.8.7 Energy Consumption and Savings Calculations for Motors in Centennial Arena**

| Description | Rated HP | Required HP | # of hours | Current Motor | | |
|---|---|---|---|---|---|---|
| | | | | Actual HP | kW | kWh |
| Compressor | 50 | 40 | 2,880 | 44.40 | 33.11 | 95,354 |
| Spray Pump | 5 | 4 | 2,880 | 4.44 | 3.31 | 9,535 |
| Brine Pump | 25 | 20 | 5,760 | 22.20 | 16.55 | 95,354 |
| Condenser Fan 1 | 10 | 8 | 960 | 8.88 | 6.62 | 6,357 |
| Condenser Fan 2 | 5 | 4 | 960 | 4.44 | 3.31 | 3,178 |
| Condenser Fan 3 | 5 | 4 | 960 | 4.44 | 3.31 | 3,178 |
| **TOTALS** | | | | | | **212,958** |

**Table B.9.1 - Energy Breakdown for Outdoor Swimming Pool**

| | Energy Consumption (kWh) | % of Total Energy Consumption |
|---|---|---|
| Heating | 4,872 | 3% |
| Lighting | 3,275 | 2% |
| Hot Water | 5,152 | 3% |
| Pool Heater | 149,267 | 91% |
| Motors | 1,541 | 1% |
| **Total** | **164,107** | |

**Table B.9.2 (a) - Electricity Usage for Outdoor Swimming Pool**

| | Consumption Data | | | Calculated Costs | | |
|---|---|---|---|---|---|---|
| Month (2004-2005) | Maximum KVA | Billed KVA | Energy (kWh) | Demand Charge | Energy Charge | Total Charge |
| October | 0 | 0 | 2,330 | $0 | $137 | $206 |
| November | 0 | 0 | 0 | $0 | $0 | $25 |
| December | 0 | 0 | 1,580 | $0 | $93 | $131 |
| January | 0 | 0 | 0 | $0 | $0 | $25 |
| February | 0 | 0 | 1,830 | $0 | $107 | $147 |
| March | 0 | 0 | 0 | $0 | $0 | $25 |
| April | 0 | 0 | 1,870 | $0 | $110 | $150 |
| May | 0 | 0 | 0 | $0 | $0 | $25 |
| June | 0 | 0 | 1,790 | $0 | $107 | $148 |
| July | 0 | 0 | 1,430 | $0 | $86 | $123 |
| August | 0 | 0 | 2,960 | $0 | $178 | $228 |
| September | 0 | 0 | 1,050 | $0 | $63 | $97 |
| **TOTAL** | | **0** | **14,840** | **$0** | **$880** | **$1,329** |

**Table B.9.2 (b) - Natural Gas Consumption for Outdoor Swimming Pool**

| Month (2004-2005) | Gas ($m^3$) | Gas (kWh) | Total Charge |
|---|---|---|---|
| November | 0.00 | 0 | $30 |
| December | 0.00 | 0 | $30 |
| January | 0.00 | 0 | $30 |
| February | 0.00 | 0 | $30 |
| March | 0.00 | 0 | $30 |
| April | 0.00 | 0 | $30 |
| May | 2187.90 | 22,644 | $1,098 |
| June | 3993.12 | 41,328 | $1,979 |
| July | 3399.70 | 35,186 | $1,689 |
| August | 3984.80 | 41,241 | $1,975 |
| September | 856.86 | 8,868 | $449 |
| October | 0.00 | 0 | $30 |
| **TOTAL** | **14,422** | **149,267** | **$7,402** |

**Notes**

The Total Charge column includes the energy charge, the demand charge, the monthly basic charge, and 14% taxes.

**Table B.9.3 - Lighting Analysis Summary for Outdoor Swimming Pool**

| Description | Quantity | Current Conditions | | After Improvements | |
|---|---|---|---|---|---|
| | | Annual Energy Consumption (kWh) | Annual Cost | Annual Energy Consumption (kWh) | Annual Cost |
| 6' T12 Fluorescents (12x2) - Replace with T8s. | 24 | 1,963 | $118 | 981 | $59 |
| 100W Incandescents - Replace with compact fluorescents. | 15 | 807 | $48 | 226 | $14 |
| Oudoor Light - Install photocell. | 1 | 216 | $13 | 108 | $6 |
| Incandescent Exit Sign - Replace with LED. | 1 | 263 | $16 | 26 | $2 |
| LED Exit Sign - No upgrade recommended. | 1 | 26 | $2 | 26 | $2 |
| **TOTALS** | | **3,275** | **$197** | **1,368** | **$82** |

| | |
|---|---|
| **Annual Energy Savings (kWh)** | **1,907** |
| **Annual Cost Savings** | **$114** |
| **Percent Annual Energy Savings** | **58%** |

These calculations are based on the assumption that the outdoor swimming pool is occupied in June, July, and August for a total of 1076 hrs/yr.

**Table B.9.4 (a) Window and Door Replacement Calculations for Outdoor Swimming Pool**

| Description | Existing | | | | New | | | Savings | |
|---|---|---|---|---|---|---|---|---|---|
| | Area ($ft^2$) | R-Value ($^oF\ ft^2hr/BTU$) | Annual Heat Loss (kWh) | Cost | R-Value ($^oF\ ft^2hr/BTU$) | Annual Heat Loss (kWh) | Cost | Energy (kWh) | Cost |
| Replace 4' x 3' windows with triple pane windows (2). | 24.00 | 2.000 | 924 | $55 | 6.25 | 296 | $18 | 628 | $38 |
| **TOTALS** | | | **924** | **$55** | | **296** | **$18** | **628** | **$38** |

**Table B.9.4 (b) Window and Door Infiltration Calculations for Outdoor Swimming Pool**

| Description | Crack Length (ft) | Crack Width (in) | Leakage on typical door (cfm) | Leakage on these doors (cfm) | Annual Heat Loss (BTU) | Annual Heat Loss (kWh) | Cost |
|---|---|---|---|---|---|---|---|
| Weatherstrip pedestrian doors (4). | 20 | 0.05 | 125 | 68 | 19,386,650 | 5,682 | $260 |
| Caulk pedestrian doors (4). | 80 | 0.005 | 10 | 22 | 6,203,728 | 1,818 | $83 |
| Caulk windows (2 - 4'x3'). | 28 | 0.005 | 10 | 8 | 2,171,305 | 636 | $29 |
| **TOTALS** | | | | | | **8,136** | **$372** |

The crack lengths around the doors is taken as a quarter of the perimeter.

The temperature is maintained at 21°C (70°F).

**Table B.9.5 - Water Usage for Outdoor Swimming Pool**

| Fixtures | Qty | Est. # of Uses/Hr/Fixture | Est. # of Uses/Yr | Current Flow (LPF or LPC) | Current Water Usage (L/Yr) | New Flow (LPF or LPC) | New Water Usage (L/Yr) | Water Saved (L/Yr) | Hot Water Savings (kWh) | Cost Savings |
|---|---|---|---|---|---|---|---|---|---|---|
| Sinks | 4 | 0.6 | 2,556 | 1.60 | 4,089 | 0.32 | 818 | 3,271 | 123 | $7 |
| Toilets | 4 | 0.2 | 942 | 13.25 | 12,475 | 3.98 | 3,742 | 8,732 | NA | NA |
| Urinals | 1 | 1.5 | 1,614 | 9.50 | 15,333 | 3.80 | 6,133 | 9,200 | NA | NA |
| Showers | 6 | 0.1 | 673 | 66.25 | 44,553 | 47.30 | 31,809 | 12,744 | 478 | $29 |
| **Total** | | | | | **76,450** | | **42,503** | **33,947** | **600** | **$36** |

| Frequency at Which Fixtures are Used | | | |
|---|---|---|---|
| | Females | Males | Totals |
| Number of People | 1 | 4 | |
| Number of Toilet Uses/day | 3 | 1 | |
| Number of Toilets | 4 | 4 | |
| Toilet Uses/hour/fixture | 0.09 | 0.13 | 0.22 |
| Number of Urinal Uses/day | 0 | 3 | |
| Number of Urinals | 0 | 1 | |
| Urinal Uses/hour/fixture | 0 | 1.50 | 1.50 |
| Number of Sinks | 4 | 4 | |
| Number of Sink Uses/day | 3 | 4 | |
| Sink Uses/hr/fixture | 0.09 | 0.50 | 0.59 |
| Number of Showers | 6.00 | 6.00 | |
| Number of Shower Uses/day | 1.00 | 1.00 | |
| Shower Uses/hr/fixture | 0.02 | 0.08 | 0.10 |

| Current Hot Water Usage (kWh) | | |
|---|---|---|
| Fixture | L/Yr | kWh |
| Sinks | 4,089 | 153 |
| Showers | 44,553 | 1,670 |
| **Total** | | **1,823** |

The high flow toilets consume 3.5 gallons per flush and the water efficient toilets consume 1.5 / 0.8 gpf
The high flow sinks consume 2.5 gallons per minute and the water efficient sinks consume 0.5 gpm
The urinals consume 2.5 gallons per flush and the water efficient urinals consume 1 gallon per flush
The current showers are assumed to use 3.5 gpm and the new showers use 2.5 gpm

**Table B.9.6 Energy Savings with Heating, Ventilating, and Air Conditioning for Outdoor Swimming Pool**

| Description | Quantity | Heating Efficiency | HDD below 70 F | Flow Rate (cfm) | Heat Loss (kWh) |
|---|---|---|---|---|---|
| Replace BDDs on washroom exhausts with motorized dampers. | 2 | 100% | 10,949 | 15 | 2,495 |

| Description | % of Time Unoccupied | HDD below 70 F | HDD below 59 F | Current Energy Used to Heat | Heat Savings (kWh) |
|---|---|---|---|---|---|
| Setback thermostats to 15°C (59°F). | 87.72% | 10,949 | 9,300 | 4,872 | 643 |

| Description | Quantity | Standard Efficiency | High Efficiency | Current Energy Consumed by Boilers | Energy Savings (kWh) |
|---|---|---|---|---|---|
| Replace pool boilers with high efficiency pool boilers. | 2 | 80% | 95% | 149,267 | 22,390 |

**Table B.9.7 Energy Consumption and Savings Calculations for Motors in the Outdoor Swimming Pool**

| Description | Rated HP | Required HP | # of hours | Current Motors | | | | Energy Savings of Premium | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Eff. | Actual HP | kW | kWh | Actual HP | kW | kWh |
| Main Pool Pump | 7.5 | 6.0 | 268 | 88% | 6.8 | 5.08 | 1,360 | 0.18 | 0.13 | 36 |
| Kiddie Pool Pump | 1.0 | 0.8 | 268 | 88% | 0.9 | 0.68 | 181 | 0.02 | 0.02 | 5 |
| **TOTALS** | | | | | | | **1,541** | | | **41** |

**Table B.10.1 - Energy Breakdown for Town Fire Hall**

| | Energy Consumption (kWh) | % of Total Energy Consumption |
|---|---|---|
| HVAC | 106,988 | 86% |
| Lighting | 14,294 | 12% |
| Hot Water | 3,009 | 2% |
| **Total** | **124,291** | |

**Table B.10.2 (a) - Electricity Usage for Town Fire Hall**

| | Consumption Data | | | Calculated Costs | | |
|---|---|---|---|---|---|---|
| Month (2004-2005) | Maximum KVA | Billed KVA | Energy (kWh) | Demand Charge | Energy Charge | Total Charge |
| October | 13 | 0 | 4,080 | $0 | $239 | $291 |
| November | 17 | 0 | 5,120 | $0 | $300 | $360 |
| December | 19 | 0 | 7,360 | $0 | $431 | $510 |
| January | 20 | 0 | 8,880 | $0 | $520 | $611 |
| February | 21 | 0 | 8,560 | $0 | $502 | $590 |
| March | 19 | 0 | 7,040 | $0 | $413 | $488 |
| April | 19 | 0 | 7,440 | $0 | $436 | $518 |
| May | 0 | 0 | 4,720 | $0 | $283 | $341 |
| June | 0 | 0 | 3,520 | $0 | $211 | $259 |
| July | 0 | 0 | 3,840 | $0 | $231 | $281 |
| August | 0 | 0 | 2,960 | $0 | $178 | $221 |
| September | 0 | 0 | 2,080 | $0 | $125 | $160 |
| **TOTAL** | | **0** | **65,600** | **$0** | **$3,869** | **$4,630** |

**Table B.10.2 (b) - Natural Gas Consumption for Town Fire Hall**

| Month (2004-2005) | Gas ($m^3$) | Gas (kWh) | Total Charge |
|---|---|---|---|
| November | 41.595 | 430 | $51 |
| December | 1006.599 | 10,418 | $522 |
| January | 1802.45 | 18,655 | $910 |
| February | 568.465 | 5,883 | $308 |
| March | 859.63 | 8,897 | $450 |
| April | 332.76 | 3,444 | $193 |
| May | 305.03 | 3,157 | $17 |
| June | 158.061 | 1,636 | $108 |
| July | 5.546 | 57 | -$44 |
| August | 180.245 | 1,865 | $74 |
| September | 0 | 0 | $17 |
| October | 410.404 | 4,248 | $156 |
| **TOTAL** | **5,671** | **58,691** | **$2,761** |

**Notes**

The Total Charge column includes the energy charge, the demand charge, the monthly basic charge, and 14% taxes.

**Table B.10.3 - Lighting Analysis Summary for Town Fire Hall**

| Description | Quantity | Current Conditions | | After Improvements | |
|---|---|---|---|---|---|
| | | Annual Energy Consumption (kWh) | Annual Cost | Annual Energy Consumption (kWh) | Annual Cost |
| 4'x2 T12 fluorescents (10) - replace with T8 ballasts and tubes. | 20 | 2,293 | $138 | 1,381 | $83 |
| 6' T12 fluorescents (21) - replace with T8 ballasts and tubes. | 42 | 8,059 | $484 | 4,128 | $248 |
| Exterior lighting - no upgrade recommended. | 9 | 3,942 | $237 | 3,942 | $237 |
| **TOTALS** | | **14,294** | **$858** | **9,450** | **$567** |

| | |
|---|---|
| **Annual Energy Savings (kWh)** | **4,844** |
| **Annual Cost Savings** | **$291** |
| **Percent Annual Energy Savings** | **34%** |

These calculations are based on the assumptions that the fire hall is occupied for 45 hours/week.

**Table B.10.4 (a) Window and Door Replacement Calculations for Town Fire Hall**

| Description | Existing | | | | New | | | Savings | |
|---|---|---|---|---|---|---|---|---|---|
| | Area ($ft^2$) | R-Value ($^oF\ ft^2hr/BTU$) | Annual Heat Loss (kWh) | Cost | R-Value ($^oF\ ft^2hr/BTU$) | Annual Heat Loss (kWh) | Cost | Energy (kWh) | Cost |
| Replace 32" x 48" windows with triple pane windows (4). | 42.67 | 2.000 | 1,825 | $110 | 6.25 | 584 | $35 | 1,241 | $75 |
| **TOTALS** | | | **1,825** | **$110** | | **584** | **$35** | **1,241** | **$75** |

**Table B.10.4 (b) Window and Door Infiltration Calculations for Town Fire Hall**

| Description | Crack Length (ft) | Crack Width (in) | Leakage on typical door (cfm) | Leakage on these doors (cfm) | Annual Heat Loss (BTU) | Annual Heat Loss (kWh) | Cost |
|---|---|---|---|---|---|---|---|
| Weatherstrip pedestrian doors (3). | 15 | 0.05 | 125 | 51 | 16,155,542 | 4,735 | $216 |
| Weatherstrip vehicle doors (5). | 32 | 0.05 | 125 | 108 | 33,926,638 | 9,943 | $454 |
| Caulk pedestrian doors (3). | 60 | 0.005 | 10 | 16 | 5,169,773 | 1,515 | $69 |
| Caulk vehicle doors (5). | 252 | 0.005 | 10 | 69 | 21,713,048 | 6,363 | $291 |
| Caulk windows (4). | 53 | 0.005 | 10 | 15 | 4,595,354 | 1,347 | $62 |
| **TOTALS** | | | | | | **23,903** | **$216** |

**Table B.10.4 (c) Wall/Roof Insulation Upgrade Calculations for Town Fire Hall**

| Description | Existing | | | | New | | | Savings | |
|---|---|---|---|---|---|---|---|---|---|
| | Area ($ft^2$) | R-Value ($^oF\ ft^2hr/BTU$) | Annual Heat Loss (kWh) | Cost | R-Value ($^oF\ ft^2hr/BTU$) | Annual Heat Loss (kWh) | Cost | Energy (kWh) | Cost |
| Upgrade wall insulation to R-20. | 3712.00 | 12.000 | 26,469 | $1,589 | 20.00 | 15,882 | $954 | 10,588 | $636 |
| Upgrade roof insulation to R-40. | 3300.00 | 20.000 | 14,119 | $848 | 40.00 | 7,059 | $424 | 7,059 | $424 |
| **TOTALS** | | | **40,588** | **$2,437** | | **22,941** | **$1,377** | **17,647** | **$1,060** |

The crack lengths around the doors is taken as a quarter of the perimeter.
The temperature is maintained at 21°C (70°F).

**Table B.10.5 - Water Usage for Town Fire Hall**

| Fixtures | Qty | Est. # of Uses/Hr/Fixture | Est. # of Uses/Yr | Current Flow (LPF or LPC) | Current Water Usage (L/Yr) | New Flow (LPF or LPC) | New Water Usage (L/Yr) | Water Saved (L/Yr) | Hot Water Savings (kWh) | Cost Savings |
|---|---|---|---|---|---|---|---|---|---|---|
| Sinks | 2 | 1.4 | 6,435 | 1.60 | 10,296 | 0.32 | 2,059 | 8,237 | 309 | $19 |
| Toilets | 2 | 0.6 | 2,925 | 13.25 | 38,756 | 3.98 | 11,627 | 27,129 | NA | NA |
| Urinals | 2 | 0.8 | 3,510 | 9.50 | 33,345 | 3.80 | 13,338 | 20,007 | NA | NA |
| **Total** | | | | | **82,397** | | **27,024** | **55,373** | **309** | **$19** |

| Frequency at Which Fixtures are Used | | | |
|---|---|---|---|
| | **Females** | **Males** | **Totals** |
| Number of People | 2 | 4 | |
| Number of Toilet Uses/day | 3 | 1 | |
| Number of Toilets | 2 | 2 | |
| Toilet Uses/hour/fixture | 0.38 | 0.25 | 0.63 |
| Number of Urinal Uses/day | 0 | 3 | |
| Number of Urinals | 0 | 2 | |
| Urinal Uses/hour/fixture | 0 | 0.75 | 0.75 |
| Number of Sinks | 2 | 2 | |
| Number of Sink Uses/day | 3 | 4 | |
| Sink Uses/hr/fixture | 0.38 | 1.00 | 1.38 |

| Current Hot Water Usage (kWh) | | |
|---|---|---|
| **Fixture** | **L/Yr** | **kWh** |
| Sinks | 10,296 | 386 |
| **Total** | | **386** |

The high flow toilets consume 3.5 gallons per flush and the water efficient toilets consume 1.5 / 0.8 gpf
The high flow sinks consume 2.5 gallons per minute and the water efficient sinks consume 0.5 gpm
The urinals consume 2.5 gallons per flush and the water efficient urinals consume 1 gallon per flush

**Table B.10.6 Energy Savings with Heating, Ventilating, and Air Conditioning for Town Fire Hall**

| Description | Quantity | Heating Efficiency | HDD below 70 F | Flow Rate (cfm) | Heat Loss (kWh) |
|---|---|---|---|---|---|
| Replace BDD with motorized damper. | 1 | 90% | 10,949 | 40 | 3,696 |

| Description | % of Time Unoccupied | HDD below 70 F | HDD below 59 F | Current Energy Used to Heat | Heat Savings (kWh) |
|---|---|---|---|---|---|
| Setback thermostats to 15°C (59°F). | 73.29% | 10,949 | 9,300 | 58,691 | 6,476 |

**Table B.11.1 - Energy Breakdown for Library**

| | Energy Consumption (kWh) | % of Total Energy Consumption |
|---|---|---|
| HVAC | 70,441 | 86% |
| Lighting | 8,713 | 11% |
| Hot Water | 2,482 | 3% |
| **Total** | **81,636** | |

### Table B.11.2 (a) - Electricity Usage for Library

| | Consumption Data | | | Calculated Costs | | |
|---|---|---|---|---|---|---|
| Month (2004-2005) | Maximum KVA | Billed KVA | Energy (kWh) | Demand Charge | Energy Charge | Total Charge |
| October | 0 | 0 | 3,520 | $0 | $206 | $253 |
| November | 0 | 0 | 3,160 | $0 | $185 | $229 |
| December | 0 | 0 | 4,360 | $0 | $255 | $309 |
| January | 0 | 0 | 4,600 | $0 | $270 | $325 |
| February | 0 | 0 | 4,440 | $0 | $260 | $315 |
| March | 0 | 0 | 3,560 | $0 | $209 | $256 |
| April | 0 | 0 | 3,600 | $0 | $211 | $260 |
| May | 0 | 0 | 3,400 | $0 | $204 | $251 |
| June | 0 | 0 | 3,000 | $0 | $180 | $223 |
| July | 0 | 0 | 3,480 | $0 | $209 | $256 |
| August | 0 | 0 | 4,000 | $0 | $240 | $292 |
| September | 0 | 0 | 3,120 | $0 | $187 | $232 |
| **TOTAL** | | **0** | **44,240** | **$0** | **$2,617** | **$3,201** |

### Table B.11.2 (b) - Natural Gas Consumption for Library

| Month (2004-2005) | Gas ($m^3$) | Gas (kWh) | Total Charge |
|---|---|---|---|
| November | 169.153 | 1,751 | $113 |
| December | 640.563 | 6,630 | $343 |
| January | 1031.556 | 10,676 | $534 |
| February | 360.49 | 3,731 | $206 |
| March | 549.054 | 5,683 | $298 |
| April | 219.067 | 2,267 | $137 |
| May | 160.834 | 1,665 | $2 |
| June | 99.828 | 1,033 | $79 |
| July | 2.773 | 29 | -$17 |
| August | 116.466 | 1,205 | $70 |
| September | 0 | 0 | -$26 |
| October | 263.435 | 2,726 | $133 |
| **TOTAL** | **3,613** | **37,396** | **$1,872** |

**Notes**

The Total Charge column includes the energy charge, the demand charge, the monthly basic charge, and 14% taxes.

**Table B.11.3 - Lighting Analysis Summary for Library**

| Description | Quantity | Current Conditions | | After Improvements | |
|---|---|---|---|---|---|
| | | Annual Energy Consumption (kWh) | Annual Cost | Annual Energy Consumption (kWh) | Annual Cost |
| 4'x2 T8 fluorescents in washroom (3) - Add occupancy sensors. | 6 | 396 | $24 | 99 | $6 |
| 4' x2 T8 fluorescents (45) - No upgrade recommended. | 90 | 5,937 | $356 | 5,937 | $356 |
| Flood lights on photocell (4). | 4 | 1,752 | $105 | 1,752 | $105 |
| LED Exit Signs | 2 | 53 | $3 | 53 | $3 |
| Parking Lot Controllers | 2 | 576 | $35 | 288 | $17 |
| **TOTALS** | | **8,713** | **$523** | **8,128** | **$488** |

| | |
|---|---|
| **Annual Energy Savings (kWh)** | **585** |
| **Annual Cost Savings** | **$35** |
| **Percent Annual Energy Savings** | **7%** |

These calculations are based on the assumptions that the Library is occupied from Mon-Sat, 10:30am-5pm and Tue and Thu 7pm-9pm.

**Table B.11.4 - Water Usage for Library**

| Fixtures | Qty | Est. # of Uses/Hr/Fixture | Est. # of Uses/Yr | Current Flow (LPF or LPC) | Current Water Usage (L/Yr) | New Flow (LPF or LPC) | New Water Usage (L/Yr) | Water Saved (L/Yr) | Hot Water Savings (kWh) | Cost Savings |
|---|---|---|---|---|---|---|---|---|---|---|
| Sinks | 2 | 2.2 | 9,783 | 1.60 | 15,652 | 0.32 | 3,130 | 12,522 | 469 | $28 |
| Toilets | 3 | 0.8 | 5,590 | 13.25 | 74,068 | 3.98 | 22,220 | 51,847 | NA | NA |
| Urinals | 1 | 1.9 | 4,193 | 9.50 | 39,829 | 3.80 | 15,932 | 23,897 | NA | NA |
| **Total** | | | | | **129,548** | | **41,282** | **88,266** | **469** | **$28** |

| Frequency at Which Fixtures are Used | | | |
|---|---|---|---|
| | **Females** | **Males** | **Totals** |
| Number of People | 5 | 5 | |
| Number of Toilet Uses/day | 3 | 1 | |
| Number of Toilets | 3 | 3 | |
| Toilet Uses/hour/fixture | 0.63 | 0.21 | 0.83 |
| Number of Urinal Uses/day | 0 | 3 | |
| Number of Urinals | 0 | 1 | |
| Urinal Uses/hour/fixture | 0 | 1.88 | 1.88 |
| Number of Sinks | 2 | 2 | |
| Number of Sink Uses/day | 3 | 4 | |
| Sink Uses/hr/fixture | 0.94 | 1.25 | 2.19 |

| Current Hot Water Usage (kWh) | | |
|---|---|---|
| **Fixture** | **L/Yr** | **kWh** |
| Sinks | 15,652 | 587 |
| **Total** | | **587** |

The high flow toilets consume 3.5 gallons per flush and the water efficient toilets consume 1.5 / 0.8 gpf
The high flow sinks consume 2.5 gallons per minute and the water efficient sinks consume 0.5 gpm
The urinals consume 2.5 gallons per flush and the water efficient urinals consume 1 gallon per flush

**Table B.11.5 Energy Savings with Heating, Ventilating, and Air Conditioning for Library**

| Description | Quantity | Heating Efficiency | HDD below 70°F | Flow Rate (cfm) | Heat Loss (kWh) |
|---|---|---|---|---|---|
| Wire HRV to programmable stats. | 1 | 95% | 10,949 | 800 | 8,753 |

| Description | % of Time Unoccupied | HDD below 70°F | HDD below 59°F | Current Energy Used to Heat | Heat Savings (kWh) |
|---|---|---|---|---|---|
| Setback thermostats to 15°C (59°F). | 74% | 10,949 | 9,300 | 37,396 | 4,193 |

| Description | % of Time Unoccupied | HDD above 70°F | HDD above 75°F | Current Energy Used to Cool | Heat Savings (kWh) |
|---|---|---|---|---|---|
| Setforward thermostats to 75.2°F | 74% | 184.32 | 5.22 | 33,046 | 23,914 |

# APPENDIX C

# WATER EFFICIENCY

# TABLE OF CONTENTS – APPENDIX C

## Leaks

- A leak of one drop per second wastes 10,000 litres of water per year. A toilet that runs after a flush can waste 200,000 litres of water per year. Fixing a hot water leak will save energy as well as water.

- Check for differing water meter readings at bedtime and in the morning. If no water has been intentionally used, a difference in meter readings indicates a leak.
- If a few drops of food colouring put in your toilet tank seep into the toilet bowl (without flushing), check the flapper valve, valve seat and flapper lift chain for the source of the leak.
- Conduct a periodic "leak check" a minimum of twice a year on water using fixtures and appliances, including outside hose connections. Replace worn washers, O-rings and faulty fixtures.

## On-Site Wastewater Systems

- Wise water management is necessary. All septic systems have limitations and water conservation should be practiced.
- Do not use substitutes for toilet paper. These products may not decompose in the tank and could clog the system.
- Perform regular maintenance checks on your entire system, including regular pump outs of the septic tank and inspection of the disposal field for signs of saturation or leakage.

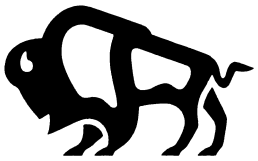
## For More Information, Please Contact:


Water Efficiency Coordinator
Pollution Prevention
Manitoba Conservation
123 Main Street, Suite 160
Winnipeg MB R3C 1A5

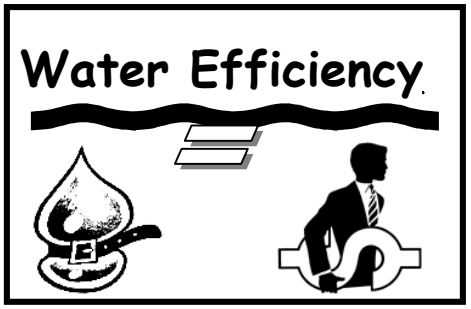
Phone: (204) 945-8980 or
1-800-282-8069 ext. 8980
Fax: (204) 945-1211
E-mail: lliebgott@gov.mb.ca



**Publication Number: 98-06E**

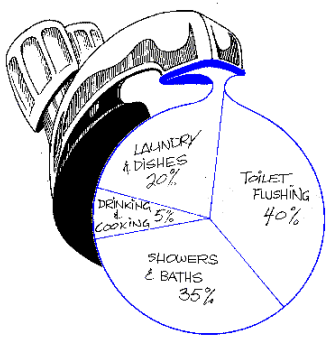

**Pollution Prevention**
Manitoba Conservation

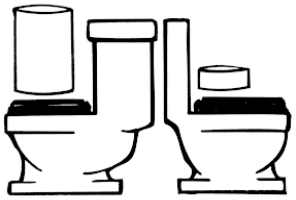

# Water Use

### How you can reduce yours!

- Save money.
- Delay the need to expand our water and wastewater treatment plants.
- Prolong the life of in-ground sewage disposal systems, i.e., septic fields.
- Protect our water sources.



## Bathroom




- Replace toilets that flush 13 to 26 litres of water with 6 litre or dual flush toilets, cutting water used by toilets by half or more. See www.cwwa.ca for toilet performance ratings. In the mean time, reduce water per flush in toilets by up to 35% by installing early closure devices (don't use bricks – as they break down, pieces interfere with the flapper seal).
- Refrain from using the toilet to dispose of trash.
- A partially filled tub uses less water than a long shower; a short shower uses less than a full tub.
- Replace your 20 litre per minute showerhead with a low-flow 9.5 litre per minute showerhead. You'll use less than half the water.
- Make it a habit to be finished your shower in less than 5 minutes.
- Install a water conserving 3.5 litre per minute aerator on your bathroom tap.
- When shaving, rinse the razor in a cup or a partially filled sink instead of letting the tap run.
- Brush teeth using a glass of water to rinse.

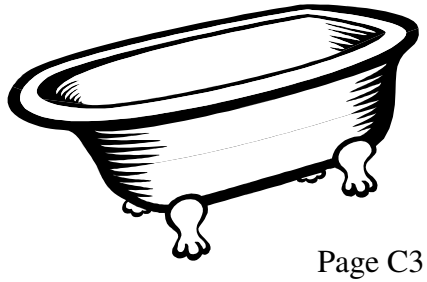
## Kitchen & Laundry

- Install a water saving 9 litre per minute aerator on the kitchen tap.
- Rinse dishes in a stoppered sink or basin, not with running water.
- Wash vegetables in a basin or stoppered sink, then quickly rinse using running water.
- Keep drinking water in the fridge. Wash the container and change the water every few days.
- Thaw food in the fridge rather than under a running tap. This conserves both energy and water.

- Compost organic wastes instead of using a sink garbage disposal.
- Buy a low water use dishwasher to save on energy, water and detergent costs.
- Wash only full loads of laundry and dishes.
- Front loading washing machines use less water than top-loading washers do. If unavailable, choose a clothes washer with a suds saver, and water saving cycle.

## General Water Use

- Only use water treatment or softening systems, if required. If possible, only use softened water for bathing and cleaning – use unsoftened water for cooking, drinking and watering plants.
- Ensure a water softener regenerates only when the resin is exhausted.
- Turn the system off if you will be away for more than a few days.
- Insulate hot water tank and pipes to reduce the need to run water until it is hot. Install a heat trap on the pipe above your water heater to save energy and water.
- Know location of sink, toilet and main shut off valves in case a pipe or water heater blows, or so you can turn off your water when you are away.
- If your water pipes tend to freeze, do not let the tap run continuously. This wastes water, and overloads sewer systems. Instead, install heat tape or connect a pump-back reservoir system (discuss options with your plumber, electrician or call Manitoba Conservation).



# APPENDIX D

# INCENTIVE PROGRAMS

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**Table D.1 Manitoba Hydro Power Smart Incentives**

| Item | Incentives | Contacts |
|---|---|---|
| Compact Fluorescents | $5 - Non-reflectorized screw in lamp, $10 - Reflectorized screw-in lamp, $45 - New hard wired fixture | Kelly Epp at kepp@hydro.mb.ca or 204-474-3615 |
| T8 Electronic Fluorescents | T8 Premium Ballast - $20, T8 Standard Ballast - $15, T8 Dimmable Ballast - $60, 8 Foot T8 Ballast - $35 | Kelly Epp at kepp@hydro.mb.ca or 204-474-3615 |
| LED Exit Signs | $45 per new sign | Kelly Epp at kepp@hydro.mb.ca or 204-474-3615 |
| High Pressure Sodium Lighting | The lesser of $500 per kilowatt saved or $100 of lighting fixture cost | Kelly Epp at kepp@hydro.mb.ca or 204-474-3615 |
| Parking Lot Controllers | $25 for each controlled circuit | May Arason-Li at marasonli@hydro.mb.ca or 204-474-7813 |
| Air Barrier System | $0.46 per square foot or $5 per square meter of net wall area | May Arason-Li at marasonli@hydro.mb.ca or 204-474-7813 |
| Windows | Depends on replacement window's U-Value and net window area | May Arason-Li at marasonli@hydro.mb.ca or 204-474-7813 |
| Geothermal Heat Pump | Manitoba Hydro will pay up to half the cost of a feasabillity study to help decide whether a geothermal heat pump is the right choice for you building. Manitoba Hydro also offers a custom incentive towards the capital cost of your heat pump system, based on the energy savings calculated in the feasability study. | Domenic Marinelli at dmarinelli@hydro.mb.ca or 204-474-4273 |
| High Efficiency Furnaces | $245 for each furnace installed. | Jamie Hopkins at jhopkins@hydro.mb.ca or 204-474-4018 |
| Condensing Boilers | Boilers < 300MBH, Manitoba Hydro will pay $500 + $5/MBH input. Boilers > 300MBH, Manitoba Hydro will pay $2000 + $8/MBH input (retrofits) and $2000 + $5/MBH input (new construction). | Jamie Hopkins at jhopkins@hydro.mb.ca or 204-474-4018 |
| Air Conditioners | Depends on the EER, the cooling capacity, and the incentive factor. | Jamie Hopkins at jhopkins@hydro.mb.ca or 204-474-4018 |

Notes
For general information and information kits contact:
Power Smart for Business
Phone: 474-3676
Email Address: powersmartforbusiness@hydro.mb.ca

**Table D.2. Other Incentive Programs**

| Program Name | Eligibility | What Type of Projects are Available | Ref. Page | Available Funding | Funding Maximums | Deadline For Applications | Prospect of Funding | Project Sponsor | Contact | Email | Website |
|---|---|---|---|---|---|---|---|---|---|---|---|
| EnerGuide for Existing Buildings (EEB) | Comm. & Institutional Bldgs. Aboriginal, northern, rural or remote communities may receive special consideration. | Projects that reduce energy consumption. Includes costs for project planning and development, materials and labour, monitoring and tracking and staffing training and awareness. | 13 | $7.50/GJ (277.8 kW H) | up to 25% of costs based on energy savings ($250,000 max) | On-going | Good | NRCan | MarieLynn Tremblay | Marie_Lyne.Tremblay@nrcan-rncan.gc.ca | http://oee.nrcan.gc.ca/commercial/existing.cfm?attr=20 |
| Municipal Rural Infrastructure Fund (MRIF) | All MB local governments | Projects that construct, restore or improve infrastructure that ensures sustainable use and management of water and wastewater resources. Projects that construct, restore or improve public arts and heritage infrastructure, such as museums, heritage sites, sites for performings arts, and cultural or community centres. - See detailed program info for more info. Program has many requirements and caveats. | 23, 46, 54 | | 2/3 of the approved costs | On-going | Good | Canada-Manitoba Infrastructure Programs | | infra@gov.mb.ca | http://www.infrastructure.mb.ca/e/index.html |
| Renewable Energy Development Initiative (REDI) | …Municipalities…, solar air/water heating, biomass | Projects involving solar air or water heating and clean burning biomass combustion projects. | 25 | 25% of purchase and install of qualifying system | $80,000 | 31-Mar-07 | | NRCan | | redi.penser@nrcan.gc.ca | http://www2.nrcan.gc.ca/es/erb/erb/english/View.asp?x=455 |
| Community Places Program | Non-profit community organizations in MB, except public schools, universities, hospitals, nursing homes, monnercial coops, federal, provincial and city of Winnipeg departments. | Projects involving the upgrading, construction or acquisition of community facilities available to the general community. Priority given to proposals for critical repairs to extend the life of existing well-used facilities. Projects must provide lasting, long-term benefits to the community. | | Up to 50% of first $15,000 and 1/3 of the rest of project | $50,000 | | | Manitoba Culture, Heritage and Tourism | Varies by region | www.gov.mb.ca/chc/grants | http://www.gov.mb.ca/chc/grants |
| Sustainable Development Innovations Fund (SDIF) | Municipal corporations, local governments, private and non-profit organizations and businesses | Sustainable community development, Eco-efficiency initiatives, environmental stewardship. Emphasis on youth involvement, first nations and northern communities. | 55 | | $50,000 (usually $25,000 or less) | | fair | Manitoba Conservation | | sdif@gov.mb.ca | http://www.gov.mb.ca/conservation/pollutionprevention/sdif/index.html |

# APPENDIX E

# TRANSPORTATION AND EQUIPMENT EFFICIENCY

# TABLE OF CONTENTS – APPENDIX E

**Transportation and Equipment Efficiency for Small Municipalities (< 10,000 population).**

Municipal governments may wish to:

- Assess Regulatory, Standards & Industry "Best Practices" to ensure compliance and demonstrated "Due Diligence". Includes Provincial, Federal, Society of Automotive Engineers (SAE), Canadian Standards Association (CSA), American National Standards Institute (ANSI), Workplace Safety & Health audits, Safety inspections, Workplace Hazardous Materials Information System (WHMIS), Transportation of Dangerous Goods regulation (TDG), etc.

- Review current fuelling habits & education on "economical operation" (Driver training, minimal idling, proper lubricants for seasonal operation etc.)

- Review "Alternative Fuel" options, e.g., Diesel and Biodiesel, Propane, Compressed Natural Gas (CNG). Note: Electric Vehicles are not an option yet due to initial cost and the prevailing ambient temperatures experienced in Manitoba

- Consider recycling initiatives for disposal of Fleet Waste Stream products, eg. tires, lubricating oil, anti-freeze, aerosol cans, paints, controlled products, ferrous & non-ferrous scrap metal, plastics etc.

**Other Opportunities:**

***Transportation Demand Management***

- Education & awareness programs on ride-sharing, telecommuting & teleconferencing

***Encouragement of Alternative Modes of Transportation***

- Possibility of van based transit or "pool" operations for commuting within towns & outlying areas. May be viable for transporting groups of employees to & from work locations

- Provision of bike racks, lockable bike containers or small fenced compounds at key locations

- Education & awareness programs on vehicle emissions, "fuel saving" driving habits etc.

***Traffic & Parking Management***

- Possibility of synchronizing traffic lights (if installed) and implementing parking fees etc. to manage parking

## CHOOSING A VEHICLE

### Vehicle Construction

The following points are important when considering fuel efficiency.

- A five speed manual transmission is about 5% more efficient than an automatic.
- Smaller engines use less fuel.
- Front wheel drive vehicles are lighter and therefore more fuel efficient than rear wheel drive vehicles
- SUV's tend to have low fuel efficiency
- Front wheel drive vehicles provide better traction than rear wheel drive in most cases.
- Small engines with a turbocharger can help make up the power difference between large and small engines by using energy from hot exhaust.

### Vehicle Ratings

The Office of Energy Efficiency of Natural Resources Canada, issues a list of the most fuel efficient vehicles in each of a number of categories. See their website for the latest list.

### Extra Features

Air conditioning, power steering, and roof racks are some of the big energy using extras. Air conditioning can increase your fuel consumption by 10 to 20 percent in city driving. A fully loaded roof rack can add 25% to your fuel costs. Even empty, it will add about 1% due to wind resistance

## DRIVING ECONOMICALLY

Driving technique is critical to fuel economy.

- Maintain recommended tire pressure to maximize fuel efficiency and tire life.
- Keep your engine well tuned and maintained.
- One minute of idling uses more fuel than restarting the engine.
- Avoid jack-rabbit starts.
- An open sun roof and open windows increase air resistance, especially on the highway. Use the car's ventilation system instead.
- Most cars use 10% less fuel when driven at 55 miles per hour as opposed to 62, or 90 kilometers as opposed to 100.
- Adjust your speed in advance of changes in traffic flow. Take your foot off the accelerator and progressively gear down rather than accelerating up to a stop sign and breaking hard.

## ENGINE BLOCK HEATERS - IS THERE A SAVINGS?

- In sub-freezing temperatures, the first 15 to 20 minutes of driving, after a cold start cause the engine to use about 30% more fuel than a warm engine.
- A timer can be installed for your vehicle's block heater to start warming the engine a couple hours before you head out.
-

- With the cost of electricity accounted for, you should still come out ahead, over the course of a winter.

**FUEL OPTIONS**

- Diesel engines are more fuel efficient than gasoline engines, as Diesel contains 10% more energy per unit volume than gasoline. Higher diesel engine costs are offset by increased fuel economy and engine life.
- Many fleet operators are converting their vehicles to biodiesel for cost advantages and a cleaner burn.
- There are many advantages to a dual-fuel system, which allows you to switch between gasoline and propane or natural gas with the flick of a switch.
- Hybrid vehicles…

From the Office of Energy Efficiency, Natural Resources Canada:

# Buying a Fuel-Efficient Vehicle

- Fuel consumption can vary widely from one vehicle to the next. Whether you're buying new or used, the choices you make today will either save you money (through reduced fuel consumption) or cost you money for years to come.

- How big is big enough? It's always a good idea to avoid buying more vehicle than you need. Larger vehicles tend to be heavier and have bigger and more powerful engines, so consider buying the most fuel-efficient vehicle that meets your everyday needs.

- If you're buying a new vehicle, check the EnerGuide label for its fuel consumption rating. EnerGuide labels are now affixed to all new light-duty vehicles sold in Canada.

- Fuel consumption ratings for all new cars, light-duty trucks and vans sold in Canada are also available in the free Fuel Consumption Guide. You can download a PDF version of the Guide, or call 1 800 387-2000 to order your free copy. Past editions are available, so you can also check fuel consumption ratings for used vehicles.

- Have a look at the list of the most recent winners of the EnerGuide Awards, presented each model year to the manufacturers of the most fuel-efficient vehicles in different classes – two-seater, subcompact, compact, mid-sized and large cars, as well as station wagons, vans, pickup trucks and special purpose vehicles.

- Your choice of transmission will directly affect the cost of the vehicle and its fuel consumption. As a general rule, a manual transmission is more fuel efficient than an automatic, assuming you shift properly. If you buy an automatic, the more gears, the better.

- Four-wheel drive and all-wheel drive offer superior traction and braking under slippery conditions, but the weight and friction of additional drivetrain parts can increase fuel consumption by 5 to 10 percent compared with two-wheel drive vehicles. How often would you need to use this option, and is it worth the extra fuel cost for as long as you own the vehicle?

- Under normal driving conditions, smaller engines deliver better fuel economy than larger engines. Choose the smallest engine that meets your everyday needs.

- Are you willing to pay a fuel penalty for as long as you own your vehicle just to have the convenience of options such as power windows, seats and mirrors? Many options increase fuel consumption by adding weight, increasing aerodynamic drag, or drawing extra power from the engine.

- Do you really need an air conditioner? Operating an air conditioner in hot weather can increase fuel consumption by more than 20 percent in city driving. Consider using the car's ventilation system and options such as a sunroof and tinted glass.

- For most drivers, cruise control saves fuel on the highway by keeping your speed constant and avoiding inadvertent speeding.

- Explore your fuel options. Will a fuel-efficient diesel vehicle meet your needs? What about propane or natural gas, which produce fewer greenhouse gas emissions and are cheaper to use than gasoline or diesel fuel? Ethanol fuel blends are also widely used by Canadian motorists. And hybrid vehicles, which use a combination of high-power batteries and an internal combustion engine, are beginning to appear on the North American market.

Please note – this list of websites is not comprehensive. They have not been reviewed for accuracy, but may provide ideas and options appropriate for some municipalities.

Other vehicle and equipment information can be found on the Internet at:
http://oee.nrcan.gc.ca/publications/infosource/home/index.cfm?act=category&PrintView=N&Text=N

http://www.betterroads.com/articles/NewProds/oct05bid.htm

http://www.edmunds.com/advice/specialreports/articles/102946/article.html

http://www.betterroads.com/articles/NewProds/oct05bid.htm

http://snow.grounds-mag.com/ar/grounds_maintenance_september_2/

http://www.missoulian.com/articles/2003/11/15/news/local/news03.txt

http://rocktoroad.com/grader.html

http://news.thomasnet.com/fullstory/29180/3281

http://www.forester.net/gx_0501_graders.html

http://www.epa.gov/greenkit/quick_start.htm#greenfleet

Self Audit

**Municipal Operations -Efficiency Survey**

**(Transportation, Road Repair, Snow Clearance, Waste Disposal, etc.)**

Name of Organisation: _____
Address: _____
_____
_____
Contact Name: _____
Phone No. _____
Name of person completing form: _____
Date: _____

| **Vehicles and Construction Equipment** | | | | | | |
|---|---|---|---|---|---|---|
| | **Gasoline** | **Diesel** | **CNG** | **Propane** | **Other** | **Total** |
| **Total Fuel Usage L/Year** | | | | | | |
| **Greenhouse Gas Emissions (tonnes)** | | | | | | |

**Fuel Use Minimization Considerations**

 What type of vehicles/equipment, if any, are you planning to replace in the next few years?_____
_____
_____

 Can you downsize these vehicles/equipment?
Comments:_____
_____
_____

 Can you make process or other changes to minimize use of, or eliminate these vehicles/equipment? Comments:_____
_____
_____

 Do you have a policy in place to make fuel efficiency one of the vehicle/equipment purchase requirements? Yes ___ No ___

 Have you made operational changes such as reducing idling time of vehicles and equipment, and using block heaters and timers to reduce warm up time?
Yes ___ No ___

 Have you encouraged more energy efficient driving behaviour through training, policies, and ongoing reminders? Yes ___ No ___

 Do you have procedures in place to detect and rectify leakage of above-ground and under-ground fuel storage tanks? Yes __ No ___

 Do you use automatic shut-off fill nozzles at pumps? Yes ___ No ___

**Comments**

_____
_____
_____
_____
_____
_____

# APPENDIX F

# ENERGY CONSUMPTION MONITORING SPREADSHEETS AND GRAPHS

# TABLE OF CONTENTS – APPENDIX F

**Table F.1 - Energy Consumption Monitoring Data for the Municipal Administration Building**

| | 2004-2005 | | | | | 2005-2006 | | | | | 2006-2007 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Month** | **Billed Elect Energy (kWh)** | **Billed Natural Gas ($m^3$)** | **Total Energy Consumption (kWh)** | **HDD (°C days/ mo)** | **Energy Normalized to 2004-2005 (kWh)** | **Billed Elect Energy (kWh)** | **Billed Natural Gas ($m^3$)** | **Total Energy Consumption (kWh)** | **HDD (°C days/ mo)** | **Energy Normalized to 2004-2005 (kWh)** | **Billed Elect Energy (kWh)** | **Billed Natural Gas ($m^3$)** | **Total Energy Consumption (kWh)** | **HDD (°C days/ mo)** | **Energy Normalized to 2004-2005 (kWh)** |
| October | 4,320 | 0 | 4,320 | 429.8 | 4,320 | | 0 | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| November | 7,320 | 0 | 7,320 | 609.5 | 7,320 | | 0 | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| December | 12,600 | 0 | 12,600 | 1102.7 | 12,600 | | 0 | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| January | 18,720 | 0 | 18,720 | 1147.9 | 18,720 | | 0 | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| February | 14,640 | 0 | 14,640 | 858.7 | 14,640 | | 0 | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| March | 11,040 | 0 | 11,040 | 787.6 | 11,040 | | 0 | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| April | 10,320 | 0 | 10,320 | 349.1 | 10,320 | | 0 | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| May | 5,520 | 0 | 5,520 | 258.9 | 5,520 | | 0 | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| June | 5,760 | 0 | 5,760 | 70.2 | 5,760 | | 0 | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| July | 4,560 | 0 | 4,560 | 38.4 | 4,560 | | 0 | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| August | 5,640 | 0 | 5,640 | 89.6 | 5,640 | | 0 | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| September | 3,960 | 0 | 3,960 | 189.3 | 3,960 | | 0 | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| **TOTAL** | 104,400 | 0 | 104,400 | 5932 | 104,400 | 0 | 0 | 0 | 0 | #DIV/0! | 0 | 0 | 0 | 0 | #DIV/0! |

| | 2007-2008 | | | | | 2008-2009 | | | | | 2009-2010 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Month** | **Billed Elect Energy (kWh)** | **Billed Natural Gas ($m^3$)** | **Total Energy Consumption (kWh)** | **HDD (°C days/ mo)** | **Energy Normalized to 2004-2005 (kWh)** | **Billed Elect Energy (kWh)** | **Billed Natural Gas ($m^3$)** | **Total Energy Consumption (kWh)** | **HDD (°C days/ mo)** | **Energy Normalized to 2004-2005 (kWh)** | **Billed Elect Energy (kWh)** | **Billed Natural Gas ($m^3$)** | **Total Energy Consumption (kWh)** | **HDD (°C days/ mo)** | **Energy Normalized to 2004-2005 (kWh)** |
| October | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| November | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| December | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| January | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| February | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| March | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| April | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| May | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| June | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| July | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| August | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| September | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| **TOTAL** | 0 | 0 | 0 | 0 | #DIV/0! | 0 | 0 | 0 | 0 | #DIV/0! | 0 | 0 | 0 | 0 | #DIV/0! |

**Notes**

* Energy consumption should be recorded following the implementation of the energy saving opportunities.

1. Enter the year in row 3 of this table (starting in column E,F,G).
2. Enter the "Billed Elec Energy" (in kWh) and the "Billed Natural Gas Energy" in ($m^3$) taken from the electricity and natural gas bills, respectively next to the appropriate month.
3. Go to the following website to collect information on the Heating Degree Days for Swan River, Mb: http://www.climate.weatheroffice.ec.gc.ca/climateData/dailydata_e.html?timeframe=2&Prov=CA&StationID=10188&Year=2005&Month=8
4. Once you've arrived at this website, select the appropriate month and click the mouse on "GO"
5. From this website, record the last number highlighted in blue (refer to page F24) in the column "Heat Deg Days". This number should be entered under the heading HDD of this table, next to the appropriate month.
6. The "Energy Normalized to 2004-2005" will be calculated automatically and this point will show up on the Energy Consumption graph.

**Figure F.1 - Energy Consumption Monitoring Graph for the Municipal Administration Building**

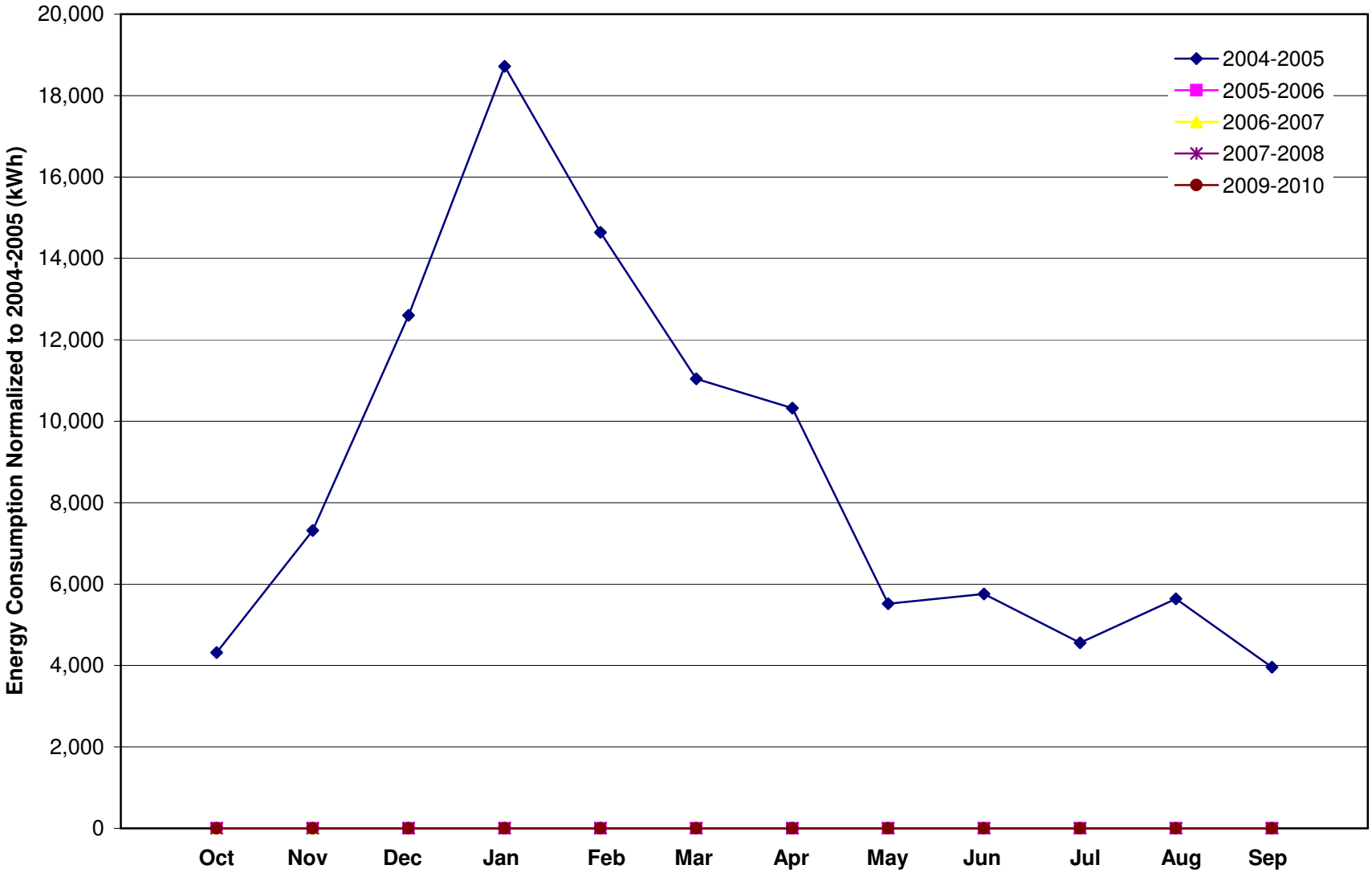


**Table F.2 - Energy Consumption Monitoring Data for the Town Garage**

| | 2004-2005 | | | | | 2005-2006 | | | | | 2006-2007 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Month** | **Billed Elect Energy (kWh)** | **Billed Natural Gas ($m^3$)** | **Total Energy Consumption (kWh)** | **HDD (°C days/ mo)** | **Energy Normalized to 2004-2005 (kWh)** | **Billed Elect Energy (kWh)** | **Billed Natural Gas ($m^3$)** | **Total Energy Consumption (kWh)** | **HDD (°C days/ mo)** | **Energy Normalized to 2004-2005 (kWh)** | **Billed Elect Energy (kWh)** | **Billed Natural Gas ($m^3$)** | **Total Energy Consumption (kWh)** | **HDD (°C days/ mo)** | **Energy Normalized to 2004-2005 (kWh)** |
| October | 1,800 | 729.30 | 9,348 | 429.8 | 9,348 | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| November | 10,680 | 1649.94 | 27,756 | 609.5 | 27,756 | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| December | 13,560 | 2248.90 | 36,835 | 1102.7 | 36,835 | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| January | 16,200 | 4345.29 | 61,172 | 1147.9 | 61,172 | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| February | 14,640 | 2567.80 | 41,216 | 858.7 | 41,216 | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| March | 10,320 | 3457.93 | 46,109 | 787.6 | 46,109 | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| April | 10,320 | 1325.49 | 24,038 | 349.1 | 24,038 | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| May | 6,480 | 1150.80 | 18,390 | 258.9 | 18,390 | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| June | 7,200 | 471.41 | 12,079 | 70.2 | 12,079 | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| July | 4,440 | 155.29 | 6,047 | 38.4 | 6,047 | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| August | 4,800 | 532.42 | 10,310 | 89.6 | 10,310 | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| September | 4,200 | 108.15 | 5,319 | 189.3 | 5,319 | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| **TOTAL** | 104,640 | 18,743 | 298,621 | 5932 | 298,621 | 0 | 0 | 0 | 0 | #DIV/0! | 0 | 0 | 0 | 0 | #DIV/0! |

| | 2007-2008 | | | | | 2008-2009 | | | | | 2009-2010 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Month** | **Billed Elect Energy (kWh)** | **Billed Natural Gas ($m^3$)** | **Total Energy Consumption (kWh)** | **HDD (°C days/ mo)** | **Energy Normalized to 2004-2005 (kWh)** | **Billed Elect Energy (kWh)** | **Billed Natural Gas ($m^3$)** | **Total Energy Consumption (kWh)** | **HDD (°C days/ mo)** | **Energy Normalized to 2004-2005 (kWh)** | **Billed Elect Energy (kWh)** | **Billed Natural Gas ($m^3$)** | **Total Energy Consumption (kWh)** | **HDD (°C days/ mo)** | **Energy Normalized to 2004-2005 (kWh)** |
| October | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| November | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| December | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| January | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| February | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| March | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| April | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| May | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| June | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| July | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| August | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| September | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| **TOTAL** | 0 | 0 | 0 | 0 | #DIV/0! | 0 | 0 | 0 | 0 | #DIV/0! | 0 | 0 | 0 | 0 | #DIV/0! |

**Notes**

* Energy consumption should be recorded following the implementation of the energy saving opportunities.

1. Enter the year in row 3 of this table (starting in column E,F,G).
2. Enter the "Billed Elec Energy" (in kWh) and the "Billed Natural Gas Energy" in ($m^3$) taken from the electricity and natural gas bills, respectively next to the appropriate month.
3. Go to the following website to collect information on the Heating Degree Days for Swan River, Mb: http://www.climate.weatheroffice.ec.gc.ca/climateData/dailydata_e.html?timeframe=2&Prov=CA&StationID=10188&Year=2005&Month=8
4. Once you've arrived at this website, select the appropriate month and click the mouse on "GO"
5. From this website, record the last number highlighted in blue (refer to page F24) in the column "Heat Deg Days". This number should be entered under the heading HDD of this table, next to the appropriate month.
6. The "Energy Normalized to 2004-2005" will be calculated automatically and this point will show up on the Energy Consumption graph.

**Figure F.2 - Energy Consumption Monitoring Graph for the Town Garage**

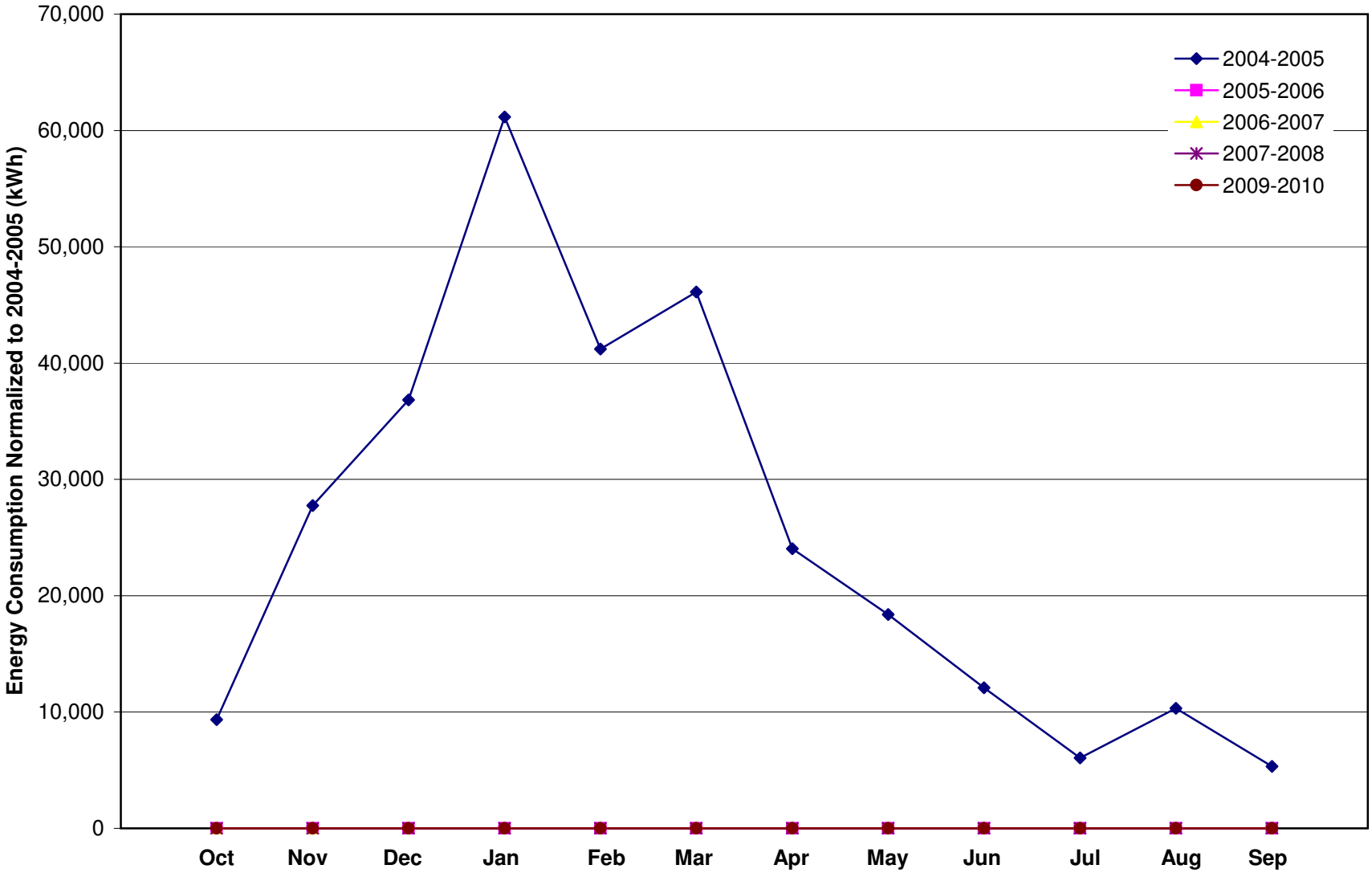


**Table F.3 - Energy Consumption Monitoring Data for the Water Treatment Plant & Lift Station #1**

| | 2004-2005 | | | | | 2005-2006 | | | | | 2006-2007 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Month** | **Billed Elect Energy (kWh)** | **Billed Natural Gas ($m^3$)** | **Total Energy Consumption (kWh)** | **HDD (°C days/ mo)** | **Energy Normalized to 2004-2005 (kWh)** | **Billed Elect Energy (kWh)** | **Billed Natural Gas ($m^3$)** | **Total Energy Consumption (kWh)** | **HDD (°C days/ mo)** | **Energy Normalized to 2004-2005 (kWh)** | **Billed Elect Energy (kWh)** | **Billed Natural Gas ($m^3$)** | **Total Energy Consumption (kWh)** | **HDD (°C days/ mo)** | **Energy Normalized to 2004-2005 (kWh)** |
| October | 28,440 | 1150.80 | 40,350 | 429.8 | 40,350 | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| November | 23,040 | 1591.70 | 39,514 | 609.5 | 39,514 | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| December | 27,360 | 2895.01 | 57,323 | 1102.7 | 57,323 | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| January | 29,160 | 2284.95 | 52,809 | 1147.9 | 52,809 | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| February | 28,080 | 1566.75 | 44,295 | 858.7 | 44,295 | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| March | 23,760 | 1777.49 | 42,157 | 787.6 | 42,157 | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| April | 33,120 | 948.37 | 42,935 | 349.1 | 42,935 | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| May | 23,760 | 1114.75 | 35,297 | 258.9 | 35,297 | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| June | 26,280 | 415.95 | 30,585 | 70.2 | 30,585 | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| July | 25,200 | 174.70 | 27,008 | 38.4 | 27,008 | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| August | 28,080 | 488.05 | 33,131 | 89.6 | 33,131 | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| September | 26,640 | 501.91 | 31,835 | 189.3 | 31,835 | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| **TOTAL** | 322,920 | 14,910 | 477,238 | 5932 | 477,238 | 0 | 0 | 0 | 0 | #DIV/0! | 0 | 0 | 0 | 0 | #DIV/0! |

| | 2007-2008 | | | | | 2008-2009 | | | | | 2009-2010 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Month** | **Billed Elect Energy (kWh)** | **Billed Natural Gas ($m^3$)** | **Total Energy Consumption (kWh)** | **HDD (°C days/ mo)** | **Energy Normalized to 2004-2005 (kWh)** | **Billed Elect Energy (kWh)** | **Billed Natural Gas ($m^3$)** | **Total Energy Consumption (kWh)** | **HDD (°C days/ mo)** | **Energy Normalized to 2004-2005 (kWh)** | **Billed Elect Energy (kWh)** | **Billed Natural Gas ($m^3$)** | **Total Energy Consumption (kWh)** | **HDD (°C days/ mo)** | **Energy Normalized to 2004-2005 (kWh)** |
| October | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| November | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| December | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| January | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| February | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| March | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| April | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| May | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| June | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| July | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| August | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| September | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| **TOTAL** | 0 | 0 | 0 | 0 | #DIV/0! | 0 | 0 | 0 | 0 | #DIV/0! | 0 | 0 | 0 | 0 | #DIV/0! |

**Notes**

* Energy consumption should be recorded following the implementation of the energy saving opportunities.

1. Enter the year in row 3 of this table (starting in column E,F,G).
2. Enter the "Billed Elec Energy" (in kWh) and the "Billed Natural Gas Energy" in ($m^3$) taken from the electricity and natural gas bills, respectively next to the appropriate month.
3. Go to the following website to collect information on the Heating Degree Days for Swan River, Mb: http://www.climate.weatheroffice.ec.gc.ca/climateData/dailydata_e.html?timeframe=2&Prov=CA&StationID=10188&Year=2005&Month=8
4. Once you've arrived at this website, select the appropriate month and click the mouse on "GO"
5. From this website, record the last number highlighted in blue (refer to page F24) in the column "Heat Deg Days". This number should be entered under the heading HDD of this table, next to the appropriate month.
6. The "Energy Normalized to 2004-2005" will be calculated automatically and this point will show up on the Energy Consumption graph.

**Figure F.3 - Energy Consumption Monitoring Graph for the Water Treatment Plant & Lift Station #1**

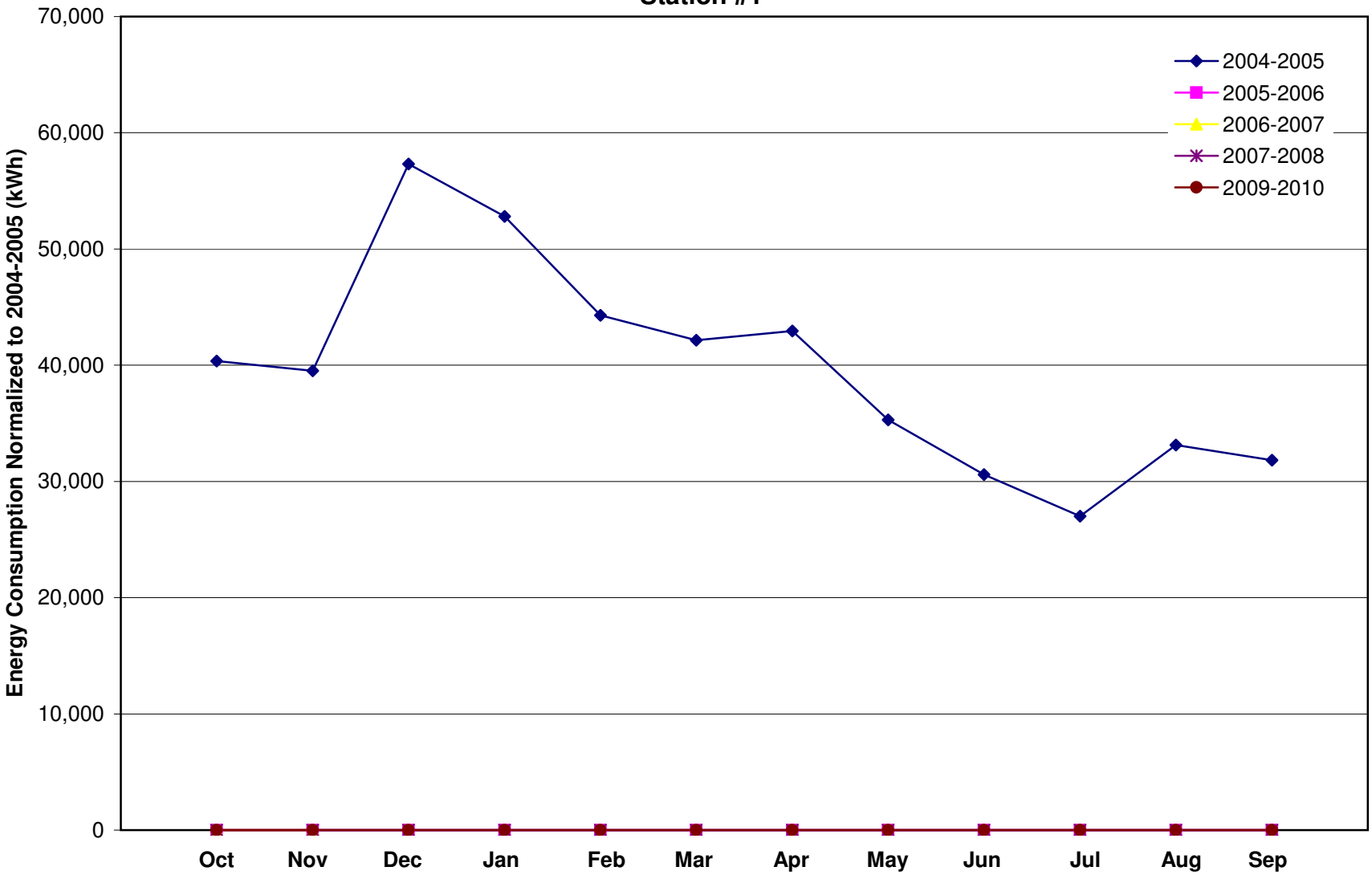


**Table F.4 - Energy Consumption Monitoring Data for the Lift Station #2**

| | 2004-2005 | | | | | 2005-2006 | | | | | 2006-2007 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Month** | **Billed Elect Energy (kWh)** | **Billed Natural Gas ($m^3$)** | **Total Energy Consumption (kWh)** | **HDD (°C days/ mo)** | **Energy Normalized to 2004-2005 (kWh)** | **Billed Elect Energy (kWh)** | **Billed Natural Gas ($m^3$)** | **Total Energy Consumption (kWh)** | **HDD (°C days/ mo)** | **Energy Normalized to 2004-2005 (kWh)** | **Billed Elect Energy (kWh)** | **Billed Natural Gas ($m^3$)** | **Total Energy Consumption (kWh)** | **HDD (°C days/ mo)** | **Energy Normalized to 2004-2005 (kWh)** |
| October | 540 | 0 | 540 | 429.8 | 540 | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! |
| November | 910 | 0 | 910 | 609.5 | 910 | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! |
| December | 1,530 | 0 | 1,530 | 1102.7 | 1,530 | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! |
| January | 2,490 | 0 | 2,490 | 1147.9 | 2,490 | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! |
| February | 1,490 | 0 | 1,490 | 858.7 | 1,490 | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! |
| March | 1,700 | 0 | 1,700 | 787.6 | 1,700 | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! |
| April | 1,070 | 0 | 1,070 | 349.1 | 1,070 | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! |
| May | 840 | 0 | 840 | 258.9 | 840 | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! |
| June | 160 | 0 | 160 | 70.2 | 160 | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! |
| July | 130 | 0 | 130 | 38.4 | 130 | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! |
| August | 240 | 0 | 240 | 89.6 | 240 | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! |
| September | 140 | 0 | 140 | 189.3 | 140 | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! |
| **TOTAL** | 11,240 | 0 | 11,240 | 5932 | 11,240 | 0 | 0 | 0 | 0 | #DIV/0! | 0 | 0 | 0 | 0 | #DIV/0! |

| | 2007-2008 | | | | | 2008-2009 | | | | | 2009-2010 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Month** | **Billed Elect Energy (kWh)** | **Billed Natural Gas ($m^3$)** | **Total Energy Consumption (kWh)** | **HDD (°C days/ mo)** | **Energy Normalized to 2004-2005 (kWh)** | **Billed Elect Energy (kWh)** | **Billed Natural Gas ($m^3$)** | **Total Energy Consumption (kWh)** | **HDD (°C days/ mo)** | **Energy Normalized to 2004-2005 (kWh)** | **Billed Elect Energy (kWh)** | **Billed Natural Gas ($m^3$)** | **Total Energy Consumption (kWh)** | **HDD (°C days/ mo)** | **Energy Normalized to 2004-2005 (kWh)** |
| October | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! |
| November | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! |
| December | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! |
| January | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! |
| February | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! |
| March | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! |
| April | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! |
| May | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! |
| June | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! |
| July | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! |
| August | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! |
| September | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! |
| **TOTAL** | 0 | 0 | 0 | 0 | #DIV/0! | 0 | 0 | 0 | 0 | #DIV/0! | 0 | 0 | 0 | 0 | #DIV/0! |

**Notes**

* Energy consumption should be recorded following the implementation of the energy saving opportunities.

1. Enter the year in row 3 of this table (starting in column E,F,G).
2. Enter the "Billed Elec Energy" (in kWh) and the "Billed Natural Gas Energy" in ($m^3$) taken from the electricity and natural gas bills, respectively next to the appropriate month.
3. Go to the following website to collect information on the Heating Degree Days for Swan River, Mb: http://www.climate.weatheroffice.ec.gc.ca/climateData/dailydata_e.html?timeframe=2&Prov=CA&StationID=10188&Year=2005&Month=8
4. Once you've arrived at this website, select the appropriate month and click the mouse on "GO"
5. From this website, record the last number highlighted in blue (refer to page F24) in the column "Heat Deg Days". This number should be entered under the heading HDD of this table, next to the appropriate month.
6. The "Energy Normalized to 2004-2005" will be calculated automatically and this point will show up on the Energy Consumption graph.

**Figure F.4 - Energy Consumption Monitoring Graph for the Lift Station #2**

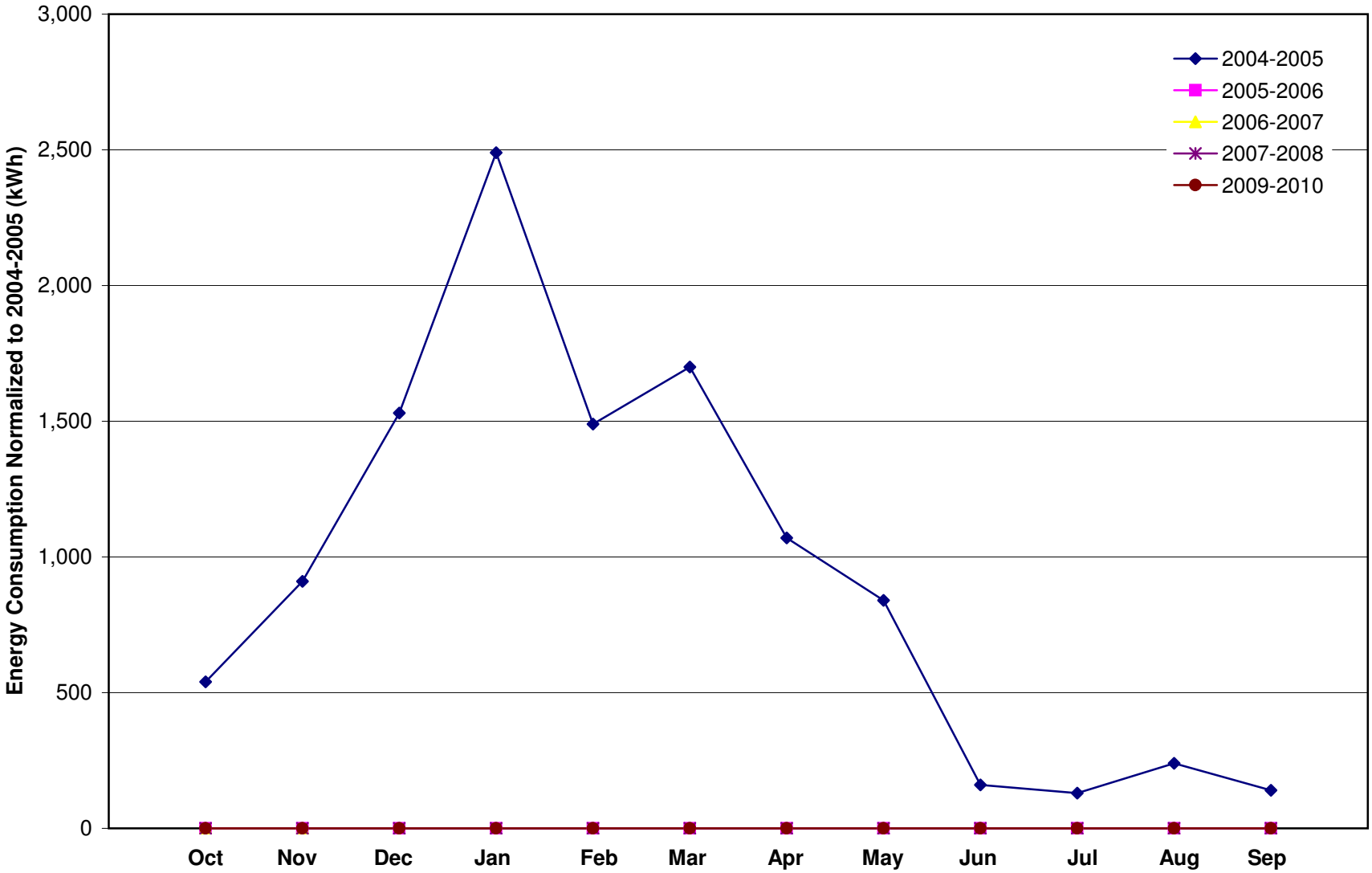


**Table F.5 - Energy Consumption Monitoring Data for the Lift Station #3**

| | 2004-2005 | | | | | 2005-2006 | | | | | 2006-2007 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Month** | **Billed Elect Energy (kWh)** | **Billed Natural Gas ($m^3$)** | **Total Energy Consumption (kWh)** | **HDD (°C days/ mo)** | **Energy Normalized to 2004-2005 (kWh)** | **Billed Elect Energy (kWh)** | **Billed Natural Gas ($m^3$)** | **Total Energy Consumption (kWh)** | **HDD (°C days/ mo)** | **Energy Normalized to 2004-2005 (kWh)** | **Billed Elect Energy (kWh)** | **Billed Natural Gas ($m^3$)** | **Total Energy Consumption (kWh)** | **HDD (°C days/ mo)** | **Energy Normalized to 2004-2005 (kWh)** |
| October | 810 | 0 | 810 | 429.8 | 810 | | 0 | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| November | 920 | 0 | 920 | 609.5 | 920 | | 0 | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| December | 1,610 | 0 | 1,610 | 1102.7 | 1,610 | | 0 | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| January | 2,400 | 0 | 2,400 | 1147.9 | 2,400 | | 0 | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| February | 2,180 | 0 | 2,180 | 858.7 | 2,180 | | 0 | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| March | 1,830 | 0 | 1,830 | 787.6 | 1,830 | | 0 | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| April | 1,740 | 0 | 1,740 | 349.1 | 1,740 | | 0 | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| May | 900 | 0 | 900 | 258.9 | 900 | | 0 | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| June | 1,030 | 0 | 1,030 | 70.2 | 1,030 | | 0 | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| July | 320 | 0 | 320 | 38.4 | 320 | | 0 | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| August | 870 | 0 | 870 | 89.6 | 870 | | 0 | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| September | 280 | 0 | 280 | 189.3 | 280 | | 0 | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| **TOTAL** | 14,890 | 0 | 14,890 | 5932 | 14,890 | 0 | 0 | 0 | 0 | #DIV/0! | 0 | 0 | 0 | 0 | #DIV/0! |

| | 2007-2008 | | | | | 2008-2009 | | | | | 2009-2010 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Month** | **Billed Elect Energy (kWh)** | **Billed Natural Gas ($m^3$)** | **Total Energy Consumption (kWh)** | **HDD (°C days/ mo)** | **Energy Normalized to 2004-2005 (kWh)** | **Billed Elect Energy (kWh)** | **Billed Natural Gas ($m^3$)** | **Total Energy Consumption (kWh)** | **HDD (°C days/ mo)** | **Energy Normalized to 2004-2005 (kWh)** | **Billed Elect Energy (kWh)** | **Billed Natural Gas ($m^3$)** | **Total Energy Consumption (kWh)** | **HDD (°C days/ mo)** | **Energy Normalized to 2004-2005 (kWh)** |
| October | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| November | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| December | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| January | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| February | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| March | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| April | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| May | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| June | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| July | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| August | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| September | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| **TOTAL** | 0 | 0 | 0 | 0 | #DIV/0! | 0 | 0 | 0 | 0 | #DIV/0! | 0 | 0 | 0 | 0 | #DIV/0! |

**Notes**

* Energy consumption should be recorded following the implementation of the energy saving opportunities.

1. Enter the year in row 3 of this table (starting in column E,F,G).
2. Enter the "Billed Elec Energy" (in kWh) and the "Billed Natural Gas Energy" in ($m^3$) taken from the electricity and natural gas bills, respectively next to the appropriate month.
3. Go to the following website to collect information on the Heating Degree Days for Swan River, Mb: http://www.climate.weatheroffice.ec.gc.ca/climateData/dailydata_e.html?timeframe=2&Prov=CA&StationID=10188&Year=2005&Month=8
4. Once you've arrived at this website, select the appropriate month and click the mouse on "GO"
5. From this website, record the last number highlighted in blue (refer to page F24) in the column "Heat Deg Days". This number should be entered under the heading HDD of this table, next to the appropriate month.
6. The "Energy Normalized to 2004-2005" will be calculated automatically and this point will show up on the Energy Consumption graph.

**Figure F.5 - Energy Consumption Monitoring Graph for the Lift Station #3**

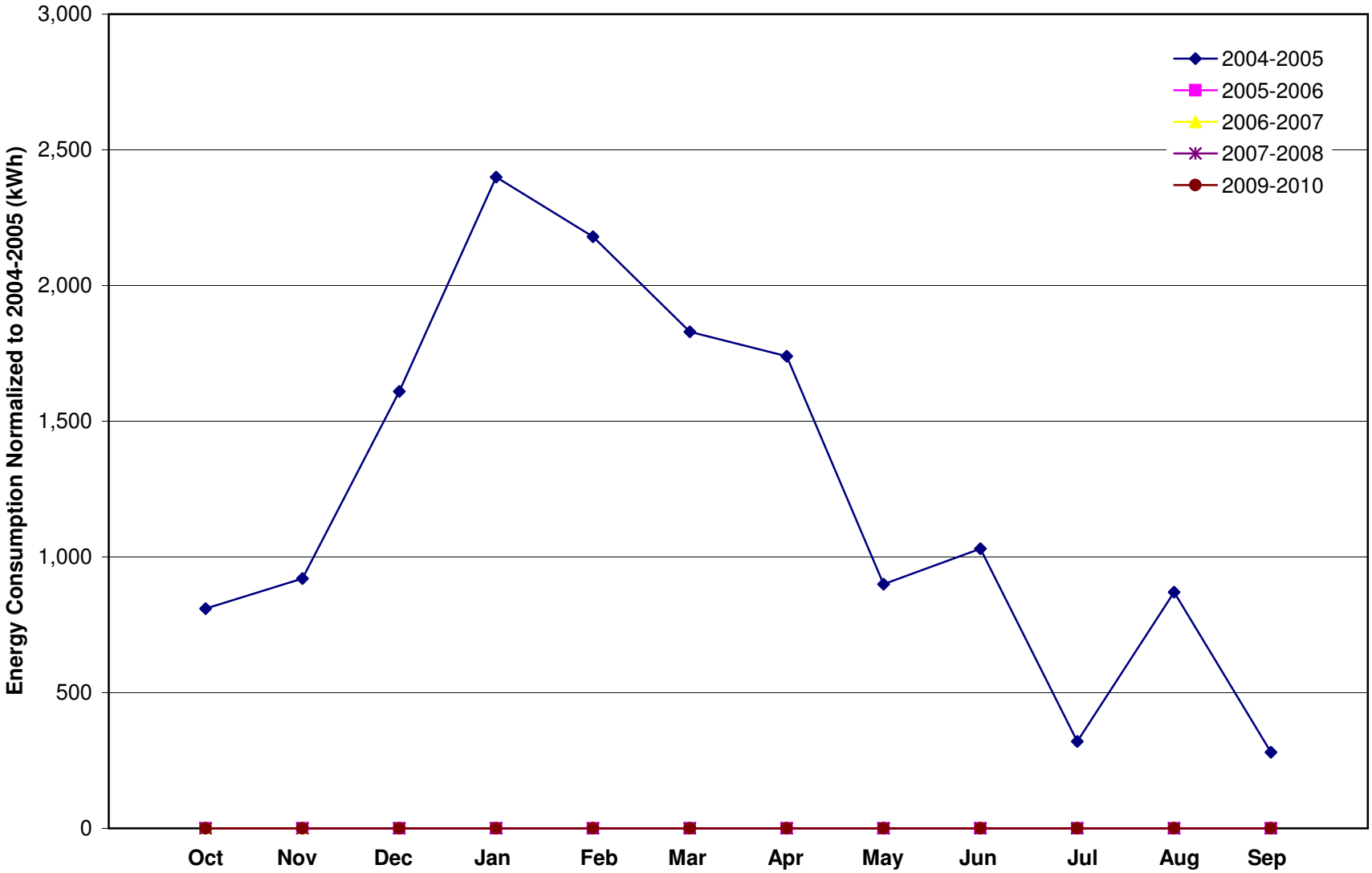


**Table F.6 - Energy Consumption Monitoring Data for Lift Station #4**

| | 2004-2005 | | | | | 2005-2006 | | | | | 2006-2007 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Month** | **Billed Elect Energy (kWh)** | **Billed Natural Gas ($m^3$)** | **Total Energy Consumption (kWh)** | **HDD (°C days/ mo)** | **Energy Normalized to 2004-2005 (kWh)** | **Billed Elect Energy (kWh)** | **Billed Natural Gas ($m^3$)** | **Total Energy Consumption (kWh)** | **HDD (°C days/ mo)** | **Energy Normalized to 2004-2005 (kWh)** | **Billed Elect Energy (kWh)** | **Billed Natural Gas ($m^3$)** | **Total Energy Consumption (kWh)** | **HDD (°C days/ mo)** | **Energy Normalized to 2004-2005 (kWh)** |
| October | 449 | 0 | 449 | 429.8 | 449 | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! |
| November | 1,252 | 0 | 1,252 | 609.5 | 1,252 | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! |
| December | 1,747 | 0 | 1,747 | 1102.7 | 1,747 | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! |
| January | 2,894 | 0 | 2,894 | 1147.9 | 2,894 | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! |
| February | 2,221 | 0 | 2,221 | 858.7 | 2,221 | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! |
| March | 2,065 | 0 | 2,065 | 787.6 | 2,065 | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! |
| April | 1,901 | 0 | 1,901 | 349.1 | 1,901 | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! |
| May | 1,176 | 0 | 1,176 | 258.9 | 1,176 | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! |
| June | 1,377 | 0 | 1,377 | 70.2 | 1,377 | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! |
| July | 417 | 0 | 417 | 38.4 | 417 | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! |
| August | 379 | 0 | 379 | 89.6 | 379 | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! |
| September | 458 | 0 | 458 | 189.3 | 458 | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! |
| **TOTAL** | 16,336 | 0 | 16,336 | 5932 | 16,336 | 0 | 0 | 0 | 0 | #DIV/0! | 0 | 0 | 0 | 0 | #DIV/0! |

| | 2007-2008 | | | | | 2008-2009 | | | | | 2009-2010 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Month** | **Billed Elect Energy (kWh)** | **Billed Natural Gas ($m^3$)** | **Total Energy Consumption (kWh)** | **HDD (°C days/ mo)** | **Energy Normalized to 2004-2005 (kWh)** | **Billed Elect Energy (kWh)** | **Billed Natural Gas ($m^3$)** | **Total Energy Consumption (kWh)** | **HDD (°C days/ mo)** | **Energy Normalized to 2004-2005 (kWh)** | **Billed Elect Energy (kWh)** | **Billed Natural Gas ($m^3$)** | **Total Energy Consumption (kWh)** | **HDD (°C days/ mo)** | **Energy Normalized to 2004-2005 (kWh)** |
| October | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! |
| November | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! |
| December | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! |
| January | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! |
| February | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! |
| March | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! |
| April | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! |
| May | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! |
| June | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! |
| July | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! |
| August | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! |
| September | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! |
| **TOTAL** | 0 | 0 | 0 | 0 | #DIV/0! | 0 | 0 | 0 | 0 | #DIV/0! | 0 | 0 | 0 | 0 | #DIV/0! |

**Notes**

* Energy consumption should be recorded following the implementation of the energy saving opportunities.

1. Enter the year in row 3 of this table (starting in column E,F,G).
2. Enter the "Billed Elec Energy" (in kWh) and the "Billed Natural Gas Energy" in ($m^3$) taken from the electricity and natural gas bills, respectively next to the appropriate month.
3. Go to the following website to collect information on the Heating Degree Days for Swan River, Mb: http://www.climate.weatheroffice.ec.gc.ca/climateData/dailydata_e.html?timeframe=2&Prov=CA&StationID=10188&Year=2005&Month=8
4. Once you've arrived at this website, select the appropriate month and click the mouse on "GO"
5. From this website, record the last number highlighted in blue (refer to page F24) in the column "Heat Deg Days". This number should be entered under the heading HDD of this table, next to the appropriate month.
6. The "Energy Normalized to 2004-2005" will be calculated automatically and this point will show up on the Energy Consumption graph.

## Figure F.6 - Energy Consumption Monitoring Graph for the Lift Station #4

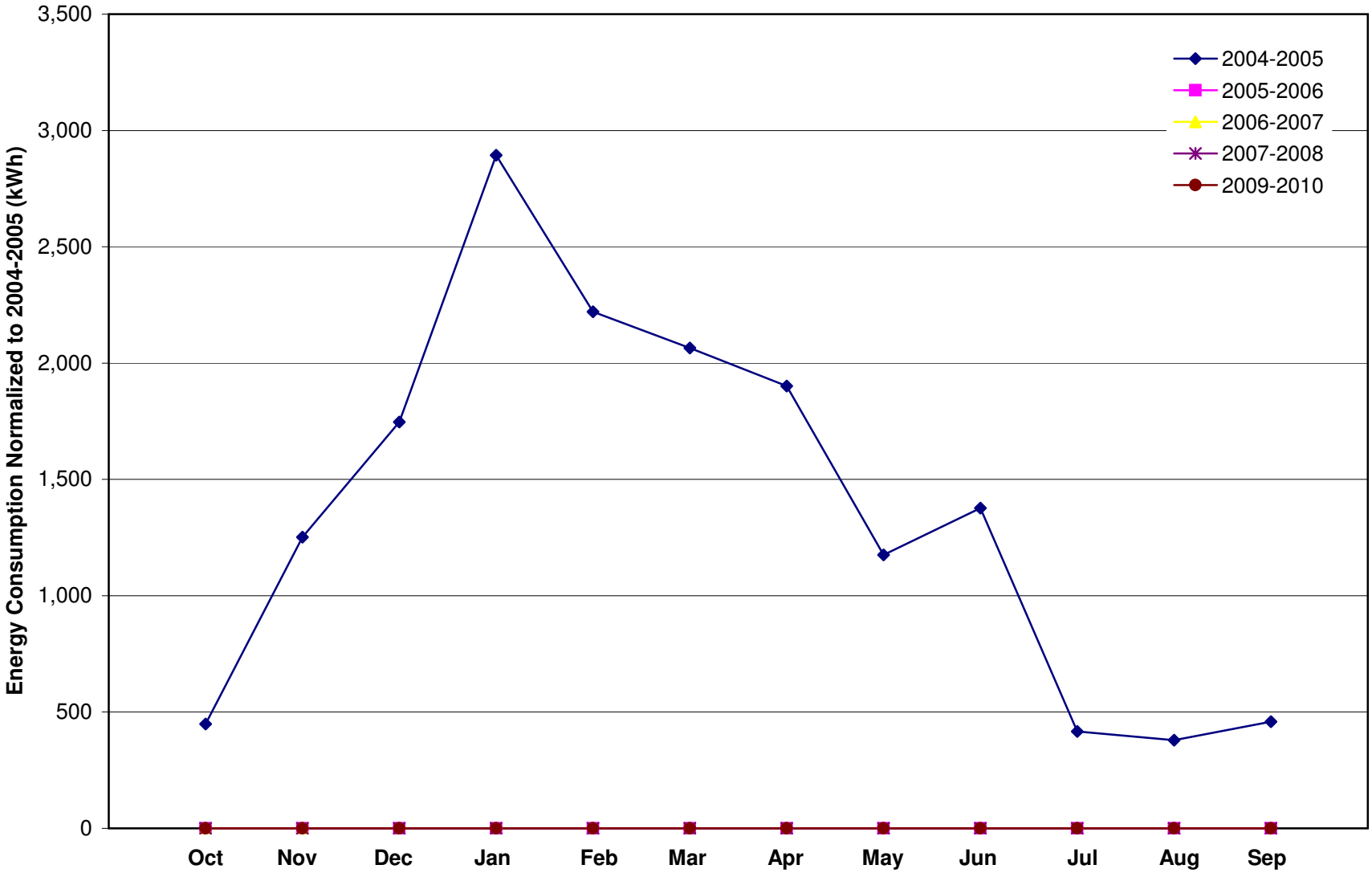


**Table F.7 - Energy Consumption Monitoring Data for the Lift Station #5**

| | 2004-2005 | | | | | 2005-2006 | | | | | 2006-2007 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Month** | **Billed Elect Energy (kWh)** | **Billed Natural Gas ($m^3$)** | **Total Energy Consumption (kWh)** | **HDD (°C days/ mo)** | **Energy Normalized to 2004-2005 (kWh)** | **Billed Elect Energy (kWh)** | **Billed Natural Gas ($m^3$)** | **Total Energy Consumption (kWh)** | **HDD (°C days/ mo)** | **Energy Normalized to 2004-2005 (kWh)** | **Billed Elect Energy (kWh)** | **Billed Natural Gas ($m^3$)** | **Total Energy Consumption (kWh)** | **HDD (°C days/ mo)** | **Energy Normalized to 2004-2005 (kWh)** |
| October | 0 | 0 | 0 | 429.8 | 0 | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! |
| November | 960 | 0 | 960 | 609.5 | 960 | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! |
| December | 0 | 0 | 0 | 1102.7 | 0 | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! |
| January | 1,120 | 0 | 1,120 | 1147.9 | 1,120 | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! |
| February | 0 | 0 | 0 | 858.7 | 0 | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! |
| March | 960 | 0 | 960 | 787.6 | 960 | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! |
| April | 0 | 0 | 0 | 349.1 | 0 | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! |
| May | 1,020 | 0 | 1,020 | 258.9 | 1,020 | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! |
| June | 0 | 0 | 0 | 70.2 | 0 | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! |
| July | 1,040 | 0 | 1,040 | 38.4 | 1,040 | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! |
| August | 0 | 0 | 0 | 89.6 | 0 | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! |
| September | 680 | 0 | 680 | 189.3 | 680 | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! |
| **TOTAL** | 5,780 | 0 | 5,780 | 5932 | 5,780 | 0 | 0 | 0 | 0 | #DIV/0! | 0 | 0 | 0 | 0 | #DIV/0! |

| | 2007-2008 | | | | | 2008-2009 | | | | | 2009-2010 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Month** | **Billed Elect Energy (kWh)** | **Billed Natural Gas ($m^3$)** | **Total Energy Consumption (kWh)** | **HDD (°C days/ mo)** | **Energy Normalized to 2004-2005 (kWh)** | **Billed Elect Energy (kWh)** | **Billed Natural Gas ($m^3$)** | **Total Energy Consumption (kWh)** | **HDD (°C days/ mo)** | **Energy Normalized to 2004-2005 (kWh)** | **Billed Elect Energy (kWh)** | **Billed Natural Gas ($m^3$)** | **Total Energy Consumption (kWh)** | **HDD (°C days/ mo)** | **Energy Normalized to 2004-2005 (kWh)** |
| October | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! |
| November | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! |
| December | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! |
| January | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! |
| February | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! |
| March | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! |
| April | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! |
| May | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! |
| June | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! |
| July | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! |
| August | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! |
| September | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! | | 0 | 0 | | #DIV/0! |
| **TOTAL** | 0 | 0 | 0 | 0 | #DIV/0! | 0 | 0 | 0 | 0 | #DIV/0! | 0 | 0 | 0 | 0 | #DIV/0! |

**Notes**

* Energy consumption should be recorded following the implementation of the energy saving opportunities.

1. Enter the year in row 3 of this table (starting in column E,F,G).
2. Enter the "Billed Elec Energy" (in kWh) and the "Billed Natural Gas Energy" in ($m^3$) taken from the electricity and natural gas bills, respectively next to the appropriate month.
3. Go to the following website to collect information on the Heating Degree Days for Swan River, Mb: http://www.climate.weatheroffice.ec.gc.ca/climateData/dailydata_e.html?timeframe=2&Prov=CA&StationID=10188&Year=2005&Month=8
4. Once you've arrived at this website, select the appropriate month and click the mouse on "GO"
5. From this website, record the last number highlighted in blue (refer to page F24) in the column "Heat Deg Days". This number should be entered under the heading HDD of this table, next to the appropriate month.
6. The "Energy Normalized to 2004-2005" will be calculated automatically and this point will show up on the Energy Consumption graph.

## Figure F.7 - Energy Consumption Monitoring Graph for the Lift Station #5

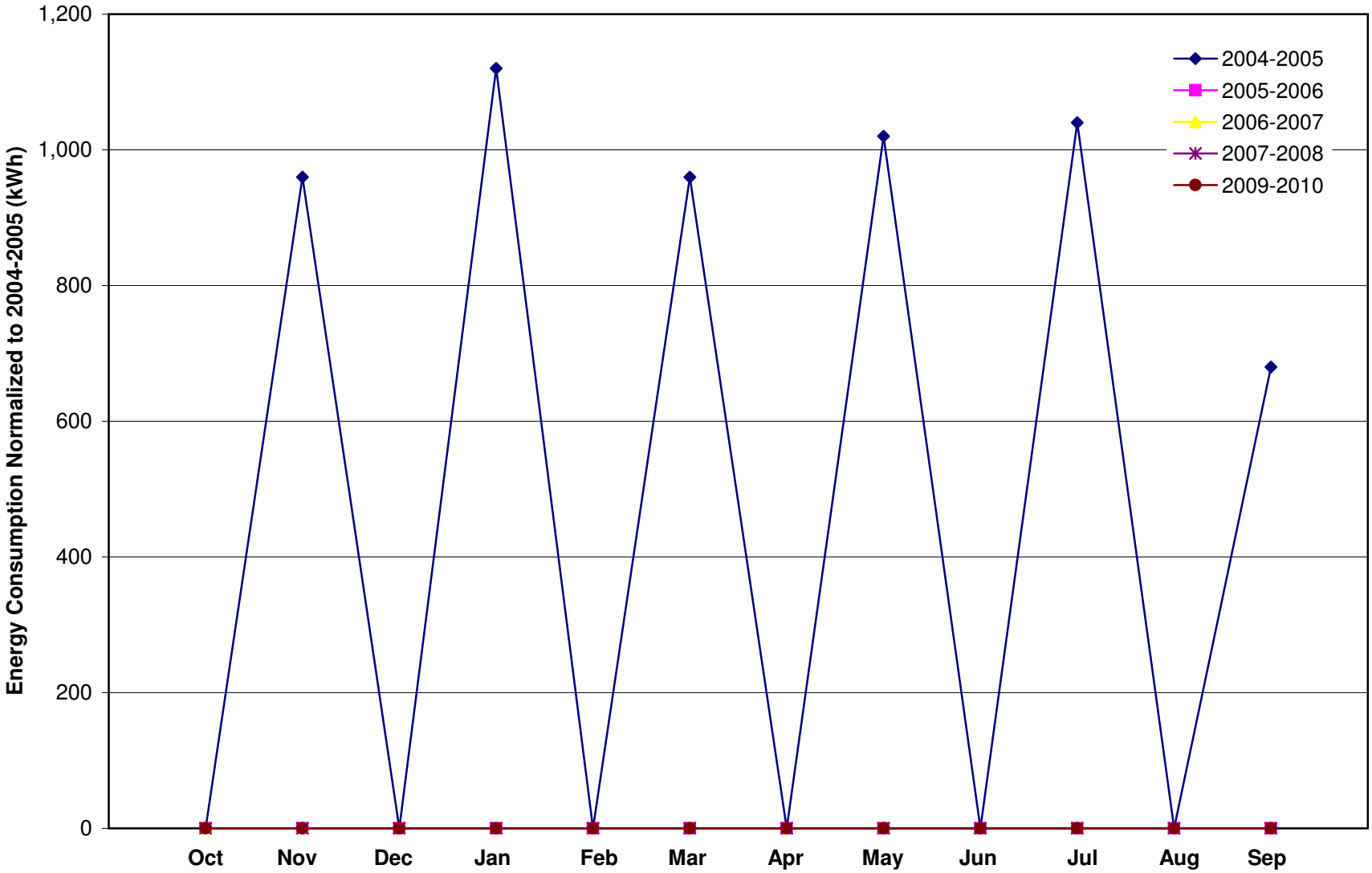


**Table F.8 - Energy Consumption Monitoring Data for the Centennial Arena**

| | 2004-2005 | | | | | 2005-2006 | | | | | 2006-2007 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Month** | **Billed Elect Energy (kWh)** | **Billed Natural Gas ($m^3$)** | **Total Energy Consumption (kWh)** | **HDD (°C days/ mo)** | **Energy Normalized to 2004-2005 (kWh)** | **Billed Elect Energy (kWh)** | **Billed Natural Gas ($m^3$)** | **Total Energy Consumption (kWh)** | **HDD (°C days/ mo)** | **Energy Normalized to 2004-2005 (kWh)** | **Billed Elect Energy (kWh)** | **Billed Natural Gas ($m^3$)** | **Total Energy Consumption (kWh)** | **HDD (°C days/ mo)** | **Energy Normalized to 2004-2005 (kWh)** |
| October | 69,360 | 442.29 | 73,938 | 429.8 | 73,938 | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| November | 71,080 | 1,651.21 | 88,170 | 609.5 | 88,170 | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| December | 97,120 | 1,039.38 | 107,877 | 1102.7 | 107,877 | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| January | 99,260 | 4,511.34 | 145,951 | 1147.9 | 145,951 | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| February | 110,240 | 1,183.12 | 122,485 | 858.7 | 122,485 | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| March | 93,640 | 3,376.13 | 128,582 | 787.6 | 128,582 | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| April | 96,360 | 685.55 | 103,455 | 349.1 | 103,455 | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| May | 63,160 | 516.00 | 68,500 | 258.9 | 68,500 | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| June | 38,540 | 291.17 | 41,554 | 70.2 | 41,554 | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| July | 21,040 | 103.20 | 22,108 | 38.4 | 22,108 | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| August | 17,160 | 309.60 | 20,364 | 89.6 | 20,364 | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| September | 94,820 | 106.89 | 95,926 | 189.3 | 95,926 | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| **TOTAL** | 871,780 | 14,216 | 1,018,910 | 5932 | 1,018,910 | 0 | 0 | 0 | 0 | #DIV/0! | 0 | 0 | 0 | 0 | #DIV/0! |

| | 2007-2008 | | | | | 2008-2009 | | | | | 2009-2010 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Month** | **Billed Elect Energy (kWh)** | **Billed Natural Gas ($m^3$)** | **Total Energy Consumption (kWh)** | **HDD (°C days/ mo)** | **Energy Normalized to 2004-2005 (kWh)** | **Billed Elect Energy (kWh)** | **Billed Natural Gas ($m^3$)** | **Total Energy Consumption (kWh)** | **HDD (°C days/ mo)** | **Energy Normalized to 2004-2005 (kWh)** | **Billed Elect Energy (kWh)** | **Billed Natural Gas ($m^3$)** | **Total Energy Consumption (kWh)** | **HDD (°C days/ mo)** | **Energy Normalized to 2004-2005 (kWh)** |
| October | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| November | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| December | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| January | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| February | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| March | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| April | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| May | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| June | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| July | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| August | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| September | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| **TOTAL** | 0 | 0 | 0 | 0 | #DIV/0! | 0 | 0 | 0 | 0 | #DIV/0! | 0 | 0 | 0 | 0 | #DIV/0! |

**Notes**

* Energy consumption should be recorded following the implementation of the energy saving opportunities.

1. Enter the year in row 3 of this table (starting in column E,F,G).
2. Enter the "Billed Elec Energy" (in kWh) and the "Billed Natural Gas Energy" in ($m^3$) taken from the electricity and natural gas bills, respectively next to the appropriate month.
3. Go to the following website to collect information on the Heating Degree Days for Swan River, Mb: http://www.climate.weatheroffice.ec.gc.ca/climateData/dailydata_e.html?timeframe=2&Prov=CA&StationID=10188&Year=2005&Month=8
4. Once you've arrived at this website, select the appropriate month and click the mouse on "GO"
5. From this website, record the last number highlighted in blue (refer to page F24) in the column "Heat Deg Days". This number should be entered under the heading HDD of this table, next to the appropriate month.
6. The "Energy Normalized to 2004-2005" will be calculated automatically and this point will show up on the Energy Consumption graph.

**Figure F.8 - Energy Consumption Monitoring Graph for the Centennial Arena**

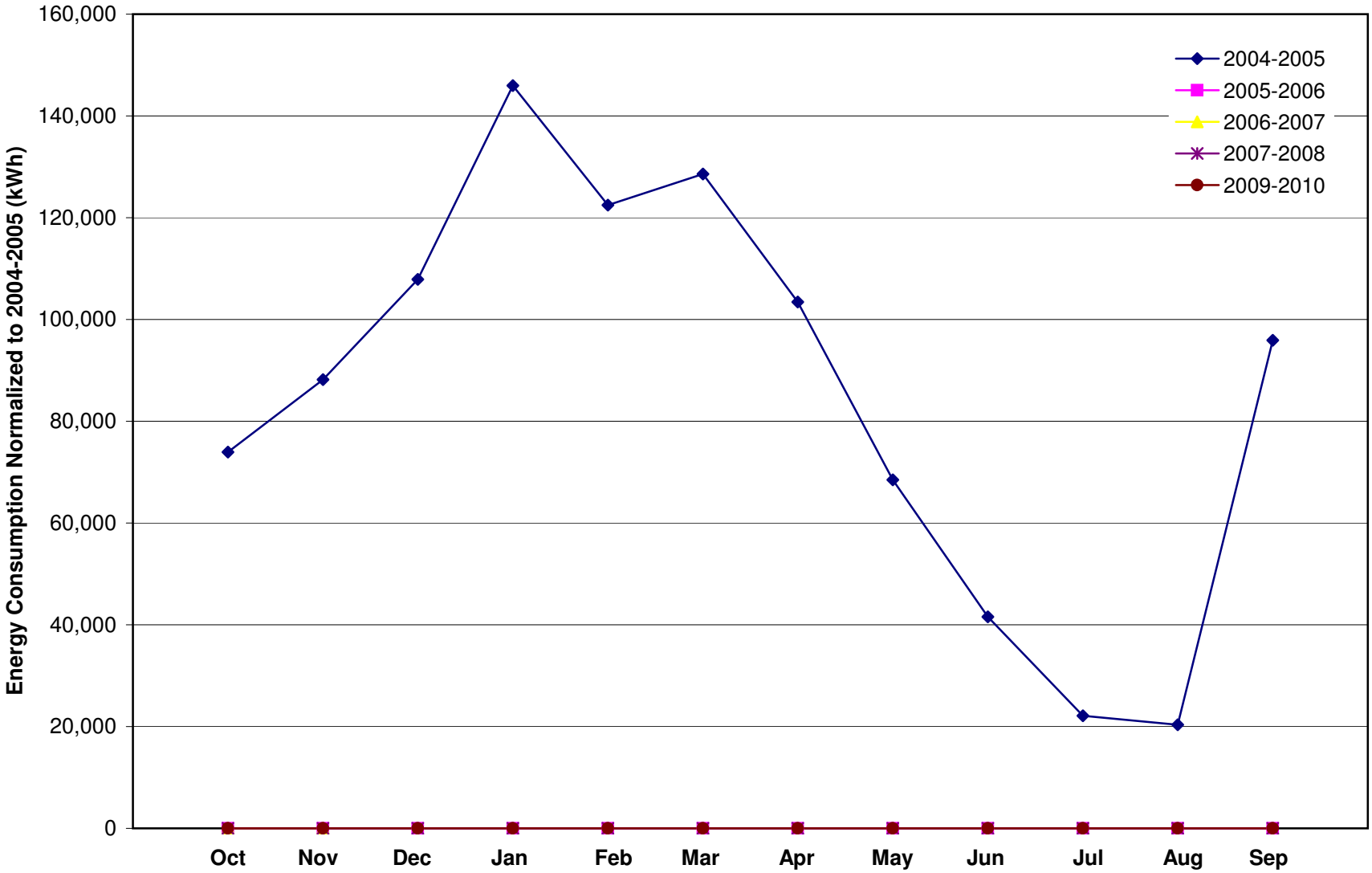


**Table F.9 - Energy Consumption Monitoring Data for the Outdoor Swimming Pool**

| | 2004-2005 | | | | | 2005-2006 | | | | | 2006-2007 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Month** | **Billed Elect Energy (kWh)** | **Billed Natural Gas ($m^3$)** | **Total Energy Consumption (kWh)** | **HDD (°C days/ mo)** | **Energy Normalized to 2004-2005 (kWh)** | **Billed Elect Energy (kWh)** | **Billed Natural Gas ($m^3$)** | **Total Energy Consumption (kWh)** | **HDD (°C days/ mo)** | **Energy Normalized to 2004-2005 (kWh)** | **Billed Elect Energy (kWh)** | **Billed Natural Gas ($m^3$)** | **Total Energy Consumption (kWh)** | **HDD (°C days/ mo)** | **Energy Normalized to 2004-2005 (kWh)** |
| October | 2,330 | 0.00 | 2,330 | 429.8 | 2,330 | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| November | 0 | 0.00 | 0 | 609.5 | 0 | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| December | 1,580 | 0.00 | 1,580 | 1102.7 | 1,580 | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| January | 0 | 0.00 | 0 | 1147.9 | 0 | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| February | 1,830 | 0.00 | 1,830 | 858.7 | 1,830 | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| March | 0 | 0.00 | 0 | 787.6 | 0 | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| April | 1,870 | 0.00 | 1,870 | 349.1 | 1,870 | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| May | 0 | 2187.90 | 22,644 | 258.9 | 22,644 | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| June | 1,790 | 3993.12 | 43,118 | 70.2 | 43,118 | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| July | 1,430 | 3399.70 | 36,616 | 38.4 | 36,616 | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| August | 2,960 | 3984.80 | 44,201 | 89.6 | 44,201 | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| September | 1,050 | 856.86 | 9,918 | 189.3 | 9,918 | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| **TOTAL** | 14,840 | 14,422 | 164,107 | 5932 | 164,107 | 0 | 0 | 0 | 0 | #DIV/0! | 0 | 0 | 0 | 0 | #DIV/0! |

| | 2007-2008 | | | | | 2008-2009 | | | | | 2009-2010 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Month** | **Billed Elect Energy (kWh)** | **Billed Natural Gas ($m^3$)** | **Total Energy Consumption (kWh)** | **HDD (°C days/ mo)** | **Energy Normalized to 2004-2005 (kWh)** | **Billed Elect Energy (kWh)** | **Billed Natural Gas ($m^3$)** | **Total Energy Consumption (kWh)** | **HDD (°C days/ mo)** | **Energy Normalized to 2004-2005 (kWh)** | **Billed Elect Energy (kWh)** | **Billed Natural Gas ($m^3$)** | **Total Energy Consumption (kWh)** | **HDD (°C days/ mo)** | **Energy Normalized to 2004-2005 (kWh)** |
| October | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| November | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| December | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| January | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| February | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| March | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| April | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| May | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| June | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| July | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| August | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| September | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| **TOTAL** | 0 | 0 | 0 | 0 | #DIV/0! | 0 | 0 | 0 | 0 | #DIV/0! | 0 | 0 | 0 | 0 | #DIV/0! |

**Notes**

* Energy consumption should be recorded following the implementation of the energy saving opportunities.

1. Enter the year in row 3 of this table (starting in column E,F,G).
2. Enter the "Billed Elec Energy" (in kWh) and the "Billed Natural Gas Energy" in ($m^3$) taken from the electricity and natural gas bills, respectively next to the appropriate month.
3. Go to the following website to collect information on the Heating Degree Days for Swan River, Mb: http://www.climate.weatheroffice.ec.gc.ca/climateData/dailydata_e.html?timeframe=2&Prov=CA&StationID=10188&Year=2005&Month=8
4. Once you've arrived at this website, select the appropriate month and click the mouse on "GO"
5. From this website, record the last number highlighted in blue (refer to page F24) in the column "Heat Deg Days". This number should be entered under the heading HDD of this table, next to the appropriate month.
6. The "Energy Normalized to 2004-2005" will be calculated automatically and this point will show up on the Energy Consumption graph.

**Figure F.9 - Energy Consumption Monitoring Graph for the Outdoor Swimming Pool**

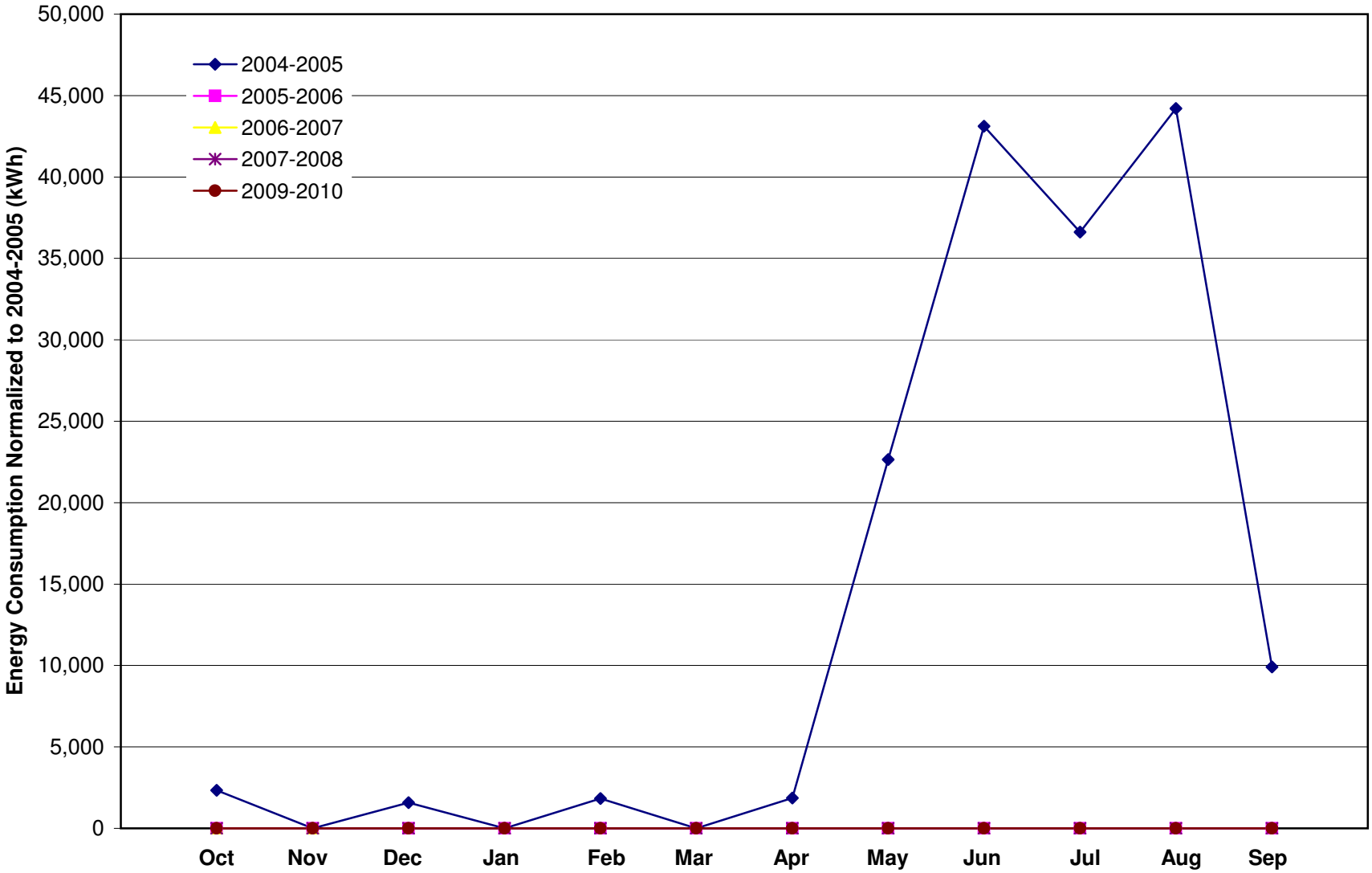


**Table F.10 - Energy Consumption Monitoring Data for the Town Fire Hall**

| | 2004-2005 | | | | | 2005-2006 | | | | | 2006-2007 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Month** | **Billed Elect Energy (kWh)** | **Billed Natural Gas ($m^3$)** | **Total Energy Consumption (kWh)** | **HDD (°C days/ mo)** | **Energy Normalized to 2004-2005 (kWh)** | **Billed Elect Energy (kWh)** | **Billed Natural Gas ($m^3$)** | **Total Energy Consumption (kWh)** | **HDD (°C days/ mo)** | **Energy Normalized to 2004-2005 (kWh)** | **Billed Elect Energy (kWh)** | **Billed Natural Gas ($m^3$)** | **Total Energy Consumption (kWh)** | **HDD (°C days/ mo)** | **Energy Normalized to 2004-2005 (kWh)** |
| October | 4,080 | 410.404 | 8,328 | 429.8 | 8,328 | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| November | 5,120 | 41.595 | 5,550 | 609.5 | 5,550 | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| December | 7,360 | 1006.599 | 17,778 | 1102.7 | 17,778 | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| January | 8,880 | 1802.45 | 27,535 | 1147.9 | 27,535 | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| February | 8,560 | 568.465 | 14,443 | 858.7 | 14,443 | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| March | 7,040 | 859.63 | 15,937 | 787.6 | 15,937 | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| April | 7,440 | 332.76 | 10,884 | 349.1 | 10,884 | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| May | 4,720 | 305.03 | 7,877 | 258.9 | 7,877 | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| June | 3,520 | 158.061 | 5,156 | 70.2 | 5,156 | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| July | 3,840 | 5.546 | 3,897 | 38.4 | 3,897 | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| August | 2,960 | 180.245 | 4,825 | 89.6 | 4,825 | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| September | 2,080 | 0 | 2,080 | 189.3 | 2,080 | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| **TOTAL** | 65,600 | 5,671 | 124,291 | 5932 | 124,291 | 0 | 0 | 0 | 0 | #DIV/0! | 0 | 0 | 0 | 0 | #DIV/0! |

| | 2007-2008 | | | | | 2008-2009 | | | | | 2009-2010 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Month** | **Billed Elect Energy (kWh)** | **Billed Natural Gas ($m^3$)** | **Total Energy Consumption (kWh)** | **HDD (°C days/ mo)** | **Energy Normalized to 2004-2005 (kWh)** | **Billed Elect Energy (kWh)** | **Billed Natural Gas ($m^3$)** | **Total Energy Consumption (kWh)** | **HDD (°C days/ mo)** | **Energy Normalized to 2004-2005 (kWh)** | **Billed Elect Energy (kWh)** | **Billed Natural Gas ($m^3$)** | **Total Energy Consumption (kWh)** | **HDD (°C days/ mo)** | **Energy Normalized to 2004-2005 (kWh)** |
| October | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| November | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| December | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| January | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| February | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| March | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| April | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| May | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| June | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| July | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| August | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| September | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| **TOTAL** | 0 | 0 | 0 | 0 | #DIV/0! | 0 | 0 | 0 | 0 | #DIV/0! | 0 | 0 | 0 | 0 | #DIV/0! |

**Notes**

* Energy consumption should be recorded following the implementation of the energy saving opportunities.

1. Enter the year in row 3 of this table (starting in column E,F,G).
2. Enter the "Billed Elec Energy" (in kWh) and the "Billed Natural Gas Energy" in ($m^3$) taken from the electricity and natural gas bills, respectively next to the appropriate month.
3. Go to the following website to collect information on the Heating Degree Days for Swan River, Mb: http://www.climate.weatheroffice.ec.gc.ca/climateData/dailydata_e.html?timeframe=2&Prov=CA&StationID=10188&Year=2005&Month=8
4. Once you've arrived at this website, select the appropriate month and click the mouse on "GO"
5. From this website, record the last number highlighted in blue (refer to page F24) in the column "Heat Deg Days". This number should be entered under the heading HDD of this table, next to the appropriate month.
6. The "Energy Normalized to 2004-2005" will be calculated automatically and this point will show up on the Energy Consumption graph.

**Figure F.10 - Energy Consumption Monitoring Graph for the Town Fire Hall**

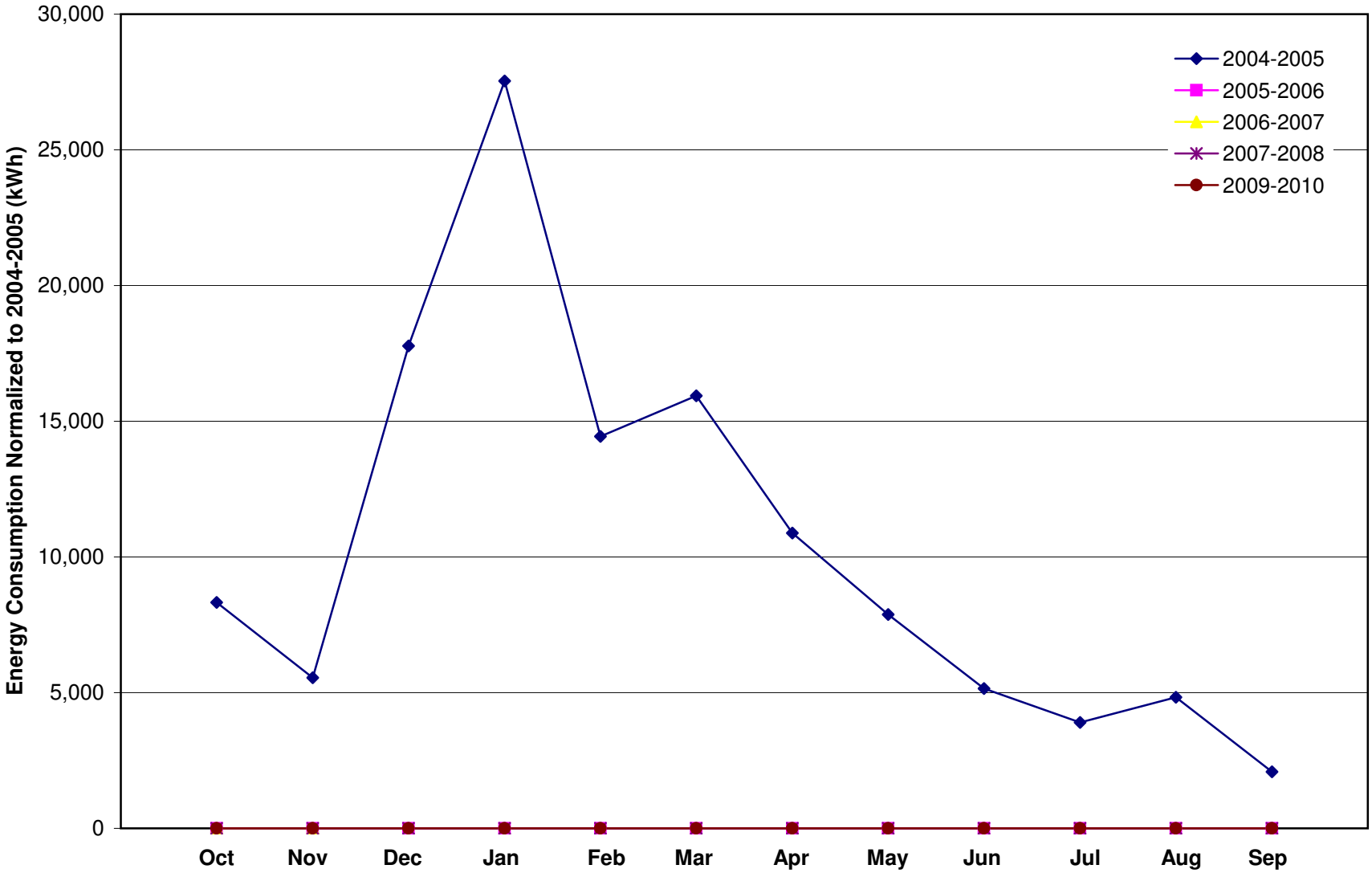


**Table F.11 - Energy Consumption Monitoring Data for the Library**

| | 2004-2005 | | | | | 2005-2006 | | | | | 2006-2007 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Month** | **Billed Elect Energy (kWh)** | **Billed Natural Gas ($m^3$)** | **Total Energy Consumption (kWh)** | **HDD (°C days/ mo)** | **Energy Normalized to 2004-2005 (kWh)** | **Billed Elect Energy (kWh)** | **Billed Natural Gas ($m^3$)** | **Total Energy Consumption (kWh)** | **HDD (°C days/ mo)** | **Energy Normalized to 2004-2005 (kWh)** | **Billed Elect Energy (kWh)** | **Billed Natural Gas ($m^3$)** | **Total Energy Consumption (kWh)** | **HDD (°C days/ mo)** | **Energy Normalized to 2004-2005 (kWh)** |
| October | 3,520 | 263.435 | 6,246 | 429.8 | 6,246 | | 0 | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| November | 3,160 | 169.153 | 4,911 | 609.5 | 4,911 | | 0 | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| December | 4,360 | 640.563 | 10,990 | 1102.7 | 10,990 | | 0 | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| January | 4,600 | 1031.556 | 15,276 | 1147.9 | 15,276 | | 0 | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| February | 4,440 | 360.49 | 8,171 | 858.7 | 8,171 | | 0 | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| March | 3,560 | 549.054 | 9,243 | 787.6 | 9,243 | | 0 | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| April | 3,600 | 219.067 | 5,867 | 349.1 | 5,867 | | 0 | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| May | 3,400 | 160.834 | 5,065 | 258.9 | 5,065 | | 0 | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| June | 3,000 | 99.828 | 4,033 | 70.2 | 4,033 | | 0 | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| July | 3,480 | 2.773 | 3,509 | 38.4 | 3,509 | | 0 | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| August | 4,000 | 116.466 | 5,205 | 89.6 | 5,205 | | 0 | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| September | 3,120 | 0 | 3,120 | 189.3 | 3,120 | | 0 | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| **TOTAL** | 44,240 | 3,613 | 81,636 | 5932 | 81,636 | 0 | 0 | 0 | 0 | #DIV/0! | 0 | 0 | 0 | 0 | #DIV/0! |

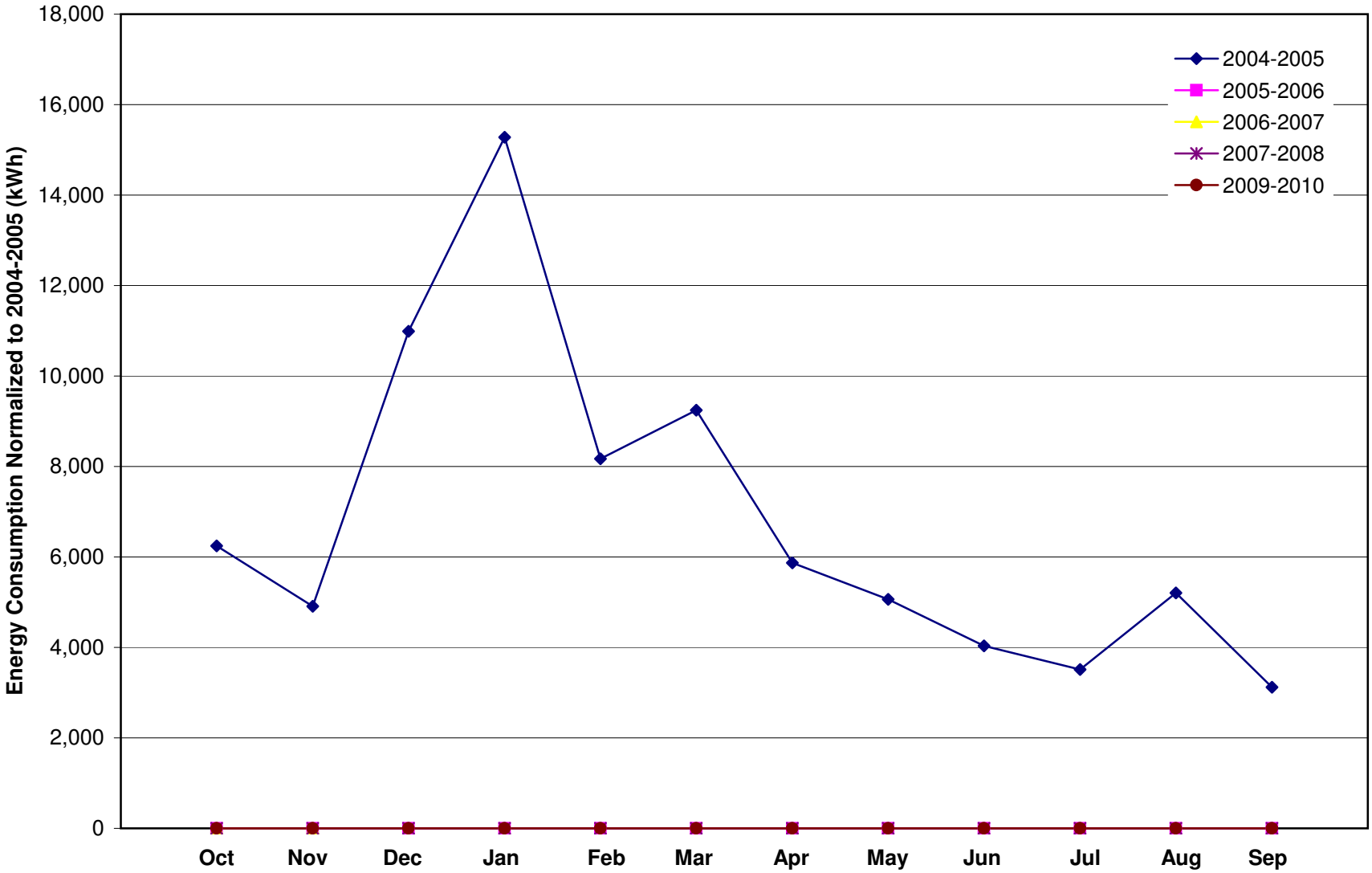
| | 2007-2008 | | | | | 2008-2009 | | | | | 2009-2010 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Month** | **Billed Elect Energy (kWh)** | **Billed Natural Gas ($m^3$)** | **Total Energy Consumption (kWh)** | **HDD (°C days/ mo)** | **Energy Normalized to 2004-2005 (kWh)** | **Billed Elect Energy (kWh)** | **Billed Natural Gas ($m^3$)** | **Total Energy Consumption (kWh)** | **HDD (°C days/ mo)** | **Energy Normalized to 2004-2005 (kWh)** | **Billed Elect Energy (kWh)** | **Billed Natural Gas ($m^3$)** | **Total Energy Consumption (kWh)** | **HDD (°C days/ mo)** | **Energy Normalized to 2004-2005 (kWh)** |
| October | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| November | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| December | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| January | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| February | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| March | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| April | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| May | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| June | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| July | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| August | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| September | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! | | | 0 | | #DIV/0! |
| **TOTAL** | 0 | 0 | 0 | 0 | #DIV/0! | 0 | 0 | 0 | 0 | #DIV/0! | 0 | 0 | 0 | 0 | #DIV/0! |

**Notes**

* Energy consumption should be recorded following the implementation of the energy saving opportunities.

1. Enter the year in row 3 of this table (starting in column E,F,G).
2. Enter the "Billed Elec Energy" (in kWh) and the "Billed Natural Gas Energy" in ($m^3$) taken from the electricity and natural gas bills, respectively next to the appropriate month.
3. Go to the following website to collect information on the Heating Degree Days for Swan River, Mb: http://www.climate.weatheroffice.ec.gc.ca/climateData/dailydata_e.html?timeframe=2&Prov=CA&StationID=10188&Year=2005&Month=8
4. Once you've arrived at this website, select the appropriate month and click the mouse on "GO"
5. From this website, record the last number highlighted in blue (refer to page F24) in the column "Heat Deg Days". This number should be entered under the heading HDD of this table, next to the appropriate month.
6. The "Energy Normalized to 2004-2005" will be calculated automatically and this point will show up on the Energy Consumption graph.

**Figure F.11 - Energy Consumption Monitoring Graph for the Library**



Environment Canada Environnement Canada

[français] [Back]

# Daily Data Report for August 2005

*Notes on Data Quality.*

## SWAN RIVER (AUT)
## MANITOBA

Latitude: 52° 7' N Longitude: 101° 13' W Elevation: 334.80 m

Climate ID: 504K80K WMO ID: 71443 TC ID: WEQ

**Daily Data Report for August 2005**

| Day | Max Temp °C | Min Temp °C | Mean Temp °C | Heat Deg Days C | Cool Deg Days C | Total Rain mm | Total Snow cm | Total Precip mm | Snow on Grnd cm | Dir of Max Gust 10's Deg | Spd of Max Gust km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 01 | 31.0 | 15.9 | 23.5 | 0.0 | 5.5 | 0.0 | 0.0 | 0.0 | 0 | | |
| 02 | 31.9 | 15.2 | 23.6 | 0.0 | 5.6 | 0.0 | 0.0 | 0.0 | 0 | | |
| 03 | 23.8 | 11.1 | 17.5 | 0.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0 | | |
| 04 | 25.5 | 11.3 | 18.4 | 0.0 | 0.4 | 0.0 | 0.0 | 0.0 | 0 | | |
| 05 | 32.0 | 10.6 | 21.3 | 0.0 | 3.3 | 0.0 | 0.0 | 0.0 | 0 | | |
| 06 | 28.6 | 12.2 | 20.4 | 0.0 | 2.4 | 0.0 | 0.0 | 0.0 | 0 | | |
| 07 | 30.7 | 10.7 | 20.7 | 0.0 | 2.7 | 0.0 | 0.0 | 0.0 | 0 | | |
| 08 | 25.3 | 11.9 | 18.6 | 0.0 | 0.6 | 0.0 | 0.0 | 0.0 | 0 | | |
| 09 | 23.1 | 9.1 | 16.1 | 1.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0 | | |
| 10 | 20.7 | 7.2 | 14.0 | 4.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0 | | |
| 11 | 20.4 | 8.6 | 14.5 | 3.5 | 0.0 | 0.6 | 0.0 | 0.6 | 0 | | |
| 12 | 17.7 | 7.3 | 12.5 | 5.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0 | | |
| 13 | 20.1 | 5.2 | 12.7 | 5.3 | 0.0 | 0.2 | 0.0 | 0.2 | 0 | | |
| 14 | 22.0 | 10.4 | 16.2 | 1.8 | 0.0 | 1.8 | 0.0 | 1.8 | 0 | | |
| 15 | 19.4 | 5.0 | 12.2 | 5.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0 | | |
| 16 | 19.3 | 3.0 | 11.2 | 6.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0 | | |
| 17 | 13.9 | 10.6 | 12.3 | 5.7 | 0.0 | 5.2 | 0.0 | 5.2 | 0 | | |
| 18 | 15.3 | 8.2 | 11.8 | 6.2 | 0.0 | 31.8 | 0.0 | 31.8 | 0 | | |
| 19 | 17.9 | 5.6 | 11.8 | 6.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0 | | |
| 20 | 17.0 | 7.5 | 12.3 | 5.7 | 0.0 | 0.2 | 0.0 | 0.2 | 0 | | |
| 21 | 21.0 | 5.3 | 13.2 | 4.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0 | | |
| 22 | 28.5 | 5.1 | 16.8 | 1.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0 | | |
| 23 | 29.0 | 11.7 | 20.4 | 0.0 | 2.4 | 0.0 | 0.0 | 0.0 | 0 | | |
| 24 | 22.6 | 16.2 | 19.4 | 0.0 | 1.4 | 4.8 | 0.0 | 4.8 | 0 | | |
| 25 | 17.4 | 8.1 | 12.8 | 5.2 | 0.0 | 0.6 | 0.0 | 0.6 | 0 | | |
| 26 | 20.2 | 11.1 | 15.7 | 2.3 | 0.0 | 1.8 | 0.0 | 1.8 | 0 | | |
| 27 | 23.3 | 10.6 | 17.0 | 1.0 | 0.0 | 0.2 | 0.0 | 0.2 | 0 | | |
| 28 | 19.0 | 7.2 | 13.1 | 4.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0 | | |
| 29 | 24.2 | 5.2 | 14.7 | 3.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0 | | |
| 30 | 26.0 | 5.7 | 15.9 | 2.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0 | | |
| 31 | 14.9 | 9.3 | 12.1 | 5.9 | 0.0 | 58.0 | 0.0 | 58.0 | 0 | | |
| **Sum** | | | | **89.6** | **24.3** | **105.2** | **0.0** | **105.2** | | | |
| **Avg** | **22.6** | **9.1** | **15.9** | | | | | | | | |
| **Xtrm** | **32.0** | **3.0** | | | | | | | | | |

## Legend

[empty] = No data available

M = Missing

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# APPENDIX G

# THE MUNICIPALITIES TRADING COMPANY OF MANITOBA LTD. REPORT

# TABLE OF CONTENTS - APPENDIX G

# MEMBER SERVICES

*The Municipalities Trading Company of Manitoba Ltd. (MTCML) allows AMM members to purchase products and services at lower prices through the power of bulk buying. This year was another great success. Sales remained consistent and the stable pool of official suppliers continued to change and grow. The products sales have consistently remained between 6.5 and 7.4 million dollars for the last 4 years.*

*The MTCML provides a major source of revenue for the AMM and allows the AMM membership dues to remain one of the lowest in Canada. This past year, the MTCML was able to rebate another $350,000 to our members based on their MTCML sales, bringing the cumulative rebate over the past four years to $1,250,000.*

## MTCML Official Suppliers

Official Suppliers are very important to the success of the MTCML. These suppliers offer hundreds of products and services that municipalities use. The Trading Company has individual contracts with each of these suppliers that ensure the best possible pricing for the purchasing members. In return, suppliers have direct contact with Manitoba's municipal market and can be a part of regular marketing opportunities through the AMM (mailings, Convention, trade shows, etc.) Each of our suppliers has shown long term commitment to the MTCML, creating a stable purchasing environment for the members of the AMM.

## Corporate Members

At present fourteen companies make up the Corporate Members list of the AMM, five of these new for 2004/2005. These members assist the buying group in providing many services and hosting various events throughout the year.

*Last year, the MTCML was able to rebate **$350,000** to our members based on their MTCML sales, bringing the total rebate over the past four years to **$1,250,000**.*

## Major Programs

There are also two major buying programs offered by the Trading Company. These programs are owned by the AMM membership, managed by the AMM and each administered by a company that has expertise in the program area.

## Petroleum Products Buying Group (PPBG)

AMM has entered into contracts with both Imperial Oil and Petro Canada, on behalf of all of our participating Members, for the supply of gasoline, diesel and lubricants. Our objective is to combat one-sided pricing advantages enjoyed by petroleum suppliers and to assist our Members to purchase fuel at a lower cost while still supporting the local fuel dealers. Currently there are 77 AMM Members who purchase over 6,000,000 litres of fuel each year and about 130 other municipalities in Saskatchewan and Alberta who purchase an additional 29,000,000 litres of fuel annually.

The concept of AMM purchasing large volumes of fuel on behalf of our Members and the careful analysis of industry pricing means fuel savings for member municipalities in all three provinces. At the same time, local fuel dealers are supported. The program is administered by Prairie Fuel Advisors Inc., who also act as our purchasing agent.

The only cost for joining the PPBG is 1.2¢ per litre for the fuel purchased and 10¢ per litre for lubricants. A municipality may withdraw from the PPBG at any time, and there is no cost to withdraw.

M.T.C.M.L.

# MEMBER SERVICES

M.T.C.M.L.

## Insurance

All AMM members outside of Winnipeg participate in the insurance program, administered by Hayhurst Elias Dudek on behalf of the AMM. Coverage includes property/road machinery and equipment; crime (loss of money); comprehensive general liability; errors and omissions liability; environmental impairment (pollution) liability; fire vehicle insurance; plus accident insurance for Councils, fire departments, ambulance services, and other 'volunteers'.

A major part of the program is the $3,500,000 annual self-insurance loss pool that keeps premiums much lower than if individual municipalities purchased their own coverage. Insurance is purchased from various providers for coverage in excess of the $3,500,000 annual loss pool amount, to provide complete protection. This allows the opportunity for significant refunds in low-claims years.

Last year, the AMM was able to offer an average 5% reduction in our insurance rates. As well, as a result of excellent risk management by municipalities, the AMM was able to refund $918,000 to municipalities out of the insurance loss pool.

*Official Suppliers have shown long-term commitment to the MTCML.*

## MTCML Official Suppliers

*Acklands Grainger Inc.*
*Airmaster Sales*
*Armtec*
*Bridgestone Canada Inc.*
*CD Awards*
*Darwen Road Technologies Ltd.*
*Denray Tire*
*Dust Free Road Maintenance*
*Fort Distributors Ltd.*
*Grand & Toy*
*Guardian Traffic Services Manitoba Ltd.*
*Hayhurst Elias Dudek Inc.*
*Kal Tire*
*MTS*
*Michelin*
*Norquay Printers Ltd.*
*PCO Orkin Swat Team*
*Prairie Fuel Advisors Inc.*
*Shippam & Associates Inc.*
*Souris Rock Shop*
*Tirecraft*
*Westcon Equipment & Rentals*
*Westman Steel Industries*

## AMM Corporate Members

*Borland Construction*
*Cochrane Engineering*
*Guertin Equipment*
*Hayhurst Elias Dudek*
*Innovative Municipal Products Inc.*
*Manitoba Aboriginal and Northern Affairs*
*Manitoba Heavy Construction Association*
*Manitoba Hydro*
*Manitoba Mixed Concrete Association*
*Manitoba Pork Council*
*Mazer Group Construction Equipment*
*Robert Watson, Attorney*
*Strong-Coley & Associates*
*Westcon Equipment & Rentals Ltd.*